TWENTY-FIRST ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM.

SEVENTEENTH ANNUAL REPORT

OF THE

AGRICULTURAL AND EXPERIMENTAL UNION

1895.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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1896.

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To the Honor

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ONTARIO AGRICULTURAL COLLEGE

AND EXPERIMENTAL FARM.

1895.

GUELPH, January 2nd, 1896.

To the Honorable JOHN DRYDEN,
Minister of Agriculture :

SIR,—I have the honor to transmit herewith the Twenty-first Annual Report of the Ontario Agricultural College and Experimental Farm.

In this report, the work of the year 1895 has been briefly reviewed under the following heads :

PART	I.	REPORT OF PRESIDENT.
PART	II.	REPORT OF ASSISTANT RESIDENT MASTER.
PART	III.	REPORT OF PROFESSOR OF GEOLOGY AND NATURAL HISTORY.
PART	IV.	REPORT OF PROFESSOR OF CHEMISTRY.
PART	V.	REPORT OF THE PROFESSOR OF VETERINARY SCIENCE.
PART	VI.	REPORT OF PROFESSOR OF DAIRYING.
PART	VII.	REPORT OF AGRICULTURIST.
PART	VIII.	REPORT OF HORTICULTURIST.
PART	IX.	REPORT OF BACTERIOLOGIST.
PART	X.	REPORT OF EXPERIMENTALIST.
PART	XI.	REPORT OF FARM SUPERINTENDENT.
PART	XII.	REPORT OF MANAGER OF POULTRY DEPARTMENT.
PART	XIII.	REPORT OF APICULTURIST.
PART	XIV.	REPORT OF PHYSICIAN.

APPENDICES—I TO V INCLUSIVE.

I have the honor to be, Sir,
Your obedient Servant,

JAMES MILLS,
President.

THE ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM, GUELPH, ONT.

HON. JOHN DRYDEN, Toronto, Ont.,
Minister of Agriculture for Ontario.

JAMES MILLS, M.A., LL.D.	President.
J. H. PANTON, M.A., F.G.S.	Professor of Natural History and Geology.
A. E. SHUTTLEWORTH, B.A. Sc	Professor of Chemistry.
J. H. REED, V.S.	Professor of Veterinary Science.
H. H. DEAN, B.S.A.	Professor of Dairy Husbandry.
WM. RENNIE	Farm Superintendent.
C. A. ZAVITZ, B.S.A.	Experimentalist.
G. E. DAY, B.S.A.	Agriculturist.
H. L. HUTT, B.S.A.	Horticulturist.
F. C. HARRISON, B.S.A.	Bacteriologist.
J. B. REYNOLDS, B.A.	Assistant Resident Master.
R. HARCOURT, B.S.A.	Assistant Chemist.
L. G. JARVIS	Manager and Lecturer in Poultry Department.
R. F. HOLTERMANN	Lecturer on Apiculture.
CAPTAIN WALTER CLARKE	Instructor in Drill and Gymnastics.
W. O. STEWART, M.D.	Physician.
G. A. PUTNAM	Stenographer.
A. McCALLUM	Bursar.

ADVISORY BOARD.

JOHN I. HOBSON, *Chairman*	Mosborough, County of Wellington.
JOHN McMILLAN, M.P.	Constance, County of Huron.
EDWARD JEFFS	Bond Head, County of Simcoe.
J. S. SMITH	Maple Lodge, County of Middlesex.
G. B. BOYCE	Norham, County of Northumberland.
D. A. DOWLING	Appleton, County of Carleton.
WM. DONALDSON	South Zorra, County of Oxford.
C. C. JAMES, *Secretary*	Deputy Minister of Agriculture, Toronto.

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PART I.

REPORT OF THE PRESIDENT.

Our work during the past year has been pleasant, and in every way satisfactory. There has been perfect harmony among the officers of the institution, and every department has earnestly striven to do the best possible, both for the students in attendance and for the country at large. Within the last week or ten days, I have read twelve of the parts into which our report for 1895 is divided, and I have no hesitation in saying that the work done and instruction given, are on practical lines and in keeping with the great agricultural province which we have the honor to represent.

CERTAIN CONDITIONS AFFECTING THE COLLEGE.

Our College is unique among the institutions which provide education for the people of this province. It is the only educational institution in Ontario, excepting commercial schools and ladies' colleges, which has to rely wholly upon its merits. Students are legislated into our high schools, universities, theological halls, law school, medical schools, dental college, College of Pharmacy, and Veterinary College. If men and women were allowed to teach, preach, and practise law, medicine, dentistry, pharmacy, and the veterinary art, without passing a prescribed examination, the attendance of students at high schools, universities, and most of our technical schools and colleges, would be only a small fraction of what it is at the present time. Very few seek knowledge for its own sake.

If we could secure the enactment of a law which would compel people to pass a prescribed literary and professional examination before engaging in general agriculture, stock-raising, dairying, market gardening, or fruit growing, it would require a score of agricultural colleges in this province to accommodate the young men who would seek instruction in agriculture and the sciences related thereto. But, under present conditions, persons can engage in agricultural pursuits without any kind of preparation; and agricultural colleges, not having behind them the potent leverage of legal enactments, have to depend for their attendance solely upon the character of the education which they give, and upon the desire of young men here and there to obtain knowledge for its own sake, and for the possible advantage which it may be to them in their efforts to make a living. Under such circumstances, it is not surprising that the attendance of students at purely agricultural colleges is usually small.

Further, low prices for the products of the farm, and other things which make farming less profitable or less desirable as an occupation, have a two-fold tendency as regards education: First, to reduce the attendance of students at agricultural colleges; secondly, to drive young men from the farm to the high schools, and thence to the university or one of the technical colleges, with a view to gaining admission into some of the learned or other professions, where they each hope to make an easier and more respectable living than is possible on the farm.

Students in Attendance.

The number of students at the College in 1895 was 250—150 in the general course and 100 in the dairy school. Of those in the general course, exactly 80 per cent.—nearly all farmers' sons—were from the Province of Ontario. Six of the 100 dairy students were non-residents—four from Quebec and the eastern provinces, one from the United States, and one from Wales. See Nos. 3 and 4, Appendix I to this report.

County Students.

Each county in the province is allowed to send one student free of tuition, and the nomination is made by the county council. Of those on the roll in 1895, forty-five were so nominated, and as a consequence were exempted from the payment of tuition fees. The counties represented were the following:

Addington, Brant, Bruce, Carleton, Dundas, Elgin, Essex, Frontenac, Glengarry, Grey, Halton, Hastings, Huron, Lambton, Lanark, Leeds. Lennox, Middlesex, Muskoka, Northumberland, Ontario, Parry Sound, Peel, Perth, Prescott, Prince Edward, Renfrew, Russell, Simcoe, Victoria, Waterloo, Welland, Wellington, Wentworth.

Analysis of College Roll (See Appendix I.)

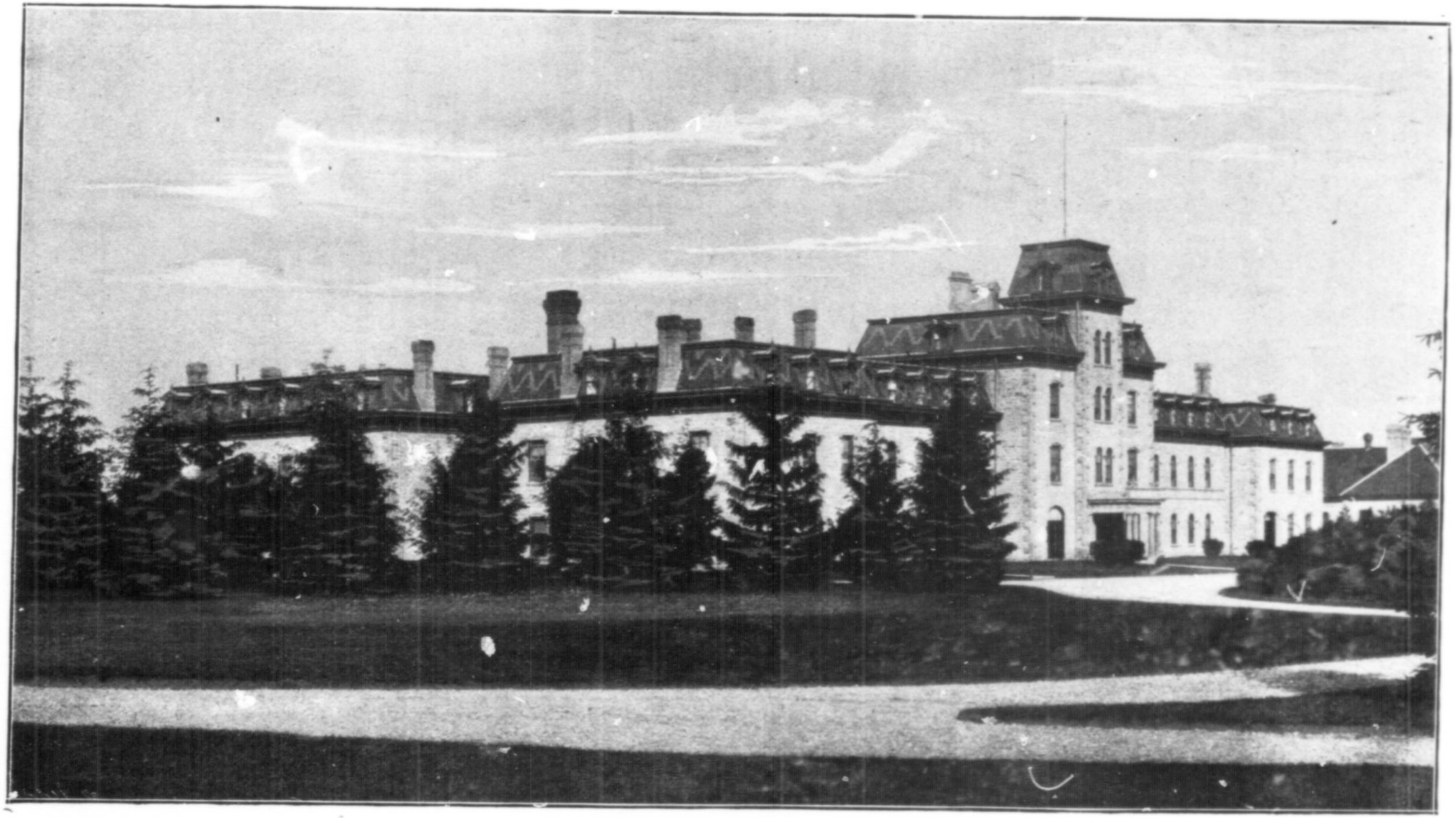
1. *General Course.*

(1) From Ontario.

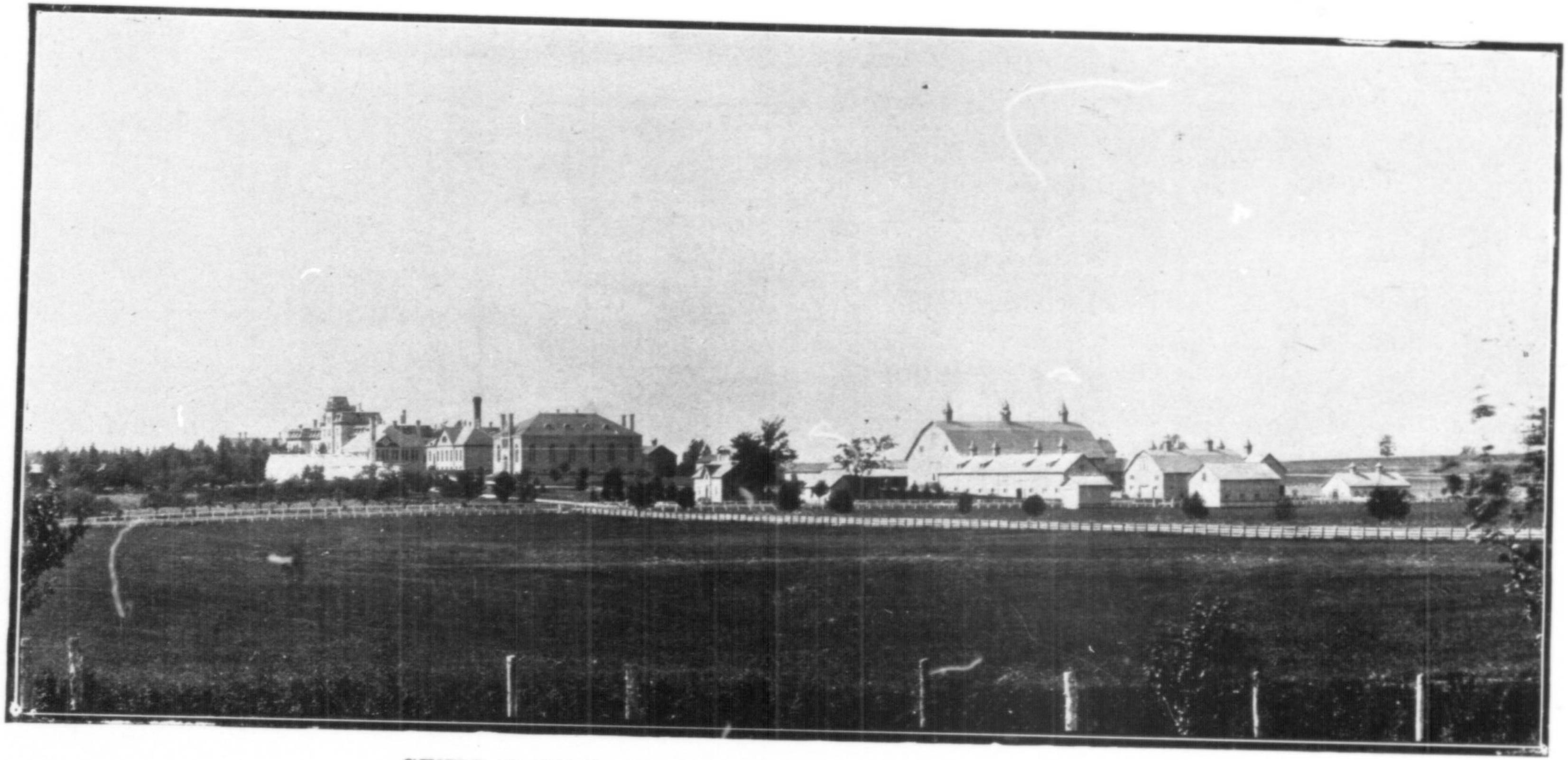
Counties, etc.	Students.	Counties, etc.	Students.
Addington	1	Muskoka	3
Brant	4	Northumberland	2
Bruce	1	Ontario	2
Carleton	2	Oxford	3
Dundas	7	Parry Sound	4
Durham	2	Peel	1
Elgin	1	Perth	6
Essex	3	Peterboro'	2
Frontenac	4	Prescott	3
Glengarry	5	Prince Edward	1
Grey	4	Renfrew	1
Haldimand	1	Russell	3
Halton	3	Simcoe	8
Hastings	1	Victoria	2
Huron	4	Waterloo	2
Kent	1	Welland	1
Lambton	1	Wellington	6
Lanark	3	Wentworth	1
Leeds	1	York	3
Lennox	2	Toronto	10
Lincoln	2		
Middlesex	3		120

(2) From Other Provinces of the Dominion.

Provinces, etc.	Students.	Provinces, etc.	Students.
British Columbia	3	Prince Edward Island	2
Manitoba	1	Quebec	3
Nova Scotia	3		
			12



ONTARIO AGRICULTURAL COLLEGE, GUELPH.



GENERAL VIEW OF COLLEGE AND FARM BUILDINGS.

Countries.

Bermuda ...
England ....
France......
India ......

Counties, etc.

Brant ......
Bruce ......
Carleton ....
Dundas ....
Elgin ......
Glengarry ..
Grey ......
Grenville....
Haldimand ..
Halton .....
Huron.......
Kent ......
Lambton ...
Lanark ....
Leeds ......
Lennox ....
Middlesex ...
Northumberlan
Norfolk .....

This analysis
Forty-one countie
in the dairy cours
seven, Perth six,
In the dairy cours
eight from Wellir
Bruce, Carleton, I

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19............
25.......
24............
19............
16............
9............
7............

A

(3) From Other Countries.

Countries.	Students.	Countries.	Students.
Bermuda	3	Ireland	1
England	7	Scotland	3
France	1	United States	2
India	1		18

Total in General Course—150.

2. *Dairy Course.*

Counties, etc.	Students.	Counties, etc.	Students.
Brant	2	Ontario	3
Bruce	4	Oxford	3
Carleton	4	Peel	1
Dundas	4	Perth	4
Elgin	2	Peterboro'	5
Glengarry	2	Russell	2
Grey	2	Simcoe	1
Grenville	1	Stormont	3
Haldimand	1	Victoria	1
Halton	3	Waterloo	2
Huron	5	Wellington	8
Kent	1	York	10
Lambton	3		
Lanark	2	British Columbia	1
Leeds	3	New Brunswick	1
Lennox	3	Nova Scotia	1
Middlesex	3	Ohio	1
Northumberland	3	Quebec	1
Norfolk	3	Wales	1

Total of dairy students—100.

This analysis shows that students in both courses came from all parts of the province. Forty-one counties and districts were represented in the general course, and thirty-one in the dairy course. For the general course, the county of Simcoe sent eight, Dundas seven, Perth six, Wellington six, Glengarry five, and other counties smaller numbers. In the dairy course, the largest number was from York, which sent ten. There were eight from Wellington, five from Huron, five from Peterborough, and four each from Bruce, Carleton, Dundas, and Perth.

Age of Students in General Course.

7	16 years of age.	6	24 years of age.
19	17 "	8	25 "
25	18 "	3	26 "
24	19 "	3	27 "
19	20 "	2	29 "
16	21 "	1	30 "
9	22 "	1	32 "
7	23 "		

Average age of students in general course—20 years.

Average age of students in dairy course—23 years.

Religious Denominations.

1. *Students in General Course.*

Presbyterians	55	Roman Catholics	3
Methodists	51	Friends	2
Episcopalians	23	Protestant	1
Baptists	11		
Congregationalists	4	Total	150

2. *Students in Dairy Course.*

Methodists	35	Congregationalists	2
Presbyterians	34	Christian Church	2
Baptists	11	United Brethren	1
Episcopalians	11		
Catholics	4	Total	100

A Preparatory Department.

For some years we refused admission to all who were unable to pass our matriculation examination, which is the same as that fixed by law for entrance into the high schools of the province; and, considering the number and character of our public schools, we could see no reason why we should not do so. This course was simple and in many respects satisfactory; but it resulted in the admission of a large proportion of city boys and others who readily passed the required examination, but did little or nothing thereafter. This injured our reputation among the farmers and with other people who were being constantly influenced by reports and stories about the character and conduct of our students. Hence we made the terms of admission somewhat easier. We admitted a number of farmers' sons who, from one cause or another, had grown up without being well grounded in the elementary branches of an English education. Some of these were very crude; but they knew the value of time—they worked hard, made rapid progress, and did much towards changing the entire character of our college life, so that, at the present time, we have as orderly and well-behaved a lot of students as can be found in any part of the world. The change was very gratifying, but our troubles were not at an end, because we found great difficulty in teaching together students of such varied attainments—university undergraduates, second-class teachers, third-class teachers, some who had just passed the high school entrance examination, and others who had not been at school for five or six years. This difficulty continued from year to year, till in July last we decided to form a preparatory department and ask for an additional master to teach English grammar, composition, arithmetic, drawing, and one or two other branches. With such additional help, we can make a more satisfactory classification of our students, and shall be able to teach all grades to much better advantage.

Fees.

Ontario students not nominated by county councils pay a tuition fee of $20 a year, and non-residents (from other provinces, Great Britain, and elsewhere) pay a fee of $100 the first year, and $50 the second year. If a non-resident student has had a year's experience in practical work on a farm, his tuition fee for the first year is $50.

New Buildings.

The equipment of the institution has been improved during the year by the addition of three new buildings—a large and commodious experimental building, a special piggery for experimental feeding and a dwelling house for the manager of the poultry depart ment.

Fowl kept in close quarters have to be carefully looked after, and while our poultry manager lived in the city (a mile and a half from the College), he could not give his department the early and late attention which it required. Hence we had to provide a house for him on the College grounds—not a large or expensive residence, but a handsome red brick cottage, sufficiently large for an ordinary family, and located within about fifty yards of house No. 1 in the Poultry Department.

For some time our Agriculturist has been anxious to do something more systematic and elaborate in the feeding of stock than has yet been done in this province; but hitherto we have not had our buildings arranged for thoroughly scientific work on this line. Now, however, I think I am warranted in saying that we are fairly well equipped for experimental work in the feeding of cattle, sheep and pigs. We have erected a special piggery for the purpose (see Part VIII of this report), and have overhauled an old barn, changing it into a root-house, feed-room, cattle stable, and sheep-pen, all specially arranged for experimental feeding.

These additions to the buildings of the institution place us in a position to do better work than we have hitherto done in the poultry and live stock departments; but the chief addition to our equipment in 1895 was our new experimental building. This is a large two-storey white brick structure, erected on the College campus, a short distance below the gymnasium. The main portion of it is forty-five by seventy feet, and a wing attached thereto is thirty-eight by fifty-two. In this building there are sixteen rooms—an office, an agricultural museum, three large work-rooms, a tool room, a dark room for photography, and six or seven basement rooms, all for the use of the experimental department; also an office and an agricultural laboratory for the Department of Agriculture; an office, a private laboratory, a work room, and a students' laboratory for the Department of Bacteriology; a class-room for practical instruction in live stock; and a lecture-room for the use of the Agriculturist, the Bacteriologist, and the Professor of Veterinary Science.

Alterations in Buildings—Physical Class-room.

Several alterations in the main Collge building were made in 1895, with a view to securing an additional class-room and providing accommodation for the Superintendent of farmers' institutes. By these changes we have secured suitable quarters for the important department of institute work, and have got a large and nicely furnished class-room for lectures and practical work in physics, and instruction in mechanics, hydrostatics, electricity, etc. With J. B. Reynolds, B.A., a first-class physicist, in charge of this department, we look for excellent results—for work which will be of much practical value to our students in after life. (See Mr. Reynolds's report in Part II of this volume.)

Geology and Biology.

Our course in geology is not an extensive one, but it is sufficiently broad for practical purposes. It embraces a concise but comprehensive statement of the outlines of general geology and a full discussion of the geology of the Dominion of Canada, with a detailed account of soils and soil formation, all illustrated by a complete and systematically arranged geological cabinet.

A reference to our circular for 1895-96 will show that our work in biology is much more extensive, and requires a much wider course of reading than the outline prescribed in the early days of the institution. It now includes the whole field of botany—structural, physiological, systematic, and economic—vegetable histology and plant pathology, a full course of lectures on general geology, and a considerable amount of laboratory practice in both zoology and botany.

Prof. Panton has had charge of the work of this department as usual, excepting the vegetable histology and plant pathology, which were taken by Mr. F. C. Harrison, our bacteriologist. (See Prof. Panton s report in Part III of this volume).

Important Chemical Investigations for the Dairy Department.

In Part IV of this volume will be found a very valuable report of work done in our chemical laboratory during the year 1895. In this report, Professor Shuttleworth gives in detail the results of an elaborate series of experiments in the analysis of milk, whey, and cheese, carried on by the help of four assistant chemists throughout the season, from April to December: (1) to determine the ratio of casein to fat in poor, medium, and rich milk—to ascertain whether it varies as the fat varies or not; (2) to determine whether the fat in milk is the exact measure of its cheese-producing power, that is, whether the cheese made from poor, medium, or rich milk, is exactly in proportion to the fat contained in the milk.

Both these lines of investigation were pursued with great care and accuracy throughout the cheese-making season, for the purpose of assisting Professor Dean and those associated with him in the Dairy Department in their efforts to find a just and satisfactory method of paying patrons for the milk supplied to cheese factories.

Veterinary Science.

Dr. Hugo Reed, our Veterinary Surgeon, looks after the live stock of the institution from year to year, and lectures from four to five hours a week on veterinary anatomy, pathology, materia medica, and obstetrics, giving a broad, accurate, and thoroughly practical knowledge of veterinary science and practice. Dr. Reed's stable lectures and his demonstrations in "practical horse" are specially interesting and profitable to all classes of students. (See Dr. Reed's report in Part V of this volume.)

Important Experimental Work in the Dairy Department.

Since the invention of the Babcock milk-tester, it has generally been admitted by well informed men that the practice of paying for milk at cheese factories by measure or weight is unjust. It gives the man with rich milk much less than his due; and by experiments made at this institution and elsewhere, it has recently been proved beyond question, that this method of payment is so utterly unfair that it should be at once abandoned by all factories which wish to deal justly with their patrons.

Almost immediately after the introduction of the tester, it was argued by prominent dairymen, and especially by Dr. Van Slyke, of the New York Experiment Station, Geneva, N. Y., that the percentage of fat should be made the basis of payment for milk at factories—that the sum paid for each 100 pounds of milk should be exactly in proportion to the amount of fat contained in it. Many maintain that this method does justice to all parties. Certainly no one can deny that it is much fairer than the quantity method; and it has the merit of encouraging the production of good milk.

For a short time, it seemed that the fat basis of payment would be generally adopted; but our Prof. Dean, with the help of our chemist, made some experiments in 1894 which led him to the conclusion that this method gave the man with rich milk something more than his equitable share; and he then took the position that the percentage of fat plus some number, say one per cent., would be a fairer basis of payment than the fat alone. He published a bulletin to that effect, and it made a great commotion among dairymen. It was said that Prof. Dean had been hasty and injudicious in making statements which would seem in any way to discredit the fat method—that he had not sufficient data for his conclusions, etc., etc. The result was that we at once employed a first-class cheese-maker and four additional chemists, to assist our professors in a thorough investigation of the question. They worked continuously for nine and a half months with milk from our own herd, from a number of cows in the neighborhood of Guelph, and from two cheese factories in different parts of this county. Cheese were made from all kinds of milk and according to the best methods known in this country; the milk, whey, and cheese were analyzed by the chemist and his assistants; the cheese were judged from time by recognized experts; and the results obtained from the year's work, unquestionably justify the conclusions announced in 1894, viz., that some number representing the casein of milk should be added to the percentage of fat to get a strictly equitable basis of payment.

Prof. Shuttleworth has suggested an addend which varies somewhat according to the richness of the milk; but Prof. Dean favors the addition of two per cent. (a little less than the average percentage of casein in milk) to all percentages of fat. This, he maintains, is simple, and gives results which are practically correct and fair to all parties.

We have, then, at the present time, three methods of paying for milk supplied to cheese factories in this province:

(1) *The quantity method*, which is utterly unfair and should be abandoned.

(2) *The fat method*, which is very much fairer than the quantity method but is regarded by many as a little too much in favor of the rich milk, that is, milk with about four per cent. of fat and upwards.

(3) *The fat and casein method*, which, so far as we can judge from our experiments, is the most equitable method.

For a full and interesting account of this and other experimental work in the Dairy Department, see Prof. Dean's report in Part VI of this volume.

Dairy School.

The third session of our Dairy School opened on the 15th January last and continued till the 15th March for special dairy students, and half a month longer for students in the regular College course. There were 100 special dairy students in attendance, and the work of instruction in milk-testing, butter-making, cheese-making, and the running of cream separators, was in every way satisfactory. A very considerable proportion of those in attendance succeeded in passing the prescribed examinations on the subjects in the course, and received non-professional certificates. After a year's successful and approved management of a factory, these non-professionals will receive professional certificates.

Dairy Circular.

The following circular was issued in the month of August for the session to commence on the 14th January, 1896:

The Dairy School in connection with the Agricultural College, Guelph, will re-open January 14th, 1896, and remain in session to the 14th March—a period of two months.

Our buildings and equipment are complete, and we are now in a position to offer students a very broad and thorough course of theoretical and practical instruction in dairying. In addition to the ordinary appliances, we have in the dairy stable, close to the school, a herd of thirty cows of different breeds, for observation and instruction in the methods of feeding and caring for dairy stock, and a cream separator run by tread power in a room attached to the dairy barn.

The course of practical instruction consists of two branches of the dairy business, viz.: Factory Dairying and Home Dairying.

Factory Course.

In this course, students, under competent instructors, make cheese and butter on a large scale, learn how to run separators, and are given full and repeated instruction in the use of the Babcock tester and the lactometer, together with directions as to the simplest and fairest method of paying patrons for their milk in factories where the Babcock tester is used.

There are five large cream separators in this department—the Danish Weston, the Alexandra, the Alpha de Laval, the United States, and the Sharples' Imperial Russian. Full and repeated instruction with practice in the running and general management of these machines is given daily throughout the session. In the milk-testing room there are seven or eight of the best makes of the Babcock tester, of different capacities, some run by hand and others by steam—all for the use of the students in attendance from year to year; and in the butter room there is constant practice throughout the session in churning, and in the working, printing, and packing of butter according to the most approved methods.

Discussions on practical dairy topics, especially on the difficulties which arise in making cheese and butter, are carried on in the cheese room for an hour every afternoon. These discussions have been of much value to students; and they will be continued in the future as in the past. From time to time during the session, this hour is devoted to the judging of cheese and butter by experts brought to the school for that purpose. The scoring of the judges is compared with that of the students and reasons given for the conclusions reached in each case. In this way, students get a clear conception of the difference between poor, medium, and first-class goods.

Cheese and butter factories should encourage their makers to devote a couple of months in the winter to this course. It is not intended to take the place of practical experience in a factory, but to supplement it. It is of much practical value to those who take it and will undoubtedly result in material advantage to the factories in which they are employed.

Home Dairy Course.

This course is intended especially for farmers' sons and daughters who wish to learn something about running cream separators, using the Babcock tester, and making butter on a farm. The department is furnished with hand separators, butter workers, printers, etc.; and full instruction is given by a competent butter-maker in every detail regarding home dairy appliances, the handling of milk and cream, and the making of butter. Special instruction in cheese-making is also given when required.

Home dairy students are admitted to all lectures and discussions, including practical drill by the Professor of Dairying on the points and peculiarities of dairy cows, in a live-stock class-room provided for the purpose.

We can accommodate from fifteen to twenty in this course, and we hope to see the full number in attendance throughout the session. Applicants may enter on or after the 14th January and remain as long as they wish—two weeks, the entire session of two months, or longer. Those who decide to take the course, should write at once, stating when they desire to enter and how long they can remain.

Instructors.

1. *Cheese-making.* T. B. Millar, London, Ont., Instructor and Inspector for Western Dairymen's Association; Assistant, R. W. Stratton, Guelph, Ont., Experimental Cheese-maker at the Ontario Agricultural College.

2. *Milk-testing.* J. W. Mitchell, B.A., Lansdowne, Ont.

3. *Cream-Separators.* Mark Sprague, Ameliasburg, Ont., Instructor for Creameries' Association.

4. *Butter-making.* T. C. Rogers, Experimental butter-maker; Assistant, J. H. Findlay, Barrie, Ont.

5. *Home Dairy.* Jas. Stonehouse, Port Perry, Ont.

Lectures.

A course of fifty lectures will be given as follows:

Professor of Dairying. Twenty-four lectures on milk, butter, and cheese; milk-testing, butter-making, and cheese-making; the marketing of dairy products; selection, breeding, and feeding of dairy-stock, etc., etc.

Agriculturist. Three lectures on general Agriculture in relation to dairying.

Professor of Veterinary Science. Three lectures on the diseases and treatment of dairy-stock.

Professor of Biology. Four lectures; two on geology and two on botany.

Professor of Chemistry. Four lectures on the nomenclature and general principles of chemistry and its relation to dairying.

Bacteriologist. Five lectures on lacteal bacteriology.

Mathematical Master. Seven lectures on mathematics and book-keeping, explaining fully the decimal system.

Lectures will begin at 8.30 a.m., and continue for one hour, after which practical work will commence.

Certificates.

Certificates of standing—for cheese-making, or butter-making, or both—will be given to those who pass all prescribed written and practical examinations, some during the course and a more difficult one at the close. The standard for passing is forty per cent.; for second-class honors, sixty per cent.; and for first-class honors, seventy-five per cent. To obtain this certificate, students must attend at least *seven weeks* during the course and take the regular work from day to day.

To anyone who holds a general certificate of standing, a special dairy certificate of proficiency in butter-making, cheese-making, or both, will be granted when he has proved his ability to manage a creamery or cheese factory—

(1) By at least two years' experience as manager, one of which must be subsequent to his College course.

(2) By sending monthly factory reports during at least one season to our Professor of Dairying.

(3) By passing a satisfactory inspection as to cleanliness, tidiness, and quality of goods made by him during the season.

TERMS OF ADMISSION, COST, ETC.

No Entrance Examination Required.

Tuition. Free to residents of the Province of Ontario; to non-residents, $5 for the course.

Incidentals. A payment of $3 in advance for incidental expenses will be required of all students in the regular course. Also a deposit of $2 to cover possible breakage. This sum of $2, if not required for breakage, will be refunded when the student leaves.

Board and Lodging in Guelph (a mile and a half from the College), or close to the College grounds, $3 per week.

Working Clothes. Each student must provide two special suits of clothes to be worn in the dairy—white and blue gingham dress, with white cap and white apron for ladies; and white linen or cotton suit, with white cap and white apron for men. These suits, including cap and apron, can be bought in Guelph for $1.50 to $2 each; and we may add that they must be kept clean throughout the session.

Home Dairy Course. A charge of $1 for incidental expenses, and a deposit of $1 to cover breakage. The latter, if not required, will be refunded when the student leaves. One suit of working clothes will be sufficient for this course. Board and lodging the same as for other students.

Prohibitions.

Card-playing, smoking, tobacco chewing, spitting, and noisy or boisterous conduct in any of the dairy buildings are strictly prohibited.

Ladies Invited.

We have made special provision for ladies who wish to take either the factory or the home dairy course. Separate apartments have been fitted up and furnished for their comfort and convenience. Six ladies were in attendance last session; and we hope to have a larger number in 1896.

Applications for admission should be addressed to the President of the College.

Candidates whose applications are accepted will be expected here on the *first day* of the course; and all students will be required to attend the lectures and practical work regularly and punctually while they remain at the school.

For further information apply to H. H. Dean, B.S.A., Professor of Dairying.

James Mills,
President.

Ontario Agricultural College,
Guelph, August, 1895.

Travelling Dairy.

Our Travelling Dairy was at work from the 9th May to the 21st November. It was in charge of F. [illegible] Sleightholm, B.S.A, with J. Hume as butter-maker. The territory covered during the season embraces the following ridings and counties: North Ontario, Victoria, Peterborough, Russell, Prescott, and Simcoe. As a rule, the meetings were well attended and close attention was given both to Mr. Sleightholm's lectures and to the practical work done by Mr. Hume. The unanimous verdict is that the Travelling Dairy is doing a work of much value to the farmers of Ontario. Wherever it has gone, great interest in dairying has been created and the quality of home-made butter has been very much improved. In several instances, cheese factories have been started in consequence of the work done and interest created by the Travelling Dairy.

Farm and Live Stock.

Work in the Agricultural Department of the institution has gone on as usual. Our Agriculturist, G. E. Day, B.S.A., has taken charge of the pedigrees and registration of stock, (cattle, sheep, and swine), has attended to a large share of the correspondence of the department, has done the class-room work in agriculture and live stock, and has given some instruction in practical operations, such as hand-sowing, mowing, the handling of sheep, etc.—all to the satisfaction of the students and others concerned. See Mr. Day's report in Part VII of this volume.

Our farm is now in good shape, thoroughly cultivated and well managed; and it is bare justice to Mr. Wm. Rennie, our Farm Superintendent, to say that the College farm is cleaner, better tilled, and much more productive than it has been at any time within the last seventeen years. We can now refer, without the least misgiving, to our own farm practice in illustration of the lectures given in our class-rooms. Every part of Mr. Rennie's management is characterized by economy and efficiency, and it is to me personally a constant source of gratification. For an account of Mr. Rennie's experience in fencing, cattle feeding, etc., see his report in Part XI of this volume.

Co-operative Experiments.

A system of co-operative experimental work has been carried on for ten years in succession throughout Ontario. The following table gives the number of ex-students of the College and other farmers in Ontario engaged in this work, for seven of the years since these co-operative experiments were begun :

In 1886 there were 12 co-operative experimenters.
" 1888 " 90 " "
" 1891 " 203 " "
" 1892 " 754 " "
" 1893 " 1,204 " "
" 1894 " 1,440 " "
" 1895 " 1,699 " "

Within the last five years, our Experimental Department has distributed upwards of 32,000 packages of choice seeds to ex-students and other Ontario farmers.

For the results of the co-operative experiments in 1895, see the report of the Experimental Union in Appendix VI to this report.

The following table indicates the character and extent of the work done throughout the province :

Numbers of experiments.	Names of Experiments.	Number of plots required for each experiment in 1895.	Class of experiments.	Number of plots used for these tests by farmers over Ontario. 1891.		1893.	1894.	1895.
1	Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure, with oats..	5	Fertilizers.	70	165	322	318	337
2	Testing nitrate of soda, and no manure, with rape	2						
3	Ascertaining the relative value of four varieties of millet	4	Fodder crops.	196	470	894	897	1,289
4	Growing lucerne as a crop for fodder	1						
5	Growing crimson clover as a crop for hay........	1						
6	Testing six leading varieties of corn...............	6						
7	Testing five leading varieties of turnips	5	Root crops.	350	705	1,230	1,310	1,480
8	Testing five leading varieties of mangels	5						
9	Testing five leading varieties of carrots	5						
10	Testing five leading varieties of spring wheat....	5	Grain crops.	2,026	4,348	4,735	4,794	5,629
11	Testing five leading varieties of barley..........	5						
12	Testing six leading varieties of oats.............	6						
13	Testing four leading varieties of peas	4						
15	Testing five leading varieties of winter wheat	5						
16	Testing six leading varieties of potatoes..........	6	Potatoes.				402	444
		65		2,642	5,688	7,181	7,721	9,179

Field Experiments at the College.

Our Experimental Department has made rapid and substantial progress within the past ten years. Our field experiments are now conducted on a more extensive scale than at any other institution of which we have any knowledge ; and I do not hesitate to refer to the report of Mr. Zavitz, our Experimentalist, in Part X of this volume, as one of the most valuable reports published in this country. Since 1888, the number of plats devoted to field experiments has increased nearly forty-fold. The following figures show the numbers for the last eight years :.

In 1886,	we had 56	plots devoted to experimental work.			
" 1889,	" 464	"	"	"	
" 1890,	" 625	"	"	"	
" 1891,	" 1,045	"	"	"	
" 1892,	" 1,523	"	"	"	
" 1893,	" 1,612	"	"	"	
" 1894,	" 1,705	"	"	"	
" 1895,	" 2,005	"	"	"	

In 1895, our grain experiments occupied 654 plots; potatoes, 364; roots, 376; fodder crops, 509; and miscellaneous crops, 32. Seventy additional plots were used for experiments made in connection with the Ontario Agricultural and Experimental Union. Elaborate series of tests were made with all kinds of farm crops—variety tests, tests in the selection of seed, tests in the method of preparing potatoes for planting, etc.; also tests with various crops, by sowing at different dates, planting at different depths, cultivating in different ways, and harvesting at different stages of maturity. Likewise a number of experiments to test special fertilizers.

Horticulture.

Our Horticultural Department embraces the six greenhouses belonging to the institution; a large garden (nearly six acres), devoted to the growing of vegetables for the College; two or three acres of small fruits—gooseberries, strawberries, currants, and raspberries; a small vinery; our apple orchards; the College lawn, or campus (between thirty and forty acres), with the walks and driveways therein; the College arboretum; and a number of forest-tree plantations scattered over the farm.

The mere enumeration of these branches, or subdivisions, will indicate very clearly to men of experience that there is a large amount of work in our Horticultural Department. Mr. H. L. Hutt, our Horticulturist, lectures on horticulture, gives more or less practical instruction in the gardens and greenhouses, and takes general oversight of the work He is ably assisted in the outside work by his foreman, Mr. William Squirrell, and in the greenhouses by Mr. Arthur James, Florist and Assistant Gardener.

So far, our efforts at fruit-growing have not been very satisfactory, for two reasons: (1) The fact that our apple orchard was planted in the wrong place (a very unsuitable place) twelve or thirteen years ago, and had to be taken up and a new one planted in 1890; (2) and chiefly because of unfavorable climatic conditions—conditions much more trying than in localities a hundred miles farther north, and not so good for grapes, etc., as Ottawa and other places where the snowfall is much heavier.

Fruit Experiment Stations.

Very valuable work is now being done in our Fruit Experiment Stations throughout the province. We have stations at the following places: 1. South-west station, in the county of Essex, to test varieties of peaches and strawberries, especially peaches; 2. Niagara station, near St. Catharines, for tender fruits; 3. Wentworth station, at Winona, with grapes as a specialty; 4. Halton station, near Oakville, for small fruits; 5. Huron station at Walkerton, for apples and other fruits suitable to that locality; 6. Georgian Bay station, near Thornbury, withplums as a specialty; 7. Simcoe station, at Craighurst, for hardy apples; 8. Eastern Central station, Whitby, for pears and apples; 9. Prince Edward Station, for apples; and 10. St. Lawrence station, near Maitland, Grenville county, for apples and other fruits suited to that locality. In addition to these ten stations, there are two sub-stations, one in South Simcoe, for gooseberries, and another at Burlington, for strawberries.

Our Horticulturist devotes a considerable amount of time to these stations. He visits them and reports uppn their work every year, and assists in the selection of varieties to be tested in the different localities. Before long, the results obtained from these stations will be of great value to the farmers of Ontario. (See Mr. Hutt's report in Part VIII of this volume.)

Birds and Bees.

Two new departments have been in operation during the past year, viz., the bird and bee departments, or poultry and apiculture.

Mr. L. G. Jarvis has had charge of our poultry, and has done good work. He tested several incubators last spring, and was fairly successful; but the results were not so satisfactory as we expected. There were too many dead chickens. He is now living quite close to the poultry buildings, and intends to conduct further experiments along this line. A number of nice young birds were raised during the year, and were sold by auction in October. (See Mr. Jarvis's report in Part XII of this volume.)

Mr. R. F. Holtermann, of Brantford, who has been honored with the highest positions in the gift of the bee-keepers of this continent, was appointed to give lectures and practical instruction to our students at the College, and to do certain experimental work in his own apiary at Brantford. The lectures were given in the spring term, and the experimental work was carried on throughout the season, which, I need not say, was an exceptionally unfavorable one. Nevertheless, Mr. Holtermann made a good beginning on two or three lines of investigation. He did what was possible under the circumstances, and reached certain conclusions which are given to the public in Part XIII of this report. We hope for valuable results from future work in this department.

Bacteriology.

During the year, we have been equipping our new Department of Bacteriology. Mr. F. C. Harrison, our Bacteriologist, ordered the apparatus, etc., in Germany early in the year, and commenced work in his department with a short course of lectures and a considerable amount of practical instruction in the Pasteurization of milk, for the benefit of the students in attendance at the Dairy School from the 14th of January to the 1st of April.

Mr. Harrison spent his summer vacation at special bacteriological work in the University of Michigan, Ann Arbor, Mich., and returned to Guelph at the opening of the College in October. During the Fall term, he has been fully occupied with lectures and laboratory work for our regular third year students in microscopy, bacteriology, vegetable histology, and plant pathology.

Our new bacteriological laboratory is now well equipped, and Mr. Harrison is ready for practical work along several inviting and very important lines. The only question is, can we arrange our programme so that his time will not be all or nearly all taken up in teaching? We must do our best to furnish opportunities for original investigation; for, as civilization advances, we seem to be more than ever exposed to the fatal attacks of disease-producing germs, or certain forms of bacteria, in air, in water, in milk, in everything; and no more important problems can engage the attention of scientific men than those presented for solution in this vast field of research. (See Mr. Harrison's report in Part IX. of this volume.)

Athletic Exercise.

We do not spend much time under this head; but Captain Clarke, our drill instructor, gives every class a certain amount of training in drill and gymnastics, enough to straighten them up and make them stronger, brighter, better looking, and better-mannered men than they are before they pass through his course of training.

Changes in our System of Heating.

At the suggestion of our engineer, Mr. R. W. Green, we decided about a year ago to dispense with five or six separate fires and heat several of the buildings on the College campus by steam conducted in pipes underground, from the College boilers to the buildings in question. It was thought by many that the work could not be done successfully; but I am pleased to be able to report that Mr. Green has carried his plans and work to completion and we are heating from the College boilers, with entire satisfaction and a great saving in fuel, the Bursar's house and the Farm Superintendent's residence, both on ground a little higher than that on which the College stands; and the Chemical Laboratory, the Gymnasium, and the new experimental building, all on ground considerably (fifteen or sixteen feet) lower than the boilers. The chief difficulty was with the latter; but Mr. Green's skill overcame every obstacle, and we are now heating all these buildings much better than formerly, with less labor and much less fuel.

Students in Residence.

For an account of the responsibility assumed for students in residence, and some statements of fact as to their conduct and the time spent in looking after their studies, etc., see the report of my Assistant Resident Master in Part II of this volume.

Class-Room Work.

Our class-room work went on as usual during the past year. Ten candidates wrote for the B.S.A. degree. Nine were successful and one was starred in drawing. A fair proportion of the first and second year students gained a respectable standing in our College examinations; but the percentage of failures is still very large, resulting in some instances from idleness but in most cases from a lack of proper training in the elementary branches of an English education.

Examiners.

The third year examinations were conducted by the University of Toronto; and those of the first and second years, by the Professors of the College, with the assistance of the following outside examiners:

Wm. Tytler, B.A. Guelph	2nd Year Literature.
J. M. McEvoy, B.A., LL.B., London, Ont	Political Economy.
A. W. Campbell, C.E, St. Thomas, Ont	Road-Making.
W. A. Kennedy, B.S.A., Guelph	1st Year Chemistry.
R. Harcourt, B.S.A., Guelph	2nd Year Chemistry.

Bachelors of the Science of Agriculture.

The examinations for the degree of B.S.A. were held in the month of May, and the candidates received their degrees at the commencement exercises of the University of Toronto in June. The list of successful candidates is as follows:

Christian, A. H	Danforth, York Co., Ont.
Doherty, M. W	Eglington, York, Ont.
Kennedy, W. A	Apple Hill, Glengarry, Ont.
King, A. A	Johnson's Crossing, N. S.
Robertson, G. A	Kingston, Frontenac, Ont.
Rowe, F.	London, England.
White, E. F.	Clarkesburg, Grey, Ont.
Wiancko, A. T.	Sparrow Lake, Muskoka, Ont.
Widdifield, J. W	Siloam, Ontario County, Ont.

Recipients of Associate Diplomas.

Twenty-five, having completed our regular course of two years, were examined for associate diplomas. Of these, twenty-four passed in all the subjects. The diplomas were presented by his Honor Lieutenant-Governor Kirkpatrick, at our closing exercises on the 29th June; and the names of the recipients are as follows:

Campbell, W. G .... Brantford, Brant County, Ont.
Cass, L. H .... L'Orignal, Prescott, Ont.
Chadsey, G. E .... Sumas, B.C.
Clark, J. F .... Bay View, P. E. I.
Dunn, E .... Plover Mills, Middlesex, Ont.
Edelsten, E. J. M .... London, W., England
Kipp, A .... Chilliwack, B.C.
Knight, J. W .... Elginburg, Frontenac, Ont.
Lang, L. W .... St. Marys, Perth, Ont.
McCallan E. A .... St. David's, Bermuda.
Maconachie, G. R. B .... Gurdaspur, Punjab, India.
McCullough, H. A .... Nantyr, Simcoe, Ont.
McGillivray, J. W .... Sumas, B. C.
McPhail, J. D .... Vernon, Carleton, Ont.
Paterson, T. F .... Lucknow, Bruce, Ont.
Payne, G. Y .... Peterborough, Peterborough, Ont.
Smith, G. A .... Morrisburg, Dundas, Ont.
Smith, P. B .... Hamilton, Bermuda.
Taylor, W. H .... Peterborough, Peterborough, Ont.
Thompson, W. J .... Barrie, Simcoe, Ont.
Tye, C. W .... Haysville. Waterloo, Ont.
Whetter, J. R .... Lorneville, Victoria, Ont.
Wilson, A. C .... Greenway, Huron, Ont.
Wilson, N. F .... Rockland, Russell, Ont.

First-Class Men.

The work in the College is divided into five departments; and all candidates who get an aggregate of seventy-five per cent. of the marks allotted to the subjects in any department, are ranked as first-class men in that department. We would like to have a larger number of such men, but we are determined that none shall be so ranked unless they really deserve it. The following list contains the names of those who gained a first-class rank in the different departments at the examinations in 1895, arranged alphabetically:

First Year.

1. Devitt, I. I., Floradale, Waterloo Co., Ont., in three departments: Agriculture, English Literature, and Mathematics.
2. Gadd, T., Varney, Grey Co., Ont., in one department: Agriculture.
3. Higginson, O. G., Hawkesbury, Prescott Co., Ont., in one department: Agriculture.
4. Hodgetts, P. W., St. Catharines, Lincoln Co., Ont., in four departments: Agriculture, Natural Science, English Literature, and Mathematics.
5. Reinke, B, F., Ancaster, Wentworth Co., Ont., in one department: Veterinary Science.

Second Year.

1. Clark, J. F., Bay View, Prince Edward Island, in five departments: Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
2. Knight, J. W., Elginburg, Frontenac Co., Ont., in one department: Agriculture.
3. Lang, L. W., St. Marys, Perth Co, Ont., in four departments: Agriculture, Natural Science, Veterinary Science, and English Literature.
4. Paterson, T. F., Lucknow, Bruce Co., Ont., in four departments: Agriculture, Natural Science, Veterinary Science, and English Literature.

Medallists.

Medals are given to the three students who rank highest in general proficiency in the theory and practice of the second year. The following were the successful competitors in 1895:

Gold Medallist. J. F. Clark, Bay View, Prince Edward Island.

First Silver Medallist. L. W. Lang, St. Marys, Perth, Ont.

Second Silver Medallist. T. F. Paterson, Lucknow, Bruce, Ont.

THE GEORGE A. COX SCHOLARSHIPS.

First Year.

1. *Agriculture, Live Stock, Dairying, Poultry, and Apiculture.* O. G. Higginson, Hawkesbury, Prescott, Ont.
2. *Natural Science.* P. W. Hodgetts, St. Catharines, Lincoln, Ont., first in two departments.
3. *Veterinary Science.* B. F. Reinke, Ancaster, Wentworth, Ont.
4. *English.* Not awarded.
5. *Mathematics.* I. I. Devitt, Floradale, Waterloo, Ont.

Second Year.

1. *Agriculture, Live Stock, Dairying, Poultry, and Apiculture.* 1st, J. F. Clark, Bay View, P.E.I., first in five departments; 2nd, J. W. Knight, Elginburg, Frontenac. Ont.
2. *Natural Science.* T. F. Paterson, Lucknow, Bruce, Ont.
3. *Veterinary Science.* Not awarded.
4. *English.* L. W. Lang, St. Marys, Perth Ont.
5. *Mathematics and Physics.* Not awarded.

PRIZE MEN.

First Year.

Agriculture, Live Stock, Dairying, Poultry and Apiculture. 1st, O. G. Higginson; 2nd, I. I. Devitt.

Natural Science. 1st, P. W. Hodgetts; 2nd, I. I. Devitt and O. G. Higginson.

Veterinary Science. 1st, B. F. Reinke; 2nd, O. G Higginson.

English Literature, Grammar, and Composition. 1st, P. W. Hodgetts; 2nd, I. I. Devitt.

Mathematics and Bookkeeping. 1st, I. I. Devitt; 2nd, P. W. Hodgetts.

General Proficiency. 1st, P. W. Hodgetts; 2nd, I. I. Devitt; 3rd, O. G. Higginson; 4th, Wm, M. Shields, Glasgow, Scotland; 5th, B. F. Reinke; 6th, J. T. Guy, Columbus, Ontario Co., Ont., and J. R. Oastler, Featherstone, Parry Sound District, Ont.

Second Year.

Agriculture, Live Stock, Dairying, Poultry, and Apiculture 1st, J. F. Clark; 2nd, T. F. Paterson.

Natural Science. 1st, J. F. Clark; 2nd, L. W. Lang.

Veterinary Science. 1st, J. F. Clark; 2nd, L. W. Lang.

English Literature and Political Economy. 1st J. F. Clark; 2nd, L. W. Lang.

Mathematics and Physics. 1st, J. F. Clark; 2nd, L. W. Lang.

General Proficiency. 1st, J. F. Clark, 2nd, L. W. Lang; 3rd, T. F. Paterson; 4th, E. A. McCallan, St. David's, Bermuda; 5th, J. W. Knight.

Valedictory Prize.

A prize of ten dollars in books is offered annually to the second-year students for a valedictory address. The subject last year was "Science in Farming," and the prize was awarded to T. F. Paterson, of Lucknow, Bruce county, Ont.

Closing Exercises.

Our closing exercises took place on Saturday, June the 29th. The weather was very pleasant and the attendance of visitors was large. His Honor, Lieutenant-Governor Kirkpatrick, favored us with his presence, and everything passed off very pleasantly. The College diplomas were presented by the Governor, and interesting addresses were delivered by His Honor and the Hon. John Dryden. Major Mutrie, M.P.P., and a number of other gentlemen from Guelph and the surrounding country assisted in the presentation of medals, prizes, and honor certificates.

Visitors.

We had a large number of visitors as usual in the month of June—not less than 10,000. Some drove in from the surrounding country, but most of them came by the Grand Trunk Railway.

Financial Statement.

For a statement of the revenue and expenditure of the different departments, see Appendix V. to this report. It will be observed that the total unexpended balances on the year's operations in all departments was $6,222.28.

Conclusion.

With the addition of our new experimental building, I think I may say that never before were we so well equipped for work in the different departments of the institution as we are at the present time. We have the principal buildings which we require, and our appliances for practical work are nearly all that we need for the students now in attendance.

JAMES MILLS,
President.

ASSIST

To the President of

SIR,—I beg here

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PART II.

REPORT OF
ASSISTANT RESIDENT MASTER.

To the President of the Ontario Agricultural College :

SIR,—I beg herewith to report on my duties as Assistant Resident Master.

COLLEGE RULES.

The rules in residence are few and simple. We have no rules, the observance of which, by any student, is not of direct benefit to himself and to his fellow students, and conducive to the welfare and good repute of the College. The most important of these rules are as follows :

1. Regarding attendance at roll-call and prayers.

Every morning, before going to lectures, the students are required to assemble in the class-room for roll-call. After roll-call a Bible selection is read, and a prayer offered. It is due to the students to say that, without exception, the most respectful and reverential silence is observed on every occasion, during prayers.

2. Regarding afternoon study.

Each afternoon, from 1.30 to 4 00, while one half of the students are at work, the other half assemble in the class-room for study. They are there under the charge of an officer, either myself or your Secretary, Mr. G. A. Putnam. As a rule the second year students have practical instruction in some one of the departments during the afternoon. Sometimes, also, a student wishes to study specimens in botany, biology, or veterinary science in the museum or elsewhere ; and if good faith is assured, he is allowed to do so.

This assembling for study in the afternoon not only provides a quiet study-room for those who are studiously inclined, but it also leads some to spend the two and a half hours in study, who would not otherwise do so.

3. Regarding evening study.

Each evening during the week, except Friday evening, promptly at seven o'clock, the students are required to go to their rooms for study, and to remain there until half-past nine. Late in the spring, the hour for going to the rooms is changed to half-past seven. This period in the evening affords another opportunity for study ; and, as a matter of fact, this is the time when most of the studying is done. Many students utilize all possible opportunities for study ; but all study, more or less, during this period from 7.00 to 9.30 p.m. An officer is in charge every evening, to see that proper quietness is maintained in the halls and dormitories.

4. Regarding leave of absence from College.

Our rules relating to leave from College are extremely reasonable, affording as much liberty as any student can possibly require, for legitimate needs. These periods are, Friday evening, Saturday afternoon, two or three afternoons a week, after study, from four till six, and one evening during the week, besides Friday. For this one evening, any student wishing to be excused from study, must report to that effect to the officer on duty and have his name entered on the register as excused. He is expected to report to the night watchman not later than 10.30 unless he obtains special permission to stay later. I notice by the register that, while a few students avail themselves regularly of this free evening, the majority of students are content with Friday evening and the hours in the afternoon available for business and social recreation.

5. Regarding attendance at church.

Every student of the first and second years is required to attend church on Sunday morning. No restriction is placed upon his choice. Anyone unable to go must report at the reception room at nine o'clock on Sunday morning, to be excused from attendance. The following morning at roll-call, attendance at church is marked in the register, each student reporting for himself.

6. Regarding general conduct.

With regard to general discipline, the method pursued here is a minimum of coercion with a maximum of self-government. From the beginning of their College course, these principles of conduct are inculcated: To do nothing in the College detrimental to the interests of their fellow students, such as making any kind of disturbance when others are at study, or interfering with one another's belongings; to do nothing outside likely to bring discredit on the College; and to conduct themselves at all times and in all places as manly, self-respecting *men* Whatever rules we have, written or unwritten, are comprehended in these injunctions, and are referred to these as their *raison d'être*. I wish to say, with regard to this method of discipline, that I have found the students truthful, honorable, and self-respecting. Whatever may now and then be done in a thoughtless or mischievous mood, an appeal to their honor and truthfulness, and to their respect for one another's rights, is seldom made in vain.

With regard to self-government among students, I wish to call your attention to the matter of the College reading-room. Two years ago, when I assumed my present duties here, the reading-room was not a reading-room properly, but rather a lounging and conversation room; a general place of resort after meals, to while away half an hour in pleasant chat before going to work or to study. It seemed to me that a reading-room could not be made to serve two such opposite functions. I appealed to the Literary Society (which represents the whole student body), to take the matter in hand, and to make it properly a reading-room, where silence should be at all times observed. They did so. Regulations were adopted, curators were appointed to take charge of the room, and at the same time the obligation resting upon themselves to respect these regulations was realized. The consequence is that now, instead of being, as formerly, a half lounging, half reading-room, it bears the appearance, at all times, of a respectable college reading-room. The results are certainly far more satisfactory in every respect, than could have been obtained by coercive measures, however reasonable. There would be now no difficulty in keeping the room perfectly quiet, if there could be provided, within the College building, a room where those who do not wish to read might retire for a few minutes' conversation after supper. As it is now, there is certainly a great temptation to drop into the reading-room to meet and converse, there being no other place. It is to be hoped that this long-felt want will soon be met.

While, owing to the general good character and orderly habits of our students, the demand for disciplinary action is but little, yet the position of Resident Master is no sinecure. A great deal of time is necessarily taken up by the constant duties of the position. First, an hour and a half every day in charge in the dining-room; Secondly, two hours and a half on three afternoons a week, in charge of students in the class room;

Thirdly, time of evening duty, a part and sometimes nearly all of the study hour, three times a week; Fourthly, the time required for inspection of the rooms, furniture and halls, which should be done at least twice a week; Lastly, the time taken in dealing with cases of infringement of rules, which, I am very much pleased to report, is not great. If to this work and consequent worry, be added the duties of teaching, of which at present a large share falls to me, and the time required to prepare for that teaching, it will be seen that the Resident Master need not be idle.

Work in Physics.

In this the first report from the Department of Physics, a brief statement concerning its growth and the present condition of its equipment will be first in order.

On commencing the teaching of physics here, in October, 1893, I found no class-room or laboratory devoted specially to that department, and only a few dollars' worth of apparatus. In the beginning of the year 1894, about 60 dollars' worth of apparatus was purchased. Professor Shuttleworth kindly allowed the use of his class-room, where water and gas were available for experiments during lectures. There the lectures and experiments in physics have been carried on, until this last term. As the agricultural building, erected during the past summer, contains a new live stock class-room, the old class-room in the College was no longer needed for lectures in that subject, consequently it has been fitted up as a class-room and laboratory for physics, making a large, well lighted, and commodious room. Large work tables, supplied with drawers and cupboards underneath, and gas and water taps above, have been fitted up, giving accommodation for experimental work to twenty students at once. A room adjoining this class-room may be used as a combined office and storeroom, and capacious shelves have been built therein by the College carpenter, for the storing of apparatus.

In addition to these rooms, where general physics is intended to be taught, room has been provided in the new agricultural building for physical investigations bearing more directly upon agriculture. This provision marks a very important step in advance, as no original investigation in this direction has yet been done here, while much might be done of great importance to agriculture, as instanced by the work of Professor King of Wisconsin.

With ample accommodation, there is now needed a stock of apparatus, by means of which this subject can be properly and successfully taught. There is none at all at the laboratory for agricultural physics. In the other laboratory, in addition to the stock previously on hand, apparatus to the value of $250 was purchased last fall. That is a very good start, and now if a liberal grant for the first stock can be procured, and after that a small yearly grant for replenishing, the department of physics will be in a position to do good work, educationally and practically.

Lectures.

The ground covered by the lectures during each term is as follows:

The work commences in the second year of the College course.

Fall Term. Statics and dynamics, embracing the following: (1) Physical forces, energy, power, work. (2) Mechanics, being chiefly a study of the simple machines, (*a*) the lever, including the lever proper, balances, weigh scales, the wheel and axle, belt machinery and cog machinery; (*b*) the pulley, different systems, with their advantages and disadvantages; (*c*) the inclined plane, including the wedge, the screw, the tread-power, drawing loads up different grades.

Winter Term. Hydrostatics and hydro-dynamics, being a study of the physical properties of gases and liquids; the theory of pumps and syphons; the theory and construction of thermometers and barometers; and capillarity, including the movement of water in soil.

Spring Term. Same subject continued, with special reference to the effect of *heat* on gasses and liquids.

Practical Work.

During the past term, the regular lectures have been supplemented by a course of experiments in mechanics, carried on under my personal supervision, the students working in turn at the different machines. The experiments to be performed were specified, and each student was required to present a report of his work and results obtained. This practical work will be continued throughout the year. In the spring term, work in determining levels with the theodolite aud measuring area with the chain will be given.

Special Course in Electricity for the Third Year.

That very important branch of physical science, electricity, has not been touched upon in our course in physics, until this year. A special course in electricity has been arranged for those third year students who have chosen chemistry as their specialty. This work has been taken once a week, on Saturday forenoons (no other time being available), and the line pursued has been, not the study of curious electrical phenomena, but the study of the application of electricity to man's needs. This course will have covered, by the end of the present academic year, the study of the telephone, the telegraph, electric lighting, electroplating, and locomotion by electricity. Thus far it has been entirely practical, each student manipulating the instruments and investigating the phenomena for himself, with only such lectures as were necessary to call attention to and explain special difficulties, and with supplementary reading in such text-books as were available. I might say just here that the library is not well supplied with books on physics, only a very few being on hand.

It is my intention, with your consent, to give the second year class some elementary work in electricity, with a view to imparting a knowledge of its application to mechanics and the arts. This will leave the third year free to pursue a more advanced course, whereas this year they had to begin at the beginning of the subject. Besides, electricity is now such an important factor in the industrial and mechanical world, that it can no longer be omitted from a course in physics that makes any pretensions to being practical and comprehensive. In fact, intelligent people will not much longer remain in ignorance of the theory of electrical machinery and the transmission of electrical energy.

In conclusion, I wish to express my thanks to you for the commodious quarters that have been provided for this department, and also for the liberal allowance made for the purchase of apparatus. With such a good beginning, there is every reason to hope that this branch of science will, in future, receive its due attention.

Work in English.

The course in English extends throughout the three years, and consists of three parts, as follows:

(1) Study of English authors.

(2) Study of Grammar, Rhetoric, and History of English Literature.

(3) Original compositions and essays.

In the first year, the selections taken this last term were (1) Poetical selections from Palgrave's Golden Treasury of Songs and Lyrics; (2) Scott's "Talisman." The points emphasized in the study of the poetical selections were: the peculiarities of poetic expression; searching into the true meaning of each selection, in detail and as a whole, and committing to memory passages of special beauty of thought or expression. Occasionally a poem formed or suggested a theme for a short essay, by way of paraphrase, comment, or criticism. In the Talisman, the study of the history of the period represented, the end of the twelfth century, was taken briefly, with the social and political conditions of that age as contrasted with those of our own time. Then the characters and chief incidents of the novel were discussed, and a thorough understanding of the story was aimed at in the writing of a number of essays describing these characters and narrating the most striking and dramatic incidents in the story.

The historical novel, as a selection for class-study, has many advantages. First, it possesses, for the average student, an interest superior to that of the formal essay. Secondly, being more diffuse, it affords much greater exercise in reading for the same amount of mental effort, and exemplifies the easy swing of the narrative style of composition, the mastery of which is so desirable an accomplishment. Lastly, it suggests an unlimited number of subjects for composition, furnishing as it does, all the data required as far as ideas are concerned, and thus affording excellent practice in arranging and expressing those ideas.

The work in Grammar, which extends throughout the year, needs no comment, it being a review and a continuation of the Grammar taught in the Public and High Schools of this Province, with special emphasis, however, on sentence-structure and punctuation.

During the winter and spring terms, the poetical selections from Palgrave will be continued. For prose, Washington Irving's Sketch Book will be read. The Sketch Book affords considerable variety of choice, as it contains examples of the narrative, the descriptive, and the argumentative styles. The easy, graceful language of the author, with his nice choice of words and his perfect sentences, makes the reading of these essays both a pleasure and a profit. The method of study will be, of course, much the same as that pursued with the Talisman.

Having explained fully the methods pursued in teaching Literature to the first year, I have to state, for the other years, only the list of selections, as the methods remain substantially the same, allowance being made, of course, for the increased literary knowledge and ability that have been acquired by the more advanced classes. Less attention to details and more attention to criticism and comparison, constitute the chief differences. The selections for the second year are as follow:

Fall Term. Shakespeare's "Julius Cæsar," and three essays from "Representative Essays," Carlyle's "History," Emerson's "Compensation," and John Morley's "Popular Education."

Winter Term. Shakespeare's "Richard III.," Blackmore's "Lorna Doone," and one or two of the Representative Essays.

Spring Term. Tennyson's "Locksley Hall," and "Sixty Years After."

During the last term eight essays were written by the second year class on subjects suggested by their studies in literature. These essays were evaluated, and the marks given will aid in fixing their relative standing for the term's work.

The third year work in English is as follows:

1. Representative selections from the following representative authors: Shakespeare, Bacon, Milton, Pope, Addison, Macaulay, Wordsworth, Tennyson, Froude, Arnold, Irving, Morley.

2. History of English Literature, being chiefly a study of the lives, works and peculiarities of the above-mentioned authors.

3. The writing of impromptu compositions in class; exercises in rhetoric.

4. The writing of six original essays on subjects assigned them. These are intended as tests of their ability to write correctly in English, and will be marked very closely.

By way of general comment on the literary ability and acquirements of our students, and also on their endeavors, I cannot do better than to quote a sentence or two from the report sent in by Mr. Tytler, who examined the second year in Julius Cæsar at Christmas. "With only a few exceptions they show a very intimate knowledge of the play, and it is evident to me that they must have given no little time and study to the preparation of the work. Where they come short is in want of ability to express their ideas in good literary English, and, in some instances, of ability to spell. Both these defects are, of course, due to inadequate preparation and training, before coming to you."

After two years' experience in teaching English here, I have come to this conclusion: In order that our students may acquire, in two or three years of study, the power to speak and to write with tolerable facility and correctness, they must first read widely from the best English authors. This will widen their vocabulary and enlarge their ideas, besides giving them models of style which, through unconscious imitation, will more or less be adopted by them. Secondly, they must write much, and their errors and defects must be pointed out to them. I have endeavored to fulfil both these conditions, and the latter has given me considerable labor in correcting their compositions. A great deal more time than I have been able to give, might with profit be devoted to this part of English teaching.

Respectfully submitted,

J. B. REYNOLDS.

PART III.

REPORT OF THE

PROFESSOR OF BIOLOGY AND GEOLOGY.

To the President of the Ontario Agricultural College:

SIR,—The closing days of 1895 bring to an end one of the most pleasant years of work, since my connection with the College began. The change in the curriculum of studies, by which more time is devoted to work in the laboratory, has made the teaching of science much more interesting and attractive. No subjects of study appeal more to the eye than those in the departments of science, and hence arises the necessity for making a free use of diagrams, and as far as possible of the objects themselves. Hitherto, our course has been so arranged, that there was not time to emphasize the work of the laboratory, but additions to the staff and a change in the curriculum by which students of the third year can specialize, have enabled us to make marked progress in the line of practical instruction this year. Below is an outline of what has been done in the department of biology.

1. WORK IN LECTURE-ROOM AND LABORATORY.

First Year. The first six weeks of the fall term are devoted to the study of biology, and the remainder to that of zoology. The winter term is occupied by a continued study of zoology and also a course of lectures on geology, as it relates to agriculture. The spring term is spent in gaining a knowledge of botany. In the study of this subject, a specimen of plant is brought into the class room for each lecture, and used in practical instruction relating to the analysis and identification of plants.

Second Year. The fall term is devoted to entomology. To aid in this study, an excellent collection of insects in the various stages of development (larva, pupa and imago) is used and is accessible to the students at any time they wish to examine it.

The afternoons of two days in each week are spent in the very careful analysis of plants and the drawing of characteristic parts. During the winter term, practical work, two afternoons a week, continues, attention being given to the microscopic structures in plants. Botany is taken up in the lecture-room during the spring term, and two afternoons weekly are spent in further practical study of plant analysis and in the mounting of twenty-five species of plants. The work done this year has been very creditable.

Third Year. During the fall term a course of lectures in structural and physiological botany is given, and also lectures on geology with special reference to the rock formations found in Ontario and their economic products.

Two afternoons are occupied in a practical study of zoology and plant physiology. The theoretical course in botany and geology is continued through the winter term and four afternoons spent in the laboratory, three in practical botany, and one in zoology.

As the examinations of third year students commences early in May no regular course is laid out for work in the spring term, but the time is spent in what seems best for the students' success. During the third year students making a speciality of biology require to mount one hundred species of plants.

2. The Museum.

As curator of this adjunct to teaching, it is my duty to make a slight reference to its condition. So many improvements in College accommodation have been going on from year to year, that I have never asked much for this room, believing that ere long an opportunity would present itself, after some much needed additions to the College were made.

I think the time has now arrived when we may reasonably ask for a few cases of more modern construction than those now used in the museum, and I would therefore suggest to you to ask for a grant of three hundred dollars for the purpose of getting a few new cases and some additional specimens. As we are now emphasizing the study of zoology, we require further means for illustration both in specimens and accommodation for them.

We require to keep before us the fact that our work is the instruction of students, rather than an arrangement to please the eye of the ordinary visitor. During 1895, we have received a few donations:

1. From Alexander Thoman, Arkona, a case of stuffed birds, skilfully prepared and mounted in a very attractive manner.
2. From Alexander McKenzie, sr., Guelph, some Indian implements.
3. From P. Kennedy, B.S.A., some fossils.
4. From Percy Tavernier, Guelph, two stuffed birds.
5. From James Hill, Wellandport, Indian implements.

3. Practical Work.

Early in the year the following "Spraying Calendar" was issued, and a bulletin on "Poisonous Plants" was prepared. In reference to the latter, it was thought better to defer its publication until near spring, when readers are more likely to observe plants and make use of such information as it contains.

SPRAYING CALENDAR.

Plant.	First application.	Second application.	Third application.	Fourth application.	Fifth application.
1. *Apple*. Scab, codling moth, bud moth.	Copper sulphate, about the time buds are swelling.	Bordeaux, just before blossoms opens; Paris green for bud moth, when buds open.	Bordeaux and Paris green, when blossoms have fallen.	9-12 days after, Bordeaux and Paris green.	Bordeaux 10-15 days later.
2. *Pear*. Leaf blight, scab, codling moth.	Copper sulphate when buds are swelling.	Bordeaux just before blossoms open.	Bordeaux and Paris green, after blossoms have fallen.	9-12 days after, Bordeaux and Paris green.	Bordeaux 10-15 days later.
3. *Plum*. Rot, etc., and curculio.	Copper sulphate before buds open.	Bordeaux and Paris green as soon as blossoms fall.	9-12 days after Bordeaux and Paris green.	Bordeaux 10-20 days later.	Ammoniacal copper carbonate 10-20 days later.
4. *Cherry*. Rot, aphis, slug.	Bordeaux as the buds are breaking. If aphis appears, kerosene emulsion.	Bordeaux, when fruit has set; for slugs, dust leaves with air-slaked lime Hellebore also good against slug.	Bordeaux, 10-15 days after, if rot appears.	Ammoniacal copper carbonate 10-15 days later.	
5. *Peach*. Rot, mildew.	Copper sulphate before buds swell.	Bordeaux before flowers open.	Bordeaux, when fruit has set.	Ammoniacal carbonate when fruit is nearly grown.	Repeat fourth 5-10 days later.
6. *Grape*. Mildews, etc., flea bettle.	Copper sulphate, when buds swell. Paris green for flea bettle.	Bordeaux, when leaves 1½ inches in diameter; Paris green for beetle.	Bordeaux, when flowers have fallen. Paris green for beetle.	Bordeaux 10-15 days later.	Bordeaux 10-15 days later if disease still appears.*
7. *Raspberry*. Anthracnose, rust.	Copper sulphate before buds break.	Bordeaux, if rust appears during summer.	Bordeaux, if the trouble appears to continue.	The only remedy, as yet, for orange rust is to cut out diseased plants.	
8. *Currant*. Worms and mildew	Paris green or hellebore for worms.	Hellebore 10 days later for worms; Bordeaux for mildew.	Hellebore if necessary for worms.		
9. *Gooseberry*. Mildew and worms.	For mildew Bordeaux as soon as leaves expand. Hellebore for worms.	Bordeaux 10-15 days later. Worms as before.	Ammoniacal copper carbonate 10-15 days later.	If further treatment is required for mildew, repeat third 10-15 days later.	
10. *Tomato*. Rot, blight.	Bordeaux, as soon as rot or blight appears.	Bordeaux, if trouble continues.	Bordeaux if necessary.		
11. *Strawberry*. Rust.	Bordeaux when first fruits are setting.	Ammoniacal copper carbonate when first fruits are ripening.	Bordeaux, when fruit is taken off.	Bordeaux if trouble continues.	
12. *Potato*. Blight, bettles.	Paris green as soon as beetles appear	Bordeaux, when plants about six inches high.	Bordeaux 10-15 days later.	Repeat if necessary in 10-15 days.	
13. *Cabbage*.	Pyrethrum may be applied in solution or dusted on, 1 part pyrethrum to 6-8 parts flour.				

* If further applications are necessary use ammoniacal copper carbonate.

Solutions Recommended.

1. *Copper Sulphate Solution.*

Copper sulphate	1 pound.
Water	20 gallons.

To be used only before the buds burst, and never to be applied on the foliage. When applied to peach trees, use 25 gallons of water instead of 20 gallons.

2. *Bordeaux Mixture.*

Copper sulphate	5 pounds.
Lime (fresh)	4 pounds.
Water	40 gallons.

Suspend the copper sulphate in five gallons of water. This may be done by putting it in a bag of coarse material and hanging it so as to be covered by the water. Slake the lime in about the same quantity of water. Then mix the two and add the remainder of the 40 gallons of water. Warm water will dissolve the copper sulphate more readily than cold water. If the lime is at all dirty, strain the lime solution. Use wooden vessels.

3. *Ammoniacal Copper Carbonate Solution.*

Copper carbonate	1 ounce.
Ammonia, sufficient to dissolve the copper carbonate.	
Water	9 gallons.

The copper carbonate may be dissolved and kept on hand to dilute when necessary.

4. *Paris Green Mixture.*

Paris green	1 pound.
Water	200 to 300 gallons.

Use about 200 gallons of water for apple trees, 250 for plum trees, and 300 for peach trees. When used upon peach trees, add 1 pound of lime to the mixture. When Paris green is added to the Bordeaux mixture to form a combined insecticide and fungicide, add 4 ounces to every 50 gallons of the Bordeaux mixture.

5. *Hellebore.*

White hellebore (fresh)	1 ounce.
Water	3 gallons.

6. *Kerosene Emulsion.*

Hard soap	½ pound.
Boiling water	1 gallon.
Coal oil	2 gallons.

After dissolving the soap in the water, add the coal oil and stir well for 5 to 10 minutes. A syringe or pump will assist much in this work. Dilute with from 9 to 15 parts of water.

7. *Pyrethrum.*

Pyrethrum powder (fresh)	1 ounce.
Water	4 gallons.

Notes.

1. When there is danger of disfiguring fruit with the Bordeaux mixture, use the ammoniacal copper carbonate solution.

2. Paris green and Bordeaux mixture may be applied together as well as separately, and thus save time.

3. Paris green is to be used for insects that *chew* the leaves, and kerosene emulsion for those that *suck* the juices of plants.

4. Prepare the mixtures well, apply them at the proper time, and be as thorough as possible in the work.

During 1895 attention was given to several investigations to which reference is now made.

(a) Oyster-shell Bark-louse. (*Mytilaspis pomorum.*)

Experiments have been carried on for the past two years to test the efficiency of kerosene emulsion upon this pest. Six infested trees were selected in a young orchard; five were treated and one omitted.

The following treatment was adopted: A solution was made from *one* quart soft soap in *two* quarts of water; and when it was heated and well mixed, one part of crude carbolic acid was added to seven parts of the above solution. This solution was applied to the trunk and large limbs in early spring. An old scrubbing brush was used to rub it on the trees. The application had an excellent effect upon the vigor of the trees and gave the bark a very healthy appearance. In order to ascertain, when the young lice would move out from beneath the scales, a badly infested branch was kept in the laboratory and examined from time to time about the end of May. In 1894 they appeared June 5, but did not show themselves until June 12, 1895, and were a week later in appearing upon the trees of the orchard. As soon as this was observed we at once sprayed the trial trees with kerosene emulsion, diluted with *nine* parts water, and made a second application nine days later.

An examination of the trees in October of 1894 showed very few scales on the wood of that year; and a further examination in October, 1895, showed that the lice had made no headway upon the shoots of this year. Some twigs showing the growth for three years are very instructive. The first growth has many lice; second, very few; and the third, none at all. This shows that kerosene emulsion applied at the time the lice are moving and again in about a week after, destroys the pest. Care should be exercised in planting out young trees to observe that they are free from bark-lice; and if not, to treat them as above. Where trees are large and the bark-louse has a good foothold, the work is difficult; but, even under such conditions, we believe the use of kerosene emulsion will be followed by good results.

(b) Injurious Fungi.

Some experiments in the use of fungicides have also been conducted during 1895.

The results were not so marked as on former occasions. This no doubt was owing to the season, which was unfavorable to the development of fungi. The following notes from my diary referring to the weather may be of interest in this connection:

April 17th.—First really spring weather, and warm days continue with little or no rain until the 21st.

May 12th.—Cold weather and some snow. On the 13th severe frost and much damage done vegetation. Snow on the 14th and considerable frost. 20th, temperature 25° F.; and on the 21st, 22° F. On the 23rd, a return to warmer weather; but on the 26th and 27th, cool. 29th, very warm.

June 4th, 5th, 6th, cool and necessary to have a fire in the greenhouse. This peculiar spring was followed by a dry summer, and hence was unfavorable to fungoid growth.

I have no doubt that the general report of experiments upon spraying this season will be somewhat disappointing as compared with those of other seasons more suitable for the growth of fungi.

Anthracnose, the Raspberry. (*Glœosporium venetum.*)

To test the effect of fungicides on this blight, 84 plants were selected and a patch where there was considerable anthracnose. Seventy-two were treated and twelve omitted.

The solutions used were:

a. One pound copper sulphate dissolved in 20 gallons of water.

b. Bordeaux mixture, consisting of 5 pounds copper sulphate, 4 pounds lime in 40 gallons of water.

c. Copper carbonate, 1 ounce in 9 gallons of water.

First application, April 23rd, with (*a*) solution.

Second application, May 9th, with Bordeaux mixture.

Third application, May 24th, with Bordeaux mixture.

Fourth application, June 8th, with a solution of copper carbonate, 1 ounce in 9 gallons of water.

An examination on July 4th indicated that the unsprayed bushes showed some signs of the disease, but the sprayed none. At the close of the season very little appeared on the sprayed and not a very marked attack on the unsprayed.

Leaf-spot on the Currant and Gooseberry. (*Septoria ribis.*)

To test the use of fungicides as a preventive of this trouble, 166 plants were selected, most of which had shown much spot in 1894.

The solutions used were the same as in the preceding experiment.

First application, April 23rd, copper sulphate solution.

Second application, May 9th, Bordeaux mixture as above.

Third application, May 24th, Bordeaux mixture as above.

Fourth application, June 8th, copper carbonate solution.

On July 4th some spots appeared on the unsprayed and in a very few caes on the sprayed. The foliage upon the sprayed bushes was much darker and quite conspicuous, as compared with that on the unsprayed. It was also noticed that the unsprayed were badly attacked by the currant worm (*Nematus ventricosus*), while the sprayed were not touched. Another season we purpose trying to what extent the Bordeaux mixture is useful against the ravages of this insect upon upon the foliage of the currant. An examination at the close of the season showed that the spraying had been helpful, but not in a marked degree, as the fungus had not made much headway upon the unsprayed bushes.

(*c*) Transpiration of Plants.

For some time my attention has been directed to the injuries sustained from weeds, with a view to discuss the subject before farmers' institutes. Amongst those I refer to is the damage done by them in using water which should be taken up by other plants of greater value. The water absorbed by weeds is very great. This passes up through the plant and a large amount of it is evaporated from the surface of the leaves. I believe one of the worst features in weeds is the waste of water which should be used in the growth of plants that are being cultivated.

With a view to find out how much water is thrown away in this manner, two species of plants were selected, the common Wild Mustard (*Brassica sinapistrum*) and the Pigweed (*Amarantus retroflexus*). These were put into large pots and placed in the garden in about the same conditions as we might expect in the field. Side by side with them, were pots filled with the same soil and submitted to the same conditions, but they contained no plants.

Water was applied as required, and the pots were weighed at regular intervals. The pots containing plants always weighed less, for the water had been absorbed by them and evaporated from their leaves.

The experiment was continued for nine days, when rain interfered and other conditions unfavorable to a continuance of the experiments.

The following figures will show the amount of water used each day by the plants under investigation:

	Wild Mustard. Ounces.	Pigweed. Ounces.
July 17th. Warm, dry, windy	10.87	8.12
" 18th. Hot, with a little wind	10.67	7.65
" 19th. Rain.		
" 20th. Sultry, with a little wind	12.33	10.13
" 21st. Sultry and cloudy	7.02	6.62
" 22nd. Dry and bright, with some wind	16.75	13.8
" 23rd. Fair and bright, with light wind	19.5	13.8
" 24th. Somewhat cloudy but fine	15.35	10.75
" 25th. Bright, with a little rain	14.6	12.9
" 26th. Bright, with a little breeze	18.8	10.8
9 days	125.87	94.57
Average per day	13.98	10.51

From this it appears that an average mustard plant pumps daily from the soil fourteen ounces, almost one pound, of water, or equivalent to seven-eighths of a gallon.

Allowing ten mustard plants to a square yard we have twenty-one tons of water, or 4,235 gallons thrown off daily from an acre into the atmosphere, a most extravagant use of water, especially in a dry season.

In the experiment water was supplied, but not in excess. No water was put directly into the pots, but into the pans in which the pots stood. The pots were weighed morning and evening.

An examination of the pots on the 16th, 19th and 27th, all rainy days, showed the daily average to be, for the mustard 7.75 ounces and the pigweed 3.33 ounces.

We purpose continuing investigation in this direction so as to show conclusively the pernicious effect weeds have in robbing the soil of moisture.

(*d*) "Tree Protectors."

Last year we undertook some experiments showing to what extent the funnel-shaped "tree protector" entrapped the codling moth.

The average upon each of twenty-five trees in 1894, numbered twenty-five worms beneath each protector. For 1895 the average for twenty three tree was only six per tree.

In the old orchard the average for ten trees was 11, while in the young orchard it reached an average of only two for thirteen trees. This marked diminution in the number may be accounted for by spraying having been done more thoroughly in 1895 than in 1894, and also by the poor crop of apples obtained this season.

(e) Roots of the Canadian Thistle.

The question having arisen to what extent a thistle root will grow, if cut into pieces, the following investigations were undertaken to get some information upon the subject:

a. The root was cut into pieces 2 inches in length.

b. " " 1½ "

The cuttings were taken from the crown down, planted in pots and placed in the propagating house. The plants from which the roots were taken were about nine inches high and had formed no flower buds.

a. Result	1st,	2 inches,	1 produced	4 buds,	1 failed.
	2nd,	2 "	1 "	3 "	1 "
	3rd,	2 "	1 "	2 "	1 "
	4th,	2 "	1 "	3 "	1 "
b. Result	1st,	1½ "	1 "	4 "	2 "
	3rd,	1½ "	2 "	5 "	1 "
	4th,	1½ "	2 "	4 "	1 "
	5th,	1½ "	2 "	3 "	1 "

6th, 7th, 8th, 1½ inches, all failed to produce a bud.

From these results it seems that if a vertical root is cut into small pieces the pieces will produce buds only as far as the fifth cutting. Sections after that fail to produce buds. This will receive further examination during 1896.

Insects Received and Identified During 1895.

Common name.	Scientific name.
Plum scale	Lecanium.
Vinegar eels	Anguillula aceti.
Pear leaf mite	Phytopus pyri.
Apple tree borer	Saperda Candida.
Canker worm	Anisopteryx pometaria.
Bark beetle	Scolytus rugulosis.
Currant tree borer	Ægeria tipuliformis.
Tapeworm	Tænia cœnurus.
Violet nematode	Anguillula.
Pea bug	Bruchus pisi.
Clover root borer	Hylesinus trifolii.
Strawberry crown borer	Tyloderma fragariœ.
Wire worms	Agriotes communis.
Measuring worm	Amphidasys cognataria.
Cherry tree borer	Dicerca divaricata.
Buffalo carpet beetle	Anthrenus scrophulariæ.
Rose slug	Selandari rosæ.
Thrips	Erythoneura vitis.
Corn leaf hopper	Tettigonia mollipsis.
The Eyed elater	Alaus oculatus.
Cut worm	Hadena devastatrix.
Cecropia emperor moth	Platysamia Cecropia.
Spittle insect	Clastoptera pini.
Ash-colored blister-beetle	Epicauta cinerea.
Black blister beetle	Epicauta Pennsylvanica.
Currant plant-louse	Myzus ribis.
Snout beetle	Sphenophorous ochreus.
Cabbage maggot	Phorbia brassicæ.
Mourning horse fly	Tabanus atratus.
Plant lice	Aphis.
Leaf-cutting beetle	Magachile brevis.
Gooseberry midge	Cecidomya grossulariæ.
Black peach aphis	Aphis Persicæ-niger.
Herbivorous lady-bug	Epilachna borealis.
Spinous currant caterpillar	Grapta progne.
Cabbage worm	Pieris rapæ.
Peach tree borer	Ægeria exitiosa.
Grain Aphis	Sphenophora avenæ.
Thorn Aphis	Aphis cratægifolii.
Pear tree slug	Selandria cerasi.
Common grasshopper	Caloptenus femur-rubrum.
Cutworm	Hadena arctica.
Pine borer	Monohammus scrutator.
Tent caterpillar	Clisiocampa Americana.
Tussock moth	Orgyia leucostigma.
Celery caterpillar	Papilio asterias.
Squash bug	Anasa tristis.
Ground beetle	Calosoma calidum.
Fall web-worm	Hyphantri cunea.
Strawberry slug	Emphytus maculatus.
Snowy tree-cricket	Oecanthus nivens.
Horn fly	Hæmatobia serrata.

Plants Identified, 1895.

Wormseed mustard	Erysimum cheiranthoides.
Rein-Orchis	Habenaria virides.
Showy Orchis	Orchis spectabilis.
Fig	Ficus Carica.
Water Arum	Calla palustris.
Labrador tea plant	Ledum latifolium.
Naked mitre-wort	Mitella nuda.
Barren strawberry	Waldsteinia fragarioides.
Star flower	Trientalis Americana.
Twisted stalk	Streptopus roseus.
Clintonia	Clintonia borealis.
Club moss	Lycopodium dendroideum.
Club moss	Lycopodium annotinum.
Coral root	Corallorhiza innata.

Ladies' tresses	Spiranthes.
Mouse ear chickweed	Cerastium vulgatum.
Rein-Orchis	Habenaria orbiculata.
Meadow fox-tail	Alopecurus pratensis.
Dock	Rumex crispus.
Rib-grass	Plantago lanceolata.
Wild sarsaparilla	Aralia racemosa.
Live-for-ever	Sedum Telephinum.
Spurge	Euphorbia Esula.
Greenbrier	Smilax hispida.
Cinque-Foil	Potentilla.
False Flax	Camelina sativa.
St. John's Wort	Hypericum perforatum.
Fleabane	Erigeron Canadensis.
Red top	Agrostis vulgaris.
Mallow	Malva rotundifolia.
Vervain	Verbena.
Plaintain	Plantago major.
Mullen	Verbascum thapsus.
Sow-thistle	Sonchus oleraceus.
Tower mustard	Arabis perfoliata.
Bladder campion	Silene inflata.
Bind-weed	Convolvulus arvensis.
Penny-cress	Thlaspi arvense.
Wild tare	Vicia Cracca.
Yellow avens	Geum strictum.
Cypress spurge	Euphorbia cyparissias.
Ginseng	Aralia quinquefolia.
Cone-flower	Rudbeckia hirta.
Pepper grass	Lepidium campestre.
Hedge bindweed	Convolvulus sepium.
Yellow melilot	Melilotus officinalis.
Sow-thistle	Sonchus asper.
White melilot	Melilotus alba.
Indian pipe	Monotropa uniflora.
Grindelia	Grindelia squarrosa.
Strawberry bush	Euonymus Americanus obovatus.
Prickly poppy	Argemone.
Catnip	Nepta cataria.
Shepherd's purse	Capsella bursa-pastoris.
Ox-eye daisy	Chrysanthimum leucanthimum.

Burdock	Arctium Lappa.
Norway Cinque-foil	Potentilla Norvegica.
Climbing finnitory	Adlumia chirrhosa.
Blue vervain	Verbena hastata.
Spurge	Euphorbia Helioscopia.
Western rye grass	Agropyrum tenerum.
Hair grass	Deschampsia cæspitosa
Wild oat grass	Danthonia spicata.
Chicory	Cichorium intybus.
Sow-thistle (perennial)	Sonchus arvensis.
Prickly lettuce	Lactuca Canadensis.
Ground cherry	Physalis Viscosa.
Spikenard	Aralia racemosa.
Horse ragweed	Ambrosia trifida.
Stone crop	Sedum acre.
Club moss	Lycopodium lucidulum.
Bladder campion	Silene inflata.
Medick	Medicago lupulina.
Sorrel	Oxalis acetosella.
Beech-drops	Epyshegus Virginiana.
Atriplex	Atriplex patula.
Solanum	Solanum rostratum.
Pepperwort	Lepidium Virginicum.
False flax	Camelina sativa.
Black bindweed	Polygonum convolvulus.
Chess	Bromus secalinus.
Spurrey	Spergula arvensis.
Poison hemlock	Conium maculatum.
Thorn apple	Datura stramonium.
Lamb's quarter	Chenopodium album.
Elecampane	Inula Helenium.
Evening primrose	Œnothera biennis.
St. Johnswort	Hypericum perforatum.
Trailing Arbutus	Epigæa repens.
Redroot	Lithospernum arvense.
Wood Betony	Pedicularis Canadensis.
Cursed crowfoot	Rarumculus sceleratus.
Bluebottle	Centaurea Cyanus.
Couch grass	Agropyrum repens.
Amaranth	Amarantus paniculatus.
Water Speedwell	Veronica Anagallis.

Answers to Correspondents.

The work in connection with answering enquiries regarding insects and plants increases each year, and shows that there is a growing desire among farmers to know something of animal and plant life, especially of those forms that are injurious, and that they recognize the Agricultural College as an important source of information such as they need.

A large number of weed seeds have been identified and many questions referring to spraying have been answered. Fifty-two species of insects and 98 of plants have also been identified, and information regarding their habits, etc., supplied to correspondents.

The following is a list of the different species of insects and plants that have been examined and reported upon during 1895; but this does not give the number of specimens sent, for in several cases the same species was received from different localities. In some cases, the same one was referred to by fifteen different correspondents. In reporting upon an attack of the Army Worm, near Petrolea in 1894, I remarked, "that the presence of a parasite, the Tachina Fly, which I noticed in many of the worms sent, indicated that they were doomed, and it is likely that this parasite will largely ward off an attack in '95."

In the autumn of this year, I wrote to the correspondent interested in the "Army Worm" and learned that he had not been troubled this year with the pest that had destroyed sixty tons of hay and 300 acres of oats for him in 1894.

During this year, no enquiries have been received referring to this insect, though in several places last year they appeared in large numbers.

Many specimens of a cutworm moth (*Hadena arctica*) were received. This moth seems to have been very common in many places.

Many questions were asked about the Russian thistle, and several specimens sent which were supposed to be the plant. But as yet I have not received a specimen of the true Russian thistle. Prickly lettuce was sent as a specimen of this weed, and also a variety of Solanum. A specimen of the Russian thistle grown for instructive purposes in our own bed, used to illustrate typical forms of plant life, attracted considerable attention while it was allowed to grow. It was, however, destroyed before maturing its seed.

The plants chicory and ginseng were referred to by a number of correspondents who were desirous to know something of their economic value. Among insects, an aphis affecting the turnips, blister beetles attacking potatoes and beans, the plum scale, and the Buffalo carpet beetle, the last a serious pest in the house, seemed to attract much notice.

The moth, *Hadena arctica*, also appeared to be very common throughout the Province. This is the first year that specimens of the carpet beetle, plum scale and blister beetle have been sent to me. The first seems to be spreading and will no doubt prove to be a very serious pest in the house among woollen goods and carpets.

Descriptions of these three species are given, so that readers may be prepared to identify them and use remedies against their distribution. Any specimens of plants or insects sent to the College for identification or information concerning them will receive prompt attention.

BLISTER BEETLES.

During this season many specimens of the common blister beetles have been received, especially those belonging to the genus *Epicauta*. The black variety, *Epicauta Pennsylvanica*, appears to have been very plentiful in various parts of the Province; many were reported feeding upon the leaves of mangels. Some specimens of the ash-colored variety, *E. cinerea*, were found feeding upon beans. This latter variety sometimes is quite destructive to potatoes as well as to beans. It owes its color to the presence of minute ash-gray scales or short hairs which can be readily rubbed off and then the beetles assume a black color. Blister beetles usually feed in crowds, and readily fly when disturbed. They lay their eggs in the soil; these hatch and the young grubs work about in search of the eggs of grasshoppers, upon which they feed. In a short time the perfect stage is reached and the mature insects then feed on a variety of plants In this insect we have a case where, at one stage of its development, it is beneficial, and at a later stage becomes injurious. Thus it is doubtful in some cases whether it is wise to destroy blister beetles, especially where grasshoppers are a nuisance However, when their numbers are such as to be troublesome it may become necessary to destroy them.

Remedies.—1. The application of Paris green, where it can be done safely, is likely to destroy any feeding upon the foliage of plants.

2. Where practicable, drive the beetles upon heaps of straw, etc., and, when many have collected upon them, set fire to the heaps.

3. Hand-picking may be resorted to in some cases and may prove fairly successful.

THE PLUM SCALE. (*Lecanium*).

This is also a comparatively new insect to our Province and may prove injurious if not kept in check.

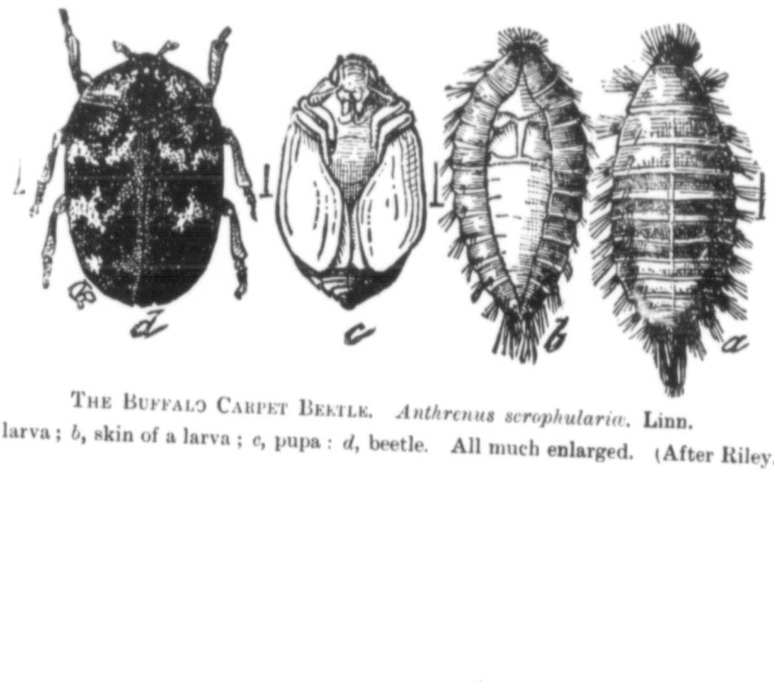
It is readily identified as an oval brown scale, about the fifth of an inch in diameter when fully developed. The small scales move early in April and make their way to the under side of the limbs. Here they remain and mature. About the end of May they begin to lay eggs under the scale.

EXPERIMENT IN THE EVAPORATION OF WATER FROM PLANTS.

1. Pot without Plant. 2. Mustard Plant. 3. Pigweed Plant.

THE

a, larva ; *b*, sk



THE BUFFALO CARPET BEETLE. *Anthrenus scrophulariæ.* Linn.
a, larva ; *b*, skin of a larva ; *c*, pupa : *d*, beetle. All much enlarged. (After Riley.)

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The young insects appear about the first of July, proceed to the leaves, and locate themselves on the under side, where they feed by sucking the juice. From this they emigrate in September to the branches and hibernate, as small scales, less than the size of a pinhead.

Kerosene emulsion applied as follows is recommended as a successful remedy:

1. Beginning of July, the emulsion diluted with six to eight parts water.
2. October, emulsion stronger, four parts water.
3. Same strength as No. 2, some time during the winter.
4. Again in the beginning of April, apply the same strength of emulsion.

Mr. Slingerland, of Cornell University, has made this insect a special study, and recommends that infested trees be sprayed thoroughly several times, twice at least in winter or before April.

If the insects can be attacked while moving, thorough spraying will be rewarded with success. Hence the necessity for observing closely for these periods in the life-history of the insects.

The Buffalo Carpet Beetle. (*Anthrenus scrophulariæ.*)

This is a European insect, which is reported as having been imported into the United States about 1874. During the present year specimens have been received from several parts of Ontario, showing that it is being well distributed here. It is comparatively harmless in Europe.

The adult insect is a small beetle, about three-sixteenths of an inch long. It is covered with very small scales, which give it a somewhat mottled appearance. There is an irregular red stripe down the middle of the back. The antennæ are composed of eleven joints, the last three being much larger than the rest. Like the potato beetle, it feigns death when disturbed. This beetle lives upon flowering plants and is frequently found on the spiræa, yarrow and some other plants of the compositæ. It lays its eggs on woollen material; these hatch and produce the larvæ, which become very serious household pests.

The larvæ are found feeding upon the woollen substance in the cracks of the floor, below carpets, and also in the carpet itself. The larvæ is about a quarter of an inch in length and is covered with coarse brown hairs, arranged in tufts on the head, and along the sides and end of the body. In autumn, the larva changes into the pupa and passes the winter in that stage, and the beetle emerges in spring.

Remedies.—1. Where carpets are infected, they should be taken up, well beaten and sprayed outside with benzine. If exposed for a few hours the smell of the benzine will pass off. The floors from which the carpets have been removed should be well washed with hot water.

2. Sometimes damping the carpet on the floor and running a hot iron over it at points infested, will prove very beneficial.

3. Corrosive sublimate (60 grains dissolved in a pint of alcohol) brushed over the floor at the edges, before the carpet is laid, and on the underside of the carpet, is a good remedy; but it must be remembered that this is very poisonous, and that it is not safe for children to play on a carpet thus treated.

4. In the case of clothing, blankets, etc., the application of benzine may be followed, but in all cases where it is used, remember that it is very inflammable and that no lights should be near during it use.

Both benzine and corrosive sublimate kill this insect readily, but as the one is very inflammable and the other poisonous, great care must be exercised in their use.

The appointment of Mr. Harrison to the position of Bacteriologist has deprived me of able assistance. His fondness for microscopic work and skill in drawing objects seen, fit him in an especial manner for his new position, and I have no doubt that he will prove himself suited for the patient and accurate work required in bacteriological research. It is hoped you will be able to continue the assistance in the department of biology, for, as you are well aware, the practical work has largely increased within the last year.

Mr. Clarke, of the third year, rendered me, during the summer, valuable help by the careful manner in which he conducted experiments upon the transpiration of plants.

Your obedient servant,

J. HOYES PANTON,
Professor of Biology and Geology.

ONTARIO AGRICULTURAL COLLEGE,
December 31st, 1895.

PART IV.

REPORT OF

THE PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College:

SIR,—It affords me pleasure to submit to you my annual report of the Chemical Department for the year 1895.

Towards the close of the year, a request from several sources came, through the Minister of Agriculture, asking the Chemical Department to analyze a large number of samples of sugar beets grown in Ontario, in the neighborhood of the following places: St. Catharines, Hamilton, London, Leamington and Amherstburg. My report contains the analyses of these sample, and of several other varieties of sugar beets grown in the Experimental Department of this institution under exactly similar conditions.

The additional grant of $300 to engage more assistance in the analytical room during the months of May to October inclusive, enabled us to enter upon extensive investigations, along with the Dairy Department, regarding the composition of dairy products, particularly in reference to the cheese-producing power of milk of varying percentages of fat. Our investigations of the latter have been very extensive; and we consider our results conclusive.

These tests began on the 1st of May and were continued without interruption until the end of October. They were conducted along the same lines as those of 1894, and are, in fact, a continuation of the work begun last year. During this period of six months, 147 vats of milk, 147 samples of whey, and 135 cheeses from the home dairy were analysed. Each sample having been analysed in duplicate, 429 complete analyses of the above products were made.

Samples of some sixteen vats of milk, and of cheese made therefrom, in the Marden factory, and of twenty-four vats of milk, and the cheese therefrom, in the Rockwood factory were also analysed, making a total of 589 complete analyses.

The extent of these investigations, covering as it does in every detail, actual factory conditions existing in Ontario, warrants, we think, the final conclusions which we have drawn therefrom.

ANALYSES OF 147 SAMPLES FROM OUR OWN DAIRY.

Milk.	Moisture.	Solids.	Fats.	Casein.	Albumen.
Average of lot L (or medium milk)......	88.071	11.929	3.215	2.371	.764
" " H (or rich milk).........	86.978	13.022	4.093	2.537	.803
" of lots L and H	87.524	12.476	3.654	2.454	.783

The averages in the above table are determined, in lot L, from complete duplicate analyses of samples from seventy-four different vats of milk, and, in lot H, from complete duplicate analyses of samples from seventy-three different vats of milk. All incomplete duplicate analyses, as well as complete duplicate analyses disagreeing with each other, were rejected in making up the averages. There is, practically, a difference of about nine-tenths of one per cent. between the average percentage of fats in lot L and that in lot H. Similar, and even greater differences occur in the percentages of fat in the milk sent by different patrons to cheese factories. But between the average percentage of casein (curd) in lot L and that in lot H, there is a difference of only .16. The difference in the average percentages of fat is more than five times greater than the difference in the average percentages of casein between lot L, which is called medium milk, and lot H, which is called rick milk.

Monthly average percentages of fat and casein in milk, showing ratio of fat to casein.

Months.	Lot L.			Lot H.		
	Fat.	Casein.	Lbs. casein to 1 lb. of fat.	Fat.	Casein.	Lbs. casein to 1 lb. of fat.
May	3.291	3.222	0.68	4.155	2.385	0.57
June	3.203	2.326	0.73	3.963	2.459	0.62
July	3.091	2.415	0.78	3.874	2.467	0.64
August	3.050	2.359	0.77	4.036	2.489	0.62
September	3.244	2.454	0.76	4.248	2.701	0.64
October	3.410	2.451	0.72	4.285	2.724	0.64
Average of all months	3.215	2.271	0.74	4.093	2.537	0.62

In the above table, are given, for each month, in both medium and rich milk, the average percentages of fats and casein, and the quantity of casein per pound of fat. These figures, for each month, are averages of from twelve to thirteen distinct samples from the same number of vats taken on different days. A comparison of the quantity of casein per pound of fat in lot L, or medium milk, of any month, with the quantity of casein per pound of fat in lot H, or rich milk, for the same month, shows more casein per pound of fat in poor or medium than in rich milk. The difference in any month is very close to the average difference for all months, which is 0.12 of a pound. The quantity of casein per pound of fat is unquestionably less in a rich than in a medium or poor milk. This difference has, as will be shown in following tables, an important influence on the quantity of cheese per pound of fat obtained from poor, medium, and rich milk.

Table showing quantity of casein per lb. of fat in groups of vats varying within fixed percentages of fat.

Milk between	Fat.		Casein.		Quantity of casein.		No of vats.
	Average %.	Increase of	Average %.	Increase or decrease of + or −.	Per lb. of fat.	Difference.	
2.5 and 3 % fat	2.926	....	2.388	....	0.82	....	16
3 " 3.5 "	3.280	0.354	2.334	−.054	0.72	−0.10	50
3.5 " 4 "	3.762	0.482	2.499	+.165	0.66	−0.06	33
4 " 4.5 "	4.207	0.445	2.530	+.031	0.60	−0.06	44
4.5 " 5 "	4.555	0.348	2.589	+.059	0.57	−0.03	4

Sixteen of the 147 vats of milk from our own dairy, lot L and lot H together, tested between 2.5 and three per cent. fat; fifty between three and 3.5; thirty-three between 3.5 and four; forty-four between four and 4.5, and four between 4.5 and five. Each successive group increases in fat by between .348 and .482%; but with these increases in fat there is a continuous decrease in the quantity of casein per pound of fat. Now this fact, together with the occurrence, in most groups of the above table, of slightly higher percentages of casein as the groups increase in fat, appears to me to demonstrate beyond all question, that increases in percentages of fat are not accompanied by proportional increases in percentages of casein in milk; but that the increases in percentages of casein are proportionally less than the increases in percentages of fat.

Table comparing actual and calculated yields of cured cheese on a fat basis.

Month.	Lot L.					Lot H.				
	Fat, per cent.	Lb. of cured cheese per lb. of fat.	Actual yield of cheese.	Calculated yield of cheese.	Difference between actual and calculated.	Fat, per cent.	Lb. of cured cheese per lb. of fat.	Actual yield of cheese.	Calculated yield of cheese.	Difference between actual and calculated.
May	3.291	2.713	401.75	384.92	−16.83	4.155	2.497	436.75	453.55	+16.80
June	3.203	2.776	319.00	303.92	−15.08	3.963	2.548	361.00	376.05	+15.05
July	3.091	2.870	340.75	318.65	−22.10	3.874	2.525	409.50	431.50	+22.00
August........	3.050	2.843	311.25	287.50	−23.75	4.036	2.455	359.00	382.76	+23.76
September	3.244	2.755	241.25	225.88	−15.37	4.248	2.445	280.75	296.05	+15.30
October	3.410	2.747	369.00	352.33	−16.67	4.285	2.515	387.75	404.44	+16.69

The figures in the table above are the averages of each month's tests of from nine to fourteen vats of medium and of rich milk. Without one exception there is less cheese per pound of fat from the rich than from the medium milk. The differences are as follows: May, .216 pound; June, .228 pound; July, .345 pound; August, .388 pound; September, .310 pound, and October, .232 pound. The average is practically three-tenths of one pound of cheese less per pound of fat from the rich than from the medium milk. The figures under actual yield of cheese represent the pounds of cheese made each month from the medium and from the rich milk, each lot of milk being kept by itself. The figures under calculated yield of cheese represent the pounds of cheese that would be credited to lot L and lot H respectively, assuming that the medium and the rich milk were mixed, and the division of cheese made upon the fat basis. For example, in the month of May, the medium milk, amounting to 4,500 pounds, and averaging 3.291 per cent., furnished 148.11 pounds of fat; and the rich milk, amounting to 4,200 pounds, and averaging 4.155 per cent., furnished 174.51 pounds of fat. Now, 838.46 pounds of cheese, the yield of the mixed milk, divided by 322.62 (148.11 + 174.51), the total fat equals 2.599, the average yield of cheese per pound of fat. But 2.599 × 148.11 equals 384.92, the calculated yield of cheese from the medium milk; and 2.599 × 174.51 equals 453.55, the calculated yield of cheese from the rich milk. These calculated yields credit the medium milk with 16.8 pounds of cheese less than the milk actually makes, and credits the rich milk with 16.8 pounds of cheese more than the rich milk actually makes. For each month, as the table shows, the calculated yield, in the medium milk, is less than the actual yield, and, in the rich milk, is more than the actual yield. For the entire season, the calculated yield of cheese from the 22,194.5 pounds of medium milk is 109 pounds less than the actual yield; and the calculated yield from the 21,894.5 pounds of rich milk is 109 pounds more than the actual yield. These differences between the actual and calculated yields of cheese follow from or are due to, the casein in milk not increasing in the same ratio as the fat.

Comparing yield of cured cheese per pound of fat in milk with yield per pound of fat and casein in milk.

Months.	Lot L.				Lot H.			
	Fat, per cent.	Casein, per cent.	Cured cheese per lb. of fat.	Cured cheese per lb. of fat and casein.	Fat, per cent.	Casein, per cent.	Cured cheese per lb. of fat.	Cured cheese per lb. of fat and casein.
May	3.291	2.222	2.713	1.619	4.155	2.385	2.497	1.592
June	3.203	2.326	2.776	1.615	3.963	2.459	2.548	1.564
July	3.091	2.415	2.870	1.598	3.874	2.467	2.525	1.534
August	3.050	2.359	2.840	1.598	4.036	2.489	2.455	1.522
September	3.244	2.454	2.755	1.568	4.248	2.701	2.445	1.495
October	4.410	2.451	2.747	1.614	4.285	2.724	25515	1.540

The figures under cured cheese per pound of fat in lot L and in lot H are obtained by dividing the pounds of fat of each lot into its respective yields of cheese. While the figures under cured cheese per pound of fat and casein are obtained by dividing the sum of the fat and the casein of each lot into its respective yields of cheese. The figures for each month are averages of twelve to thirteen distinct tests on different days. This comparison shows that while the medium milk yields nearly three-tenths of a pound more cheese per pound of fat than the rich milk, the medium milk yields only six-hundredths of a pound more cheese per pound of fat and casein than the rich milk. It will be shown in following tables that the quantity of casein in any weight of milk, of a known percentage of fat, may be calculated. The question then reduces itself into one of the relative value of cheese from medium and from rich milk. The fat and casein together never fail to determine, very nearly, the cheese-producing power of milk, whatever its percentage of fat.

Table showing that casein in milk of known percentage of fat may be calculated.

Milk between	Number of vats.	Average fat, per cent.	Average casein, per cent.	Actual casein.	Calculated casein.	Difference.	Addends.
2.5 and 3 per cent. fat	16	2.926	2.388	114.560	105.502	-9.031	2.2
3 " 3.5 "	50	3.280	2.334	350.169	345.000	-5.169	2.3
3.5 " 4 "	33	3.762	2.499	247.288	237.468	-9.820	2.4
4 " 4.5 "	44	4.207	2.530	333.963	329.950	-4.013	2.5
4.5 " 5 "	4	4.555	2.589	31.068	31.200	+ .132	2.6

From lot L or lot H, 16 vats contained below 3 per cent. fat; 50 vats, 3 per cent. and below 3.5 per cent.; 33 vats, 3.5 per cent. and below 4 per cent.; 44 vats, 4 per and below 4.5 per cent., and 4 vats, 4.5 per cent. and below 5 per cent. This grouping of the vats is to compare the quantity of actual casein in milk with the quantity of calculated casein in milk. It has been shown in tables already given that there is a very close relation between the sum of the fat and casein in milk and the cheese-producing of milk. Fat in milk can be easily and accurately determined by the Babcock tester, as readily in a cheese factory as in a chemical laboratory. Casein cannot be actually determined in milk in factories. But casein in milk being fairly constant, increasing only slowly or slightly as fat increases, not increasing proportionately with fat, its amount in any quantity of milk of a known percentage of fat can be calculated. The addends given in the last column, which are used in calculating casein, represents average percentages of casein slightly modified, making the calculation simple and somewhat in favor of the richer milk. In making casein calculation, use 2.3 as the average percentage.

Comparison of calculated yield of cured cheese on a fat and casein basis, with actual yield in medium and rich milk:

Month.	Lot L.					Lot H.				
	Fat, per cent.	Average casein, per cent.	Actual yield of cheese.	Calculated yield of cheese.	Difference.	Fat, per cent.	Average casein, per cent.	Actual yield of cheese.	Calculated yield of cheese.	Difference.
May	3.291	2.4	401.75	400.802	.95	4.155	2.5	436.75	437.437	.68
June	3.203	2.4	319.00	318.416	.59	3.963	2.4	361.00	361.622	.62
July	3 091	2.4	340.75	336.024	4.73	3.874	2.4	409.50	414.210	4.71
August	3.050	2.4	311.25	304.139	7.12	4.036	2.5	359.00	366.117	7.11
September	3.244	2.4	241.25	237.711	3.54	4.248	2.5	280.75	284.381	3.63
October	3.410	2.4	369 00	365 282	3.72	4.285	2.5	387.75	391.346	3.59

Certain addends, as explained in the previous table, can be used in calculating casein in milk. The addends used depend, as was explained, on the percentages of fat in the milk. This ready and accurate means of calculating casein in milk makes a method, considering casein as well as fat, practicable for calculating the cheese-producing value of milk. To illustrate, take the division of the total make of cheese in May, assuming L, or medium, and H, or rich milk, to be two patrons. L, or medium milk, amounting to 4,500 pounds and averaging 3.291 per cent. fat, contained 148.11 pounds of fat by actual determination, and 103.5 pounds casein by calculation, using the addend 2.3, as the percentage of fat is above 3 and under 3.5. H, or rich milk, amounting to 4,200 pounds, and averaging 4.155 per cent. fat, contained 174.51 pounds of fat by actual determination, and 105 pounds casein by calculation, using the addend 2.5, as the percentage of fat is above 4 and under 4.5.

838.46 pounds, the total yield of cheese in May, divided by 535.62 (=148.11+103.5 +174.51+105), equals 1.5787, the average yield of cheese per pound of fat and casein.

But 1.5787 × 251.61 (=148.11+103.5), equals 397.207, the calculated yield of cheese from L, or medium milk; and 1.5787 × 279.51 (174.51+105), equals 441.267, the calculated yield of cheese from H, or rich milk. Similarly, the calculated yields for each month from medium and rich milk, assuming them to be mixed, are made. The figures under differences in the above table show how much these calculated yields of cheese differ from the actual yields. They also show that the difference in every instance is favorable to the rich milk.

METHODS OF THE DISTRIBUTION OF CHEESE.

	May.		June.		July.		August.		September.		October.	
	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.
1. By fat and casein method, using addend 2.4:												
Lb. of milk	4500	4200	3594.5	3594.5	3900	4200	3600	3600	2700	2700	3900	3600
Percentage of fat	3.291	4.155	3.203	3.963	3.091	3.874	3.050	4.036	3.244	4.248	2.451	4.285
Lb. of fat in milk	148.10	174.51	115.13	142.46	120.02	162.52	109.81	146.20	87.57	114.79	134.27	154.13
Lb. of casein in milk	100.00	100.12	83.60	88.40	94.10	102.33	84.89	89.67	66.24	72.91	95.75	98.61
Lb. of calculated casein	108.00	100.80	86.26	86.27	93.60	100.80	86.40	86.40	64.80	64.80	93.60	86.40
Ratio of F. and C. to C. cheese	1.568	1.586	1.583	1.578	1.595	1.555	1.586	1.543	1.583	1.563	1.619	1.612
Actual cured cheese	401.75	436.75	319.00	361.00	340.75	409.50	311.25	359.00	241.25	280.75	369.00	387.75
Calculated cured cheese	404.08	434.39	318.40	361.60	336.02	414.20	306.70	363.56	239.60	282.40	368.13	388.52
Difference	+2.33	−2.37	−.60	+.60	−4.73	+4.70	−4.55	+4.56	−1.65	+1.65	−.87	+.83
2. By fat and casein method, using addends 2,2, 2.3, 2.4, 2.5, etc.:												
Lb. of fat in milk	148.10	174.51	115.13	142.46	120.02	162.52	109.81	146.20	87.57	114.79	134.27	154.13
Lb. of casein in milk	103.5	105.0	82.67	86.26	89.70	100.8	82.80	90.00	62.10	67.50	89.70	90.00
Ratio of F. and C. to C. cheese	1.596	1.562	1.612	1.578	1.625	1.514	1.616	1.519	1.611	1.540	1.647	1.588
Actual cured cheese	401.75	436.75	319.00	361.00	340.75	409.50	311.25	359.00	241.25	280.75	369.00	387.75
Calculated cured cheese	397.21	441.27	315.34	364.64	329.80	420.43	301.70	368.57	235.43	286.56	360.89	395.85
Difference	−4.54	+4.52	−3.66	3.64	−10.96	+10.93	−9.56	+9.57	−5.82	+5.81	−8.11	+8.10
3. By fat method:												
Lb. of fat in milk	148.10	174.51	115.13	142.46	120.02	162.52	109.81	146.20	87.57	114.79	134.27	154.13
Ratio of fat to C. cheese	2.713	2.497	2.776	2.548	2.870	2.525	2.843	2.455	2.755	2.445	2.747	2.515
Actual cured cheese	401.75	436.75	319.00	361.00	340.75	409.50	311.25	359.00	241.25	280.75	369.00	387.75
Calculated cured cheese	384.99	453.55	303.92	376.05	318.65	431.50	287.50	382.76	225.88	296.05	352.33	404.44
Difference	−16.88	+16.80	−15.00	+15 00	−22.00	+22.00	−23.7	+23.70	−15.30	15.30	−16.66	+16.60
4. By Fat + 2 method:												
Lb. of fat in milk	148.10	174.51	115.13	142.46	120.02	162.52	109.81	146.20	87.57	114.79	134.27	154.13
Fat with addend 2	238.10	258.51	187.02	214.35	198.02	246.52	181.81	218.20	141.57	168.79	212.27	226.13
Ratio of fat and 2 to C. cheese	1.687	1.689	1.700	1.684	1.719	1.661	1.712	1.645	1.704	1.663	1.738	1.714
Actual cured cheese	401.75	436.75	319.00	361.00	340.75	409.50	311.25	359.00	241.25	280.75	369.00	387.75
Calculated cured cheese	402.00	436.49	316.85	363.13	334.55	415.70	305.31	364.92	238.19	283.79	365.16	391.58
Difference	+.25	−.26	−2.15	+2.13	−6.20	+6.20	−5.94	+5.92	−3.06	+3.04	−3.84	+3.83

The above tabulated statement illustrates what the distribution of cheese between L and H, assuming these to be two patrons of a factory, would be according to each of three different methods which might be used. No. 1 in the table shows that by the use of an addend as 2.4, representing the average quantity of casein in milk, the cheese-producing power of the several lots of milk can be calculated within 1.3 per cent. of the actual yield on 336 pounds of cheese. This is the greatest difference between the actual and calculated yields in any month during the season. For the whole season the difference between the actual and calculated yields is only .06 of one pound in every one hundred pounds of cheese, which is less than one ounce. Method No. 2 uses addends, which, beginning with 2.2 and increasing .1 for each increase of .5 of one per cent. in fat, credits poor milk with a little less casein than such milk actually contains, and rich milk with a little more casein than it contains. The average increases in casein are a little less than .1 of one per cent. for increases in fat of half a per cent. These addends, therefore, credit rich milk with more cheese than its actual cheese-producing power in weight of cheese, which is equivalent to allowing something for the better quality of the cheese.

The monthly differences between the actual yields and calculated yields in L and H, or medium and rich milk, represent what they would be monthly to patrons with four to six cows, giving twenty-five pounds of milk per day.

Monthly average composition of cured cheese from medium and rich milk.

Months.	Cheese from medium milk.					Cheese from rich milk.				
	Moisture.	Solids.	Per cent. fat.	Per cent. casein.	Per cent. albumen.	Moisture.	Solids.	Per cent. fat.	Per cent. casein.	Per cent. albumen.
May	33.768	66.232	32.930	20.135	4.302	33.297	66.703	34.624	18.599	5.336
June	34.428	65 572	29.839	21.513	3.580	33 496	66.504	33.721	19.180	3.989
July	34.257	65.743	29.545	21.620	4.089	32.764	67.236	34.756	19.849	4.100
August	34.150	65.850	29.183	22.732	3.863	32.946	67.054	34.217	21.362	3.489
September	33.727	66.273	31.819	22.320	4.273	32.264	67.736	34.088	21.389	3.709
Average	34.066	65.934	30.663	21.664	4.021	32.953	67.047	34.281	20.076	4.125

This table, giving the monthly average composition of cured cheese made from medium and rich milk in the dairy tests, shows that the cheese made from the medium milk contains higher percentages of moisture and casein in each month than the cheese made from the rich milk; but lower percentages of fat occur each month in the cheese made from medium milk than in the cheese made from rich milk.

Monthly average composition of green cheese from medium and from rich milk.

Months.	Cheese from medium milk.					Cheese from rich milk.				
	Moisture.	Solids.	Per cent. fat.	Per cent. casein.	Per cent. albumen.	Moisture.	Solids.	Per cent. fat.	Per cent. casein.	Per cent. albumen.
May	36 568	63.432	32.741	22.500	1.212	35.669	64.331	35.225	20.924	.895
June	39.290	60.710	32.083	23.513	1.033	36.889	63.111	35.409	22.161	.639
July	39.213	60.787	31.295	25.248	.297	36.499	63 501	35.547	23.092	.516
August	37.515	62.485	31.480	24 736	.092	34.549	65.451	35.356	21.943	.614
September	35.776	64.224	32.431	24.792	.417	33.414	66.586	36.532	23.433	1.506
Average	37.672	62.328	32.006	24.158	.612	35.404	64.596	35.614	22.311	.834

Here is given the percentage composition of the cheese of the former table before curing. In cheese from the medium milk the percentages of moisture and casein are higher every month than in cheese from the richer milk. But the cheese from the richer milk contains, every month, a higher percentage of fat than the cheese from the medium milk. The difference between the percentages of fat in L and H cheese when green is practically the same as the differences when cured. The average difference in green cheese is 3.618, and in cured cheese, 3.608.

Absolute weights of the constituents in green and cured cheese each month from medium milk.

Months.	Moisture.		Total solids.		Fat.		Casein.		Cheese.	
	Green.	Cured.	Green.	Cured.	Green.	Cured.	Green.	Cured.	Green.	Cured.
May	155.41	133.66	269.59	266.09	139.15	132.30	95.62	80.89	425.00	401.75
June	133.39	109.83	206.11	209.17	108.92	95.19	79.83	68.63	339.50	319.00
July	141.07	116.73	218.68	224.03	112.58	100.67	90.83	73.67	359.75	340.75
August	122.96	106.29	204.79	204.96	103.18	90.83	81.07	70.75	327.75	311.25
September	91.41	81.36	164.09	159.90	82.86	76.76	63.34	53.85	255.50	241.25

The study of the table above, which gives the absolute weights for each month of each of the several constituents in green and cured cheese, shows that the percentage loss in curing is as follows: Of moisture, 14.9; of fat, 9.3; of casein, 15.3. These percentages are in terms of the absolute amounts in the green cheese. The cheese lost in curing is 5.4 per cent of its green weight.

Absolute weight of the constituents in green and cured cheese for each month from rich milk.

Months.	Moisture.		Total solids.		Fat.		Casein.		Cheese.	
	Green.	Cured.	Green.	Cured.	Green.	Cured.	Green.	Cured.	Green.	Cured
May	164.34	145.42	296.41	291.33	162.30	151.22	96.41	81.23	460.75	436.75
June	140.55	120.92	240.45	240.08	134.91	121.73	84.43	69.24	381.00	361.00
July	156.94	134.17	273.05	275.33	152.85	142.33	99.30	81.28	430.00	409.50
August	130.34	118.28	246.91	240.72	133.38	122.84	82.78	76.69	377.25	359.00
September	98.40	90.58	196.10	190.17	107.59	95.70	69.01	60.05	294.50	280.75

This table, corresponding with the former, gives similar data for cheese from rich milk. In the cheese from this milk we find the percentage loss of moisture in curing was 11.7; of fat, 8.2; of casein, 14.6. It loses in curing 4.9 per cent. of its green weight.

In the process of curing, cheese from the medium milk loses higher percentages of moisture, fat and casein than cheese from the rich milk.

Monthly average composition of whey from medium and rich milk.

Months.	Whey from medium milk.					Whey from rich milk.				
	Moisture.	Solids.	Per cent. fat.	Per cent. casein.	Per cent. albumen.	Moisture.	Solids.	Per cent. fat.	Per cent. casein.	Per cent. albumen.
May	93.303	6.696	.221	.120	.706	92.988	7.012	.332	.103	.822
June	93.301	6.699	.193	.115	.778	93.221	6.780	.237	.149	.830
July	93.380	6.620	.187	.098	.842	93.360	6.640	.261	.093	.881
August.........	93.489	6.511	.190	.119	.825	93.382	6.618	.273	.136	.859
September......	93.460	6.540	.194	.118	.921	93.193	6.807	.295	.157	.915
October	93.253	6.747	.232	.117	.825	93.019	6.981	.283	.137	.862
Average ...	93.364	6.636	.203	.114	.816	93.194	6.806	.280	.129	.862

The above table gives the percentage composition of sweet whey from medium and rich milk in our Dairy tests. The whey from rich milk contains each month a higher percentage of fat than the whey from medium milk. The difference in casein is very little. Of the total fat, 5.817 per cent. goes off in the whey from the medium milk, and 6.244 per cent. in that from rich milk. Of the total casein, 4.452 per cent. is found in the whey from the medium milk, and 4.662 per cent. in that from the rich milk.

Conclusions.

1. A given weight of rich milk makes more cheese than an equal weight of medium or of poor milk.

2. The casein per pound of fat is greater in medium than in rich milk.

3. The percentage of casein is higher in rich milk than in poor or in medium milk in averages of several samples; but, in single samples, a decrease in casein may accompany an increase in fat, and *vice versa*.

4. Casein in milk does not increase in the same ratio as the fat, in poor, medium or rich milk.

5. A medium milk yields a greater weight of cheese per pound of fat contained in it than a rich milk.

6. There is a little more fat lost in whey from a rich milk than from a medium milk.

7. Cheese in curing 30 days loses from 4 to 5.5 per cent. of its green weight.

8. Cheese from medium milk loses, in curing, a slightly higher percentage of its green weight than cheese from rich milk.

Marden and Rockwood Tests.

Once each week, during the whole season while the factories were in operation, samples of milk and green cheese were taken from Marden and Rockwood cheese factories for chemical analysis. The object in taking these samples was that our investigations should be made to cover factory conditions in every detail. The results obtained in these tests confirm every conclusion reached in the tests made with the milk from our own dairy.

Monthly average percentages of fat and casein in milk of Marden and Rockwood Factories.

Months.	Marden factory.				Rockwood factory.			
	Per cent. fat.	Per cent. casein.	Lb. casein per lb. of fat.	Number of vats.	Per cent. fat.	Per cent. casein.	Lb. casein per lb. of fat.	Number of vats.
May	3.214	2.180	.678	4	3.311	2.191	.661	3
June	2.983	2.352	.788	4	3.021	2.372	.785	3
July	3.213	2.306	.717	3	3.207	2.351	.733	4
August	3.476	2.272	.653	4	3.558	2.329	.655	5
September	....	....	....	....	3.604	2.522	.700	2
October	....	....	....	....	3.900	2.715	.696	5
Average	3.221	2.277	.707	15	3.274	2.310	.708	22

The above table gives the monthly averages of fat and casein in the milk of the neighboring cheese factories of Marden and Rockwood. These averages, each month, are made up from duplicate analyses of several vats. The quantities of milk in most of the vats were in the neighborhood of 4,000 pounds. Here then are actual factory conditions as existing in Ontario. Though the percentages of fat do not vary widely, there is considerable irregularity in the quantities of casein per pound of fat in the different months.

Table showing quantity of casein per pound of fat in the average of all analyses of each group of vats varying within fixed percentages of fat.

Milk between—	Number of vats.	Fat.		Casein.		Lb. casein per lb. of fat.
		Average per cent.	Increase of.	Average per cent.	Increase or decrease of.	
2.5 and 3 per cent. fat	3	2.836	....	2.281	....	.804
3 " 3.5 " "	22	3.282	.446	2.273	−.007	.700
3.5 " 4 " "	9	3.635	.353	2.494	+.221	.607
4 " 4.5 " "	3	4.065	.430	2.732	+.238	.681

In this table, the vats of Marden and Rockwood factories are grouped within fixed percentages of fat, to obtain greater differences in fat percentages, in order to study the relation of fat to casein. Each succeeding group is richer in fat than the preceding one by nearly half of one per cent. With these increases in fat, the casein per pound of fat decreases regularly by one-tenth of one pound, except in the last group. The slight increase in the last group, as the study of other tables will show, appears to be characteristic of September and October milk, in which months this higher percentage of fat occurred. Here, as in our dairy tests, there is an evident decrease of casein per pound of fat as milk increases in richness.

Table showing yield of green cheese per pound of fat in the two cheese factories.

Factory.	Per cent. of fat.	Lb. cheese per lb. of fat in milk.	Factory.	Per cent. of fat.	Lb. cheese per lb. of fat in milk.
Marden	2.985	3.171	Rockwood	3.006	3.063
"	3.199	2.921	"	3.398	3.012
"	3.235	2.835	"	3.458	2.826
"	3.485	2.642	"	3.546	2.789
			"	3.599	2.827
				3.903	2.789

From the analyses of the several vats of milk of each month, the average percentages of fat and casein in the milk are calculated Since the different vats did not contain equal qualities of milk, these monthly averages are not just the same as the monthly averages of the analyses. The same is true for the casein. In the above table, the monthly averages are arranged in the order of increasing percentages of fat. In Marden milk, there are regular decreases in yield of cheese per pound of fat as the percentage of fat increases. The same general tendency shows itself in Rockwood milk, though here, in most instances, there are very slight increases in fat.

Distribution of cheese according to five different methods.

Lb. of milk.	Average per cent. of fat.	Actual yield.	Pooling.		Fat basis.		Fat + 2 basis.		Fat and casein basis.	
			Lb.	More or less + or −	Lb.	More or less + or −	Lb.	More or less + or −	Lb.	More or less + or −
16,642	2.841	•1,595.5	1,620.27	+ 24.8	1,366.74	−228.8	1,461.17	−134.3	1,434.03	−161
86,043	3.269	8,164.75	8,377.15	+212.4	8,132.40	− 32.4	8,223.42	+ 58.7	8,190.85	+ 26
33,230	3.626	3,339.75	3,235.27	−104.5	3,483.53	+143.8	3,390.96	+ 51.2	3,422.91	+ 83
12,590	4.055	1,358.50	1,225.76	−132.7	1,475.81	+117.3	1,382.62	+ 24.1	1,410.70	+ 52

This table shows the quantity of green cheese made from the total milk in each group of vats of the Marden and Rockwood factories. By reference to previous tables giving results of samples from our own dairy, it will be seen that the grouping of the vats depends on the percentages of fat, each succeeding group being one-half of one per cent. richer in fat than the preceding one. The table above also shows what the distribution of the total make of cheese among the four groups, which may be considered patrons of one factory, would be, according to each of four different methods by which dividends in cheese factories may be distributed. By the pooling method, which considers only the weights of milk, each of the two poorer groups is credited with more than the milk actually makes, while each of the two richer groups is credited with less than the milk actually makes. Remembering that a 3.6 and 4 per cent. milk make a quality of cheese probably better than the quality of that from a 3.2, and most clearly superior to that from a 2.8 per cent. milk, remembering also that disregarding quality of milk is an inducement to the dishonesty disposed to water and skim milk, it is most apparent that the pooling method is bad and should not be practised in any factory. The fat basis of distribution is in the right direction. It considers the quality as well as the weight of milk. But by this method, since casein in milk does not vary as the fat, it makes a very great distinction in favor of the rich milk. Previous tables show that variations in percentages of fat are proportionately greater than in casein. The fat basis of distribution, therefore, reverses the advantage, crediting the two poorer groups with much less than the milk actually makes, and the two richer groups with much more than the milk actually makes. This method gives the advantage to the richer milk, and discourages watering and skimming. For these and other reasons it is commendable. But owing to the facts (1) that the casein of milk, as well as the fat, enters into the cheese, influencing, like fat, its amount and its quality, and (2) that the variations in the percentages of the casein in milk are not in the same ratio as those in the percentages of fat, the fat basis of distribution gives too great an advantage to the richer milk. Two being somewhat in the neighborhood of the average percentage of casein, particularly in milk between 3 and 3.5 per cent. of fat, its addition to the fat reading considerably reduces the advantage given, by the fat basis alone, to the richer milk. But the fat + 2 method does not recognize any difference in the percentages of casein in poor, medium and rich milk. For this reason, as in our dairy tests for May, a poor milk may be credited with more cheese than the milk produces, and the rich milk with less cheese than it produces and *vice versa*. The fat and casein method, using addends to calculate casein, distributes the cheese, as in the dairy tests, fair to all qualities of milk, making due allowance for quality and quantity of cheese.

Comparison between the different methods of distribution of cheese from equal quantities of milk with different percentages of fat.

Lb. of milk.	Average per cent. of fat.	Actual yield.	Pooling.		Fat basis.		Fat + 2.		Fat and casein basis.	
			Lb.	More or less + or −	Lb.	More or less + or −	Lb.	More or less + or −	Lb.	More or less + or −
15,000	2.841	1,438.4	1,496 95	+ 58.6	1,238.5	−204.9	1,330.22	−108.2	1,301.56	−136.84
15,000	3.269	1,423.4	1,496.95	+ 73.6	1,419.34	− 4.1	1,447.83	+ 24.4	1,437.88	+ 14.48
15,000	3.626	1,507.5	1,496.95	− 10.6	1,574.34	+ 66.8	1,545.93	+ 38.4	1,555.88	+ 48.38
15,000	4.055	1,618.5	1,496.95	−121.6	1,760.52	+142.0	1,663.82	+ 45.3	1,692.46	+ 73.96

To make the figures of the preceding table more intelligible, they are calculated to equal weights of milk. Fifteen thousand pounds of milk would represent the quantity sent to a factory in one month by one patron, having twenty cows, giving a daily average of 25 pounds of milk. By the fat and casein method of distribution, the quantities of cheese, over actual yield, going to the 2nd, 3rd, and 4th patrons, are in fair proportion to quantities of fat in the respective lots of milk; from which it will be seen that every conclusion drawn from the experiments made with samples from our dairy, is confirmed by the results obtained from Marden and Rockwood factories.

Single Tests of Yield of Cheese from Medium and Very Rich Milk.

After the conclusion of our more elaborate experiments, five single tests were made to see (1) the effect of setting at 80° and heating gradually to 100° on the quality of cheese made from very rich milk, and (2) if the conclusions drawn in our experiments with milk varying in fat would hold good for very wide differences in fat. Details of these tests will be reported by the dairy department.

Following is a table showing yields of cheese, etc., from each of the two extremes.

Yields of green cheese from single lots of milk containing wide differences in the percentages of fat, and the distribution of the cheese by four different methods.

Date of tests.		Lb. of milk.	Per cent. fat B. deter.	Actual yield of cheese.	Pooling.		Fat basis.		Fat + 2.		Fat and casein.	
					Lb. cheese.	Diff. from actual in 15,000 lb. milk.	Lb. cheese.	Diff. from actual in 15,000 lb. milk.	Lb. cheese.	Diff. from actual in 15,000 lb. milk.	Lb. cheese.	Diff. from actual in 15,000 lb. milk.
December 20	L	300	3.25	28.25	31.75	+175.00	25.798	—122.6	27.783	—23.35	27.319	— 46.5
	H	300	4.75	35.25	31.75	—175.00	37.705	+122.6	35.721	+23.35	36.179	+ 46.5
December 21	L	300	3.20	28.50	33.94	+272.00	24.965	—176.75	27.783	—35.85	27.0435	— 72.8
	H	300	5.50	39.375	33.94	—272.00	42.909	+176.75	40.072	+35.85	40.8111	+ 72.3
December 23	L	300	3.10	28.50	32.00	+175.00	26.449	—102.50	28.381	— 5.5	28.097	— 20
	H	300	4.4	35.50	32.00	—175.00	37.540	+102.50	35.61	+ 5.5	35.90	+ 20
December 28	L	300	3.00	26.50	31.875	+268.75	23.610	—144.5	26.34	— 8	25.789	— 35.4
	H	300	5.10	37.25	31.875	—268.75	40.138	+144.5	37.402	+ 8	37.954	+ 35.4
December 30	L	300	3.00	28.50	32.125	+181.25	24.093	—220.4	26.770	—86.5	26.187	—115.2
	H	300	5.00	35.75	32.125	—181.25	40.155	+220.4	37.478	+86.5	38.045	+115.2

In comparing the results in this table, it should be remembered that the figures represent single tests, and that the samples are from cows which have been milking for some time or are well advanced in their period of lactation. A comparison of the figures of this table with those representing averages in previous tables under the regular dairy tests reveals nothing conflicting with former conclusions.

Testing ratio of fat to casein in individual cow's milk through periods of several weeks

Belle Temple.

Date.		Total solids.	Fat, per cent.	Casein, per cent.	Quantity of casein per lb. of fat.	Lb. of milk.	
						Morning.	Evening.
August	2nd..........................	15.540	6.277	2.854	.46	6	7
"	7th..........................	14.946	5.928	2.831	.48	8	..
"	9th..........................	13.956	5.650	2.835	.50	6	6
"	12th..........................	14.906	5.842	2.903	.50	8	8
"	13th..........................	15.317	5.989	3.025	.51	9	9
"	14th..........................	15.139	5.897	3.157	.54	8	7
"	15th..........................	15.185	6.031	3.100	.51	9	6
"	16th..........................	14.330	5.139	3.007	.59	8	8
"	17th..........................	15.682	6.589	2.975	.45	8	7
"	19th..........................	15.938	6.288	3.053	.49	5	6
"	20th..........................	15.576	6.187	3.222	.52	6	6
September	20th..........................	15.189	5.853	3.128	.53	5	6
"	21st..........................	15.631	6.189	3.116	.50	7	5
"	23rd..........................	15.488	5.863	3.157	.58	5	5
"	24th..........................	16.713	7.391	3.172	.43	7	5
"	30th..........................	16.118	6.821	3.138	.46	4	6
October	12th..........................	17.264	7.546	3.459	.46	4	4

Belle Temple, a Jersey cow, dropped her calf August 10th, 1894. We began testing her milk **August 2nd, 1895.** By taking averages of fat and casein percentages from August 2nd to August 15th, August 16th to August 20th, and September 20th to September 30th, there is, in each succeeding period, an increase in fat and in casein. Both increase again on October 12th. The amount of casein, .50, per pound of fat remains constant in the first three periods, but drops to .46 on October 12th.

Nora.

Date.		Total solids.	Fat. per cent.	Casein. per cent.	Quantity of casein per lb. fat.	Lb. of Milk. Morning.	Lb. of Milk. Evening.
August	23rd	10.689	3.004	2.123	.706	17	13
"	26th	11.948	2.900	2.385	.823	15	15
"	27th	11.161	2.762	2.407	.872	15	14
"	29th	11.907	3.612	2.475	.685	14	12
September	25th	10.002	2.293	2.122	.926	7	7
"	26th	11.008	3.274	2.163	.661	10	7
"	27th	11.514	3.025	2.407	.795	8	10
"	30th	11.249	2.548	2.441	.958	10	11
October	1st	11.103	2.840	2.387	.839	10	9
"	2nd	10.532	2.689	2.272	.845	8	11
"	30th	12.943	4.140	2.573	.621	8	7
"	31st	12.667	3.823	3.009	.787	9	7
November	1st	12.164	3.671	2.838	.773	9	7
"	2nd	12.728	3.644	2.607	.715	9	7
"	4th	11.100	4.250	2.464	.582	8	7
"	5th	12.962	3.685	2.456	.666	8	7
"	6th	12.815	3.900	2.372	.608	6	6
"	7th	12.357	3.896	2.759	.708	7	6

Nora is a Shorthorn grade cow, nine years old. She dropped her calf the first week in May, 1895. We began testing her milk on August 23rd. In the percentages of fat and casein there are many variations. The average percentage of fat from August 23rd to October 2nd is 2.923; but from October 30th to November 7th it is 3.876. The average percentage of casein for the latter period is practically .3 per cent. higher than for the former. The tendency appears to point distinctly to an increase in both fat and casein as the season advances; but the ratio of fat to casein in the first period being 1:.80, and in the latter being 1:.68, shows that the casein has not increased as the fat.

Patience.

Date.		Total solids.	Fat per cent.	Casein per cent.	Quantity of casein per lb. of fat.	Lbs. of milk. Morning.	Lbs. of milk. Evening.
October	3rd	13,672	4,023	2,750	.68	8	7
"	4th	14,067	6,039	2,263	.37	9	7
"	5th	14,725	6,223	2,728	.44	8	9
"	8th	15,223	5,770	2,425	.42	8	9
"	9th	16,297	7,647	3,115	.41	8	9
"	10th	16,095	6,543	3,139	.48	8	8
"	11th	13,841	4,874	2,719	.56	8	7
"	12th	13,654	5,298	2,894	.55	7	9
"	15th	14,450	4,698	3,328	.71	7	8
"	17th	13,415	4,608	3,194	.69	7	8
"	18th	14,193	5,655	2,972	.53	7	5
"	19th	13,620	4,959	2,975	.60	7	5
"	21st	14,971	5,646	3,047	.54	5	5
"	22nd	14,848	5,112	3,241	.63	6	5
"	23rd	13,530	4,416	3,369	.76	6	5
"	25th	13,453	4,380	3,093	.71	7	7
"	26th	13,783	5,127	3,372	.66	6	5
"	28th	14,671	5,371	3,124	.58	5	4
"	30th	13,487	4,640	3,178	.71	7	3

Patience, an Ayrshire cow, dropped her calf February 11th, 1895. Her milk was tested during the month of October. Taking averages of the fat and casein for the first half, 3rd till 15th, and for the second half of the month, it appears that, though the fat is less in the latter half than in the former half of the month, the casein averages about .3 of one per cent. more from the 17th to the 30th, than from the 3rd to the 15th. The casein, therefore, though accompanied by a decrease in fat, has increased with the advance in season.

Margaret.

Date.	Total solids.	Fat per cent.	Casein per cent.	Quantity of casein per lb. of fat.	Lbs. of milk.	
					Morning.	Evening.
August 2nd	13,063	4,018	2,556	.64	11	10
" 7th	13,470	4,322	2,457	.57	8	9
" 12th	13,591	4,718	2,547	.54	10	6
" 13th	13,619	4,332	2,791	.64	10	6
" 14th	13,344	4,394	2,738	.62	6	7
" 15th	13,169	4,415	2,784	.63	10	6
" 16th	12,473	3,591	2,703	.75	..	9
" 17th	12,733	3,889	2,707	.70	9	8
" 19th	14,007	4,592	2,972	.65	9	8
" 20th	13,646	4,454	2,897	.65	8	8
" 21st	13,496	4,636	2,847	.61	7	7
" 24th	12,925	3,974	2,760	.70	9	7
" 27th	13,072	3,493	2,806	.80	8	8
" 28th	12,932	4,180	2,835	.68	7	8
" 29th	12,819	3,902	2,847	.73	7	8

The cow *Margaret* is a Holstein, eight years old. She dropped her calf on the 19th March, 1895. We began testing her milk on August 2nd, and continued testing it until October 2nd. The cow having aborted on October 3rd, and the September tests being unsatisfactory, only those made in August are reported. Dividing the time into three periods as follows: 2nd to 14th, 15th to 20th, and 21st to 29th, the fat decreases each succeeding period, while the casein increases.

In all these tests of individual cow's milk, whether fat increases or decreases, casein increases in the latter periods in each test. It is not easy to name, without further investigations, the exact causes of these slight variations in casein. Among the causes, no doubt, are the condition of animal, the season, and the period of lactation.

Sugar Beet Analysis

	Grower.	Size of plot.	Kind of soil.	When manured.	Date of seeding.	Distance between rows.	Distance between plants.	Date of thinning.	Number of hoeings.	Average length of root.	Average of root above ground.
						in.	in.			in.	in.
1	Elliott Kimball, Leamington	......	Clay loam	......	May 27.	24	......	......	3	11.3	1.5
2	Peter Conover, "	30 rods	Sandy loam	Clover sod	......	......	12	July	3	12.0	1.0
3	" " "	"	"	"	......	......	12	"	3	6.1	.0
4	Thos. Harris, "	1-10 acre	"	1895	May 18.	30	......	......	4	17.0	8.0
5	" " "	1-10 "	"	"	" 18.	30	......	......	4	11.6	3.1
6	Robt. Wilkinson, "	¼ "	Clay loam	1894	" 26.	20	5	July	3	12.3	1.4
7	Jas. M. Wigle, "	......	Sandy loam	......	June 1.	30	10	......	2	15.5	.0
8	Lionel Robinson, "	½ acre	Clay loam	......	May 10.	18	......	......	1	10.0	.5
9	Wm. Armstrong, "	¾ rod	"	......	June 1.	20	......	July 3	1	12.0	.5
10	Thos. Armstrong, Goldsmith, Essex Co.	10 rods	Sandy loam	1895	May 18.	24	8	June 6	3	9.6	.0
11	Jas. Shanks, Leamington, Essex Co	10x15 ft.	Sandy	1894	" 15.	20	10	" 7	3	9.3	.0
12	David Reid, Goldsmith	3 rods	Clay loam	1884	" 15.	42	8	" 10	3	12.0	1.5
13	A. Ellis, Leamington	⅓ acre	Sandy loam	1894	" 16.	24	......	" 10	3	18.0	.0
14	" "	⅓ "	"	"	" 16.	24	......	" 10	3	13.5	2.5
15	Andrew J. Noble, Leamington	¼ "	Black loam	"	" 22.	18	10	......	1	14.5	2.0
16	Industrial Home, Welland	¼ "	Clay loam	"	June 7.	30	9	......	....	12.9	1.6
17	" " "	¼ "	Yellow loam	"	" 7.	30	9	......	....	9 8	1.0
18	Jas. Walker, Beamsville	1-5 "	Sandy loam	"	May 22.	36	6	June 5	3	19.0	9.0
19	" "	1-5 "	"	"	" 22.	36	6	" 5	3	12.3	1.3
20	" "	1-5 "	"	"	" 22.	36	6	" 5	3	11.3	1.2
21	J. Edmonson, Owen Sound	......	Gravelly loam.	......	" 15.	18	......	July	1	13.4	5.6
22	T. D. Campbell, "	......	Clay loam	1895	" 15.	24	......	"	3	....	....
23	Geo. Lockwood, "	......	Sandy loam	"	" 15.	24	......	"	5	14.3	6.8
24	A. H. Pettit, Grimsby	......	......	......	......	......	......	......	....	12.5	2.5
25	" " "	......	......	......	......	......	......	......	....	13.0	4.0
26	" " "	......	......	......	......	......	......	......	....	15.5	4.5
27	Lot 6, Con. 7, Mersea Tp., Essex Co	......	......	......	......	......	......	......	....	10.5	.0
28	" " " "	......	......	......	......	......	......	......	....	9.3	1.0
	Experimental Farm, Guelph.										
29	Jersey	1-100 acre.	Clay loam	1895	May 1.	26.4	10	When 3 in. high.	....	11.0	1.7
30	New Danish Improved	"	"	"	"	26.4	10	"	....	9.0	1.2
31	Austria Electoral Wohanka	"	"	"	"	26.4	10	"	....	9.5	.7
32	French Yellow	"	"	"	"	26.4	10	"	....	9.2	.5
33	Improved Imperial	"	"	"	"	26.4	10	"	....	8.5	.5
34	Red Skinned	"	"	"	"	26.4	10	"	....	10.5	1.5
35	Red Top	"	"	"	"	26.4	10	"	....	11.5	2.2
36	Vilmorin's Improved White	"	"	"	"	26.4	10	"	....	10.0	1.0
37	Lane's Improved	"	"	"	"	26.4	10	"	....	9.7	1.0
38	French White	"	"	"	"	26.4	10	"	....	8.5	1.5
39	Kleinwanzelben	"	"	"	"	26.4	10	"	....	8.5	1.0
40	Champion	"	"	"	"	26.4	10	"	....	10.0	1.0
41	White Silisian							"	....	10.0	1.0

SUGAR BEET ANALYSIS.—*Continued.*

Date of thinning.	Number of hoeings.	Average length of root.	Average of root above ground.	Average weight of root.		Estimated yield per acre.	Analysis of juice.			Remarks.
							Solids.	Sugar.	Purity.*	
		in.	in.	lb.	oz.					
....	3	11.3	1.5	5	1	....	17.00	16.56	97.4	Three beets.
July	3	12.0	1.0	4	9	25 ton	14.20	13.50	95.1	Three beets.
"	3	6.1	.0	2	7	25 ton	16.10	15.12	93.9	Three beets.
....	4	17.0	8.0	9	5	......	14.65	13.95	95.2	One beet.
....	4	11.6	3.1	3	14	......	17.20	16.74	97.3	Three beets.
July	3	12.3	1.4	2	2	......	14.00	12.42	88.7	Three beets.
....	2	15.5	.0	4	12	25 ton	15.20	13.77	90.6	Four beets withered and soft.
....	1	10.0	.5	5	0	25 ton	17.20	16.10	93.7	Two beets long and tapering.
July 3....	1	12.0	.5	3	9	......	16.00	14.40	90.0	Two beets.
June 6....	3	9.6	.0	3	4	......	17.50	16.02	91.8	Three beets.
" 7....	3	9.3	.0	2	9	.. ..	14.65	12.60	86.0	Three beets, scabby.
" 10.. .	3	12.0	1.5	4	4	......	16.80	15.12	90.0	Four beets, smooth and fine.
" 10....	3	18.0	.0	2	13	......	14.30	13.14	91.9	One beet, smooth.
" 10....	3	13.5	2.5	6	13	......	16.10	14.31	88.9	Two beets.
....	1	14.5	2.0	6	2	......	14.00	11.70	83.6	Two beets.
....	....	12.9	1.6	5	10	24 ton	13.40	11.52	87.4	Six beets, very thick at crown.
....	....	9 8	1.0	3	7	24 ton	15.45	13.50	87.4	Six beets, short, thick, numerous rootlets.
June 5....	3	19.0	9.0	10	2	25 ton	13.40	10.80	80.7	One beet, rough, rotten at centre.
" 5....	3	12.3	1.3	2	15	.... .	15.60	14.58	93.4	Three medium smooth beets.
" 5....	3	11.3	1.2	2	14	......	15.10	14.00	92.7	Three beets, very smooth.
July	1	13.4	5.6	4	2	......	13.30	11.16	83.9	Five smooth even beets.
"	3	....	....	3	8	......	18.10	17.85	98.6	Four medium smooth and even beets.
"	5	14.3	6.8	6	1	... ..	11.15	8.60	77.2	Three beets, over half above ground.
....	....	12.5	2.5	3	14	......	15.80	14.96	94.6	On account of drouth came up very irregularly. Six roots divided into three lots of two each according to size and shape.
....	....	13.0	4.0	5	9	......	15.00	12.45	83.0	
....	....	15.5	4.5	6	1	......	14.40	13.68	95.0	
....	....	10.5	.0	5	8	......	18.20	15.75	86.5	Two roots, short and rough.
....	....	9.3	1.0	2	3	.. ..	15.45	13.32	86.2	Two beets.
When 3 in. high.	....	11.0	1.7	1	10	15.13	19.80	18.39	92.9	These thirteen varieties were grown by the Experimental Department under similar conditions. For further particulars regarding their growth and cultivation, see the report of the Experimentalist.
"	....	9.0	1.2	1	8	13.00	16.40	14.40	87.8	
"	....	9.5	.7	1	7	15.80	18.00	16.92	94.0	
"	....	9.2	.5	1	6	13.20	16.60	14.40	86.7	
"	....	8.5	.5	1	5	12.43	18.65	17.55	94.1	
"	....	10.5	1.5	1	10	12.35	14.80	12.60	85.1	
"	....	11.5	2.2	1	11	15.40	16.00	15.03	93.9	
"	....	10.0	1.0	1	12	14.00	17.60	16.20	92.0	
"	....	9.7	1.0	1	9	16.20	16.40	14.62	89.2	
"	....	8.5	1.5	1	15	11.08	16.60	14.94	90.0	
"	....	8.5	1.0	1	7	12.58	17.00	15.12	88.9	
"	....	10.0	1.0	1	4	11.15	17.90	16.74	93.5	
"	....	10.0	1.0	1	13	15.19	15.00	13.50	90.0	

The specimens received at Guelph for analysis were very irregular in shape and size. Some of the beets were very large. In these, the solids, sugar, and purity were low as a rule. In all instances, where the same samples contained both large and small beets, the juice of the smaller beets gave higher readings. But in a few instances, large beets of one sample gave higher reading than small beets of another. It is also noticeable that beets grown with large portions out of the ground give low readings.

INSTRUCTIONS TO GROWERS OF SUGAR BEETS.

These instructions were sent to growers at the time of the distribution of the seed.

SOIL. No definite rule can be given in regard to soil from its chemical composition alone. Actual results must prove the best and most reliable test. In a general way, it may be said, that any soil which will give good crops of grain, fruit or potatoes will produce good sugar beets. Soils which have been under cultivation for a few years are better adapted to this crop than virgin soils containing large quantities of organic nitrogen. All soils should have good natural or artificial drainage, so that the beet roots shall not reach the water-line of the soil. Hard clay subsoils at a small depth are not suitable. The soil should have a tillable depth of from twelve to fifteen inches, should be well drained, mellow in texture, and easily kept porous. In the experiments made in Ontario, the best general results have been obtained from clay loam or sandy loam soils, although a few very fine returns have been derived from heavy clay, and occasionally from sandy soil.

MANURES AND PREPARATION OF THE SOIL. The most approved system of cultivation is to have the sugar beets succeed a grain crop. If the soil was fairly enriched with manure for the preceding grain crop, no manure need be used for the beet crop. Otherwise, barnyard manure at the rate of fifteen loads per acre should be applied as soon as possible after harvest of the grain crop, and plowed in to a light depth, and towards winter this should be followed by deep plowing and subsoiling. As soon as the soil is fit to be worked in spring, it should be brought into as fine tilth as possible, and the seed at the rate of at least twelve pounds per acre should be sown as early as the proper temperature will permit, as there is less danger to the young plants from frost than there is from drouth. The seeding should follow as quickly as possible after the last cultivation of the ground, before the surface gets too dry. Barnyard manure should not be applied in spring, unless it has been thoroughly rotted; fresh or only partially rotted manure may give a large yield in weight, but the roots will contain so much foreign matter as will largely reduce their value.

SEEDING. The seed must be of approved varieties, specially adapted to the production of beets rich in sugar. It should be sown in drills not over 24 inches apart, and in very rich soils 18 inches is a still better distance. The seed needs a very light covering, not exceeding one inch. If part of the seeds are not covered at all, it will not cause so much damage as if they were covered too deeply. As soon as sowing is completed, the land should be rolled, because in thus pressing the surface the humidity is drawn by capillary attraction from the deeper soil. In the Province of Ontario, 12 pounds of seed per acre have been found to be ample, although in Europe fifteen to twenty pounds are generally used. It is recommended that the rollers used after sowing should have rings, because they make the land a little rough, and the soil after a heavy rain is not so liable to become crusted.

SUBSEQUENT CULTIVATION. Whenever the plants have grown so that the rows are visible, hoeing must be done, not only for the purpose of destroying the weeds, but because the plants require a loosened soil. The oftener the soil is hoed by hand or by the cultivator the better, both as to yield and quality of the crop. Care must be taken that no soil shall cover the leaves of the young plants.

THINNING OUT. When the plants have three or four leaves they must be thinned out, so as to leave a space of from four to eight inches between each of the remaining plants in the row. The richer the soil, the smaller the space required for each plant. The thinning can be done partly by use of the hoe and partly by hand, as in the case of carrots. Care should be taken to preserve the strongest plants. It is not sufficient to cut off the leaves of the superfluous plants, as the leaves grow again. Much of the success of the crop depends on the care exercised in thinning out.

It is most desirable that farmers should carefully investigate the question of close cultivation, as there has been too general a disposition to keep the rows too far apart, and the distance between the plants too great, for the purpose of saving in labor, and with the expectation that as much money would be obtained from the crop of a smaller number of large beets as would be obtained from a crop of larger number of small beets. To test this, take a plot of one acre, ten rods wide and sixteen rods long, make the drills thirty inches apart, which would give you sixty-six rows of beets, and with beets twelve inches apart, would give 17,424 beets to the acre, which at two pounds weight per beet, would give 17.424 tons. On the other hand, making the drills twenty-four inches apart, you get eighty-two rows of beets, and with plants six inches apart, there are 528 beets in the row, or 43,296 plants per acre, which at one pound per root would give 21.648 tons per acre. Although some very large yields of good quality have been obtained from the wider cultivation, all authorities agree that the best results generally are derived from the close cultivation, especially as to the percentage of sugar, which is estimated as fully twenty per cent. greater under the latter method of cultivation. Irrespective of the claim for larger yield per acre, the higher price obtained per ton of roots will largely exceed the extra expense of labor incurred under close cultivation.

FURTHER CULTIVATION. When hoeing or cultivating, which should be done as frequently as possible until the leaves become too large to permit of it, the soil must be kept hilled up, so that no part of the roots shall protrude above the ground; as any part of the beet exposed to the sun and light is not only deficient in sugar, but becomes impregnated with mineral salts, etc., and is thus rendered valueless for the factory.

HARVESTING. When the leaves become yellowish green and fall off, leaving a kind of wreath around the plant, the roots are ripe, and should be taken up. There is quite a variety of implements used for extracting the roots from the soil, and cutting off the heads by which a large saving in labor is effected, some of which will be found necessary when beet cultivation is carried on extensively. The green heads are cut off, and the roots should be immediately covered with earth in small heaps, as they should not be allowed to lie and wilt after being harvested. If not intended to be transported to the factory or to be fed at once, they should be pitted in a manner such as used for potatoes, securing them from wet, freezing or heating.

EXPERIMENTS IN THE CULTURE OF THE SUGAR BEET IN NEBRASKA.

The following extracts on the cultivation of sugar beets are taken from "Bulletin No. 16, Sugar Beet Series No. 16," and "Bulletin No. 36, Sugar Beet Series No. IV," of Nebraska.

Cultivation.

Soil, climate and cultivation are factors of equal importance in the culture of the sugar beet.

In respect to the first two, nature has here left but little to be desired. That the beet grower may be enabled to make the condition that is left wholly with him equal to the others in value; the following pages, giving the results of the best experience of European farmers, have been prepared by Mr. H. E. L. Horton of this station, who has had considerable experience in beet growing and with beet growers, both in this country and in Europe.

Preliminary.

Tillage gives a porous soil, which allows of circulation of air and moisture, two very important factors, and secures to the particles of plant food an equal distribution through the layer of soil worked.

On every hand we see the utmost care taken in preparing a homogeneous mellow seed-bed when a crop of importance is to be raised. Air must come to the seed and plant, else it will rot and die; moisture and warmth it must have, and then as it starts growing the soil must be mellow and present no obstacle to the rootlets.

The natural tendency of the root is to grow downward, and it does not bore its way, but pushes through the interstices between the earth particles. The beet has a arge root system, and when it is well developed it is a safeguard against drouth.

Who does not know that trees and plants tend to a symmetrical form in their growth, and how every obstacle interferes and distorts? This is equally true with roots.

Tillage comes in and reduces to a minimum the disturbing influences.

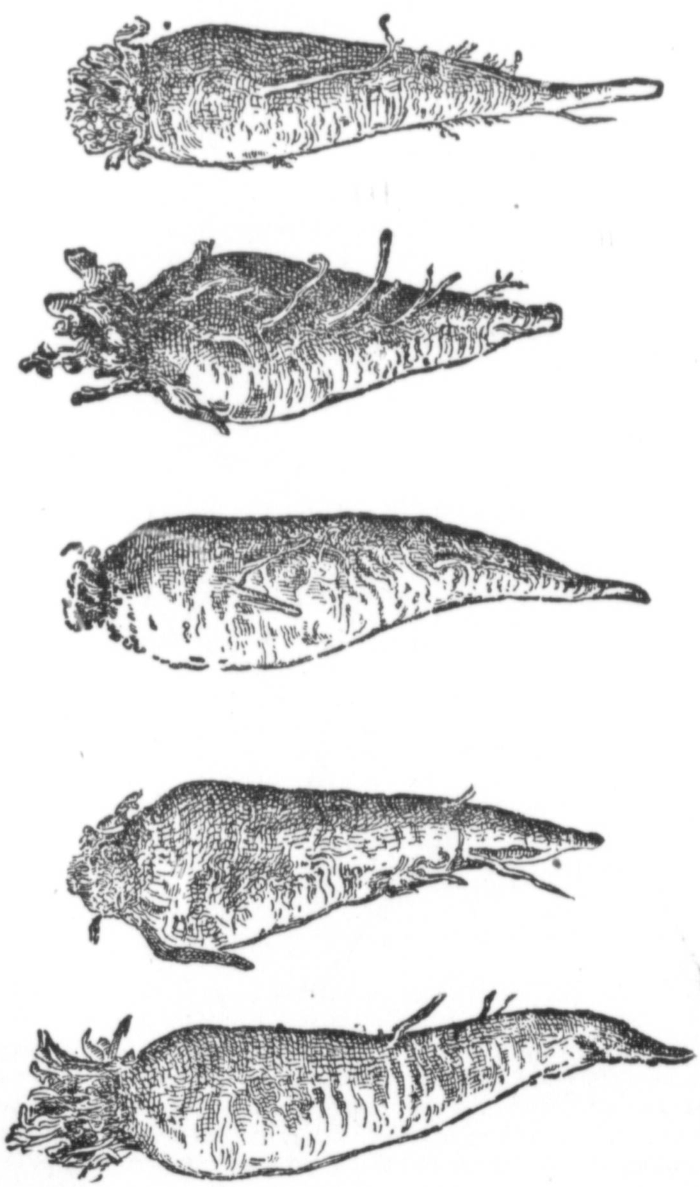
From the handling of thousands of beets at Grand Island, I have been able to identify stunted and many legged beets with a shallow and poor tillage.

The depth of the homogeneous mellow soil-bed is of great importance, for the deeper it is the longer and better will the roots be, and the easier will they take moisture and plant food from the soil, and more than this, the root will have a symmetrical form.

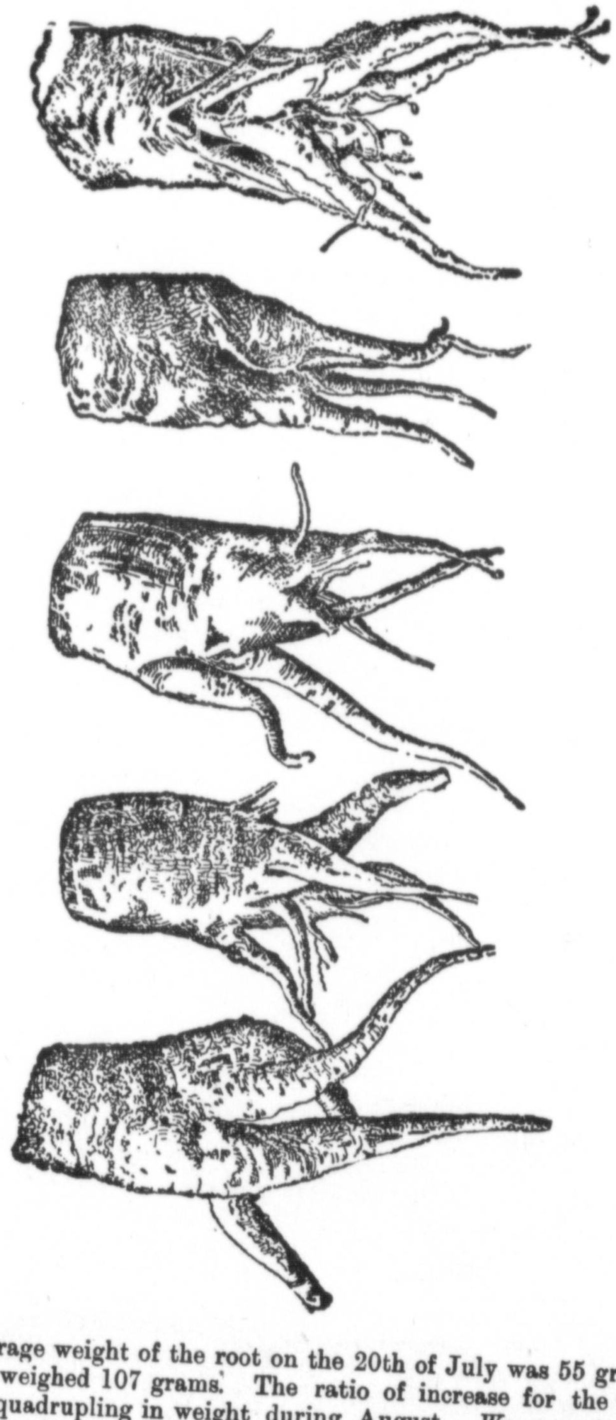
And we must not stop content with a good seed-bed when we desire good beets, but we must follow up the subsequent culture assiduously.

To make the point clearer than is possible with words we beg to call especial attention to the accompanying plates.

The first plate represents beets of white Silesian variety grown on good soil and with proper care and plenty of cultivation. The beets are of good form and show good characteristics, and would be sought after by factory.



The second plate represents beets of white Silesian variety grown on same soil from same kind of seed, but without proper care and with insufficient cultivation. They have no good characteristics, and are dreaded by factory, and are only fit for forage purposes.



In 1893 the average weight of the root on the 20th of July was 55 grams. In 1892 the root at this time weighed 107 grams. The ratio of increase for the two years was the same; the roots quadrupling in weight during August. *We cannot escape the conclusion that thorough and deep preparation of the ground in the fall and the earliest possible planting of the seed in the spring are the most potent factors in producing a large* *yield.* If possible, April planting should be the rule. The dangers of frost can be in part overcome by using large amounts of seed and in getting a thick stand, affording mutual protection.

Again, the sugar yield is more the function of the climate and frequent and thorough cultivation. The *ratio* of increase in the sugar content was greater in 1893 than in 1892. While, this season, the sugar content on July 20th was 8.6 per cent. against 8.8 per cent. in 1892, yet by September 6th it had reached 10 per cent., a rate of increase even greater than that of the previous season, when the sugar content only reached 9.4 per cent. on September 8th. *The facts indicate, very plainly, that if we can induce a rapid growth and larger weight of the root in the early part of the season the sugar content will take care of itself in the latter part, even if the season is hot and dry.* (*Nebraska Reports.*)

In conclusion, I beg to mention the names of my assistants, Mr. Robert Harcourt, B.S.A., and Messrs. W. A. Kennedy, B.S.A., A. T. Wiancko, B.S.A., and P. B. Kennedy, B.S.A., all of whom rendered valuable service in the dairy investigations. But I am particularly grateful to Messrs. Harcourt and W. A. Kennedy, who have given much of their private time when it was needed. I also desire to express my appreciation of the new method of heating the laboratory and the adjoining buildings. The amount of heat that is furnished by the system will, it appears, be quite sufficient on the coldest days.

Respectfully submitted,

A. E. SHUTTLEWORTH,
Prof. of Chemistry.

PART V.

REPORT OF THE

PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of submitting to you my annual report for the year 1895.

During the different terms of the year I have lectured and demonstrated to the students as follows: To the 1st year students on veterinary anatomy and veterinary materia medica, also a course of practical stable lectures. The subjects taken by the 2nd year were veterinary pathology, veterinary obstetrics, the laws of breeding and a course of lectures on practical horse. In the latter I take a horse into the class-room and point out the desirable and undesirable points and the conformation of the different classes of horses, explain and demonstrate the different modes of administering medicines, applying bandages, poultices, fomentations, etc., also the methods of securing horses for minor operations, the general care of the feet, the normal appearance of a healthy horse, as compared with that of a deceased one, as regards the pulse, respiration, external temperature, condition of the coat, appearance of the mucous membranes, general actions, etc., etc. To the special dairy class I delivered a short course of lectures on the ordinary diseases of dairy cattle. I have endeavored to make all lectures as plain and practical as possible.

As you are aware, there have been no text-books for the students on my subjects, which necessitated a great deal of dictation during lectures. This made progress comparatively slow. During the summer I prepared and had printed in pamplet form, notes on veterinary anatomy and pathology. I supplied the students with these books at 75 cents each, which appears a high price, but as there is no demand for them outside the College, it will be some years before I shall realize, even at this price, sufficient from the sale to cover the actual cost of publication. I find that the use of the printed notes makes a great improvement in the course of instruction in these subjects. I may, with your approval, get notes on other subjects printed later on.

The live stock class-room in the new experimental building is an improvement and a great advantage, it having many advantages over the old class-room in the College building proper. Allow me to congratulate the Hon. Minister of Agriculture and yourself on securing such excellent facilities for teaching and demonstrating the different subjects. I am especially pleased with the live stock class-room, and, as far as my subjects are concerned, I consider the arrangements complete under existing circumstances, that is as my time is not fully occupied at the College. If at any time the Government should consider it wise to employ the whole time of the Professor of Veterinary Science, he would have opportunities to carry on extensive experiments, which might prove valuable; and in such a case, it would be necessary to have increased accommodation and appliances; but this is a matter upon which I do not consider that I should here express an opinion. Besides my work in the class-room, I have given professional attention to the live stock of the institution, and I am pleased to be able to report that the losses have been comparatively light. Below will be seen particulars.

Horses. We had a case of strangles in the dairy horse, a few cases of lymphangitis, several of influenza, a few serious cases of acute indigestion, also cases of colic, calks, sore shoulders, sore necks, worms and other minor cases in the farm horses, but in all cases prompt and careful treatment resulted in recovery.

Cattle. During my absence attending institute meetings in January, there occurred a fatal case of gastritis in a steer. There were a few cases of difficult parturition, some of retention of the placenta, metritis, mammitis, indigestion, impaction of the rumen, fardel bound, paraplagia, eczema, etc., etc., but they all made perfect recoveries.

I dehorned 20 head of dairy cattle, and after giving both the saw and the clippers a fair trial, in private practice as well as in the dairy herd, I strongly favor the clippers, as by their use the operation can be performed much more quickly and consequently with less pain, and the after results are the same. There are a great many kinds of clippers in use, most of them of American manufacture. The difficulty appears to be the making of a machine that has sufficient power to enable a man to remove a large horn without assistance. As dehorning is becoming general in many sections (and I think it is probable it will become more general) it is of great importance that the operators have a machine that gives satisfaction, and I am pleased to be able to state that the most satisfactory machine in the market is manufactured in the Province of Ontario.

During the past season I have tested a few animals for tuberculosis; but all the animals tested have passed or stood the test.

Sheep. There were some losses in our flocks, especially in lambs, from wool balls in the pyloris. This is a trouble in lambs that appears almost impossible to avoid, especially in early lambs. Last spring Mr. Rennie arranged compartments in the pens, which would not admit the ewes. In these the lambs were supplied with finely pulped roots, which satisfied their hunger and prevented them from nibbling at their mother's fleece and swallowing the wool. This arrangement proved helpful, but did not entirely stop the practice. We lost one ewe from rupture of the uterus while lambing, another from metritis, and a lamb from gastritis. We were not troubled with tape-worm in the lambs. The treatment adopted the two preceding years appears to have been effectual in getting rid of these pests. The treatment was as follows: I made a decoction of pumpkin seeds, and administered to each lamb the product of from one to two and a half ounces of the seeds (according to the size of the lamb). This was done every ten days, from the middle of May to the first of September.

Pigs. There was no fatality among the pigs, with the exception of some newly born ones.

Respectfully submitted,

J. HUGO REED, V.S.

GUELPH, December 27th, 1895.

PART VI.

REPORT OF THE

PROFESSOR OF DAIRYING.

To the President of the Ontario Agricultural College:

SIR,—I beg leave to present the report from the Dairy Department for 1895. The past year has been a busy one in experimental work in connection with the dairy. I am indebted to the instructors of the Dairy School, to my assistants in butter-making, cheese-making, and the dairy stable, and to the gentlemen who have come to the dairy from time to time to score cheese and butter. I would not forget to thank the students of the Dairy Class of 1895 for their patience and forbearance in the trying times of vaccination and quarantine, especially the two lady students, Miss Jackson and Miss Campbell.

You will find my report under the following heads:

I. DAIRY SCHOOL.

II. EXPERIMENTAL WORK: CHEESE-MAKING, BUTTER-MAKING, FEEDING.

III. DAIRY STOCK.

IV. TRAVELLING DAIRY.

V. EUROPEAN DAIRYING.

VI. MISCELLANEOUS DAIRY NOTES AND EXPERIMENTS.

I. DAIRY SCHOOL.

The Dairy School opened January 14th with about one hundred students in attendance, of whom eleven were in the Home Dairy. Owing to an outbreak of smallpox which occurred the first week of the Dairy School, many were deterred from coming who would otherwise have been here and some few went home after quarantine was over. Happening as this did at the commencement of the session, it rather put a damper on the course. Eighty men and two lady students lived in the dairy buildings for nearly two weeks, and our experiences during that time were not of the most pleasant nature. Some sixty-three, including two ladies, wrote on the final examinations, of whom fifty-six were granted certificates, having successfully passed the practical and written examinations. A few have sent in reports during the season and are now entitled to Special Professional Certificates.

We have endeavored to make this course as practical as possible, following along the lines indicated in my last report, and making such changes and improvements as suggested themselves from time to time. The students who come for this special dairy course are a fine class as a rule and a credit to the dairy industry of the country.

II. EXPERIMENTAL WORK.

Experiments in the Manufacture of Cheese.

The experiments in the Cheese Department were conducted by Mr. R. W. Stratton, a graduate of our Dairy School. The work covered the following points :

1. The effect of different percentages of fat in milk on the quantity and quality of cheese produced.
2. The effect of dipping at different stages of acid on the curd.
3. The effect of different quantities of salt on curds from normal, rich and poor milk.
4. The effect of cooking temperatures on normal, rich and poor milk.

*5. The effect of different temperatures for setting milk.

*6. The effect on the curd of milling at different stages of acid.

*7. The effect of different temperatures of curd at the time of putting to press.

8. Effect of different quantities of rennet in milk on the quantity and quality of spring cheese.

Some of these experiments were made in the months of November and December. Consequently, the cheese are unfit for judging at this time, and the report on these will be made in a special bulletin early in 1896, with the consent of yourself and the Honorable the Minister of Agriculture. The conclusion of the experiments on the relation of fat in milk to the quantity and quality of cheese produced must be held over until the November and December cheese are properly ripened. I hope to give in this special bulletin the results of the work done in these two months, together with a summary of the two years' work done in the department in relation to this important question of the relative values for cheese-making purposes of samples of milk containing different percentages of fat. At this time, I shall merely report the data up to the end of October and leave the conclusions largely until the whole year's work is in a condition to report upon.

Relation of Fat in Milk to Quantity and Quality of Cheese.

These experiments commenced April 10th and continued on the average three days each week from May to December. During April, but six trials were made. Unless stated otherwise, two vats were used daily, each containing 300 pounds of milk. The milk was chiefly bought from three farmers in the vicinity of the dairy. Our own herd contributed some of the milk. The plan adopted to secure rich and poor milk was to test each cow in the four herds every two weeks. The milks from the rich and the poor cows were kept separate until reaching the dairy, when the cans were tested with a Babcock tester and the milks carefully weighed before being put into the vats. We were unable to secure so wide a variation in the percentage of fat as we would have liked, owing to the limited quantity of milk we had to choose from. The average difference in the percentage of fat in the two lots of milk was in the neighborhood of one per cent., which is about the average variation in milk supplied to cheese factories. There were a great many difficulties in the way of successfully carrying on these tests during a period of nine months, but most of them were overcome. We are indebted to Messrs. MacLaren, Bell and Brill for their assistance in scoring the cheese. No doubt the work might have been done differently, but, on the whole, it has been satisfactory. We submit the results to date and hope to summarize the two years' work later on. I shall group the results into spring, summer and fall months, and give the chief conditions of manufacture for the three periods. The detailed results and averages of each month I will give in tabular form.

* Not completed at time of preparing report, but will be reported on later.

April.

Relation of fat in milk to quantity and quality of cheese.

Date.	Per cent. fat in milk.	Lbs. fat in milk.	Lbs. of cheese. Green.	Lbs. of cheese. Cured.	Lbs. milk for 1 lb. cheese. Green	Lbs. milk for 1 lb. cheese. Cured	Lbs. cheese for 1 lb. fat in milk. Green	Lbs. cheese for 1 lb. fat in milk. Cured	Per cent. fat in whey.
1895.									
April 10	4.1	12.3	34.	32.5	....	....	....	....	0.23
	3.35	10 05	30.25	28.75	....	....	....	....	0.20
" 11	4.20	12.6	34.	32.5	....	....	....	....	0.15
	3.30	9.90	29.25	27.75	....	....	....	....	0.15
" 17	4.20	12.6	34.	32.25	....	....	....	....	0.18
	3.70	11.10	30.25	28.75	....	....	....	....	0.18
" 18	4.10	12.30	33.25	31.75	....	....	....	....	0.22
	3.20	9.60	28.50	27.00	....	....	....	....	0.18
" 24	4.40	13.20	33.50	32.00	....	....	....	....	0.25
	3.50	10.30	28.50	27.25	....	....	....	....	0.15
" 25	4.30	12.90	33.25	31.50	....	....	....	....	0.15
	3.30	9.90	28.25	26.75	....	....	....	....	0.10
Average for rich milk	4.21	75.9	202.00	192.5	8.9	9.3	2.66	2.54	0.19
Average for poor milk	3.39	61.05	175.00	166.25	10.3	10.8	2.86	2.72	0.16

May.

Date.	Per cent. fat in milk.	Lbs. fat in milk.	Lbs. of cheese. Green.	Lbs. of cheese. Cured.	Lbs. milk for 1 lb. cheese. Green	Lbs. milk for 1 lb. cheese. Cured	Lbs. cheese for 1 lb. fat in milk. Green	Lbs. cheese for 1 lb. fat in milk. Cured	Per cent. fat in whey.
April 30	4.30	12.9	33.00	32.00	....	....	....	....	0.20
	3.20	9.6	26.75	25.25	....	....	....	....	0.20
May 1	4.00	12.00	33.25	32.00	....	....	....	....	0.20
	3.20	9.60	27.00	25.50	....	....	....	....	0.15
" 2	4.35	13.05	34.50	33.00	....	....	....	....	0.25
	3.15	9.45	27.25	26.00	....	....	....	....	0.15
" 7	4.10	12.30	32.50	30.00	....	....	....	....	0.25
	3.20	9.60	26.00	24.50	....	....	....	....	0.15
" 8	3.9	11.70	31.25	29.75	....	....	....	....	0.20
	3.3	9.90	26.75	25.25	....	....	....	....	0.20
" 9	3.90	11.70	31.25	29.75	....	....	....	....	0.22
	3.30	9.90	26.00	24.50	....	....	....	....	0.18
" 14	4.20	12.60	33.50	32.00	....	....	....	....	0.25
	3.5	10.50	30.25	29.00	....	....	....	....	0.20
" 15	4.00	12.00	32.50	31.00	....	....	....	....	0.15
	3.70	11.10	30.00	28.50	....	....	....	....	0.15
" 16	4.10	12.30	33.75	32.00	....	....	....	....	0.25
	3.40	10.20	29.50	27 56	....	....	....	....	0.15
" 21	4 20	12.60	35.00	33.25	....	....	....	....	0.22
	3.50	10.50	32.00	30.00	....	....	....	....	0.18
" 22	4 30	12.90	33.50	31.50	....	....	....	....	0.30
	3.40	10.20	29.00	27.50	....	....	....	....	0.20
" 23	4.00	12 00	32.00	30.25	....	....	....	....	0.25
	3.40	10.20	28.00	26.50	....	....	....	....	0.20
" 28	4.10	12.30	35.25	33.50	....	....	....	....	0.20
	3.40	10.20	31.25	29.50	....	....	....	....	0.15
" 29	4.00	12.00	32.00	30.50	....	....	....	....	0.25
	3.10	9.30	27.75	26 25	....	....	....	....	0.20
" 30	3.90	11.70	31.75	30.00	....	....	....	....	0.20
	3.00	9.00	27.50	26.00	....	....	....	....	0.15
Average for rich milk	4.09	184.05	495.00	470.50	9.09	9.98	2.68	2 55	0.22
Average for poor milk	3.30	149.25	425.00	401.75	10.58	11.21	2.84	2.69	0.17

June.

Date.	Per cent. fat in milk.	Lbs. fat in milk.	Lbs. of cheese. Green.	Lbs. of cheese. Cured.	Lbs. milk for 1 lb. cheese. Green	Lbs. milk for 1 lb. cheese. Cured	Lbs. cheese for 1 lb. fat in milk. Green	Lbs. cheese for 1 lb. fat in milk. Cured	Per cent. fat in whey.
1895.									
June 4	4.20	12.60	32.50	30.75	......	......	......	......	0.22
	3.40	10.20	28.25	26.75	......	......	......	......	0.18
" 5	3.70	11.10	31.00	29.75	......	......	......	......	0.20
	3.30	9.90	28.25	27.00	......	......	......	......	0.20
" 6	4.00	12.00	33.25	31.75	......	......	......	......	0.20
	3.10	9.30	28.25	27.00	......	......	......	......	0.22
" 11	4.00	12.00	32.00	30.25	......	......	......	......	0.20
	3.00	9.00	27.00	25.50	......	......	......	......	0.15
" 12	3.90	11.70	31.50	30.00	......	......	......	......	0.22
	3.20	9.60	28.00	26.50	......	......	......	......	0.15
" 13	4.00	12.00	32.50	30.75	......	......	......	......	0.20
	3.00	9.00	28.00	26.50	......	......	......	......	0.10
" 18	4.00	12.00	31.75	30.50	......	......	......	......	0.20
	3.00	9.00	27.25	26.00	......	......	......	......	0.20
" 19	4.00	12.00	31.00	29.50	......	......	......	......	0.20
	3.10	9.30	28.25	26.75	......	......	......	......	0.15
" 20	3.90	11.7	31.75	30.00	......	......	......	......	0.18
	2.90	8.7	28.25	26.75	......	......	......	......	0.15
" 25	4.00	12.0	32.00	30.25	......	......	......	......	......
	3.60	10.8	29.25	27.75	......	......	......	......	......
" 26	3.80	11.4	31.75	29.00	......	......	......	......	......
	3.20	9.6	27.25	26.00	......	......	......	......	......
" 27	3.80	11.4	30.50	28.50	......	......	......	......	......
	3.20	9.6	28.00	26.50	......	......	......	......	......
Average for rich milk	3.94	141.9	381.50	361.00	9.43	9.92	2.68	2.54	0.15
Average for poor milk	3.16	114.0	336.00	319.00	10.71	11.29	2.94	2.80	0.12

Spring Months. The chief conditions of manufacture in the spring months—April, May and June—were as follows: The rennet test at setting varied from seventeen to twenty seconds; the temperature at setting was eighty-six degrees; the amount of rennet was one ounce of Hansen's per 300 pounds of milk; coloring was used as required to give the proper shade; the time required for coagulation was about thirty minutes; the curds were cooked to ninety-eight degrees; they were dipped in about two and a half hours, with one-eighth of an inch of acid; milling was done about half-way between dipping and salting, or when the curds were meaty and showed about one inch of acid on the iron; the amount of salt used was two and a half pounds per one hundred pounds of curd; the cheese were pressed about twenty hours in a gang press with a spring head; they were then weighed carefully, marked and placed in the curing room at a temperature of about sixty-five to seventy degrees; at the end of one month they were weighed again and scored by expert judges who came to the dairy for that purpose. Samples of the whey were taken by collecting all the drippings and pressings of each cheese separately and mixing these with the whey as run off the vats. All work was done carefully and systematically. It was necessary to use a "starter" nearly every day.

Summer Months. During July and August, the conditions of manufacture were similar to the spring conditions, except in the weather, the ripening of the milk and the cooking and salting of the curds from rich milk. The weather was warm and the milk worked faster; consequently it was not ripened so much before setting. July 2nd, the milk was ripened to eighteen seconds; and on August 22nd, the milk was ripened to but twenty-seven seconds. Commencing July 18th, the rich milk curd was cooked to 99° instead of 98°; and in the latter part of August, the temperature was increased to 100°, and the amount of salt to two and three-quarters and three pounds per 100 pounds of curd, instead of two and one-half. Cooking to 100° and adding three pounds of salt made the cheese somswhat harsh in texture.

JULY.

Date.	Per cent. fat in milk.	Lbs. fat in milk.	Lbs. cheese.		Lbs. milk to 1 lb. cheese.		Lbs. cheese to 1 lb. fat in milk.		Per cent. fat in whey.
			Green.	Cured.	Green	Cured	Green	Cured	
1895.									
July 2	3.90	11.70	30.00	28.75					0.20
	3.30	9.90	28.00	26.75					0.20
" 3	....		....	....					.....
	3.00	9.00	28.00	26.50					0.20
" 4	3.70	11.10	29.50	28.00					0.20
	3.10	9.30	27.75	26.25					0.20
" 9	3.50	10.50	30.00	28.25					0.20
	2.70	8.10	26.50	25.00					0.20
" 10	4.00	12.00	33.50	31.75					0.15
	3.00	9.00	28.50	27.00					0.10
" 11	3.90	11.70	32.00	30.50					0.15
	3.00	9.00	28.25	26.75					0.15
" 16	3.70	11.10	30.75	29.00					0.20
	3.00	9.00	27.25	25.50					0.15
" 17	3.50	10.50	29.50	28.00					0.35
	2.90	8.70	27.50	26.25					0.25
" 18	3.70	11.10	30.50	29.25					0.25
	2.90	8.70	27.75	26.50					0.20
" 23	3.50	10.50	29.75	28.25					0.20
	3.05	9.15	27.00	25.50					0.15
" 24	4.20	12.60	32.75	31.25					0.25
	2.95	8.85	27.25	25.50					0.15
" 26	4.00	12.00	31.75	30.50					0.30
	3.15	9.45	28.00	26.50					0.20
" 30	3.65	10.95	31.25	29.75					0.20
	3.10	9.30	27.50	26.00					0.20
" 31	3.90	11.70	31.50	30.25					0.22
	2.95	8.85	27.25	26.00					0.18
Average for rich milk	3.78	147.45	402.75	383.50	9.68	10.17	2.73	2.61	0.22
Average for poor milk	3.00	126.30	386.50	366.00	10.86	11.50	3.06	2.90	0.18

AUGUST.

Date.	Per cent. fat in milk.	Lbs. fat in milk.	Lbs. cheese.		Lbs. milk to 1 lb. cheese.		Lbs. cheese to 1 lb. fat in milk.		Per cent. fat in whey.
			Green.	Cured.	Green	Cured	Green	Cured	
August 1	3.65	10.95	31.00	29.75					0.20
	3.10	9.30	29.50	28.00					0.20
" 6	4.30	12.90	32.25	30.50					0.25
	2.85	8.55	27.25	25.75					0.20
" 7	3.70	11.10	31.75	29.25					0.25
	2.90	8.70	27.50	26.25					0.20
" 8	3.60	10.80	29.75	28.25					0.30
	2.80	8.40	27.25	25.75					0.20
" 13	3.50	10.50	30.75	29.25					0.22
	2.80	8.40	27.25	25.75					0.15
" 14	3.95	11.85	31.50	30.25					0.30
	2.90	8.70	28.25	26.75					0.20
" 15	3.60	10.80	30.75	29.25					0.20
	2.80	8.40	27.00	25.50					0.20
" 20	4.00	12.00	32.75	31.25					0.25
	3.00	9.00	28.00	26.75					0.20
" 21	3.55	10.65	30.75	29.50					0.20
	2.85	8.55	28.50	27.00					0.10
" 22	4.30	12.90	34.50	33.00					0.25
	3.00	9.00	27.75	26.50					0.20
" 27	4.00	12.00	31.50	30.25					0.25
	2.70	8.10	25.75	24.75					0.20
" 28	3.90	11.70	31.25	29.75					0.30
	2.90	8.70	25.50	24.25					0.25
" 29	3.60	10.80	29.75	28.50					0.20
	3.30	9.90	27.75	25.50					0.20
Average for rich milk	3.82	148.95	408.25	388.75	9.55	10.03	2.74	2.61	0.24
Average for poor milk	2.91	113.70	357.25	338.50	10.91	11.52	3.14	2.97	0.19

FALL MONTHS. During the latter part of August and up to the middle of September, one patron fed brewers' grains to his cows. I was away from the College at the time and the cheese-maker did not know what was the matter with the milk for some days. It was not until after my return, about the middle of September, that the person stopped feeding the "grains." A few of the August cheese were tainted and all of the Septembers. The taint continued to exist for nearly two weeks after the feeding of the "grains" had been stopped. The results as to yield, etc., were not affected materially, but the quality of the cheese we have left out altogether in the month of September.

The milk was ripened more before setting in October, and experiments were made in these months as to the effect of temperature in cooking and of salt on curds from rich milk. These points will be discussed under the head of quality in the cheese.

I wish to call particular attention to the fact that in every month the poor milk produced more cheese per pound of fat in the milk than did rich milk per pound of fat. There seems to be no exception to this rule in all our experiments; therefore we may consider that point settled. THE YIELD OF CHEESE IS NOT IN THE SAME RATIO AS THE FAT IN THE MILK.

SEPTEMBER.

Relation of fat in milk to quantity and quality of cheese.

Date.	Per cent. fat in milk.	Lbs. fat in milk.	Lbs. cheese.		Lbs. milk to 1 lb. cheese.		Lbs. cheese to 1 lb. fat in milk.		Per cent. fat in whey.
			Green.	Cured.	Green	Cured	Green	Cured	
1895.									
September 3	3.90	11.70	32.25	30.25	......	......	......	.. ..	0.25
	3.20	9.60	29.75	27.75	... ..	......	......	......	0.22
" 4	3.90	11.70	32.25	30.75	......	......	......	......	0.22
	3.40	10.20	28 75	27 25	.....	......	.....	.....	0.15
" 5	3.95	11.85	32.00	30 50	......	......	......	......	0.30
	3.10	9 30	27 75	26 25	......	......	......	......	0.20
" 10	4.10	12.30	32.50	31 00	......	...	.....	......	0.30
	2.90	8.70	27.00	25.50	......	......	......	.....	0.20
" 11	4.00	12 00	30.00	28.75	......	......	......	......	0.25
	3.00	9.00	27 00	25.50	......	......	......	......	0.20
" 12	3.80	11.40	31.00	29.75	......	......	......	......	0 25
	3.00	9 00	27 25	25.75	......	......	......	......	0.20
" 17	4.15	12.45	32 75	31.25	......	......	......	......	0.25
	3.10	9 30	28.50	26.75	......	.....	......	......	0.15
" 18	3 85	11.55	32.50	31.00	......	......	......	......	0.20
	2 75	8 25	27.75	26 25	......	.....	......	......	0.15
" 19	4.40	13 20	33.50	32 25	......	......	......	......	0 30
	3.20	9.60	29 50	27 75	.....	......	......	......	0.20
" 24	3.90	11.70	32 50	30 75	......	......	......	......	0.25
	3.25	9.75	29.25	27 75	......	......	.....	......	0.20
" 25	4.10	12.30	33.75	32.50	......	......	......	......	0 25
	3.00	9.00	27.75	26.50	.....	......	......	......	0 20
" 26	4 10	12.30	33 00	31 50	.....	......	.... .	....	0.20
	2.80	8.40	26.50	25.00	......	......	......	......	0.25
Average for rich milk	4.01	144.55	388.00	370.25	9.27	9.72	2.68	2 56	0.25
Average for poor milk	3.06	110.10	336.75	318.00	10.69	11.32	3.06	2.88	0.19

October.

Relation of fat in milk to quantity and quality of cheese.

Date.	Per cent. fat in milk.	Lbs. fat in milk.	Lbs. cheese.		Lbs. of milk to 1 lb. cheese		Lbs. cheese to 1 lb. fat in milk.		Per cent. fat in whey.
			Green.	Cured.	Green	Cured	Green	Cured	
1895.									
October 1	4.25	12.75	34.00	32.50	....	....	....	....	0.25
	3.35	10.05	30.25	28.75	....	....	....	....	0.20
" 2	4.20	12.60	34.25	32.75	....	....	....	....	0.20
	3.20	9.60	29.75	28.25	....	....	....	....	0.20
" 3	4.00	12.00	32.75	31.25	....	....	....	....	0.25
	3.10	9.30	28.75	27.25	....	....	....	....	0.20
" 8	3.85	11.55	34.00	32.50	....	....	....	....	0.20
	3.00	9.00	29.75	28.25	....	....	....	....	0.15
" 15	3.80	11.40	34.00	32.50	....	....	....	....	0.20
	3.00	9.00	29.50	27.75	....	....	....	....	0.15
" 16	3.90	11.70	33.25	31.75	....	....	....	....	0.20
	3.20	9.60	28.75	27.25	....	....	....	....	0.20
" 17	4.00	12.00	34.50	33.00	....	....	....	....	0.20
	3.40	10.20	31.00	29.50	....	....	....	....	0.15
" 22	4.00	12.00	34.25	32.50	....	....	....	....	0.20
	3.40	10.20	29.25	27.75	....	....	....	....	0.20
" 23	3.70	11.10	33.00	31.50	....	....	....	....	0.20
	3.20	9.60	29.25	27.75	....	....	....	....	0.20
" 24	4.30	12.90	33.75	32.25	....	....	....	....	0.25
	3.45	10.35	30.25	28.75	....	....	....	....	0.20
" 29	3.90	11.70	34.75	33.00	....	....	....	....	0.20
	3.30	9.90	30.75	29.25	....	....	....	....	0.20
" 30	4.10	12.30	34.75	33.25	....	....	....	....	0.20
	3.30	9.90	30.75	29.25	....	....	....	....	0.20
" 31	3.90	11.70	32.25	30.75	....	....	....	....	0.25
	3.50	10.50	30.50	29.25	....	....	....	....	0.20
Average of thirteen experiments for rich milk	3.99	155.70	439.50	419.50	8.87	9.29	2.82	2.69	0.21
Average poor milk	3.26	127.20	388.50	369.00	10.03	10.56	3.05	2.90	0.18

Loss of Fat in Whey.

The amount of fat lost in the whey is an important factor in the questions before us. The average percentage of fat in the whey was given in a previous table, but I will place the percentages for the different months side by side, that we may see and discuss them more clearly.

Month.	Average per cent. of fat in	
	Whole milk.	Whey.
April	4.21	0.19
	3.39	0.16
May	4.09	0.22
	3.30	0.17
June	3.94	0.15
	3.16	0.12
July	3.78	0.22
	3.00	0.18
August	3.82	0.24
	2.91	0.19
September	4.01	0.25
	3.06	0.19
October	3.99	0.21
	3.26	0.18

It will be seen that the average percentage of fat in the whey from the rich milk was always slightly higher than in that from the poor milk. There was not a great deal of difference, it is true, but still enough to make quite a difference in the total amount of butter-fat in the whey tank at the end of a year in a large factory. In the whey from some lots of very rich milk manufactured in December, the loss of fat was much greater than in the whey from normal milk.

Loss in Weight of the Cheese made from Rich and Poor Milk During one Month in the Curing Room.

All the cheese made from the milk of different qualities were weighed when taken from the press and again at the end of one month. The percentage of loss or loss per one hundred pounds of green cheese made from rich and from poor milk during each month was as follows:

Month.	Cheese made from	
	Rich milk.	Poor milk.
	Per cent.	Per cent.
April	4.7	5.0
May	4.9	5.4
June	5 3	5.0
July	4.8	5.3
August	4.7	5.2
September	4.5	5.6
October	4.5	5.0

It will be seen that the cheese made from the poorer milk lost a greater percentage in weight while curing. The explanation of this is likely found in the fact that the cheese made from the poorer milk were smaller, and consequently there was a greater surface exposed for evaporation per one hundred pounds of cheese. There may be other causes, but this suggests itself to my mind as the chief one.

Effect of Higher Cooking and Salting of Rich Milk Curds in these Experiments.

We will take the month of October to illustrate the effects of higher cooking and higher salting on the rich milk curds. On October 1st, the cheese made from milk testing 4.25 per cent. of fat, the curd of which was cooked to one hundred degrees and salted three pounds to the one hundred pounds of curd, was scored sixteen points out of twenty for texture. The judges pronounced it pasty. The other cheese made the same day out of 3.25 per cent. milk was also pronounced pasty. The following day (October 2nd), the cheese made from 4.2 per cent. milk, cooked to ninety-eight degrees and salted two and a half pounds was pronounced "mushy"—or was still softer in texture and body. Its mate made from 3.2 per cent. milk was "pasty." Also on October 3rd and 8th, the cheese from both lots of milk were weak in body. Evidently in these cases some other element entered to affect the quality of the cheese other than fat, temperature and salt. What that element was is difficult to say definitely, but in all probability it was too much moisture left in the curd. Right here comes in a factor that is as important as any in the manufacture of cheese, viz., the skill and judgment of the maker. All these things render cheese-making a complex study, and he is a bold man who says he knows all about it or that any *one element* is the controlling factor in the making of fancy cheese. Each part is necessary to the other. Good cheese cannot be made without butter-fat, neither can it be made without salt or water. A nice combination of skill, good milk, utensils, and agents (rennet, salt, etc.,) is needed to manufacture the finest cheese. October 16th, a cheese made out of 3.9 per cent. milk, which had been cooked to ninety-eight degrees and salted two and a half pounds to the one hundred pounds of curd, scored thirty one points in flavor, nineteen in closeness, fourteen in color, and nineteen in texture—or ninety-three altogether. The next day (October 17th) a cheese made out of four per cent. milk cooked to one hundred degrees, and salted three pounds, scored thirty-one points in flavor, eighteen in closeness, fourteen in color, and 18.5 in texture—91.5 altogether. It will thus be seen how careful one should be about drawing conclusions from one or two experiments. I shall cite but two more experiments on the point. On October 29th, one vat of milk testing 3.9 per cent. of fat, which was cooked to one hundred degrees and salted three and a quarter pounds, scored ninety points. The other vat testing 3.3 per cent. of fat, which was cooked to ninety-eight degrees and salted two and three-quarter pounds, scored ninety-two points. October 30th, the cheese made from 4.1 per cent. milk, which was cooked to ninety-eight degrees and salted two and three-quarter pounds, scored ninety-one points, while the other cheese made from 3.3 per cent. milk and treated exactly the same in every way, scored ninety-three points. Truly there are many mysteries in connection with cheese-making.

Practical Application to Cheese Factory Work.

In this part, I desire more especially to call attention to the application of the results of all this work to the methods of dividing proceeds among patrons of cheese factories. The principles underlying the three methods now in use I discussed in my report of last year and at the dairy conventions of 1895; therefore, I need not repeat them. The addition of two per cent. to the fat readings, as seen in the table, gives results corresponding closely to the actual value of the cheese produced. In the case of those months in which the milk averaged *over* four per cent. of fat, the two per cent. system does not give quite so much money as the cheese are entitled to. From 3.82 per cent. up to 3.99 per cent. of fat in the milk, the addition of two per cent. to fat readings gives a slight advantage to the richer milk. This is as it ought to be, as we need from 3.25 to 3.75 (or an average of about 3.5) per cent. of fat in the milk in order to make good cheese; but I have yet to see that it is any advantage to manufacture milk containing four per cent. of fat and over into Canadian Cheddar cheese. Such milk can more profitably be made into butter.

It is possible that adding the exact percentage of casein to the fat as proposed by our chemist may be more scientifically correct than adding a common number, two, to all percentages of fat; but it is more complicated and not so easily applied as the single number, which is near enough for all practical purposes, especially when we consider that most of the percentage of casein above two per cent. is represented by the fat and casein lost in the whey.

Month.	Lbs. of milk.	Average % fat in whole milk.	Lbs. of cured cheese made.	Reckoning cheese at eight cents per lb. each lot would receive the following amounts of money when paid according to			
				Weight of milk	% of fat.	% of fat + two.	Weight of cheese.
				$ c.	$ c.	$ c.	$ c.
April	1,800	4.21	192.50	14 35	15 90	15 36	15 40
	1,800	3.39	166.25	14 35	12 79	13 33	13 30
May	4,500	4.09	470.50	34 89	38 53	37 31	37 64
	4,500	3.30	401.75	34 89	31 24	32 47	32 14
June	3,600	3.94	361.00	27 20	30 17	29 11	28 88
	3,600	3.16	319.00	27 20	24 23	25 29	25 52
July	3,900	3.78	383.50	28 87	32 30	31 06	30 68
	4,200	3.00	366.00	31 09	27 66	28 90	29 28
August	3,900	3.82	388.75	29 09	32 99	31 56	31 16
	3,900	2.91	338 50	29 09	25 18	26 62	27 08
September	3,600	4.01	370.25	27 53	31 07	29 78	29 62
	3,600	3.06	318.00	27 53	23 98	25 27	25 44
October	3,900	3.99	419.50	31 54	34 72	33 59	33 56
	3,900	3 26	369.00	31 54	28 36	29 49	29 52

Quality of Cheese Produced from the Rich and Poor Milk.

As previously noted, all the cheese made from the milk containing the different percentages of fat were judged by capable men. The scale of points used was the following:

Flavor	35
Closeness	20
Even color	15
Texture	20
Finish	10
Total	100

The tables give the possible score and the actual points scored by the cheese made from the two lots of milk during each month. The possible score is got by multiplying the points given for each quality (such as flavor, etc.,) by the number of experiments or cheese made in each month, *e. g.*, six experiments in April made it possible for each lot of cheese made from rich and poor milk to score (6 × 35) 210 points in flavor; (6 × 20) or 120 points in closeness, and so on with each. The points scored are obtained by adding together the points given by the judges to each cheese for flavor, closeness, etc.

April.—Six experiments.

—	Possible score.	Cheese made from milk averaging	
		4.21% fat. Points scored.	3.39% fat. Points scored.
Flavor	210	189	185
Closeness	120	106	103
Even color	90	80	78
Texture	120	104	100
Finish	60	60	60
Totals	600	539	526

May.—Fifteen experiments.

—	Po sible score.	4.09% fat in the milk. Points scored.	3.30% fat in the milk. Points scored.
Flavor	525	459	443
Closeness	300	273	272
Even color	225	210	215
Texture	300	254	255
Finish	150	150	150
Totals	1,500	1,346	1,335

JUNE.—Twelve experiments.

——	Possible score.	3.99% fat in the milk. Points scored.	3.16% fat in the milk. Points scored.
Flavor	420	357	349
Closeness	240	216	213
Even color	180	168	168
Texture	240	214	207
Finish	120	120	120
Totals	1,200	1,075	1,057

JULY.—Thirteen experiments.

——	Possible score.	Cheese made from milk averaging	
		3.78% fat. Points scored.	3.00% fat. Points scored.
Flavor	455	388	400
Closeness	260	225	229
Even color	195	186	192
Texture	260	215	222
Finish	130	130	130
Totals	1,300	1,144	1,173

AUGUST.—Thirteen experiments.

——	Possible score.	3.82% fat. Points scored.	2.91% fat. Points scored.
Flavor	455	365	369
Closeness	260	233	230
Even color	195	180	179
Texture	260	229	233
Finish	130	130	130
Totals	1,300	1,137	1,141

OCTOBER.*—Thirteen experiments.

——	Possible score.	3.99% fat in milk. Points scored.	3.26% fat in milk. Points scored.
Flavor	455	389.5	387.0
Closeness	260	236.0	231.5
Even color	195	185 0	185.0
Texture	260	233.5	234.0
Finish	130	130.0	130.0
Total	1,300	1,174.0	1,167.5

While not wishing to draw definite conclusions until the whole year's experiments are completed, or in fact until we have made several years' experiments in relation to the question, the results of the six months' tests as to the quality of the cheese produced from rich and poor milk are as follows:—The total score of seventy-two lots of cheese made from milk averaging 3.98 per cent. of fat (practically four per cent.) was 6,415 points, out of a possible score of 7,200. The total score of the same number (seventy-two) of cheese made from milk averaging 3.17 per cent. of fat was 6,399½ points out of a possible 7,200, a difference of 15½ points in favor of the cheese made from the richer milk. In 1894, the total score of cheese made from milk averaging 3.94 per cent. of fat was 3,852½ points out of a possible 4,300. The cheese made from milk averaging 3.37 per cent. of fat scored 3,896 points out of a possible 4,300, or a difference of 43½ points in favor of the cheese made from what we might call average milk.

As I have stated elsewhere, we must have a certain percentage of fat in the milk (say 3 5 on the average), in order to make good Cheddar cheese; but there does not seem to be any particular necessity of having four per cent. milk or over, in order to make good Canadian Cheddar cheese.

DIPPING SPRING, SUMMER AND FALL CURDS AT DIFFERENT STAGES OF ACID.

The acid which a curd contains is commonly measured with a hot iron, by placing a piece of curd next to a clean iron heated to a proper temperature. In these trials the acid varied from "sweet" to one-half an inch on the iron. About one-eighth of an inch gave the best results in spring cheese, although a very nice cheese was made with one-quarter of an inch of acid. The texture seemed to be best at about one-eighth of an inch. Curds dipped sweet, or nearly so, seemed to break down more easily or were softer in texture, but lacked keeping quality. Further trials are needed to settle the point as to the right amount of acid to give spring curds. We would advise about one-eighth of an inch.

From July to October some further tests are made in which the acid of one vat was allowed to develop as much as one and one-quarter inches on the hot iron. It will be noticed by the table that so much acid on the curd did not produce so fine cheese as a rule, nor was the yield of cheese quite so great. Three hundred pounds of milk were used in each vat, the milk having been previously mixed together, so as to have the same quantity and quality in each vat.

*As previously explained, the scoring of the September cheese is not given, owing to the bad flavor caused by one patron feeding brewers' grains. As this tainted milk was in some cheese and not in others, it would be impossible to make comparisons.

Effect of dipping at different stages of acid.

Date.	Amount of acid.	Hours from dipping to salting.	Lb. cheese from 300 lb. milk.	Per cent. fat in		Score.
				Milk.	Whey.	Max. 100.
		hrs. min.				
April 16	1/8 inch	3 ..	29.75	3.60	0.20	88
	1-16 "	3 35	29.75		0.20	87
" 19	1/2 "	3 16	28.50	3.60	0.30	88
	1/4 "	3 31	28.25		0.30	90
" 20	1/8 "	3 18	28.75	3.60	0.18	90
	Perceptible	4 5	28.50		0.18	89
" 22	1/8 inch	3 15	29.00	3.60	0.22	90*
	Sweet	4 29	28.75		0.22	88
July 19	1/8 inch	3 ..	28.00	3.6	0.15	87
	1-16 "	2 26	28.00		0.15	86
Aug. 2	1/2 "	3 ..	27.25	3.3	0.15	89
	1/4 "	3 20	27.25		0.15	93
" 16	1/8 "	3 20	26.75	3.4	0.2	86
	Perceptible	4 35	27.00		0.2	88
" 30	3/8 inch	3 25	28.50	3.4	0.2	89
	1-16 "	4 19	26.50		0.2	91
Sept. 13	5/8 "	2 58	28.75	3.3	0.15	87
	1/4 "	3 30	28.75		0.15	88.5
" 27	3/4 "	2 30	29.00	3.4	.2	87.5
	1/4 "	3 12	29.25		.2	85.5
Oct. 11	1 "	2 5	28.50	3.4	.2	89
	1/4 "	3 3	29.00		.2	91.5
" 25	1 1/4 "	2 21	30.50	3.5	.2	88.5
	1/2 "	3 13	31.00		.2	90.5

Effect of Salt on Curds from Normal, Rich and Poor Milk.

For these experiments 600 pounds of milk were treated as usual, up to the salting stage, when the curd was divided as evenly as possible and different quantities of salt added to the curd. The amount per 100 pounds of curd varied from one-quarter of a pound to three and one-half pounds in the spring. Cheese with a small amount of salt—say up to one pound per 100 pounds of curd—are weak in body and texture and insipid in flavor. The best spring cheese at the end of twenty-three days was made (April 29th) by using salt at the rate of two pounds per 100 pounds of curd. The other half of the curd was salted at the rate of three pounds per 100. This latter cheese did not score quite so high at the end of twenty-three days, but on June 14th (when about six weeks old) it was better in flavor than the cheese salted at the rate of two pounds per 100. It would seem that about two and one-half pounds of salt per 100 pounds of curd would be about right for spring cheese. But in this a maker must use his judgment, putting more salt on a moist curd and less on a dry one.

The amount of salt should be increased during the summer and fall. A difference of half a pound of salt per 100 pounds of curd did not seem to affect the quality of the cheese to any considerable extent so long as the quantity was somewhere near three pounds of salt per 100 of curd during the summer and fall. The table shows the results.

* These two cheese were kept for a while in the curing room. On June 14th the cheese which had been dipped with one-eighth inch of acid was still the better cheese. The sweet curd cheese was soft.

Effect of salt on curd from milk with average per cent. of fat.

Date.	Lbs. milk.	Per cent. fat in milk.	Lbs. salt per 100 lb. curd.	Lbs. cheese. Green.	Lbs. cheese. Cured.	Score. Max. 100.
			lb.			
April 23	916	3.70	¼	48.25	46.00	74
			1¼	49.00	47.00	88
" 26	793	3.60	½	41.75	41.00	80
			1½	39.50	39.00	83
" 27	777	3.60	1	39.50	37.75	82
			1¾	39.25	37.50	83
" 29	800	3.60	2	40.00	38.50	90
			3	39.50	38.00	89
May 3	715	3.40	2½	33.25	31.50	83
			3½	32.50	30.75	86
June 15	600	3.60	2½	31.50	30.00	86
			3	31.00	29.50	86
" 29	600	3.70	2½	31.50	29.75	89
			3¼	32.00	30.25	89
July 13	600	3.70	2¾	31.50	29.75	86
			3¼	31.75	30.00	86
" 27	600	3.7	2¾	30.25	28.75	84
			3½	30.00	28.58	84
Aug. 10	600	3.6	2¾	30.25	28.50	90
			3½	29.75	28.25	91
" 24	600	3.6	2¾	30.50	29.00	85
			3¾	29.75	28.50	89
Sept. 7	600	3.6	3	30.25	29.00	87
			3¾	30.25	29.00	88.5
" 21	600	3.7	3	30.25	29.00	91.5
			4	29.75	28.50	89
Oct. 19	600	3.6	2¾	31.50	29.75	90
			3½	31.50	29.75	89.5
" 26	600	3.4	2¾	30.25	29.00	89
			3¼	30.75	29.75	90.5

Owing to the difficulty of securing a sufficient amount of rich milk, there were not a sufficient number of experiments to warrant us in laying down any hard and fast rule, but the results indicate that rich milk curds should be salted more heavily than poorer milk curds. The tendency of cheese made from rich milk is towards a "pasty" texture and poorer keeping quality. An extra amount of salt remedies this to some extent. Curds from four per cent. milk and over need to be salted at a higher rate than other curds. The quantity will vary with the season, the amount of moisture in the curd, and the length of time the cheese are to be kept before they are placed on the market.

Effect of salt on curd from rich milk.

Date.	Lbs. milk.	Per cent. fat in milk.	Lbs. salt per 100 lb. curd.	Lbs. cheese. Green.	Lbs. cheese. Cured.	Score. Max. 100.
			lb.			
May 4	600	4.00	2½	31.50	30.00	91
			3½	30.75	29 25	95
" 10	615	3.85	1	32.00	30.75	82
			2½	30.25	29.25	88
" 18	600	4.00	2½	33.25	31.75	87
			2¾	33.00	31.50	87
June 1	600	3.80	2½	30.00	28.75	88
			3	29.75	28.50	87
Oct. 5	600	3.80	3	33.00	31.25	90
			4	32.25	30.75	92.5

The general results indicate that less salt should be used per 100 pounds of curd when the latter is derived from poor milk—say about three per cent. of fat. It will be noticed that there are cases when the higher salted curds made slightly better cheese. For instance, September 28th and October 12th. In both cases this is due to an improved flavor. If the milk or curd is not first-class in flavor, heavier salting will no doubt tend to improve the flavor.

Effect of Salt on Curd from Poor Milk.

Date.	Lbs. milk.	Per cent. fat in milk.	Lbs. salt per 100 lb. curd.	Lbs. cheese. Green.	Lbs. cheese. Cured.	Score. Max. 100.
			lb.			
May 11	600	3.35	1	29.50	27.75	81
			2½	28.75	27.00	89
" 25	600	3.30	2½	29.00	27.25	86
			5	28.50	27.00	86
June 8	600	3.30	1½	28.50	26.75	90
			2½	28.50	27.00	90
" 22	600	3.00	2½	29.50	27.50	91
			1¾	28.75	27.00	91
July 6	600	3.10	2	28.25	26.75	78
			2½	28.00	26.50	78
July 20	600	3.00	2¼	28.50	28.25	89
			2¾	27.00	26.50	88
Aug. 3	600	2.90	2½	27.50	26.00	86
			2¾	27.75	26.25	87
" 17	600	3.00	2¾	27.50	26.25	91
			3	27.50	26.25	87
" 31	600	3.00	2¾	27.50	26.00	85
			3¼	27.25	26.00	86
Sept. 14	600	3.30	3	30.00	28.50	....
			3½	30.25	29.00	....
" 28	600	3.10	3	29.50	28.25	87.5
			3¾	28 00	27.00	88.5
Oct. 12	600	3.20	2½	30.25	29 00	88 5
			3	30.25	28.75	89.5

The cooking of curd made from milk with an average per centage of fat in it (from 3.4 to 3.7) to 100° or over, does not appear to be of any advantage, except in the case of curds which have a bad flavor. On July 29th, the curds were "gassy" and the cooking to 100° improved the flavor two points; but in texture the cheese was "off" one point, as compared with the curd cooked to 98°. Generally speaking, we may say, that the experiments made, indicate that the higher cooking has little or no effect on the time from setting to dipping, or from dipping to salting, and no effect on the percentage of fat lost in the whey. In two out of four trials, there was slightly less cheese made from the curds cooked to 100° and over. The effect on quality was to make the cheese somewhat harsh in texture, though it seemed to improve the flavor of a gassy curd.

Effect of temperature in cooking curds from milk with an average per cent. of fat.

Date.	Lbs. milk.	Per cent. fat in milk.	Temp. for cooking.	Hours from setting to dipping.	Hours from dipping to salting.	Lbs. of cured cheese.	Per cent. of fat in whey.	Score.
			deg.	hrs. min.	hrs. min.			
July 15	300	3.7	98	2 42	2 53	29.25	0.15	91
	300	3.7	99	2 40	3 4	29 25	0.15	91
" 29	300	3.7	98	2 45	3 6	29 25	0.20	90
	300	3.7	100	2 40	3 7	29.00	0 20	91
Aug. 12	300	3.7	98	3 3	3 42	27.50	0.20	90
	300	3.7	101	3 0	3 57	27.50	0.20	89
Sept. 23	300	3.6	98	2 58	3 20	28.75	0.20	88
	300	3.6	103	2 55	3 28	28.50	0.20	87

The experiments made indicate that one or two degrees higher temperature in cooking would improve the texture of cheese made from rich milk, say milk containing 4 per cent. of fat and over, although some of the cheese scored higher, at a lower cooking temperature. If the usual temperature for cooking is 98°, we would recommend cooking to 99° or 100° when making up milk containing over 4 per cent. of fat into cheese. The higher cooking tends to improve the body and texture and to overcome the tendency to pastiness in cheese made from rich milk.

Cooking—Rich Milk.

Date.	Lb. milk.	Per cent. fat in milk.	Temp. for cooking.	Hours from setting to dipping.	Hours from dipping to salting.	Lb. of cured cheese.	Per cent. of fat in whey.	Score.
			deg.	hrs. min.	hrs. min.			
May 6	300	4.05	98	2 34	3 3	29.00	0.15	84
	300	4 05	94	2 44	2 53	29.50	0.15	85
" 20	300	4.00	95	2 32	2 48	30.00	0.18	82
	300	4.00	98	2 32	2 55	29.25	0.18	83
June 3	300	3.08	98	2 31	3 7	28.75	0 20	91
	300	3.08	96	2 29	3 1	28.75	0.20	92
" 17	300	3.08	98	2 26	2 56	29.25	0.15	89
	300	3.08	97	2 21	3 ..	29.00	0.15	90
Aug. 26	300	3.08	98	2 30	3 47	28.50	0.20	86
	300	3 08	102	2 27	3 47	28 50	0.20	87
Oct. 21	300	3.08	98	3 42	3 42	29.00	0 20	89.5
	300	3 08	104	3 44	3 40	28.50	0.20	90

The general results of the effect of cooking temperatures indicate that one or two degrees lower than normal (98°) would have a beneficial effect on curds from poor milk, say milk containing from 2.90 to 3.25 per cent. of fat. This is presuming that the usual quantity of salt is used. The effects of cooking, salting, stirring, dipping, milling, etc., when combined, are so complex that it is difficult to say just what are the effects of any one of these operations in the manufacture of cheese. Then again, the maker's skill and judgment come into play so often that it makes the whole question a very intricate one. More light is needed on these points. It will require years of patient research to settle the many questions which arise in the manufacture of cheese and butter.

Effect of Different Temperatures for Cooking Curds.

Cooking—Poor milk.

Date.	Lbs. milk.	Per cent. fat in milk.	Temp. for cooking.	Hours from setting to dipping.	Hours from dipping to salting.	Lbs. cured cheese.	Per cent. fat in whey.	Score.
			deg.	h. m.	h. m.			
May 13	300	3.4	98	2 37	2 47	27.75	0.15	87
	300	3.4	90	2 54	3 17	28.50	0.15	86
" 27	300	3.2	98	3 6	3 53	27.00	0.12	88
	300	3.2	91	3 2	3 58	27.25	0.12	91
June 10	300	3 3	98	2 59	3 58	26.25	0.1	89
	300	3.3	92	3 7	3 45	26.50	0.1	91
" 24	300	3.0	98	1 57	2 45	26.25	0.00	86
	300	3.0	94	2	2 35	26.25	0.00	86
July 8	300	3.0	98	2 35	3 13	25.50	0.15	84
	300	3.0	94	2 39	2 56	25.75	0.15	84
" 22	300	2 9	98	2 33	3 25	24.50	0.15	90
	300	2.9	95	2 28	3 43	24.50	0.15	89
August 5	300	2.95	98	2 17	2 47	26.00	0.15	84
	300	2.95	95	2 12	2 51	26.00	0.15	84
" 19	300	2.8	98	3 9	3 5	26.00	0.15	86
	300	2.8	97	3 6	3 6	25.75	0.15	87
September 2	300	3.4	98	3 23	3 40	27.75	0.15	73.5
	300	3.4	99	3 20	3 50	28.00	0.15	75.5
" 16	300	3.4	98	2 42	3 45	29.00	0.15	90
	300	3.4	100	2 37	3 55	29.00	0.15	90
" 30	300	3.3	98	3 4	3 42	28.75	0.2	89
	300	3.3	101	2 55	3 52	28.50	0.2	88
October 28	300	3.3	98	2 57	3 25	29.00	0.15	90.5
	300	3.3	102	3 22	3 1	29.00	0.15	91

Effect of Different Quantities of Rennet on Spring Cheese.

Beginning April 3rd, nine experiments were made to determine the effect of different quantities of rennet used in milk on the quantity and quality of cheese. Six hundred pounds of milk were mixed in a large vat, and the coloring and "starter" added after it was brought to a temperature of eighty-six degrees. The milk was then equally divided between two vats of 300 pounds in each. The milk was ripened in both vats to about nineteen or twenty seconds, and then the rennet was added, varying in quantity from one ounce per 1,000 pounds of milk to nine ounces per 1,000 pounds of milk. The extreme quantities of rennet were always added to one of the vats, and the other vat was set with about the normal quantity used in spring cheese. Salt was used at the rate of two and a half pounds per 100 pounds of curd.

In the experiments where but one and two ounces of rennet per 1,000 of milk were added, the time required for coagulation was too long and considerable cream rose to the top. As a consequence the percentage of fat in the whey was high, .3 and .2 per cent.; and the yield of cheese was less, being half a pound less in the case of one ounce and a quarter of a pound less where two ounces of rennet were used. This loss was on 300 pounds of milk and would amount to considerable in a large vat. There also seemed to be less yield of cheese where the extra large quantities of rennet were used, and more loss of fat in the whey.

Effect of rennet in cheese-making.

Date.	Rate of rennet per 1000 lbs. milk	Rennet test. Seconds.	Minutes coagulating.	Time from setting to dipping.	Time from dipping to salting.	Lb. cheese from 300 lbs. milk	Per cent. fat in		Score, May 22nd, Max. 100.
							Milk.	Whey.	
	oz.			h. m.	h. m.				
April 3	3 1	19	30 65	2 25 2 41	3 20 3 3	28.75 28.25	3.65	0.15 0.30	86 83
" 4	3 2	19	33 42	2 33 2 27	3 8 3 9	29.75 29.50	3.65	0.15 0.20	87 88
" 5	3 2½	20	36 40	2 39 2 40	3 53 3 50	29.25 29.00	3.65	0.15 0.20	91 92
" 6	3½ 4	20	27 23	2 29 2 26	3 20 3 27	29.75 29.25	3.60	0.18 0.18	85 86
8	3½ 5	20	27 20	2 47 2 44	3 3 3 6	30.00 29.75	3.65	0.20 0.20	88 89
" 9	4 6	18	23 16	2 26 2 33	3 45 3 38	29.00 29.00	3.50	0.20 0.20	85 87
" 12	4 7	20	28 16	2 50 2 47	3 3 8	29.25 29.25	3.50	0.15 0.15	86 89
" 13	4½ 8	20	26 15	2 33 2 36	3 27 3 32	30.00 29.50	3.60	0.18 0.18	89 89
" 15	4½ 9	20	25 13	2 36 2 44	3 38 3 10	29.75 29.50	3.6	0.20 0.25	89* 89

The best cheese were made on April 5th, when three ounces and two and a half ounces of rennet were used per 1,000 pounds milk. These two cheese the experts pronounced "very good spring cheese."

April 15th, rennet was used at the rate of four and a half ounces in one vat and nine ounces per 1,000 pounds milk in the other. These cheese were scored on May 22nd by two experts who said that there was little or no difference in the two cheese. These two cheese were kept and judged again on June 25th, when the cheese with the large quantity of rennet (nine ounces per 1,000 pounds milk) was scored two points "off" in flavor, while the four and a half ounce cheese had kept its flavor well, and gained one point in closeness.

The table shows the chief points in the experiments. Similar experiments were made in November and December, but the cheese are not sufficiently cured to report this year.

Experiments in Creaming and Butter-making.

The past year has been a busy one in the Experimental Dairy. As soon as the dairy school was over I arranged a series of experiments to be conducted in the Cheese and Butter Departments. The cheese experiments have been reported. While we have been paying special attention to our cheese work we have not neglected the butter. This branch of the dairy will require special attention in the coming years.

* On June 25th these two cheese were scored again after having been kept for a month, and the cheese made by using four and a half ounces of rennet scored 90 points, and the cheese made with nine ounces of rennet scored 88 points. The former improved one point and the latter deteriorated a point.

The experiments in the butter department were conducted by Mr. T. C. Rogers, our butter-maker. Each day in the week was set apart for a certain line of experiments, and, as far as practicable, this has been adhered to. For instance, on Monday of each week experiments were made to compare the three systems of creaming milk—separator, deep setting and shallow pan. Tuesdays were devoted in observing the effect of washing on butter. On Wednesdays a number of different experiments were made. Thursdays were given up to sweet cream churnings; Fridays, to the best methods of ripening cream; and Saturdays, to miscellaneous experiments. While the students were at the College the time taken for instruction in the dairy interfered more or less with our experimental work. I trust that during 1896 we shall be able to systematize the work even better than during 1895, as it is only by doing systematic and carefully planned experimenting that we may hope to accomplish any considerable amount of the great deal of work which yet remains to be done in the dairy.

Creaming of Milk in Shallow Pans at Different Temperatures.

This is a continuation of experiments made on similar lines in 1893 and 1894. This year the experiments were made in October, the month when farmers begin to bring in the milk pans from the milk cellar and put them in the pantry or around the kitchen stove to keep the milk warm so that the cream may rise. Three hundred pounds were set in pans in a cool place, and 300 pounds of the same kind of milk (having been first well mixed with the former) were set in a warmer place. Fifteen trials were made in all. Twenty pounds of milk were set in each place. The average temperature at which the milk was set in the cool place was 78.1°. The average temperature when skimmed was 44.1°. The temperature of the room varied from forty to fifty degrees. The average percentage of fat in the skim-milk was .39.

The other lot of milk set at the same average temperature in a room where the heat varied from forty-eight to seventy degrees and the average temperature of the skim-milk was 54.1° (ten degrees higher than the other) contained .45 per cent. of fat in the skim-milk.

For three years we have had better results in creaming milk with shallow pans set in a cool room than in setting milk in these pans in a warmer place. We are satisfied that it is a mistake to carry milk in shallow pans into the pantry or kitchen in order to keep the milk warm for the cream to rise. A nice cool milk cellar where the milk will not freeze is much better—better, in order to get the cream to rise, and better for the flavor of the butter.

Hours Required for Cream to Rise on Deep Pails.

From April to December, twenty-two trials were made, comparing twelve, twenty-four and thirty-six hours' setting of milk in deep cans in ice water. During the summer months twelve hours' setting gave good results, but in November and December the skim-milk from twelve hours' setting contained over .5 of one per cent. of fat. The twenty-four and thirty-six hours' setting had considerably less. The average loss of fat during the whole season in the skim-milk, skimmed at a temperature of 41.1 degrees in twelve hours, was .44 per cent. of fat, and the cream contained 18.1 per cent. of fat. A portion of the same kind of milk, skimmed at twenty-four hours, contained .372 per cent. of fat in the skim-milk and 20.34 per cent. of fat in the cream. The remaining third of the milk, skimmed at thirty-six hours, contained .31 per cent. of fat in the skim-milk and 21.13 per cent. of fat in the cream.

The practical lessons from these trials are:

1. In winter, when the cream does not rise so readily and there is little or no danger from souring of the milk or cream before skimming, the milk should be set from twenty-four to thirty-six hours before being skimmed. When the cows are fresh and the weather is warm, and the dairyman has plenty of ice, skimming at twelve hours will give best results.

2. In one trial in November, where no ice was used, but the milk was cooled with water to forty-seven degrees before skimming, the loss of fat in the skim-milk was 1.0 per cent. at twelve hours, .9 per cent. at twenty-four hours, and .6 per cent. at thirty-six hours. *It pays to use ice and cool the milk rapidly.*

3. The longer the milk stands, the richer will be the cream. Some makers have the cream so thin that it takes a long time to churn and makes more labor than is necessary in winter. Allow the milk to sit a longer time and obtain thicker cream, which is less troublesome to churn.

Influence of Temperature in Deep Setting of Milk.

During May, July and August, ten trials were made to determine the influence of temperature in deep setting of milk. Three hundred pounds of milk were set at an average temperature of eighty degrees in ice water and skimmed at an average temperature of 41.4 degrees. The loss of fat in skim-milk was .206 when set for twenty-four hours. An equal quantity of the same milk was reduced to 46.7 degrees and the skim-milk tested .316 per cent. of fat. Another portion of this milk was set in cold water which reduced the temperature of the milk to 52.4 degrees. The loss of fat in the skim-milk set under such conditions was .71 per cent., or over three-quarters of a pound of butter to 100 pounds of skim milk. Yet this is the manner in which a great many dairymen set their milk for farm butter-making and for the cream-gathering creamery. These latter conditions are even better than the average farm conditions, as it is doubtful whether by using ordinary well water without ice the milk is cooled to even 52.4 degrees. How long shall this waste of butter continue?

In nine experiments made with 270 pounds of milk brought to the dairy by patrons furnishing milk for the cheese department, which had been hauled some three or four miles before being set under conditions similar to the above, the loss of fat in skim-milk was .25 per cent. from milk at 40.5 degrees; .44 per cent. from milk at 46.6 degrees, and .65 per cent. from milk at 51 6 degrees.

Separating Milk at Different Temperatures.

To throw some light on the question of the best temperature for separating milk with the cream separator, we made a number of trials from April to October. We used the Alexandra separator (Nos. 2 and 3) for this work.

In twenty-eight trials, where the average temperature of skimming was 82.2 degrees, there was left in the skim-milk an average of .09 per cent. of fat, and the cream contained 26.44 per cent. of fat. A portion of this same milk was heated to an average temperature of ninety-seven degrees, in which case the skim-milk contained .065 per cent. of fat, and the cream 28.04 per cent. of fat. Another portion of the same milk was heated to 107.7 degrees and the skim-milk tested an average of .065 per cent. of fat, and the cream 29.39 per cent. of fat. The remaining portion was heated still higher, to an average of 118.2 degrees, and the skim-milk tested .062 per cent., and the cream 30.9 per cent. of fat.

The results were that the higher temperature of the milk at separating showed (1) less loss of fat in the skim-milk (feed and speed of the machine remaining constant as far as possible in all the trials); (2) a higher percentage of fat in the cream, and (3) in the case of the Alexandra separators, the cream was smoother at the higher temperature. The butter made from the samples of cream separated at the different temperatures was quite similar in quality. We need, of course, to consider the expense of heating the milk and cooling the cream. Nevertheless, it would often pay the users of the Alexandra separators in the winter to separate at a much higher temperature than is now common. It would increase the capacity of the machine, give smoother cream, cause a higher percentage of fat in the cream and less loss of fat in the skim-milk, while there would not be so much danger of spoiling the grain or body of the butter in winter.

Diluting Cream with Water and Separating the Second Time.

It has been claimed by some that if cream was diluted with from one to six times its volume of water and run through the separator a second time it would improve the quality of the butter, as it would cause a more complete separation of the caseous or curdy matter. In some trials made during the past year it was found that such a practice did not improve the quality of the butter—in fact, it rather injured the body of the butter and did not improve the flavor. Water added to cream in any large quantity spoils the flavor to some extent, and the more that cream is hauled about and handled, the poorer is the quality of the butter, as a rule. The more quickly the cream is churned and the less handling it receives, consistent with good buttermaking, the better the quality of the butter.

Separating Milk Containing Different Percentages of Fat.

Sixteen trials were made from April to October to see the effect on the cream of separating milk containing different percentages of fat; 3,593 pounds of milk, containing an average of 4.18 per cent. of fat, were run through an Alexandra separator at an average temperature of eighty-five degrees. This amount of milk produced 543 pounds of cream, containing an average of 26.47 per cent. of fat. The skim-milk averaged .08 per cent. of fat. Three thousand six hundred and eighty-five pounds of milk, separated at an average temperature of eighty-seven degrees and containing 3.3 per cent. of fat, produced 544 pounds of cream which tested 21.64 per cent. of fat. The skim-milk in this case tested .09 per cent. of fat. In the case of the rich milk (4.18 per cent. of fat), 100 pounds of it produced 15.1 pounds of cream, and the poorer milk (3.3 per cent. of fat) produced 14.7 pounds of cream per 100 pounds. The general effect seemed to be that richer milk did not produce a great deal more *volume* of cream than did poorer milk, but the cream contained a higher percentage of fat, or was richer. The *machine*, and not the richness of the milk, governs the *volume* of cream obtained from a cream separator.

Separator, Deep Setting and Shallow Pan Methods of Creaming Compared.

During the past three years we have been comparing the three common methods used for creaming milk. During 1893 and 1894 the position of the methods, as regards completeness of skimming, quantity of butter made, and quality of butter, was separator first, deep setting second, and shallow pan third. This is the relative standing for 1895 also. The table shows the chief points in the experiments by months.

By way of summary, it may be said that 3,938 pounds of milk were creamed by each method. The average percentage of fat in the whole milk was 3.66; in the separator skim-milk the fat averaged .093 per cent.; the skim-milk from deep setting averaged .29 per cent. of fat, and the shallow pan skim-milk .313 per cent. of fat. The average percentage of fat in the separator cream was 22.38; in the cream from deep setting it averaged 19.12 per cent., and the shallow pan cream averaged 18.34 per cent. of fat.

The buttermilk from separator cream averaged .135 per cent. of fat; from deep setting the buttermilk averaged .195 per cent., and from the shallow pan it averaged .24.

The total quantity of butter produced from the separator cream was $164\frac{1}{2}$ pounds; from deep setting cream $160\frac{3}{4}$ pounds, and from the shallow pans 157 pounds and one ounce.

The pounds of milk required to make a pound of butter for the season was 23.91 for the separator, 24.47 for deep setting, and 25.05 for the shallow pans.

As to the quality of butter produced from the three methods, it may be said that there was not much difference in them during the cooler weather. In hot weather the shallow pan butter was not so good, but at other times it compared favorably with the other two. Taken for the nine months, the separator butter was slightly better in quality, although not *always* so.

Result of experiments in creaming milk with separator, deep setting and shallow pan.

Months.	Method of creaming.	Lbs. milk.	Temperature set and separated.	Per cent. of fat in Whole milk.	Skim-milk.	Cream.	Butter-milk.	Temperature of milk when skimmed.	Lbs. and oz. of butter made.
			deg.					deg.	lbs. oz.
April	Separator	297	83	4.05	.075	23.05	.10	....	14 4
	Deep setting	297	83	4.05	.175	21.00	.10	38	14
	Shallow pan	297	83	4.05	.25	21.70	.17	43	13 12
May	Separator	440	85	3.77	.08	20.46	.1	....	19 12
	Deep setting	440	85	3.77	.23	19.20	.13	41	19 8
	Shallow pan	440	85	3.77	.26	21.60	.15	53	19 4
June	Separator	575	87	3.38	.11	24.15	.08	....	21 15
	Deep setting	575	87	3.38	.19	19.65	.17	45	21 11
	Shallow pan	575	87	3.38	.29	18.70	.25	64	20 4
July	Separator	560	88	3.33	.09	21.30	.14	....	22 4
	Deep setting	560	88	3.33	.22	18.75	.2	45	21 13
	Shallow pan	560	88	3.33	.30	15.50	.25	57	20 13
August	Separator	415	85	3.36	.08	21.40	.12	....	16 1
	Deep setting	415	85	3.36	.22	19.00	.15	43	16
	Shallow pan	415	85	3.36	.26	16.80	.20	60	15 8
September	Separator	536	85	3.62	.05	22.27	.16	....	22 4
	Deep setting	536	85	3.62	.36	18.60	.25	43	21 10
	Shallow pan	536	85	3.62	.30	19.31	.26	58	21 2
October	Separator	397	83	3.84	.06	20.50	.20	....	17 5
	Deep setting	397	83	3.84	.33	18.90	.18	41	16 11
	Shallow pan	397	83	3.84	.33	17.20	.2	44	16 10
November	Separator	468	79	3.72	.17	19.90	.22	....	19 8
	Deep setting	468	79	3.72	.45	18.20	.2	44	19
	Shallow pan	468	79	3.72	.42	17.70	.33	42	18 14
December	Separator	251	81	3.82	.09	22.05	.20	....	11 3
	Deep setting	251	81	3.82	.35	19.4	.3	38	10 7
	Shallow pan	251	81	3.82	.30	16.6	.35	39	10 14

Sweet Cream Butter.

For some four years we have been making experiments with churning sweet cream. Our results have been practically the same throughout, viz., that butter can be made from sweet cream, which will suit a certain class of customers, who like mild, fresh, creamy flavored butter; but by the majority of persons in Canada, ripened cream butter is liked better. Other points we have learned, are:

1. We must churn sweet cream at a very low temperature (forty-five degrees or below) in order to obtain all the butter. Churning at ordinary temperatures means a great loss of fat in the buttermilk. Cream rich in butter-fat (twenty-five to thirty per cent.) gives best results.

2. Sweet cream butter does not possess "keeping quality" the same as ripened cream butter. We have found that it quickly goes off in flavor and does not improve or take on the flavor of ripened cream butter as claimed by some.

3. The temperature of the cream usually rises about ten degrees in the process of churning, indicating that the low temperature is not suitable for bringing the butter (yet necessary to start with) in order to gather all the particles of fat.

VIEW OF DAIRY DEPARTMENT, TAKEN FROM THE COLLEGE.

DAIRY BUILDING, SILO, Etc.

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During 1895 eighteen trials were made, in which 1,919 pounds of cream were churned at an average temperature of 45.6 degrees at the beginning, and 55.4 degrees at the end. The time required for churning ranged from half an hour to one hour and fifty-five minutes, with an average time of one hour. The average percentage of fat in the buttermilk was 0.223.

Ripening Cream.

The most difficult part of the buttermaker's task, and the one requiring the most skill and good judgment, is the proper ripening of the cream. A number of different "starters" were used in our dairy during the past season. Of all the "pure cultures" which we have tried, there appears to be none that produced so marked an effect on the flavor of the cream and butter as Conn's Bacillus No. 41. Between August 6th and the 10th, a similar flavor to that produced by B. 41 was produced in the cream and butter by using a starter made in the ordinary way, viz., by heating some skim-milk to ninety degrees and allowing it to sour. In cream-gathering creameries, where it is difficult sometimes to get a good flavor in the butter, or in fact at any creamery or dairy where the flavor of the butter is not first-class, we would recommend a trial of Dr. Conn's "B. 41."

As a "starter" for ordinary creamery work, we would recommend pasteurizing the skim-milk (heating to 170 degrees for twenty minutes) cooling it to eighty-five degrees and then adding about five per cent. of good flavored buttermilk, or any "starter" of good flavor, in order to obtain a uniformly good-flavored cream and butter from day to day. Add from five to ten per cent. of this "starter" to the cream, and it will result in a more even flavored butter during the year.

Should we Wash our Butter?

During the past year we have made one experiment each week, by taking out about one-third of each churning, and salting, working and packing this in a tub without washing. The remaining two-thirds we washed once; and then salted, worked and packed one-half of it. The other half (or remaining third of the original churning) we washed twice and then salted, worked and packed it. We have found that by adding about twenty-five per cent. of water to the contents of the churn before drawing off the buttermilk, we thin the buttermilk and so allow a better separation of the butter, whereas, if this is not done, it is difficult to get the buttermilk from the butter. We would recommend adding in winter about ten per cent. of water at churning temperature, when the butter "breaks," and the remaining fifteen per cent. of colder water after the granules are full size. After this revolve the churn a few times to mix the water with the milk and then draw off the buttermilk and water.

As a result of the season's experiments on this point, we would recommend little or no washing where the butter is made into pound prints for customers who like highly flavored butter, and who will consume it in from eight to ten days after it is made. While we have found the unwashed butter to keep fully as well as the washed in some cases, yet the general results indicate that the former has not quite so good keeping quality as the washed butter. For packing in tubs, butter may be washed once or twice, but we feel satisfied that many makers are spoiling the flavor of their butter by too much washing. To-day (Dec. 28th) I have just examined three prints of butter, from the same churning, made at the dairy on the 18th instant, and the print of unwashed would score three or four points higher in flavor than the others which were washed. Winter butter especially should not be washed too much.

The Oil test Churn Compared with Actual Results in Churning.

The oil-test churn has been the subject of a number of attacks from patrons of cream-gathering creameries and others. To compare this test with the actual yields of butter from the churn, twenty-seven trials were made during the months of July, August and September. Altogether, there were churned 2,385¼ pounds of cream, which made 592 pounds 5 ounces of butter. Tested by the oil-test churn method, there were 530.6 inches of cream, which varied in the test from seventy-five per cent. to 140 per cent. The total amount of butter credited in these churnings by the oil-test churn was 575.94 pounds, compared with 592.34 pounds as the actual yield, a difference of 16.4 pounds. Half of this difference was made in one day, June 30th, when the oil-test credited the churning with 29.43 pounds of butter, whereas the actual butter churned was 38.42 pounds. Why there was so much difference on this particular day, it is difficult to say.

Only three times out of the twenty-seven trials did the oil-test credit more than the actual yield from the churn.

Experiments in Feeding.

Value of Milk for Calves. Beginning May 6th, an experiment was commenced to find the relative value of skim-milk and whole milk for calves. Two grade calves, as nearly alike in age and weight as we could get, were selected. Number one, fed on skim-milk only, was dropped May 3rd and weighed sixty-one pounds on May 6th. At the end of six weeks it weighed 141 pounds, a gain of eighty pounds, or nearly two pounds per day. During this time the calf drank 714 pounds of skim-milk. Calf number two fed on whole milk (dropped April 19th) weighed seventy-five pounds at the beginning, and 201 pounds at the end of six weeks, a gain of 126 pounds, or three pounds per day.

These calves were both sold to a local butcher, who pronounced the calf fed on whole milk worth one cent a pound more than the other. The calf fed on skim-milk sold for $3.50, and the one on whole milk sold for $7.50. Allowing $1.50 as the value of No. 1 calf and $2.00 as the value of No. 2 at the beginning of the experiment, we have $2.00 as the value of 714 pounds of skim-milk, or twenty-eight cents per 100 pounds, and $5.50 as the value of 714 pounds of whole milk, or seventy-seven cents per 100 pounds. To produce one pound of gain, required 8.9 pounds of skim-milk. The whole milk gave one pound of gain for 5.6 pounds fed.

A similar experiment was commenced on two other calves at the same time, except that these received meal and some clover hay in addition to the milk. Calf No. 3, fed on skim-milk, was dropped April 17th, and weighed seventy pounds at the beginning of the experiment, May 6th, and 192 pounds at the close, May 31st. During the twenty-five days it consumed 546 pounds of skim-milk, twelve pounds of meal (made up of ground wheat, bran and oil-cake mixed in equal proportions), and nine pounds of clover hay. The gain averaged 4.8 pounds per day, which seems rather high, but this was an exceptionally hearty calf and of the age to make the best gain. With this calf, 4.5 pounds skim-milk (with the meal) produced one pound gain. The other calf, No. 4, dropped April 2nd, was fed on whole milk and the same kind of meal as No. 3, consumed 462 pounds of milk, twelve pounds of meal, and eleven pounds of clover hay. During twenty-five days it gained 110 pounds, and averaged 4.4 pounds gain per day; 4.2 pounds whole milk (with the meal) gave one pound gain in flesh. In addition, both calves were fed all the salt they would eat—three pounds each during the twenty-five days of the experiment.

Further experiments were made during the summer, but the results were not nearly so satisfactory, due in all probability, first, to the fact that the calves were from cows which had been bought to replenish the dairy herd, and were likely sired by "scrub" bulls; secondly, to the fact that during hot weather and fly time calves do not gain so rapidly, unless extra precaution is taken. From June 3rd to July 15th, a "scrub" calf (No. 5) fed on 432 pounds of skim-milk, and thirty-four pounds of meal, gained but forty-four pounds, or a little over one pound per day. Another calf (No. 6) of similar breeding consumed 1,420 pounds of skim-milk, ninety-five pounds bran, and forty-seven pounds of oil cake from July 15th to September 24th, and gained but seventy-two pounds in that time—or about one pound per day. These two experiments illustrate the importance of *breed* as well as *feed*.

Value of Sweet Whey for Calves. Two experiments were made to determine the feeding value of sweet whey for calves. The results were not altogether satisfactory, and I think larger gains would be made with a better class of calves. The one calf (No. 7) that showed some breeding, seemed to thrive fairly well. If whey could be got sweet from the vats and fed warm to thrifty calves, they would do very well, if fed some meal in addition.

In changing the feed from milk to whey, it was done gradually. The meal was mixed with the drink for a time, and then gradually changed to a dry meal ration.

Calf No. 5, which had been previously receiving a skim-milk ration, and had gained but forty-four pounds in forty-two days, was gradually changed to a sweet whey and meal ration, which continued from July 16th to September 24th. During the seventy days it consumed 1,240 pounds of whey, 105 pounds skim-milk, sixty-seven pounds bran, and thirty-four pounds of oil cake, and gained eighty-five pounds—about the same gain as it had previously made on skim-milk and meal. This calf never seemed very thrifty. All unthrifty calves are reared at a loss to the feeder.

Calf No. 7, which was about the same age as calf No. 6, and was fed on whey during the same time that No. 6 received skim-milk (from July 15th to September 24th), consumed 1,420 pounds of whey, 105 pounds of whole milk, ninety-five pounds of bran, and forty-seven pounds of oil cake. During this time it gained fifty-five pounds, or about three-quarters of a pound per day.

Experiments in Pig Feeding.

Sweet Milk vs. *Sour Milk for Grown Pigs.* These experiments are a continuation of last year's work in this line. The first experiment commenced April 29th, with thirteen Yorkshire grade pigs—six pigs in pen No. 4, and seven in pen No. 5.

Pen No. 4 weighed 908 pounds (an average of 151 pounds each) at the beginning of the experiment. For three weeks they were fed on *sweet* skim-milk, some whey, pease, and middlings. At the end of three weeks they were weighed. During the next three weeks they were practically fed on the same ration, except that they received more of it, and *sour* skim-milk instead of sweet. Pen No. 5 weighed 1,007 pounds (144 pounds each) when they commenced on *sour* skim-milk, meal, and some whey. At the end of the first period (three weeks) they were weighed and then changed to a ration of *sweet* skim-milk and meal.

The total gain of both lots on *sweet* skim-milk was 277 pounds, and the total gain of both pens on *sour* skim-milk was 269 pounds in six weeks—practically the same.

July 15th a similar experiment was made, except that the feeding periods continued for six weeks, instead of three. The pigs were Berkshire grades.

No. 2 pen, consisting of nine pigs, weighed 904 pounds when they commenced the experiment on sour milk; and No. 3 pen (eight pigs), weighed 569 pounds when they started on sweet milk. The total gain on *sweet* milk and middlings with both lots was 517 pounds; and on the *sour* milk and middlings the gain was 991 pounds. To produce 517 pounds of gain the hogs consumed 5,476 pounds of *sweet* skim-milk, and 2,040 pounds of middlings. To produce a gain of 991 pounds required 5,770 pounds of *sour* skim-milk and 2,118 pounds of middlings.

Wet vs. Dry Feed. This experiment is also a continuation of last year's experiments in the same direction. The pigs were four Yorkshire grades. The experiment commenced July 15th, when they were fed on wet middlings in the form of a slop for six weeks. At the beginning of the trial the total weight was 402 pounds; and at the end of six weeks they had gained 323 pounds. During the next six weeks, from August 26th to October 8th, when they were fed dry meal, they gained but 132 pounds, or less than half what they had gained in the previous period. The explanation of this would seem to be that in the first period they were at the stage of growth when they would naturally make the greatest growth, and when changed to the dry meal they did not appear to relish it so well, and did not eat so much in proportion to weight. During the wet meal period these hogs consumed 570 pounds of middlings, and 850 pounds of skim-milk, together with a small amount of whey—fifty pounds. While fed on dry meal for six weeks they consumed 566 pounds of middlings, 840 pounds of skim-milk, and 420 pounds of whey.

Last year there did not appear to be much difference in the results from dry and wet meal, while this year there is a marked difference in favor of the wet meal. Individual characteristics of the pigs would account to some extent for differences in results. *In all experimental work with live stock allowance must be made for the individuality of the animal.*

III. DAIRY STOCK.

The stock at present in the dairy consists of two pure-bred Jersey cows, one two-year old, and three yearling heifers; one Holstein cow and a yearling heifer; one Ayrshire cow; twenty-four grade cows, three yearling grade heifers, and three calves. Our cows were turned out to pasture on May 10th, the earliest since my connection with the Department. Later, however, frosts came and destroyed the excellent pasture, and it never recovered from the injury, consequently we were obliged to feed more grain and soiling crops than usual. Some silage left over from the winter also helped through the dry spell. Our plan is to sell or exchange dry and unprofitable cows for fresh milkers, so as to have some fresh cows in the herd all the time, and to keep none but first-class cows for any length of time. We have had difficulty in getting our cows in calf during the year, and two cows have aborted. We have discarded the system of watering the cows in the stalls by means of iron troughs, as we found it impossible to keep the water pure.

We have kept a sufficient number of pigs to consume the skim-milk and most of the whey from the dairy. Some of these we bought, and others we raised. Our aim is to raise the pigs needed in the dairy, but when thrifty pigs, six to eight weeks old, can be bought from \$1.25 to \$1.50 apiece, as I have bought them this fall, it is a question whether it pays to raise them or not.

Record of the Dairy Herd for 1895.

The following is a record of the dairy herd for 1895. As we have been buying and selling throughout the year, the record is not complete for all cows which have been in the herd during the year. Some were in at the commencement of the year, but were sold for beef during the summer, as they were unprofitable. Others were bought later in the year, and have not had time to prove their worth. Under these circumstances, I have withheld the records of all cows which have not been at the dairy for at least 200 days. We still adhere to our standard of at least 6,000 pounds of milk, or 250 pounds of butter yearly. If a cow does not reach this standard, she must go. This makes a good many changes necessary during the year. In time, we hope to build a dairy herd second to none. We have a number of promising heifers from some of our best cows. From these we shall hear later on :

Yearly Record of Dairy Cows, ending Dec. 8th, 1895.

Name of cow.	Weight.	Bred.	Calved.	No. of days milking.	Total lbs. of milk.	Per cent. fat: Highest.	Per cent. fat: Lowest.	Per cent. fat: Average.	Total lbs. of fat.	Lbs. of milk to one lb. of fat.	Total lbs. of butter.	Remarks.
Queen......	1,110	Sept. 27	Apr. 28....	266	6,749	4.3	2.4	3.38	228	29.6	250.8	
Carrie......	1,140	May 16	Mar. 16....	308	8,258	5.2	2.2	3.96	327	25.2	359.7	
Jessie......	1,065	Sept. 20	Mar. 14....	287	7,663	4.3	2.9	3.06	275.8	27.7	303.3	
Jennie......	965	Sept. 23	Apr. 19....	280	7,315	3.5	2.6	3.08	225.3	32.4	247.8	
BelleTemple	915	July 2	Nov. 8....	343	4,639	7.2	4.2	6.27	290.9	15.94	320	
Pansy......	1,055	Feb. 2	Nov. 2....	287	6,723	4.3	3.0	3.52	236.6	28.4	260	
Annie......	935	Nov. 7	Aug. 7....	315	6,569	4.8	3.0	4.38	287.7	22.4	316.4	
Birdie......	1,115	Feb. 22	Nov. 8....	329	7,439	5.6	3.2	4.32	321.3	23.14	353.4	
Margaret...	1,460	Dec. 4	Oct. 26, '94	372	10,090	4.8	3.0	3.67	370.3	27.2	407.3	Aborted
Rebecca....	1,100	....	....	238	6,595	4.0	3.0	3.53	232.8	28.3	256.0	Aborted
Bella.......	1,335	June 24	Mar. 3....	280	8,402	4.3	3.0	3.55	298.2	28.16	328	
Patience ...	1,245	Apr. 23	Feb. 11....	245	6,940	5.0	2.9	4.08	281.0	24.7	309	
Star Light..	1,367	June 24	....	280	6,352	4.2	3.4	3.53	224.0	28.3	248	
Dairy Queen	1,150	June 24	....	210	5,602	4.1	2.7	3.50	196.0	28.6	215.6	Bought in spring
Nora.......	1,165	....	....	224	4,992	4.2	2.5	3.19	159.24	31.34	175.1	Sold for beef
Fancy......	......	....	....	203	5,281	4.7	3.5	4.00	211.24	25.0	232.3	" "
Nancy......	......	....	....	217	5,200	4.8	3.0	4.05	210.6	24.06	231.6	" "
Lily.......	......	....	....	245	4,415	4.6	3.0	3.67	162.03	27.25	178.2	" "
Fill-Pail ...	1,180	....	....	287	4,897	4.5	3.0	3.62	177.27	27.6	195.0	Bought in spring
Mabel......	967	....	....	210	5,137	3.8	2.8	3.28	168.00	30.4	185.3	" "
Dora	1,025	....	....	217	3,776	4.2	2.8	3.45	130.27	29.0	143.3	Sold for beef

IV. TRAVELLING DAIRY.

Prof. H. H. Dean :

Sir,—I have the honor to submit herewith my report of the work of the Travelling Dairy in 1895.

Under the direction of Dr. Mills, I left the College in the month of April, and arranged for meetings in the north riding of Ontario County and also in Victoria and Peterboro' Counties. On the 7th of May, the Travelling Dairy left the College and drove to the village of Goodwood, where at 1.30 p.m. on the 9th the first meeting of the season was held. The attendance here was small. At our meeting at Uxbridge on the day following, about twenty-five were present and much interest manifested.

Three gallons, more or less, of separator cream was supplied us for churning. Though churned at a temperature of fifty-three degrees Fahrenheit, the butter came quite soft. This was partly due to the high temperature at which it was ripened—seventy degrees Fahrenheit. Though cooled by ice water to fifty-three degrees Fahrenheit before churning, such rapid cooling did not materially affect the butter fat, as it would have done had the cream been allowed to stand at this low temperature an hour or two before churning. This is a beautifully rolling section of country, well watered and admirably suited for dairy purposes. There are no factories in the immediate vicinity, a creamery at Stouffville (eight miles distant), and a newly opened cheese-factory at Leaskdale (ten miles away) being the nearest. A sample of skim-milk from a Sharples (Russian) separator showed three-tenths of one per cent. of fat, and one from deep setting, without ice, five-tenths of one per cent. These were made the basis of an object lesson to the meeting. At Utica, the following day, the meeting was full of interest. Many, however, were convinced, that, because of the low price of butter then prevailing, it did not pay to go to much trouble to make or market butter, apparently forgetting that it is under just such circumstances that the gilt-edged article proves its superiority from a financial standpoint.

The question of feeding calves with whey was broached and discussed. This, we submit, is a feature of our Canadian dairy practice that hitherto has not received the attention that is its due. That *sour* whey is useless for calf-feeding all must admit, but we believe that *sweet* whey may be made the basis of a satisfactory ration. Whey is not so badly balanced a food for young animals as some suppose, but it contains too much water in proportion to dry matter — 93.7. Many good calves have been raised on whey and grain rations. We would suggest the following supplement to the whey. After a week's feeding on new milk, gradually change to *sweet* whey, adding oilcake and flaxseed in equal quantities, to replace the oil and albuminoids of the milk. At two weeks old, the calf might receive whey only, with about one-quarter pound of flaxseed and one-quarter of oilcake to every two gallons of whey. Both should be boiled before adding to the whey. As soon as the calf will eat grain, ground oats with bran, oats and barley, or some like combination of grain, should be regularly supplied. Feed always at the *same temperature*, and not lower than eighty degrees Fahrenheit.

The remaining meetings held in this riding were at Sandford, Zephyr, Leaskdale, Greenbank, Pinedale, Sunderland, Wilfrid, Cannington, Beaverton, Brechin, and Uptergrove, fourteen in all. A sample of sweet-cream buttermilk, churned in nine minutes, was brought us at one of these meetings, and found to contain two and seven-tenths per cent. of fat. We find that this is no isolated instance, and is but further proof of the need of close and continued examination of the by-products, that such losses may be avoided.

There was an average attendance of about thirty in this riding. The people who attended, showed much interest in the subject. There are few factories for the manufacture of either butter or cheese in this riding, but there is an inclination on the part of many towards the establishment of such, were it not that they are afraid that this branch of agriculture is likely to be overdone. At the Beaverton meeting, intense interest was manifested in regard to the use of the Babcock milk-tester in the farm dairy. The secretary of this riding, Mr. J. E. Gould, and the president, Mr. John Feasby, are certainly capable of filling their respective positions satisfactorily.

Leaving Uptergrove, we drove to the little village of Dalrymple, which lies on Mud Lake in the north-western part of Victoria County. Immense tracts of rocky plains, Trenton limestone, cover a goodly portion of this section of Victoria, with stretches of swampy land interspersed. These latter supply, during dry summer weather, much of the fodder for stock. Hence rank-flavored milk is not uncommon. Little corn is grown, and not much of anything to supplement dried up pastures. Little or no attention is paid to improving the herd, but indiscriminate breeding and quite as indiscriminate feeding almost everywhere prevail.

About forty attended our meeting at Kirkfield, on May 30th. Little ambition was manifest here for dairy improvement, the majority being satisfied to take the low prices offered by the stores. After leaving this, the northernmost meeting of this riding, we lectured successively at Glenarm, Woodville, Oakwood, Little Britain and Lindsay, at all of which we had most excellent meetings, the average attendance being close to sixty.

Thanks to the secretary, Mr. Keith, of Lindsay, the meetings were well advertised.

In the west riding of this county, we held meetings as follows: Cambray, Omemee, Downeyville, Dunsford, Bobcaygeon, Fenelon Falls, Coboconk, Kinmount, Haliburton and Minden.

At Bobcaygeon, we met with Mr. Thurston, the genial secretary, and also a progressive farmer. At Fenelon Falls we met a gentleman who spoke very highly of his hand Alexandra separator and said that, in his experience, a herd of six cows would pay for the use of one. At Kinmount, a farmer was present, who had travelled seventeen miles to the meeting; he brought a sample of milk from each of his cows to be tested.

We thought as we noted the deep interest he took in the proceedings and his careful questioning, that if the dairymen of our more favored districts were equally zealous and progressive, Ontario would *at once* o'erleap itself and stand at the forefront in this industry. At Haliburton and Minden, we held royal meetings, about seventy-five present at each. We remarked that in this north country milk stood higher in percentage of fat at this season than in any other place we visited. We have asked ourselves if the continued pasturing of the cows on the unbeaten natural grasses on the slopes and river bottoms of this country for a series of years had anything to do with it.

PETERBORO' COUNTY.

In the west riding, the president, Mr. J. F. Davidson, and the secretary, Mr. John A. Davidson, made arrangements for the following meetings, commencing Saturday, June 22nd: Ventress' school house, Lakehurst, Selwyn, Lakefield, Union Hall, Ennismore, Temperance Hall (Smith township), Springville and Centreville. These meetings were only moderately attended, and were without any noteworthy feature. The average attendance did not exceed twenty.

The east riding differed little in general interest and attendance from the west. We lectured and exhibited in Greystock, Keene, Westwood, Warsaw, Hall's Glen, Roman Catholic church (Douro township), school house (Douro township), and Norwood. Exception should be made from the general statement above in the case of Greystock and Hall's Glen. These meetings were intensely interesting. At the latter, sixty people were present and they were pleased to express themselves as well satisfied with the meeting, which was doubtless due, at least in some measure, to the fact that they possessed that excellent gift—the power to question wisely and well. The rather small attendance at the east Peterboro' meetings was due largely to the fact that haying and harvesting were in full operation, though the secretary, Mr. J. O'Reilly, and the president, Mr. F. Birdsall, did much to make them a success.

At the close of these meetings, the Travelling Dairy took a vacation of a couple of weeks, while harvesting operations were in progress, after which, sending our team and goods by rail 150 miles east, we found ourselves launched on a series of twenty-five meetings in the county of Russell, commencing at Vernon on the 5th of August. This was a fairly good meeting, owing largely to the interest taken and energy manifested by Mr. D. McPhail, an Associate of the O. A. C. Leaving Vernon, we visited successively Osgoode, Manotic, Nolan's school house, Billings' Bridge, Champagne Settlement school house, Cyrville school house, Taylorville, Metcalfe, Duncanville—a splendid meeting and capable chairman—Embrun, St. Albert, Casselman, South Indian, Bearbrook Station, Sarsfield, Navan's Corners, Daniston, Canaan, Cumberland, Rockland, Clarence Front, Clarence Creek, The Lake, and The Brook.

At Clarence Front, we had a very good meeting, and lectured to a people fully converted to the necessity of thoroughness in their profession. Mr. Shirreffs, an O. A. C. ex-student, supplied the cream and interested himself in various ways to secure a satisfactory meeting. We are sorry that we cannot speak so favorably of the other meetings of this county. The Farmers' Institute had not attended properly to the advertising nor yet to getting a supply of cream, which latter had been left in many cases to the pleasure of disinterested persons; in short, the general working up of the meetings had been sadly neglected and resulted in a series of the worst meetings ever held by the Travelling Dairy. We did not have the pleasure of meeting the Secretary at any of our meetings.

PRESCOTT COUNTY.

The 10th of September found the Travelling Dairy at Wendover, on the Ottawa river. It was quite apparent, before many meetings were held here, that a great change was manifest over previous arrangements. With one exception, Curran's, out of twenty-two meetings, the cream was on hand promptly at the appointed hour, and the advertising was done with at least fair thoroughness, due in large measure to a shrewd business capacity on the part of the genial and off-handed secretary of Prescott County Farmers' Institute, Mr. Wm. McAdam, of Vankleek Hill. Every meeting, without exception, gave evidence of the work of some master mind or minds. The president, Mr. Jonathan Cross, of Caledonia, is a competent head to this Farmers' Institute; a gentleman capable and willing and, withal, a farmer of more than usually progressive tendencies. Messrs. Cross and McAdam proved themselves men of more than ordinary executive ability, as the marked success of the tour of the Travelling Dairy in that county abundantly shows. But they did not stand alone. Mr. A. Evanturel, M.P.P., proved himself a worthy and energetic seconder in the cause of dairy development. This gentleman, at considerable trouble to himself, exercised a personal supervision over a number of the meetings held in the county, and assisted the lecturer of the Travelling Dairy at more than one meeting over the difficulty experienced with the dual languages of the county. The Travelling Dairy takes this opportunity of offering to the esteemed member for Prescott their cordial thanks for the assistance so generously rendered and the trouble taken to make their tour a satisfactory one.

Meetings were held at the following places: Wendover, Plantagenet, Curran's, Pendleton, St. Isidore, Fournier, Vankleek Hill (two days at exhibition here), Caledonia Front, Caledonia Flats, St. Amour, Horse Creek, Alfred, Lefaivre, The Marsh, L'Orignal, Henry, Hawkesbury, Chute Au Blondeau, St. Eugène, St. Anne de Prescott and Barb.

The average attendance in this county would not fall far short of forty or forty-five, and the majority of the meetings were quite satisfactory. There are a great many, in fact too many, cheese factories in this county, but knowledge of butter-making is not wide. The herds are small, very small, and, after the factory closes, the product made is so small that the people can hardly be induced to adopt the most satisfactory methods.

After our meeting at Barb, October 9th, we took train for the west and on Friday, October 18th, commenced work again at Alliston, Simcoe county, continuing with Lisle, Creemore, Dunedin, Glen Huron, Duntroon, Lawrence's school house, Batteaux, Stayner, Angus, Cookstown, Beeton, Bondhead, Croxon's Corners, Stroud, Painswick, Grenfel, Crown Hill, Minesing, Phelpston, Craighurst, Vasey, Hobart's, Orillia, Lovering, Hawkstone and Severn Bridge; twenty-seven meetings in all.

At our first meeting in this riding, we found a people thoroughly alive to their agricultural interests and possessing an active and intelligent knowledge of dairying in its varied aspects. Some fifty to sixty people were present and the meeting was characterized throughout by an actively questioning spirit. Mr. Applegate supplied the cream for this meeting. He supplies milk to the town of Alliston, and, with some others, has interested himself in the establishment of a creamery, but thus far none has been erected. The president of the Farmers' Institute in this riding, Mr. Charles Lawrence, Collingwood, and the secretary, Mr. W. A. Furlong, were present at the Duntroon meeting, and by pertinent questioning and helpful hints added much to the usefulness of the proceedings. Mr. Lawrence offered some suggestions relative to butter-making, the result of considerable observation while judging butter at our exhibitions. A sample of milk tested showed seven per cent. of fat. At several meetings there was a general expression of opinion that the too common practice of trading butter at the village stores is very reprehensible and damaging to the interests of good butter-making. The meeting at Orillia was decidedly the best in the county, about seventy-five alert and intelligent people being present. There was an average attendance of about forty throughout the county.

In the course of the past season the Travelling Dairy has addressed, at one hundred and twenty meetings, about four thousand people, made upwards of one thousand pounds of butter, and tested about as many samples of milk. I beg leave to add that Mr. M. J. Hume, my assistant, has done his work satisfactorily.

Obediently yours,

F. J. Sleightholm.

V. EUROPEAN DAIRYING.

The following notes and suggestions have been made from a hurried trip to Europe:

On my arrival in England, on the 29th of July, I proceeded at once to visit a number of the commission houses and provision dealers in Liverpool, Manchester, and Glasgow. The following firms in these places gave me valuable hints on the needs of the dairy trade and I am indebted to them for their kindness and courtesy: Messrs. Marples, Jones & Co., Geo. Fletcher, Liptons & Harrison, in Liverpool; Fulton & Co., of Manchester; A. Clement & Son, and R. & N. Davidson, of Glasgow. Other places which I visited in Scotland were, the Kilmarnock Dairy School, and some of the leading dairy farms in Ayrshire. The firms of Messrs. Cross at Knockdon, and Wallace at Auchenbrain, were specially interesting, as the herds of these gentlemen are probably two of the best in Ayrshire, that of Mr. Alexander Cross being especially good.

From Scotland, my route lay through the Midland Counties of England to London, from which place I made a number of short trips, the most important of which were to the Rothamstead Experiment Station and to the Aylesbury Dairy Co. From London, I proceeded to the contient, *via* Harwich and the Hook of Holland, visiting the Amsterdam Exposition, the Edam Cheese and Cattle Fair, and the Model Dairy Farm of North Holland at the Broek; thence *via* Germany to Denmark, where most of my time was spent in visiting creameries and dairy farms on the Island of Zealand, the Copenhagen Milk Supply Co., and the Royal Veterinary and Agricultural College and Experiment Station at Copenhagen.

From Copenhagen, I crossed the Sound to Sweden and called at the Agricultural College and Experiment Station of Alnapp. I then retraced my steps to London and went *via* Southampton to the Islands of Jersey and Guernsey, where some of the leading dairy and stock farms were visited.

Wants of the Dairy Trade.

Butter. The demand seems to be for mild, fresh flavor, in all classes of dairy goods. The Danish, Irish and Australian butters are most popular. On every hand, the good qualities of Australian and New Zealand dairy products were spoken of, and every year will see stronger competition from these Colonies. Dealers seem shy of Canadian butter. The reason for this was seen in some tubs of Canadian butter which I tried in one of the warehouses. It was "greasy," and "off" in flavor. It also had what is more objectionable, a "woody" flavor. This "woody" flavor is due to the fact that the tubs were not properly prepared. Another objection was that it had too much salt in it for the English trade. On the morning of my visit, a buyer tried to empty the butter out of one of the tubs, but could not, and consequently did not buy. All butter packages should be lined with parchment paper or cloth, in order to protect the butter from the wood, and also to facililate the "stripping" of it.

The British market desires butter with less coloring, less salt, and less water in it than the average butter sent from Canada. In addition, it must be clean and good in the flavor, which is the most important quality.

Mr. Davidson, of Glasgow, had experiments made with different quantities of salt in Australian butter, and found three per cent. (one-half ounce to the pound) about right. Five per cent. be found was too much.

"There is a good demand for tinned butter, wherever it is hot," said Mr. Harrison, of Red Cross Street, Liverpool, who does about fifty per cent. of this trade. The process is the opposite of canning fruit, as the butter must be of extra quality and packed at low temperatures. The apparatus is expensive and great care and cleanliness are required t produce a good article.

Cheese. "Canadian cheese is all right," said nearly all the dealers with whom I talked. One merchant remarked that our spring cheese might have a little more moisture in it, in order to be ready to eat a little more quickly. Some fault was found with the boxing, as many of the boxes are badly broken when they reach English warehouses. The cause for this, in many cases, is rough handling in loading or unloading from the steamer. At Quebec, I noticed that many times the lids and scale-boards flew off the boxes as they were put on the steamer. The lids were returned, but not the scale-boards.

Mr. Davidson was in favor of branding the date of manufacture on cheese. He remarked, "while many times it might be to my advantage not to have the date on the cheese, yet for the sake of honesty and square dealing, I consider it would be better to have the date on the cheese." The effect, in his opinion, would be to lower the price of early cheese and raise the price of Septembers. At present September cheese do not bring their full value, because dealers are aware that large quantities of June and July cheese are stored, awaiting a rise in the markets.

Bacon. For bacon that is mild in flavor, with fat firm, lean parts mellow, and no salt on the outside, there is a good demand. Mr. Tulton, Lancaster Avenue, Manchester, told me that some brands of Canadian bacon were equal to the Danish, while others were so inferior that he could scarcely sell them at all—one lot actually brought him loss of customers, as it was too strong and too salt. There would seem to be room for a good trade in this branch of the dairy business at remunerative prices. The firm of Tulton & Co. recommends the sending of shipments forward regularly and in not too large quantities at a time. Danish bacon is shipped in linen sacks and has the appearance of fresh meat, slightly cured. "See! that is what we want," said Mr. Tulton, pointing to a dray load of Danish bacon, which was being unloaded at his warehouse; and he ripped open one of the sacks to show me how mild and pleasant this class of meat is, which comes in regularly from Danish bacon curing establishments. "Compare that with this," said he, pointing to some hard, salt Canadian, which he had hanging near by, "and you will see why my trade prefers the former."

How these Wants are supplied by some European Dairy Countries.

Dairy Farming. In Scotland, cheese are manufactured chiefly by women in private dairies. The Dairy School at Kilmarnock is doing good work in assisting Scotch farmers to make a better quality of cheese and butter. It was a pleasure to find a Canadian, Mr. Drummond, in charge of the work. The system of cheese-making taught in the school and practiced on these Scotch farms is essentially Canadian.

The pastures of Scotland, and in fact of all northern Europe, where I went, are such as Canadian dairymen may well envy. No doubt this is largely due to climate; but I am satisfied that if a greater variety of grasses and clovers were used in seeding down and more seed to the acre were sown, it would result in an improvement of our pastures. Mr. Wallace, of Auchenbrain, uses the following when seeding to grass: one and a half bushels of perennial rye grass, eight pounds timothy, two pounds tall fescue, two pounds meadow fescue, three pounds meadow foxtail, four pounds perennial red clover, and three pounds white clover per acre. He top-dresses pasture land with bone meal and fine barnyard manure. In North Holland, where I saw perhaps the best pastures, the farmers also top-dress grass land as often as possible. The grass is natural, and much of the land is never plowed.

In Denmark and Sweden, the farming resembles that of Ontario in many ways; but these and other European countries are very much behind in machinery and rapid methods of doing work. Here one sees the cradle still in use for cutting the harvest. In one field I saw fifteen cradlers at work. Very few reapers are used.

The rotation on Lenchenfeld farm, near Kallandborg, in Denmark, is: (1) bare fallow, (2) wheat, (3) barley, (4) mangels and potatoes, (5) barley, (6) oats, (7) hay, (8) pasture.

On the islands of Jersey and Guernsey, where the most intensive farming is followed—as is found necessary in order to pay the high rents (£5 to £10—$25 to $50 per acre yearly)—they grow two or three crops on the land each year. The first crop is potatoes, and the second (in the same year) is roots, parsnips, or barley. Three crops of hay are quite common. Lucerne clover is largely sown for pasture and soiling crops. All liquid manure is gathered in tanks and sprinkled on the grass land at proper times. A great deal of guano and other artificial fertilizers is used. The average size of a farm is fifteen to twenty acres; but on such a farm a great deal of stock is kept. The farm of Mr. Bell, at La Rocque, Jersey, consists of thirty-two acres, on which he kept the following at the time of my visit: three horses, sixteen cows, sixteen heifers and calves, two bulls and thirty-six pigs. He buys no feed except some bran and dairy cake. He and his son manage the farm, but they keep five men all the year round and have extra help in the potato season. On this farm I saw the two first-prize cows in the butter test at the Royal Agricultural Fair, in the spring of 1895. One of these cows made three pounds four and a half ounces of butter in twenty-four hours on the fair grounds, and the other made three pounds in the same time.

The rotation on this farm is somewhat as follows: Grass is grown so long as it is good. Then the land is plowed and potatoes are planted, which are followed by mangels, carrots or parsnips. Next year wheat is sown, and the land is seeded down after harvest. Sometimes roots are grown two years in succession by changing the places. Thus a field might be in three strips, with mangolds in one, carrots in another, and parsnips in another; and by sowing mangolds on the carrot ground of the previous year, and changing them in this way, roots are grown two years in succession.

Dairy Cattle. I made it a point to visit the homes and some of the best herds of the four leading dairy breeds of Ontario, viz., Ayrshire, Holstein, Jersey and Guernsey.

The Ayrshires. A leading breeder of Ayrshires informed me that many Canadians and Americans are making a mistake in importing yearling and two-year-old prize winners, as the animals are almost always a failure as milkers. So much is the show-ring injuring the milking qualities of the Ayrshire, that he maintained that there are two distinct breeds (types) of the Ayrshire—one for showing purposes and one for producing milk in paying quantities. The light color with patches or spots of red is the common color, though many are dark, and some a dark red with white spots. Whether in the valley, on the gentle slopes, or climbing the steep hillsides of Ayrshire, the native cow, with medium-sized body, agile step, and square, good-sized udder, if properly bred and fed, is essentially a dairy animal. Breeders are endeavoring to remedy the defect of short teats.

The Holstein. The Holstein at home has abundance of grass in summer time. She remains in the stable for six months and in the fields for six months of the year. During summer her drink is the water of the Zuyder Zee (salt), mixed with the rainwater that falls on the fields—the two kinds of water being confined in ditches, whence the mixture is dipped into wooden tubs for the cattle.

I saw a few Holsteins red and white in color, though black and white is more common. At the Edam fair there seemed to be a tendency to the "beef form" in many of the cows, and they lacked the large udders which are characteristic of the best of these cattle in Canada. Prizes were given for fat cows and fat steers. This I judge a mistake in any dairy breed.

The Jersey. The home of the Jersey is a beautiful place in summer. The excellent roads, arched over by ivy-twined elms, the well kept farms, the flowers and the fruit in profusion, and the creamy cows tethered in the fields, or grazing at will in the walled-in pasture, or else roaming over the rocky hills and sandy shore of the north-west coast, make a pleasant picture for the traveller as he rides along on the paragon car, in the lumbering bus, or on the steam track, that has a wooden gate across it at every level road crossing, to prevent harm to foot or wagon travellers, which gate the station agent runs down to open for the train to pass through every half hour. Both French and English are spoken; and most of the names smack of the French, though the people are very loyal to Great Britain. I was told that you cannot insult a Jerseyman more than by calling him a Frenchman.

In size, the Jersey at home is not quite so large as her progeny in America; but her udder is better developed and her bone finer, as a rule. There appears to be nothing superfluous about her. She is an almost perfect machine for turning feed into rich milk. The light, creamy color seems to be the favorite among the cows, though some have patches of light color, and a few are dark—almost black. The bulls are chiefly dark colored on the sides and joints, with squirrel-colored top and under side. A few are yellow.

In addition to seeing some of the best Jerseys on the farms, I was fortunate in being on the island at the date of the autumn fair of the Royal Agricultural Society, when the best cattle on the island, including cows, bulls, heifers and calves, were on exhibition.

THE GUERNSEY. The island of Guernsey is not so large, nor so well cultivated, as Jersey. The farmers are embarking largely in glass-house fruit culture, and dairy farming is not carried on so extensively as formerly. Butter is imported from Jersey. The herds of Messrs. De Garis and Le Prevost, in Bastel Parish, have captured most of the Queen's prizes since their inauguration in 1889. While driving to these places from St. Peter's Port, the chief town, I saw some cows that were almost black and white in color and a few of a brindle shade. The dark color is not liked, and Mr. Le Prevost offers one pound ($5) for every black hair found on the cattle of his herd. The fawn and white, light red and white, or light red, are the favorite colors.

These cattle are large and handsome, with large udders and well-developed milk veins, and have every appearance of being healthy and good milkers. The bulls are kept in the stable, and the cows are tethered in the field, where the best milkers are milked three times a day. I have not seen in Canada such representatives of the Guernsey breed as may be seen on these farms.

DANISH AND SWEDISH CATTLE.

There are two breeds of dairy cattle in Denmark, the Red Danish and the Jutland breed. The former are considered best for the dairy; but of those I saw there is nothing particular to note. Their records are nothing extraordinary, and it is doubtful if their dairy qualities are equal to those of the four breeds mentioned above. The cows are mostly tethered in the field, though some practice herding. One man and a boy herd as many as 130 cows, except in harvest, when an extra boy is needed. Milking three times a day, and usually in the field, is quite common.

In Southern Sweden the Holstein is the dairy cow. A few Ayrshires and Jerseys are also found in the dairy herds. In the Station dairy herd at Alnapp, which consists of 200 cows, there were a number of Shorthorns in addition to those mentioned.

METHODS OF BREEDING, FEEDING AND CARING FOR CATTLE AND SWINE.

Breeding. Ayrshires, Holsteins and Guernseys are bred to drop their first calves at from two and a half to three years old—Jerseys at about two years or under. Cows are usually dry one or two months in the year. Calves are raised on skim-milk, meal and hay, or pasture, after having been fed for two or three weeks on whole milk. In Jersey and Guernsey in-breeding is quite common. One Guernsey breeder adopts the plan of going to the opposite side of the island when he desires to introduce fresh blood into his herd, while his neighbor in the same parish keeps three or four families on his farm and does not use any blood outside of these. Both have excellent stock. The effect of breeding young, on size, is seen in the Jersey, the smallest of the four dairy breeds. When the heifers do not drop their first calves until they are two and a half to three years of age the breeds are larger.

Feeding. During summer the main dependence of European dairies for feed is grass. In Jersey the farmers buy "grass mixtures" from reliable seedsmen; and this plan has given good results. Instead of cutting the green feed and carrying it to the stable, the cows do their own mowing and carrying. I saw cows tethered in lucerne clover from two to three feet high, and when a circle of fifteen to twenty feet was mown they were moved to a new plot. With cows accustomed to the rope and pin, the labor of moving them twice a day is less than that of cutting and carting the feed to the stable; and the waste is no greater. Most farmers tether with a light chain fastened about the horns, to which is attached a long rope by means of a swivel. This prevents twisting, and the chain does not shrink with the wet like a rope. A few feed grain, bran or oilcake in summer; but this is not common.

The winter ration in Scotland is hay and bean meal. Cows drink at a trough outside. Mr. Van Wiltenburg, in North Holland, feeds four pounds of oilcake to each cow daily in winter, and as much hay as she will eat. Water is supplied in the stable, and cows do not go out at all during the winter. Strings from the ceiling, with a piece of leather attached to the tail in such a way as to keep the cows' tails out of the dirt in the gutter, seemed like a good device for keeping cows clean.

Mr. P. Holm, in Denmark, feeds hay, mangolds, cotton cake and oats in winter, while a Jersey winter ration is composed of hay, roots, meal and dairy cake (a mixture of various oil-cakes and concentrated foods bought from dealers).

Most of the stables I saw were built of stone, having stone floors with a drop behind the cows, and mangers made of hollowed stone. Some stables had no mangers whatever. Cattle were fed on the floor where they stood. The location and arrangement of the stables appear to be such that as little land as possible is used to hold them, and for this reason the sanitary adjustments are not the best, as in some cases the owner steps from bed into the kitchen and from the kitchen into the stable. In many places one roof covers stable and the house. This may be all right where the stables are kept extra clean, such as some I saw that were scrubbed out every day. In one place in Holland, carpets were laid on the floor of the stable and lace curtains were on the windows; but on some farms the house was too near the stable for good health. In Scotland, the cows are usually milked in the stable. In one stable I saw the "Murchland" milking machine in use; and in another, the "Thistle." Both appeared to be satisfying the farmers, as they saved time and labor, especially experienced help, such as is necessary for hand-milking. Stables are usually whitewashed. All liquid manure is saved for grass land.

Swine. Some things which have no doubt gained for Danish bacon its good reputation, are:

1. The pigs (chiefly Yorkshire grades) are long and lean when sold to the slaughter establishments, where they are graded into Nos. 1 and 2. No. 1 hogs are long and lean, and weigh from 170 to 180 pounds. Many of the slaughter houses are co-operative—owned and managed by farmers.

2. The swine are fed on lean-producing foods, and foods which give a mellow, lean, and firm fat. Green-cut clover, mixed with meal for twenty four hours before feeding, is a common ration in summer. When the pigs are young they receive a greater proportion of cut clover, and as they increase in size the proportion of meal is increased. This, together with skim-milk, is the bacon food of Denmark. Sows raise five litters in two years. They are given plenty of exercise to keep them strong and vigorous. Pigs are weaned at six to eight weeks of age.

In the Channel Islands, Jersey Kale, a plant peculiar to these islands and to the north of France, is the green food of pigs. This Kale or cabbage grows to a large height (eighteen feet sometimes, though five or six feet is more common), and the stem is covered with large leaves which may be plucked several times during the year. At the time of my visit in August, I saw a patch that had been plucked four times this year, and still had a heavy crop of leaves, which would give three or four more pickings before December, when the plants go to seed and all the straight stalks are sold to dealers who make walking sticks of them.

Scotch hogs are imported from Ireland as "stores" and fattened on whey and meal. While it is the farmer's duty to furnish the right kind of pig, properly fed, of the right weight, it is the duty of the bacon curers to prepare these hogs in the very best manner for market.

Manufacturing Cheese and Butter.

Cheese-making. As already stated, we have little to learn from Europeans as to methods of making Cheddar cheese; but in the matter of cleanliness, tidiness and careful handling of the milk, so as to prevent bad flavors, we might learn a few things.

In "fancy" cheese-making, we have nearly everything to learn. I see no reason why we cannot produce nearly all the fancy cheese that is now imported. In the vicinity of Guelph, Stiltons are now made, which nearly, if not quite, equal the best English make. The Edam and Gouda might also be made in private dairies. The following is an outline of Edam cheese-making as practised on a Dutch farm:

The cows are milked at 3.30 morning and evening, and the fresh, warm milk is put at once (twice a day) into a tin-lined tub, holding about 200 quarts of milk. Two teaspoonful of rennet are added, and when the milk is thickened, it is cut fine with a wire breaker and the whey run off. The curd is then put into the moulds by hand and afterwards pressed for three hours in a press which gives continuous pressure. The cheese are then placed in the salting mould, and dry salt rubbed on the outside for three days. Then they are put into brine for one day, and next put on the shelves to cure. These shelves have hollow, round places for the cheese, which helps to mould them into the ball shape peculiar to Edams. Some are dipped in purple coloring matter. They are ready to ship in two or three weeks and weigh three or four pounds each. As cheese is made only in the summer months, when the cows are on grass, the stable is frequently the curing room.

Butter-making. I shall not mention the details as practiced in each country, because they are very similar to our own in many things, but simply point out the characteristics of the Channel Islands and Danish methods.

In the former places, the small shallow pan, and old fashioned earthenware crocks and pans are still in common use for creaming milk. Some few have separators. The cream is not cooled after skimming, as cold water is scarce and ice is expensive. Hence butter is often very soft in hot weather. The cream is ripened and churned in barrel churns twice a week. In hot weather the cream becomes very sour; but this is remedied by repeated washings, which remove much of the acid and curd. For the English markets, little or no salt is used. The butter is worked with a hand roller-worker and made up by hand into round pound, and half-pound, prints. Each print of butter is required to have the name of the maker stamped on it. For local trade, each print is sent to market on a cabbage leaf. This butter sells for one shilling and sixpence to two shillings per pound (36 to 48 cents).

In Denmark, the creameries are largely supplanting private dairies. Most of the former are co-operative—owned and managed by the farmers. The company usually hires a "manager," who is responsible for the business, and for the quality of butter produced. So far as I can judge the reputation of Danish butter is due to:

1. The good quality (flavor, etc.) of the milk used in making the butter.

2. The almost universal use of the cream separator.

3. The pasteurising of the cream and the use of cultures in many of the creameries and dairies. Cultures are bought from dealers and added to sterilized milk. Some keep two sets of starts or fermenters on hand all the time so that if one goes wrong the other is likely to be all right. From five to fifteen per cent. of the starter is added to the cream sixteen to twenty hours before churning.

4. Little or no washing of the butter, as but a small quantity of water is added to the butter when it "breaks," and after further churning it is dipped out of the buttermilk by means of hair sieves.

5. The use of a small percentage of salt (three) which suits the English taste.

6. The removal of the excess of moisture by working two or three times. This result, I judge, might be better attained by using a centrifugal butter dryer, such as I saw in England.

7. The use of a package lined with paper, and of a style which suits the British market.

8. The shipment of the butter to market as soon as possible after it is made—once a week on the average; and there is now an agitation in favor of shipping twice a week. Provision is not made in the creameries for storing any quantity of butter.

9. The intelligent use made of the instruction and help furnished to dairymen by the Government through the dairy instructors, and the work done by the Royal Agricultural Experiment Station, especially the chemical department. I shall refer to this work more in particular.

Butter Exhibitions at the Experiment Station.

Six years ago the chemical division of the Royal Experiment Station at Copenhagen, began what are known as dairy exhibitions. The chief cause for these was the fact that in England the cry was raised that Danish butter was adulterated with water. Another cause was, that many of the wholesalers of butter complained of the large loss in weight through leakage of brine and recouped themselves by demanding extra weight of butter in the packages. To settle the question as to what percentage of water is contained in Danish butter, to see what is the actual loss in leakage of brine, and to get the criticism of expert judges, these exhibitions were started and have resulted in much good to the butter industry of the country.

Some of the chief facts gleaned on these and other points, I obtained through the kindness of Dr. Emil Holm, one of the chemists at the station. I submit them for the benefit of Canadian butter-makers.

About twenty exhibitions are held each year and from eighty to ninety samples are collected for each. The manner of securing samples is as follows: The station has a map of the country, with all the creameries and dairies located, which agree to send in samples of the butter on hand whenever requested. About one-half of the creameries and large dairies co-operate in this work. Dr. Holm informed me that they could call in 600 in two days if necessary. When a wholesaler gets a lot of butter from a creamery or dairy that is not first-class, the fact is reported to the laboratory, and a day or two before it is intended to hold an exhibition, all such, and perhaps others, are telegraphed to send a sample of the butter on hand, which is done as a matter of honor. (This butter is bought by the Government, and when the judging and experimenting is completed it is sold. The yearly appropriation for this work is 30,000 kroners—about $7,500.)

On arrival at the station properly marked, so that the owners are known to the chemists, the casks of butter are placed in cold rooms and a numbered can put over each so that the judges know the samples by numbers only.

Under each cask is a pan so arranged that it catches all the brine that leaks from the butter, and this is carefully weighed. On the day appointed, the samples are divided into three separate rooms, and three sets of judges (three men in each set) with corn slippers on their feet, and the ability to tell good butter by smelling, examine each cask of butter carefully and give a written report to the laboratory. Thus, three separate reports are obtained of each cask of butter, which reports are sent to the owners the evening of the day on which they are judged. Samples are also taken from each tub to determine the amount of moisture, and the result of this is also forwarded to the dairymen owning the butter. Samples from the poorest dairies will be asked for at the next exhibition. As a result of this, and of the work done by the instructors who are sent wherever needed, but especially to the dairies and creameries producing the poorest butter, the quality of the butter has been known to improve about seventy-five per cent. in one month, or from one exhibition to another. This is the kind of work that tells for improvement in any article of manufacture.

The average percentage of moisture is seen in the table :

In 1891	Danish butter	contained	14 57	per cent.	water.
In 1892	"	"	14 57	"	"
In 1893	"	"	14.24	"	"
In 1894	"	"	13.83	"	"

The average percentage of moisture has decreased nearly three-quarters of one per cent. in four years. The average percentage of moisture found in 4,458 samples during the past five years is 14.32. Two samples contained from 9 to 9-9 per cent.; 1,250 samples ranged from 14 to 14.9 per cent., and eight samples had from 19 to 19.9 per cent. of water. There were others ranging between the maximum and minimum, but these I have omitted to save space. The chemist informed me that the average percentage of water in Danish butter is decreasing all the time. This is being done to meet the demand for butter containing less water. In England it is talked of branding all butter with more than sixteen per cent. of water in it as adulterated. The English consumer realises that water at one shilling a pound is rather expensive.

In former years the winter butter contained much more water than the summer make, and also leaked more brine. Now, there is not so much difference. Six years ago, out of 1,419 casks of summer butter examined, 140, or ten per cent., leaked. Of winter butter, 362 casks (twenty per cent.) leaked, out of 1,751 tested. The table shows the decrease by years :

Year.	Per cent. that leaked.		Average of both.
	Summer.	Winter.	
	Per cent.	Per cent.	Per cent.
1890-91	13	48	36
1891-92	10	42	24
1892-93	9	24	17
1893 94	8	24	19
1894-95	12	14	13

It was found that the amount of brine which leaked from the casks did not depend so much upon the water content as upon the quality of the butter—the better the quality, the less the leakage.

The loss of weight in summer by evaporation, in only seven days, was twenty-seven kirnt (about one-quarter of a pound), and the total loss by evaporation and leakage in summer was seventy-three kirnt (about three-quarters of a pound) per 112 pounds. The winter loss was respectively eighteen and fifty-six (one-sixth and one half pound) kirnt. One hundred kirnt equals one Danish pound, which is about ten per cent. heavier than an English pound.) The station found that the average loss in weight was greater by evaporation than by leakage and that the amount was no greater from butter containing a light percentage of water than from butter with a low percentage of moisture.

Having stated that pasteurising cream (heating to 160 degrees F) is probably one of the causes of the good quality of Danish butter, I will give a few facts under this head. In 1893, six per cent. of the samples was from pasteurised cream ; in 1894, ten per cent., and in 1895. twenty-eight per cent. of the exhibition butter was made from cream treated in this way. During the past three years it has been found that the average score of butter made from pasteurized cream has been one point higher, and the butter has contained over half of one per cent. less moisture than the samples which have been made from cream not so treated.

Milk Supply for Cities.

In London, England, the Aylesbury Dairy Co. is one of the largest concerns of the kind in the world. They have beautiful premises at St. Petersburg Place; but a call there resulted in my gaining the information that, "it is strictly against the rules to allow strangers in the place without an order from the president" (who was away for six months and I could not await his return), "or from the secretary," who was also out of town indefinitely. I had the privilege, however, of seeing two large men in blue clothes, yards of braid, and brass buttons, whose duties appeared to be to see that no one should enter the door or climb up any other way, without a permit. Two ladies in the office seemed to be also under their protecting care.

The Milk Supply Co. of Copenhagen was more courteous; and I am under obligation to Dr. Borsh, the president, and his good Scotch lady, who very kindly showed me over the premises and explained the workings at an hour when they would probably have otherwise been resting at home, as from nine to eleven or twelve o'clock at night is the best time to see the work go on.

This is a model institution and no other city in the world has the same care exercised over its milk supply. Some, or all of its features might well be copied by Canadian cities. A full description would take too much time and space, besides it has been fully writen up in several pamphlets which may be easily obtained. I shall mention but a few of its leading features.

1. All herds of cows supplying milk to the company are under the strict supervision of veterinary surgeons, and no unhealthy cow's milk is sent to the city. If an animal becomes sick from any cause, the milk is paid for as usual until she becomes better or is taken from the herd, thus there is no temptation to dodge the rules. If contagious disease breaks out in the family, no exposed person is allowed to come near the milk; and, if a serious case occurs, the milk is not sent, but paid for as usual, if the party complies with the regulations as to notifying the company.

2. The feeding and management of the cows is so regulated by written contract and overlooked by expert dairymaids, that it is difficult for a bad taste or taint to get into the milk. The following foods are prohibited: "Brewers' grains, and all similar refuse from distilleries, turnips, rutabagas and tops. Oilcake, carrots, sugar beets, and mangels are permitted, up to one-half bushel per cow, but only when at least seven pounds of corn, bran, or cake are given along with them. Cows supplying infants' milk may get carrots, but never more than one quarter bushel per head. Rape seedcake is the only oil-cake which may be used; one and one-half pounds is the furthest limit of this, along with at least five pounds of meal and bran. Infant milk cows must not receive any cake. Stall feeding in summer is not permitted. The cows must be fed in the open air, upon clover and grass. Vetches are forbidden. In autumn, the cows have to be clipped on the udder, tail, and hind quarters before being taken in. The milk of cows newly calved must be withheld for twelve days after calving and must not be less than three quarts per day."

The above are only a few of the rules in reference to care and feeding.

3. Great cleanliness is exacted during milking. The milk must be strained through a wire sieve, covered with a clean woolen cloth. Immediately after milking, and during all seasons of the year, the milk must be cooled down with ice water to forty degrees Fahrenheit. Thirty pounds of ice must be kept in stock for every 100 pounds of milk produced.

4. On arrival at Copenhagen (about nine p.m.) the milk is weighed and sampled for testing. Expert tasters (women) examine each can, and if anything is found wrong, the party is notified by wire in the morning.

5. All milk is filtered through sand filters, which remove all impurities. A specialty is made of milk for infants. This milk is bottled and sealed, that persons may know that it is pure. Pasteurised milk, cream of two grades, and skim-milk containing about one per cent. of fat, are also sold. Very poor people are given milk free, as the object of the company is to supply pure milk to the people, and not to make money.

6. Surplus milk is made into butter, which is packed in earthenware jars and sold at a moderate price.

7. All bottles, cans, filters, etc., are sterilized with live steam after each using. The most perfect order, discipline and cleanliness prevails. Women in white dresses, caps and aprons, do the bottling.

8. The city is divided into forty districts, and each district has a van for distributing the milk. Some hand vans stand on the street, and people come for their supplies. In addition, the company has eight hospital vans for carrying milk to public institutions.

Lessons for Canadian Dairymen.

1. We should endeavor to lessen the effects of summer drouths by providing better pasture and more soiling crops. This may be done by using more seed, and a greater variety, especially of deep-rooted plants, such as lucerne. This, with pease and oats, corn, bran, and some cake would increase the returns from our cows.

2. More labor wisely directed, would enable us to grow two crops each year on some land, and in some portions of the Province. This would mean the use of a greater depth of soil and of more fertilizing material. The Jersey farmer plows twelve to fourteen inches deep, and uses large quantities of sea-weed and artificial manures, in addition to all the farmyard manure obtainable.

3. The wants of the markets of the world should be more closely studied, not forgetting the home markets. Endeavor to supply these in the very best manner possible and in the cheapest way, consistent with good quality.

4. At the present time Canadian cheese has a good reputation in the British markets, but continued care and improved quality are necessary to enable us to hold our place, as competition is very keen and it is becoming more difficult each year to sell goods of inferior quality.

The practice of storing cheese in ice-houses will eventually (if it is not doing so now) hurt our cheese trade. There are few cheese that reach the consumer across the ocean too green, and the storing of early cheese results in their becoming over-ripe in many cases. There is less demand each year for strong dairy products. They must be mild in flavor.

5. The best Canadian butter when first made is as good as any butter produced in Europe (with the possible exception of salt and color for British taste), and the problem we have to solve is, *to have all our butter equal to the best and to get it on the market within two or three weeks after is is made.*

6. The best Canadian bacon is equal to anything offered in the market, and by paying attention to the breeding and feeding of hogs, and by brushing up some of our curers, we may have our full share of the bacon trade.

7. Our *best* dairying cattle, stables, utensils, and methods of manufacturing are equal or superior to those in European dairies, with, perhaps, a few exceptions noted. Canadian dairymen, as a class, considering their opportunities and experience, are the equals or superiors of dairymen in the Old Land. We need not be disconraged, as we are on the right track and bound to win our share of the world's trade in eatables. European dairymen are becoming alarmed at the quantity and quality of dairy products sent from the British colonies, and as a consequence are somewhat reluctant to let us into any secrets of the trade which they may possess. We, on the other hand, give our knowledge freely to the world.

Suggestions.

1. We need some distinctly *Canadian packages* for our first-class dairy products. All that there is in a name, is associated with the package in the eyes of a Britisher. If we had a cheese box or style of cheese different from that of any other country in the world, it would result in a higher price for our cheese. The same is true of a package for

butter or a method of marketing bacon, provided the quality is extra in all cases. At present, little or no distinction is made between Canadian and American goods. Our cheese is made in the same style and marketed in the same kind of a box, while our butter is shipped in tubs, casks, square boxes, etc., which is probably well at present, but which would not do for a country producing a really fine article. We are slavish imitators in the matter of packages, and I would suggest a handsome prize for the best original Canadian cheese, butter and bacon packages, and that if found suitable, we adopt them for our export trade. It would be ahead of brands, which are very easily removed, and, besides, it would strike the eye of the purchaser without requiring him to hunt up a mark.

2. There is room for the development of dairy trade in the following branches:

(*a*) In tinned butter, for export to warm countries and for use on board ships.

(*b*) In the cold process of condensing milk, and the freezing of milk, for ship use in summer.

(*c*) In the manufacture of fancy cheese for home markets.

(*d*) In the supplying of Cheddar cheese to countries where it is little known, or where butter is made a specialty and fancy cheese are imported at a high price.

3. Pressure might be brought to bear on the Imperial Government to prohibit or restrict the sale of margarine and all butter imitations, "filled" cheese, and such like, which would open up a market for large quantities of pure cow products, that is now glutted with vile imitations. A dealer in Glasgow assured me that if the Colonial Governments would act in this matter, in his opinion, it would result in the prevention of the sale of this cheap stuff which nobody wants, but which is thrust before the people on every hand.

4. Something in the nature of "dairy exhibitions" of both cheese and butter might be profitably undertaken. To some central point or points, samples of goods might be forwarded from our cheese factories and creameries, where they could be judged by experts and the results sent to the owners. This done once a month would result in much good. Samples might also be taken for chemical analysis and the proportion of the most important constituents determined. At present, we do not know the percentage composition of Canadian cheese and butter.

In addition, the system of instruction in our creameries might be perfected. It is impossible for one man to give proper instruction to all the creameries in Ontario.

With the hope that the foregoing may be of benefit to Ontario farmers and dairymen, this brief report is respectfully submitted.

VI. MISCELLANEOUS DAIRY NOTES AND EXPERIMENTS.

Meetings Attended in 1895.

In addition to my work at the College, I have attended meetings and given addresses at the following places: Gananoque (Eastern Dairymen's Association), Kingston, Chesley (Creameries' Association), Stratford (Western Dairymen's Association), St. Thomas, Simcoe and Kincardine (branch meetings of Western Dairymen's Association), New Dundee, Cheltenham, Tottenham, Glen Huron, Erin, Mount Forest, Fergus, Elora, Freelton, Listowel, Millbank, Shakespeare, Rockwood, Campbellville, Arkell, Brockville, Sandwich South, Sarnia, Alvinston and Beachburg. These places cover a good portion of the Province, located, as they are, some in the extreme west and some in the east, and comprising the counties of Renfrew, Leeds, Frontenac, Peel, Simcoe, Halton, Wellington, Waterloo, Perth, Bruce, Elgin, Norfolk, Essex, and Lambton.

The superintendent of Farmers' Institutes also arranged a series of Farmers' Institute meetings, which I attended in December, at the following places: Perth, Smith's Falls, Merrickville, North Gower, Manotick, Metcalfe, Almonte, Pakenham, Renfrew, Cobden, Westmeath, Stella, and Emerald, comprising the counties of Lanark, Grenville, Carleton, Russell, Renfrew and Amherst Island. These make altogether some forty meetings which I have attended during the year.

Souring Cream with Acids.

During the month of May, three experiments were made with hydrochloric acid added to sweet cream. At each trial, a sample of the sweet cream was churned at the same time. The first experiment was made by adding one c.c. of hydrochloric acid to eight ounces of sweet cream, which was churned in a quart bottle in the oil test churn. Both the acid cream and the sweet cream churned in thirty-five minutes. The second trial was made by heating the cream to one hundred and fifty degrees F. for ten minutes and then cooling it to fifty degrees F. Two c.c. of hydrochloric acid were added and the butter came in twenty-three minutes, while the sweet cream, without acid required twenty-five minutes for churning. To a third sample of the same kind of cream (*i.e.*, cream that has been heated and cooled) was added five c.c. of vinegar, and the sample churned in twenty minutes. At the third trial, three c.c. of the acid were added to one sample, and ten c.c. of vinegar to another, and a third sample was churned sweet. The hydrochloric acid sample churned in ten minutes, the vinegar sample in seventeen minutes, and the sweet cream from the separator in twelve minutes.

All the butter made from cream to which hydrochloric acid had been added, had a smell resembling that of rotten eggs. The vinegar samples had a vinegar flavor. There would seem to be nothing in the addition of these acids to cream to aid in the production of good butter.

Low Percentages of Fat in the Milk of 1895.

From many parts of Ontario, come complaints that the milk has been testing very low in fat during the past season. We have had several cans of milk in our own dairy that have also tested very low. We had ten cans that tested below three per cent. during August, September and October. One sample went as low as 2.3 per cent. of fat, with a lactometer reading of 29.5 and 7.95 per cent. of solids not fat. Others ranged from 2.4 to 2.9 per cent. of fat and 8.1 to 8.65 per cent. of solids not fat.

This shows the possibility of milk, as it comes from the cow, testing below three per cent. of fat and below 8.5 per cent. of solids not fat, and emphasizes the fact that inspectors and others who prosecute patrons for watering and skimming milk, should, as a rule, make some sort of test, before entering an action against a person for tampering with his milk. The simple fact of the milk testing low one morning at the factory, is not, to my mind, evidence sufficient to establish guilt. A sample should be taken night and morning, from the suspected cow's milk, after the suspicious test has been made. This compared with the sample or samples tested at the factory, is far more satisfactory to my mind and lessens the danger of throwing suspicion on innocent persons.

Loss of Milk in Weight from Standing Over Night in Cans.

A patron of a cheese factory propounded the question as to what loss in weight occurred from allowing milk to stand over night in the cans. We were unable to answer the question; so made a number of tests to ascertain the truth in the matter. These tests (twenty-four in all) were made during the summer. Sometimes the cans were set outside the dairy, sometimes in a cool room in the basement of the dairy building and sometimes in water. The milk was carefully weighed in the evening and again in the morning. Samples for the Babcock tester were also taken from sixteen different cans.

The results showed a shrinkage in weight of from 1,761 pounds to $1,753\frac{3}{4}$ pounds, that is, seven and a quarter pounds in the whole twenty-four trials. The average percentage of fat in the milk in the evening was 3.675, and in the morning it was 3.653, or practically the same thing, showing that milk will test the same in the morning as it did the previous evening—*if none of the cream has been removed, and the milk has been properly cared for, so that the cream may be thoroughly mixed with the milk again, in order to get a fair sample.*

Whey Butter.

On May 6th, we ran 780 pounds of whey containing 0.2 per cent. fat through the No. 3 Alexandra separator. The temperature for separating was ninety-one degrees to ninety-two degrees, as it was taken as soon as possible after being dipped. It took twenty-five minutes to run it through the first time; but, owing to the fact that the "cream" was so thin (only 2.0 per cent. of fat), we put it through a second time, occupying ten minutes more. Finally we got six pounds of cream, testing 20.1 per cent. of fat. This cream was cooled; the next day it was churned at a temperature of fifty-nine degrees; and the product was found to be one and a quarter pounds of very good butter. In grain and body it was not quite up to the mark, but otherwise it was very fair.

When butter is scarce and dear, it may pay to separate the cream from the whey and churn it; but it would not pay at present prices.

Centrifugal Drying of Curds.

Some experiments were made with a centrifugal curd dryer. We had no special machine for the purpose, but got a tinsmith to make a perforated pan to be attached to a Babcock tester. Our trials did not indicate any special value in the process. In the case of quick-working curds, where it is necessary to get the excess of moisture quickly and thoroughly removed, it might be of advantage to have a machine, something like a clothes dryer, to expel the moisture. It might also assist in retaining an *even* amount of moisture from day to day.

Cheese-curing Room Cool.

In hot weather, there is a great loss of weight in cheese, largely due to the evaporation of moisture; but, in many cases, there is also a loss of butter-fat where the cheese became too warm. A simple device which we used the past season, prevented our curing room from going above seventy degrees F. in the hottest weather; and our room is not so well constructed as it might be, owing to the fact that it is an old building re-modelled. The device was simply a large, open, shallow pan made of galvanized iron, with a hole in one corner. The pan is about three inches deep, three feet wide, and six feet long. This pan was placed on an upper shelf in the curing room and two or three blocks of ice were put in daily. The water was conducted from the hole in the pan, by means of a tin pipe and a piece of hose, to a hole in the floor below. During very hot weather, the ice water was caught in a pail and sprinkled on the floor. This plan is cheap, and with us it worked very satisfactorily. A hygrometer was kept in the curing room, and the moisture was shown to be "normal," or nearly so, during the whole summer.

Rennet Tests for Determining the Ripeness of Milk in Cheddar Cheese-making.

For our work, we use what is known as the dram test with eight ounces of milk at a temperature of eighty-six degrees F. In the hands of a careful person this test gives good results. An improvement might be made, however, by measuring the rennet in a pipette, instead of a dram glass, to get a more accurate quantity. A new rennet test was sent us from Hansen's Laboratory, Little Falls, N.Y., called the Marschall, for trial this season. This test consists of a graduated cup, with a small opening in the bottom, a one c.c. pipette, a glass in which to dilute the rennet, and a spatula for stirring the milk. In making the test, measure one c.c. of rennet extract with the pipette and empty this into the glass which has been previously filled about half full of pure cold water. Rinse the pipette into the glass and mix the water and rennet well. After stirring the milk well in the vat, which should be a temperature of eighty six degrees F., fill the cup with milk and place it on a level board, in such a position that the milk will flow freely from the opening at the bottom. Then take the glass of diluted rennet in one hand and the spatula in the other, and when the milk lowers to the o mark, stir in the diluted rennet, and let it stand. When the coagulation is complete, the milk stops running and the graduated scale may be read.

It is claimed for this test that it does not require so much skill to manipulate it as do the others in use, and that the maker is able to tell exactly the point of coagulation. There are good points about the test, but we have the following objections to it:

1. Too much milk is required. True, this milk need not be wasted, but it is likely to be at a factory.

2. It takes too long a time for coagulation. We have found that it takes about a minute for the milk to run down one degree on the scale. If the milk is very sweet and needs a "starter," it requires more time than should be spent in testing. To run down to six, eight or ten on the scale would require that number of minutes. On the other hand, if the milk is working "fast," a loss of two or three minutes in setting may make considerable difference in the quality of cheese, as fast working milk must be handled promptly, so as not to allow the acid to get ahead of the rennet, as cheese-makers say.

3 The scale is not fine enough for accurate results. A smaller cup with a finer scale would seem to me to be an improvement.

We have compared the Marschall with the dram test, and have found the following relations between the two:

Date.	Marschall test.	Dram test.
October 5	4 degrees.	25 seconds.
" 5 (2nd trial,	3 "	20 " (at 87°)
" 12	3¼ "	22 "
" 18	3½ "	21 " (at 87°)

Testing of Apparatus, etc.

During the year, we have received considerable dairy apparatus, brands of rennets, etc., to be tested. This work, we are glad to do, so far as time will allow. On April 27th, we made a trial of the Bartlett aerator and cooler. The average temperature of the milk when put into the cooler was ninety-four degrees. The temperature of 198 pounds of milk direct from the cows, was reduced to seventy-eight degrees by the time the ice in the chamber was all melted. For a small quantity of milk, this cooler and aerator would answer very well.

A steel churn sent for trial did good work and was very neat in appearance; but we found that the butter stuck to the sides rather too much for economy.

A tub lined with paraffine wax seems to possess all the good qualities of a tin-lined tub and is much cheaper. After standing one month with butter in it, no leakage whatever appeared on the outside. Neither was there any disagreeable flavor.

A glass jar package with tin cover was sent here for trial. We did not find the butter keep any better in this package than in the ordinary package, while the risk of breaking, if shipped long distances, would be considerable.

A sample of Fairlamb rennet appeared to be of equal strength with Hansen's and produced good flavored cheese.

Provincial Dairy Show.

The Provincial Dairy Show held at Gananoque, October 1st, 2nd and 3rd, was characterized by the attendance of some of the best dairy stock in Canada. Nearly all the leading breeders were present. It also had this feature, that the cows in the milking classes were judged according to a scale of points adopted by the British Dairy Farmers' Association.

I was asked by the Secretary of the Agriculture and Arts Association to take charge of these tests. Mr. Hutton, one of our second year students, gave me valuable assistance in the work. There were some forty-eight entries for the milking classes, but only twenty-four cows finally entered the list. The breeds were represented by four Jerseys, eight Ayrshires, eight Holsteins, two Guernseys and two grade cows, making a fairly representative lot from each of the dairy breeds.

The cows were milked out clean on the evening of September 30th, and the test commenced at six o'clock the morning of October 1st. It concluded on the morning of October 3rd, making five milkings in all from each cow. The fat was determined by the Babcock tester and the solids by the lactometer, according to a formula used in our dairy school work, which was described in Bulletin No. 93, published last year. The standing of each cow, as determined by the scale, will be found in the table below. I have omitted the result by classes and have placed the cows in their order of merit. Readers will please note that the following are *three year old*, (and this needs to be considered when comparing the cows): Emery Beauty, Lady Heather 2nd, Lady Peterje, White Lillie, Belinda of Eastview and Lady Graceful:

Name of cow.	Breed.	Number of days milking.	Lbs. of milk in 2½ days.	Average per cent. of fat.	Total lbs. fat in 2½ days.	Average per cent. solids not fat.	Total lbs. of solids not fat in 2½ days.
1. Carmen Sylvia	Holstein	33	138.00	2.80	3 827	8.81	12.03
2. Eunice Clay	"	66	103.00	3.13	3.217	8.23	8.44
3. Aaggie Ida	"	59	99.50	3.20	3.226	9.19	9.15
4. Maggie Mitchell	Ayrshire	77	93.25	3.50	3.292	9.14	8.52
5. Lady Dewdrop	Holstein	91	96.75	3.10	2.984	8.44	8.15
6. Oxford Jewel	"	54	96.75	3.06	2.960	8.69	8.40
7. Grade	Grade cow	117	82.25	3.93	3.230	9.06	7.46
8. Josie Lass	Holstein	18	99.25	2.60	2.606	9.44	9.37
9. Nellie Osborne	Ayrshire	18	92.50	2.90	2.704	9.09	8.44
10. *Emery Beauty	Holstein	53	87.75	3.06	2.666	8.82	7.69
11. Jean Armour	Ayrshire	8	82.75	3.30	2.756	9.51	7.85
12. *Lady Heather 2nd	"	51	68.00	3.33	2.247	9 37	6.34
13. Spotted Maid	"	229	59.75	3.46	1.956	9.26	5.52
14. Ada of Eastview	Guernsey	53	59.75	4.33	2.581	9.74	5.81
15. Jess	Grade cow	112	57.25	3.76	2.250	8.95	5.09
16. *White Lillie	Ayrshire	18	62.00	3.63	2.302	9.26	5.77
17. *Lady Peterje	Holstein	190	57.50	3.13	1.807	8.81	5.03
18. Gipsy	Jersey	92	52.75	4.53	2 436	9.41	4.96
19. Rose of Bethal	Ayrshire	46	57.50	4.06	2.323	9.24	5.32
20. *Belinda of Eastview	Guernsey	124	51,50	4.44	2.279	9.84	5.06
21. Satanella	Jersey	16	59.00	4.10	2.358	8.75	5.14
22. Silver Delle	"	50	51.00	4.80	2.412	9.24	4.64
23. Lulu Delle	"	48	45.75	4.86	2.241	9.22	4.22
24. *Lady Graceful	Ayrshire	91	46.00	3.66	1.675	9.37	4.30

*Three year old heifers.

From the data given in the preceding table, we can figure out the points for each cow. Trusting that some more of our dairy exhibitions will award the prizes for milk cows on this or a similar scale, I will give the method of calculating the points for the first cow, *Carmen Sylvia*. Our scale allows one point for each pound of milk; therefore, this cow is credited with 138 points for milk. For each pound of fat, twenty points are allowed; therefore, we credit her with 3.827 pounds of fat $\times$ 20=76.54 points. For each pound of solids not fat, she is credited with four points, or 12.03 $\times$ 4=48.12 points. For each ten days in milk after the first twenty days (limit 200 days), she is credited with one point, or 33 – 20=13, and 13 $\div$ 10=1.3 points for days milking. Our scale further states that for each per cent. of fat below three, ten points are to be deducted; therefore, as her average percentage of fat was 2.8, we must deduct two points from her total score, which makes her final score as follows:

	Points.
Points for milk	138.00
" " fat	76.54
" " solids not fat	48.12
" " days milking	1.30
Total	263.96
Points deducted	2.00
Final score	261.96

To show that cows in different periods of lactation are placed on a more even footing than with any other scale that I have seen, and that nearly all points of value are included in the scale, I append the scoring of each cow:

Name of cow.	Points for milk.	Points for fat.	Points for solids not fat.	Points for days milking.	Total score.	Points deducted.	Final score.
1. Carmen Sylvia	138.00	76.54	48.12	1.30	263.96	2.00	261.96
2. Eunice Clay	103.00	64.34	33.76	4.60	205.70	....	205.70
3. Aaggie Ida	99.50	64.52	36.60	3.90	204.52	....	204.52
4. Maggie Mitchell	93.25	65.84	34.08	5.70	198.87	....	198.87
5. Lady Dewdrop	96.75	59.68	32.61	7.10	196.14	....	196.14
6. Oxford Jewel	96.75	59.20	33.60	3 40	192.95	....	192.95
7. Grade	82 25	64 60	29.85	9.70	186.40	....	186.40
8. Josie Lass	99.25	52.12	37.46	....	188.83	4.00	184.83
9. Nellie Osborne	92.50	54.08	33.78	....	180.36	1.00	179.36
10. *Emery Beauty	87.75	53.32	30.76	3.30	175.13	....	175.13
11. Jean Armour	82.75	55.12	31.40	....	169.27	....	169.27
12. *Lady Heather 2nd	68.00	44.94	25.36	3.10	141.40	....	141.40
13. Spotted Maid	59.75	39.12	22.10	18.00	138.97	....	138.97
14. Ada of Eastview	59.75	51.62	23.24	3.30	137.91	....	137.91
15. Jess	57.25	45.00	20.36	9.20	131.81	....	131.81
16. *White Lillie	62.00	46.04	23.09	....	131.13	....	131.13
17. *Lady Peterje	57.50	36.14	20.10	17.00	130.74	....	130.74
18. Gipsy	52.75	48.72	19.83	7.20	128.50	....	128.50
19. Rose of Bethal	57.50	46.46	21.26	2.60	127.82	....	127.82
20. *Belinda of Eastview	51.50	45.58	20.25	10.40	127.73	....	127.73
21. Satanella	59.00	47.16	20.56	....	126.72	....	126.72
22. Silver Delle	51.00	48.24	18.57	3.00	120.81	....	120.81
23. Lulu Delle	45.75	44.82	16.88	2.80	110.25	....	110.25
24. *Lady Graceful	46.00	33.50	17.20	7.10	103.80	....	103.80

Milking Machines.

Considerable interest has been manifested during the past year in machines for milking cows. An article clipped from a paper puts forth their importance in the following manner:

A writer in the *Agricultural Gazette*, England, makes the point that the number of cows that can be kept are now limited by the number of milkers that can be provided, and that this fact has operated to restrict the amount of butter and milk products that are placed upon the markets. The milking machine would change all this, and do for the dairy interests what the twine-binder has for the grain markets. The twine-binder multiplied the capacities of wheat sections to put wheat on the market with the result that it has practically destroyed the wheat producing interests of England. He does not find in the impatient waiting of milkmen for the milking machine a cause of commiseration, for should it come it would at once change milk production as it has wheat production. It would enable large farmers, who have been obliged on account of the labor market to maintain small herds of cows, to keep large ones. This would concentrate dairying into the hands of the few, and greatly increase the production of butter. Perhaps we had better use his language, which is as follows:

"That the amount of milk may be doubled, tripled, or multiplied many times if there is a market for it, and that produced abroad will all find its way to this country, with the usual lowering of prices from over-production. There will not be a reduction in the number of workers at all, so that there will be no saving of labor in one sense, for, though the number of milkers will be reduced, the increase in the number of cows will give more other work to balance this, so that few will be thrown out of employment. Now the introduction of the milking machine will make it possible to keep a cow to every three acres throughout the dairy regions of the earth. The man who kept fifty cows on a 300-acre farm could now keep 100 cows, while 200 may be kept to the square mile."

The above writer, who predicts the great change that will result from a successful milking machine, says that we have now two successful milking machines and must face the probabilities of prices going still lower. Leaving out preliminaries we quote the following from this writer:

"Dr. Shiels, of Glasgow, taking up Gray's machine, developed and improved it so much, that after a trial of many months, chiefly at the farm of Mr. Wallace, of Auchenbrain, N.B., (who is known as a winner of cheese-making championships), it is pronounced a perfect success and a company is just launched this week with a capital of £50,000 to make them to supply the world. Murchland's machine has been in constant use by Mr. Speir, near Glasgow, for several years, so that there are now two in the market which the makers are prepared to fit up, and which are guaranteed to give satisfaction. Milking cows by steam (or rather by oil-engine) is now, therefore, an ordinary, practical work-a-day success, and farmers who have a difficulty in procuring milkers can now have the apparatus fitted up at a cost of about 12s. per cow, plus the cost of the engine to drive. Murchland has been advertising his set at £70 for a dairy of forty cows, this price including a small oil-engine as a motor. An article appears from the pen of Mr. Speir in the current volume of the "*Farming World* Year-Book," describing the successful use of the same, and all doubts may now be dispelled as to its efficiency."

The interest in milking machines is very great in the home of the Ayrshire, where "The two most successful machines," originated, and it might be well to quote, a lively discussion on the subject, which occurred a short time since at a meeting of the Glasgow Dairymen's Association. The report is from *The Scottish Farmer*:

The "Thistle" Milking Machine.

On Wednesday evening Mr. Kennedy, South Portland Street, Glasgow, lectured before the members of the Glasgow Dairymen's Association on "The 'Thistle' Milking Machine"—the new invention of Dr. Shiels, of Glasgow, and Mr. Elliot, of Messrs. Lawrie & Symington, Lanark. There was a good attendance of dairymen, and the audience included a number of farmers and others who are interested in the subject. A small hand-power machine, with all the necessary appliances, was exhibited in the room, and its working was fully explained at the close of the lecture. Dairymen, cowfeeders, farmers, and all others present greatly enjoyed the description given of the machine, and the explanations which followed the lecture were of the highest importance to those present.

Mr. James Stirling, Dunbarton Road, President of the Association, occupied the chair. In introducing Mr. Kennedy, he said they were met to have explained to them the working of the machine they saw before them. Mr. Kennedy had set himself the task of proving that it was going to be a sanitary reformer and a saver of labor—two matters of the utmost importance, not only to them as dairymen, but also to those in whom they were interested. (Applause.)

Mr. Kennedy, who had a most cordial greeting on rising to address the meeting, said it gave him great pleasure to come and tell them about the "Thistle" milking machine. Well, what good would such a machine do? In the first place it would ensure cleanliness, and, this, as they knew, was one of the greatest things they had to look to in their trade. In this connection, and as showing the general utility of the machine, the lecturer quoted from articles and reports in *The Scottish Farmer*. The first of these referred to was the lecture delivered by Mr. Fulton, Shiels Farm, Renfrew, before the members of the Glasgow and West of Scoltand Agricultural Discussion Society, and speeches by Mr. Robert Wilson, Manswraes; Mr. John Gilchrist, Orbiston Mains, and others, all of whom testified to the benefit which the "Thistle" milking machine would confer upon dairy farmers. That such a machine was wanted was quite evident, for in the report of the British Dairy Farmers's Association meeting in *The Scottish Farmer* he read that Colonel Curtis Hyward pointed out that the object of the dairy show was to find the best milking machine. The necessity for the machine was undoubtedly admitted. The foreign competition with which they had to contend involved two alternatives. The first of these was to force bigger prices. That was politically impossible. (Hear, hear.) Well, they could cheapen the cost of home production, and the "Thistle" milking machine was a step in the latter direction. There were two classes of machines. The one class was adapted for milking from one to four cows, and was driven by hand power. The power machine would milk from four to twenty cows. All the machines were made on the same principle—viz., the suction produced by vacuum in the teat cup which pressed against the teat of the cow and extracted the milk, which was carried off to a receiving pail. When the teat was drained of its milk air entered the cup, allowing the former pressure to relax, and the teat was again filled with milk from the udder. Vacuum was once more created in the teat-cup, which again collapsed, pressing out the milk into the tube, and it passed then to be received as before. The teat-cup was made of flexible India-rubber, and it was adapted to any cow. There was no difficulty in attaching these, and the four teats were milked simultaneously. In order to know when to stop milking, there was a glass cover on the top of the receiving pail, from which it could be see when the milk ceased to flow. When that was so the cow could be disconnected till the rest were done. What good would the machine do? In the first place the milk would be drawn off clean, and that of itself was a great matter. (Applause). In this connection he would refer them to the lecture delivered by Mr. Campbell to the members of the trade, at the request of their worthy President, Mr. Stirling. In the report which appeared in *The Scottish Farmer* on the 22nd December, 1894, Mr. Campbell said: "Milk could only be defiled by the hands of the milker, by the milk dishes, and by the air. If these were absolutely filth-free there could be no souring." (Applause.) Then about ills brought about by dirty milkers, Mr. R. H. Beamish was reported in *The Scottish Farmer* of the 9th February, page 107, to have spoken strongly at the Dublin Dairy Conference "about preventing contamination of milk by dirty milkers and dirty udders." Once more, as regards the matter of cleanliness, he would remind them of "Golden Rules for Butter-making," by Mr. James Blyth, as published in *The Scottish Farmer* of 16th February at page 128. One word more about cleanliness, and this was in reference to the hands. In Mr. Campbell's speech as reported in *The Scottish Farmer*, he said:—"Hands well washed and disinfected were not clean. Visible dirt there might not be. Had they examined their skin with a magnifier? . . . Only then could they realize how easily these things could lurk in a man's skin; only then could they understand what clean hands really meant." (Hear, hear.) The machine he was describing guarded against all this. (Applause.) The milk, too, was drawn off in less time than by hand. A hand machine milked four cows, and a power machine milked four cows and upwards within ten minutes. The machine seemed, under all the circumstances, to cause less annoyance to the cow than the human hand, and fractious cows with sore teats seemed to suffer less pain when milked by the machine than if a milkmaid had performed the operation. Kicking cows were very easily managed when the machine was used. Indeed, from a test which had been made they seemed rather to like the machine, because it was more like the calf's mouth. That was stated in a report by Principal M'Call to the patentees which, however, was not yet made public. He would now give them some details regarding the machine, a model of which they saw before them on the table. It was patented by Dr. Shiels and Mr. Elliot, of Lanark, and the principle on which it was based was simplicity itself, being the means of a creation of pulsating vacuum from a storage tank. Mr. Kennedy asked how many dairymaids would be required to milk thirty cows, and what would these cost?

Mr. Semple replied that they would require four women at a cost of £80 per annum.

Mr. Kennedy said that a hand machine for four cows, with a woman and a lad, was capable of milking thirty cows in less time than four women could do it. It cost £45, and this was a saving of labor of about £40, so that the price of the machine was almost realized the first year. In that way they would see that the machine would be a great saving. He did not think he could get four dairymaids at £80, but they would take it at that. And then there was the necessity for milking all cows regularly at the same hour, which could be guaranteed by the use of the machine. Putting all these advantages together, this seemed to him an investment by which any dairy farmer could save one hundred per cent. per year. Mr. Kennedy then went on to explain the construction of the machine and how it was wrought. The vacuum once created, sufficient power was instantly obtained to commence milking, for which no preparations were necessary, but to place the milking pails under the cows, put the cups on the teats, and connect with the exhaust tube—all the work of a few seconds. The exhaustion was, of course, effected by means of an air pump, which could be worked by the motive power if convenient. In connection with the actual milking the teat cup was by far the most important part of the machine, and, as might easily be imagined, was only brought to its present marvellous state of efficiency after many patient trials, many alterations, and heavy expense. Great difficulty was experienced in getting the cup manufactured on account of the complications of movement required in imitating the calf's lip and tongue, special machinery having to be manufactured for this purpose alone. The action of the cup on the teat was exactly like the pulsation of the heart, each stroke being felt by putting the finger and thumb either on the outside or inside the cup. Further, this beautiful and most ingenious movement could be distinctly seen, and better understood, by turning up the cup and placing a piece of glass over it, which, excluding the air, permitted the movement to go on as when actually attached to the teat and in full working order. This was a most interesting experiment, and one that gave the best possible idea of its working, the view of its action being so clear and distinct, and the mode of withdrawing the milk from the udder so easily understood. A stroke of fifteen pound, as shown on the gauge, gave sufficient pressure on the teat to withdraw the milk, five pound again opening the lips of the valve, so as to give a fresh pressure, exactly like the action of a calf sucking, or more familiarly, the grasp of the human hand in the act of milking. The teat cups were about the size of an ordinary wine glass in circumference, and just large enough for the admission of the teat without difficulty, and about three times the depth. The four cups joined at the bottom, with a tube attached long enough to carry the milk to the glass cylinder, or trap, on the top of the pail; another tube connecting this glass trap with the exhaust pipe running overhead, and to which it was screwed in. The cups being placed on the teats, the exclusion of the air was complete, the machine in full working order, and the milk at once began to flow, not, however, in a continuous stream, as most people would imagine, but intermittent, streaming into the glass receiver with each respiration of the pulsometer, just as it did when the hand closed on the teat in the act of milking. The momentary interval between each stroke was exactly the same. It was worthy of notice that the milk frothed up in the pail quite as much as in milking by the hand, the force exerted in either case being about equal. As already noticed, the milk flowed direct from the teat into a glass receiver, and thence to the pail, which was a most excellent idea, as it not only showed in the clearest and most satisfactory manner the action of each pulsation, but it also showed when the milk had ceased to flow, thus enabling the attendant to remove the cups the instant the last drop had been drawn from the cow. No injury, was, however, done to the animal by the suction going on for a few minutes after the flow had ceased, this having been proved by special experiment. In placing the cups on the teats, there was no mechanical arrangement for fixing them on, nor was such necessary, as the attachment by suction alone was so complete at the instant of contact, that they could scarcely be removed by force without injury to the animal, and yet they fall off when the milk was finished with the most perfect ease, by admitting air into the tube and thus destroying the vacuum. The friction necessary to strip the teat was so gentle that the cows seemed rather to enjoy it than otherwise; and, instead of twisting about to avoid being interfered with, most of them stood placidly chewing their cud all the time the cups were attached. It was worthy of notice that two newly-calved cows, that had never before been milked by mechanical agency, stood quietly and let down their milk as freely, and were stripped as cleanly, us the cows that had been milked by the machine for the past twelve months. On the removal of the pails, a man went over the whole of the cows that he saw milked and stripped them carefully, but it was a needless operation, as he only managed to squeeze out about four wine-glassfuls from the entire lot. He examined the udders and teats and found them perfectly limp and soft, and was told that although an average of 20 cows had been milking all through the past year, there was not a sore teat amongst them, the regularity of the pulsation, and the absence of mechanical attachment, contributing in no small degree to such an eminently satisfactory result. The rubber tubes were kept delightfully fresh and clean by letting water from a pipe run through them for a few moments, and then throwing them into a cistern of cold water with a handful of salt. They remain there till again required. By this system the tubes were not only kept clean, but the material was rendered almost imperishable by being kept moist, and free from the action of the air. Rubber was the material used in the manufacture of the cups and connecting tubes, and answered the purpose admirably—being at once soft, pliable, easily cleaned, and durable. The outside rim of the cup was thickened even to rigidity, to give strength to protect the delicate and ingenious breathing apparatus which it contained. The internal, or pulsating, arrangements consisted of several layers of rubber of varying thickness, in imitation of the tongue and lips of a calf in the act of sucking, in the centre of which the teat must be carefully placed—this being one of the most important points in the entire manipulation of the machine, as, if negligently done on any single teat, the milk will not be drawn with the same precision. Some idea might be formed of the extreme delicacy and adaptability of the pulsations, when it was explained that the grasp on the teat was uniform, the pressure commencing at the root of the teat, and finishing at the point, closely following the stripping action of the human hand, and the number of pulsations being from forty-three to forty-six in each minute. The machine he saw at work was designed to milk twenty cows at a time, and would easily, with a man and two lads, milk 120 in an hour by shifting the teat-cups, but could not milk that number all at once, the entire question of numbers resting on a correct calculation of the available power. On Saturday, 23rd March, he was at Lanark and saw the milking of eight cows. Five of the cows were small Ayrshire cattle, which had been milked by the machine before, the other three were rather large beasts, and had not seen a milking machine before to the knowledge of the proprietor. The five small cows showed no symptoms of fear, and quietly gave their milk; the other three seemed shy, but two also submitted to the process. The third cow had recently calved and seemed to be keeping back its milk, while it continued lowing for its calf, but in a minute or two gave its milk freely. The eight cows were milked within nine minutes, and, allowing for the loss of time caused by one of the cows withholding its milk, he would say the process was accomplished in seven minutes. The power obtained by the exhaustion of air was so equal and so continuous that the furthest off cow from the exhaust tank was milked with the some ease as the one nearest it. The time taken to milk a cow was within five minutes. The time, therefore, to finish a herd of twenty or a hundred must be regulated by the number of teat-cups, pails, and connecting tubes the owner might see fit to provide. The greater the number of appliances, the greater the economy of time, as a large number of cows could be milked at once, and there was less time taken up shifting and reattaching. Although the milker has been in use for over twelve months, it wasnot as yet generally known, as its inventors desired to test and perfect it to the utmost possible limit before offering it to the general public by getting it on the market. Two only had been in actual operation—one at Lanark, the other at Mauchline—the both had given such satisfaction as to warrant the erection of extensive works in the East End of Glasgow for the manufacture of the machinery, which were now completed, and large orders had been already received. (Applause.)

Mr. Thos. Fulton, Shiels Farm, Renfrew, said he had listened with very great pleasure to Mr. Kennedy's description of the machine. He did not expect to be called upon to speak so early in the evening, although he might have offered a few remarks at a later stage. In October last he saw the machine milking ten heifers. They had very small teats; in fact no farmer would care to buy cows for milking purposes that had such small teats. After the ten were milked, the attendant went over them, but he hardly got any milk left. A fortnight or so afterwards, he went to Auchenbrain, where they had been using the machine for six months upon one of the finest stocks in Ayrshire. All the cows had large teats. They would, therefore, see that it made no difference, so far as the machine was concerned, whether the teats were large or small. Fractious cows seemed rather to like the machine, because it was so natural in its operation, and just like the calf sucking. As regards the glass globe at the top of the receiving vessel, he did not think it was quite necessary. It was, no doubt, a good thing to have a few of these globes to satisfy the farmer that the milk was coming freely away, and that the cow was being milked dry; but he had never heard of the case where injury was done by the cups by being left on the teats. Before he saw the "Thistle" machine he had the opportunity of seeing another machine at work. It was a most awkward machine, which had to be held between the knees, and it was also very difficult to get the cups attached to the teats. That machine was thrown aside, and he never heard of it again. Referring to the "Murchland" or "Kilmarnock" machine, he said it was wrought with water from a tank placed above the cows in the byre. Mr. Fulton then referred to the working of the "Murchland," the "Gray & Nicholson," and other milking machines, and then said he would like to correct Mr. Kennedy about the expense in connection with the "Thistle." The milking of cows only occupied two or three hours in the day, and at other times the servants were engaged in other work. They could not therefore put their whole expense of service against milking. Where there was no power already on the farm with which to drive the "Thistle" machine, he was of opinion that an oil-engine would be most convenient, and as far as he could gather, one of these which would milk twenty cows, cost about £75. Mr. Fulton was convinced that from its excellence, the "Thistle" machine would come into general use in a few years. (Applause.)

Mr. Kennedy, in reply, said there was not much outdoor work on ordinary dairy farms, and they usually required four milkers to get through the work. There were many seasons of the year when there was nothing, absolutely nothing else to do for these women.

Mr. Fulton said he had spent all his days about a farm, and he had never seen the case in which they could not find something for the women to do.

Mr. James Ritchie asked Mr. Fulton how long it took to milk these ten heifers at Lanark, and also what assistance they required in carrying away the milk from the byre.

Mr. Fulton said he forgot exactly how long it took to milk the heifers, but he thought the machine could milk a dairy of thirty cows in half an hour. The milk was not carried out of the byre at all. It was taken from the cows and emptied in the churns which were standing in the byre.

Mr. Ritchie: A most objectionable custom.

Mr. John Campbell, B.Sc., assistant to the professor of agriculture, and lecturer on dairying in the Glasgow and West of Scotland Technical College, said he was sorry he had not been able as yet to get to Lanark to see the machine at work; but he had been speaking to a gentleman from Ayrshire who was an extensive dairy farmer, who commented very favorably upon the "Thistle" machine, and said it was almost perfect. There was one point about the machine, and it was this, that as soon as it was perfected dairy farming in this country would go down. All the Colonies wanted was a machine of this kind. They had plenty of grass all the year round, and a large extent of virgin soil, and they just wanted a machine of this kind to save labor. Then they would send to this country vast quantities of dairy products. Another point he would mention was in reference to the keeping qualities of the milk. Indeed, although they had a machine of this kind, the milk was not coming in contact with the air, and could not therefore wash from it any deleterious matter. That was the point that would undoubtedly impress itself upon those who had to do with dairying business. The only difficult question was cleaning of the tubes, and he thought that would be overcome. It would be quite easy to get the material that would clean the tubes without in any way harming them or the milk which passed through them. (Applause.)

Mr. Telford, Crown Dairy, Glasgow, said the machine was very interesting to him, because he had never seen it before. The machine would, however, he thought, be a valuable adjunct to the dairy trade, in so far as that a great difficulty with the farmers was to get sufficient milking-maids, and them only at great expense. He noticed that there were two tubes connected with the glass vessel. In the case of a machine milking four cows, would there be four tubes leading to the glass? If so, he was not quite of opinion, like Mr. Fulton, that the glass could be done away with. It was necessary to see that every teat was giving its milk. They knew that in some instances there were some cows very much worse to draw than others. Would the same amount of suction draw the milk from those cows that were harder to milk than others? On the other hand, he was glad that the difficulty had been overcome with regard to over-milking or over-drawing, because he knew that in the case of other machines that had not been so. All of them were aware of the result. Mr. Telfer knew of nothing that was so injurious as to have streaks of blood in their milk. These went to the bottom of the vessel, and they were seen when the milk was emptied out.

Mr. Kennedy reminded Mr. Telfer that the milk from the four teats met in one tube, and was carried to the receiver. The other tube was for extracting air from the milk pail or receiving can. To cease the milking of one cow did not affect the others. There was a small crane the turning of which destroyed the vacuum, and the teat cups fell off. The India-rubber closed over the metal and stopped the air.

Mr. Semple, Hillhead, said the first point that struck him was the stripping of the udder so cleanly. The great difficulty he had with his servant maids was to get them to milk the cows clean. If they could manage to bring down the price of the machine, it would go like steam.

Mr. John Kean said he would have liked very much to have seen a greater number of farmers present. They were often much troubled by milk being late about the term time. If this machine was coming into use, it would be better for all parties, as they would know that their milk was brought to them in a proper sanitary condition.

Mr Fulton reminded the meeting that they had assembled just a month too late to have a large attendance of farmers. They were busy at home sowing.

Mr. Bachelor, Craigie, Dundee, said that where he came from they paid women so much per milking. They had fifty cows, which were milked by five women. Three of them were the men's wives on the place, and the other two were connected with the house. The men's wives were paid 3d. per milking, or 9d. per day. Each woman was supposed to milk ten cows for 3d.

Mr. KENNEDY: Labor is evidently cheaper there than with us.

Mr. BACHELOR: Don't you think you will get them to do it for that here?

Mr. KENNEDY: Not for double that.

A member said the general rate was 1s. per milking.

Mr. BACHELOR said he could not pass any opinion on the machine, but he would like to know what would be the result if anything went wrong with the motive power?

Mr. JOHN BEATTIE thought the machine was too dear. If it could be brought down to £20 it would be a great inducement for them to go in for it. It would take the price of three or four cows to pay for a machine at the present rate.

The chairman said the machine seemed, from practical experience, to be the right thing, and a very successful patent. That had been proved by the two instances given, and by the observation of their practical friend, Mr. Fulton. Of course patents were were always dear to begin with, but they must just reckon it this way, that the farmer could get the work done at half the cost, which was about the correct value. Like Mr. Fulton, he did not think women about a farm had much idle time. They would have more idle time in the future. It was unreasonable the time they had to work at present, and it would not bear investigation. Of course the present demands on labor were great, but it was a question if the public had a right to insist upon an unreasonable thing from a brother or a sister. The machine would be the means of saving labor. That was beyond a doubt. As to sanitary reform in reference to dirty hands, dirty clothes, and so forth, the machine was certainly a secure safeguard. The only thing he saw about the machine that he did not care for was the India-rubber tube. Mr. Campbell said something could be got to clean it. He had no doubt that was right. The patentees would likely look to that. It had been the experience of those who wrought with India-rubber about milk—he did not say it was the same quality as that before them—that it very soon got into holes on the inside. Now, if cracks were getting into the inside of these tubes, he could not see what antiseptic they could use to bring it out. But he had no doubt they would yet substitute the piping for a large portion of the tubing. As regards the stripping he was relieved to know that they could take off the cup by admitting the air. If there was one risk they had to run it was the stripping of the cows. The milk was often taken and the cream left. In any case, the last four gills that were left in the can never came to Glasgow. (Laughter.) He hoped they would patent this machine in such a way that the cup would not come off until the cow was dry. The machine was certainly of great interest to them as dairymen, because they were concerned with everything that was connected with the handling of milk. (Applause.)

Mr. KENNEDY said the question of milking was one of those things which would be considered in working out the details. He maintained that at the present price the machine was cheap by the labor it saved.

On motion of Mr. John Logan, Mr. Kennedy received a hearty vote of thanks for his lecture, and for showing them the working of the machine.

Those present were afterwards permitted to examine the construction of the machine, and to see how it was manipulated.

During my recent visit to Scotland, I found that these machines were creating considerable stir. I visited two farms in the vicinity of Kilmarnock where they were at work. At the first the Murchland machine had been in use several years, and the farmer, Mr. McFadyean, told me it worked well. The chief point of merit which he mentioned was the fact that it enabled him to do his milking with less help than formerly and with less experienced help. The power was supplied by hand, a good strong Scotch girl furnished the energy to drive the pump handle. Mr. Murchland showed me an oil engine that would do the work very cheaply. The inventor, a sturdy Scotchman, appears to have great faith in the possibilities of his machine.

Early in the year one of the Murchland milkers was sent to us for trial. We set it up and made a number of trials, which were not altogether satisfactory, chiefly on these grounds:

1. We had difficulty in securing sufficient pressure to hold the cups on the teats and to milk the cows. This can be remedied, to some extent, if not altogether, by having a larger water tank overhead. The one we used is too small to hold the pressure.

2. Our cows did not give so much milk as when milked by hand, nor did the machine milk all the cows out clean.

3. The per cent. of fat was always less when the machine was used.

The two latter difficulties might disappear when the cows became accustomed to its working, though they did not appear to mind it very much. We hope to make some further trials with this machine.

Another milking apparatus was sent here by a Mr. Armstrong, from the Province of Quebec. A pail was suspended under the udder by means of a strap passing over the cow's quarters. Quills, something the same as milking tubes, were inserted in the teats and the milk allowed to flow out. Most of our cows objected to the pail, and the effect of the tubes or quills was to cause the cow to give thick or bloody milk in a short time. I think this apparatus is not constructed on sound principles, though we made several trials to convince ourselves, before finally abandoning the apparatus, as the sender seemed so confident of its utility.

As to the third, the Thistle milking machine, I can only say that it appears to give good satisfaction to Mr. Wallace, at Auchenbrain, Scotland, whose farm I visited and where I saw several cows milked with the machine. At the time of my visit Mr. Wallace was milking forty cows, but only half of these were milked by machinery. He informed me that if any cow showed a dislike for the machine he would not persist in milking her with it. Other reasons induced him to use it on but half the herd. On the morning of my visit I saw seven cows milked in eighteen minutes with four pails, Mr. Wallace attending to these himself. I noticed that he was careful to start each teat, and to wet them before applying the cups. He also went over the cows after the machine to be sure that all were milked out clean. The average time to milk each cow was seven to ten minutes. One cow, a very hard milker, which used to take two women fifteen minutes to milk her, was milked with the machine in ten minutes. This cow gave three gallons of milk. She had very short teats.

One of these machines was sent to the dairy in July, and as I was away at the time, I cannot do better than quote your letter which you sent to the press on the results of trials here:

A Milking Machine Tested.

Sir,—When the Hon. Thomas Ballantyne, of Stratford, was in Scotland last spring, he had an opportunity to examine carefully what is known as the Thistle milking machine. He was pleased with the work which he saw the machine doing, and, being anxious that Canada should be abreast of the times in everything pertaining to the dairy industry, he suggested to the makers that they should send a machine to the Agricultural College, Guelph, to be tested and reported upon.

The machine came, was set up, run for seven or eight days, and, in the absence of our Professor of Dairying, I beg to submit for the information of your readers, a brief report of the results of the test, which closed on Friday, the 9th inst.

The Thistle milking machine was invented about four years ago by Alexander Shiels, M.B.C.M., B.Sc., of Glasgow, Scotland, and is now manufactured in the same city, 25 Gateside street, by the Thistle Mechanical Milking Machine Company.

The machine has been tested by a number of competent judges in different places, and is now being used by some of the most prominent Scotch dairymen, including Thomas Kerr, Kirkcudbright, who has a herd of eighty cows; Robert Wallace, Mauchline, forty cows; and Mr. McBride, Garroch Tree, Staneear, one hundred cows. One was put up a short time ago for D. H. Burrell & Co., Little Falls, N.Y., and I believe the only one in Canada is that which has lately been at work in our dairy stables.

The company makes a hand machine to milk four cows at once, and a three horse-power machine to milk ten. I have not seen the hand machine, but we have tested the power machine, and I have no hesitation in saying that it does its work very satisfactorily.

The machine is a large air pump of special and peculiar construction—of good quality, strong, substantial and well made. It is set on a concrete foundation, made of gravel, cobblestones and Portland cement, three feet three inches by four feet, and two feet deep, outside of our dairy stable, and close to the wall of the building and a short distance from a row of fifteen cows, opposite which there is another row of the same number of cows, with a feed passage between. A copper suction pipe, passes from the pipe through the wall into the stable and overhead to the passage between the two rows of cows. From this main tube, two smaller copper tubes are carried along on top of the stall divisions, one above the necks of each row of cows and in each stall, at the side of each cow, there is an opening in this cross tube, from which a short piece of smaller copper tube points downwards, slanting towards the passage behind the cows. This smaller piece of tube in each stall is controlled by a stop-cock; and to it a rubber tube is attached when milking begins. This moveable rubber tube extends down to a heavy, broad-bottomed tin pail on the floor, and another rubber tube connects the pail with the teat-cups which are attached to the udder.

For milking ten cows, ten pails and ten sets of teat-cups are used—five for each row of cows, so as to keep the two suction tubes in front of the two rows of cows working at the same time. It, of course, takes less time to milk some cows than others; so, when a cow is milked, the man in charge shuts the stop cock, detaches the rubber tube, empties the pail into a large milk can standing close by, removes the apparatus (the rubber tube, pail and teat cups) to another stall, and places them in position to milk another cow.

In this way he keeps on moving the pails from stall to stall, one at a time, till all the cows in his row are milked. Another man or boy does the same thing in the opposite row. It is not necessary, however, to milk both rows of cows at once. The ten pails might all be used on one side, in which case a man, or a man and a boy, could attend to them and keep his eye on the working of the pump.

As stated below, the milk pail is heavy, broad and low, so that it is difficult to upset. The cover is soldered on and the milk enters through a strong glass bottle which is inserted like a cork into the lid at one side, resembling a bottomless quart fruit jar, but only about half the length. By observing the glass bottle, one can see how the milk is flowing from the udder and know when to stop milking.

Owing to the action of a reducing valve which is used for the admission of air at regular intervals, the suction acts in a series of successive pulsations, resembling the action of the mouth of a calf in sucking, or the hand in milking, and varing in the proportion of fifteen to five. As the suction increases, the teat cup contracts first at the top and then gradually downwards to the bottom, forcing the milk out of the teat; when it reaches the maximum of fifteen, air is admitted which reduces it to five thereby partially releasing the teat and allowing it to fill with milk again. In this way the milking is done naturally, quickly, thoroughly and without any annoyance to the cow. The machine operates more regularly than the hand. Hence it is likely to produce better results, and it makes it next to impossible for any kind of dust or dirt to get into the milk during the progress of milking.

We used our portable farm engine in making the test; and we found that a man and a boy could milk twenty-six cows in from twenty to twenty-six minutes. I think it might be arranged so that one man could milk nearly as many in the same time.

We weighed and tested the milk from each cow as usual, and found about the same quantity as was obtained by hand, but a marked fall in the percentage of fat, due, we have no doubt, to the excitement caused by the noise of the machine and the presence of a large number of people in the stable. As the cows became accustomed to the noise, the percentage of fat gradually increased.

I have had no communication with any member of the firm, and have no interest to serve in recommending the machine; but I must say that, in my judgment, the inventor deserves great credit for what he has done to remove one of the chief obstacles to successful dairying on a large scale. The only thing to prevent this machine from being extensively used is the cost of the machine and of the power necessary to run it.

JAMES MILLS,
President Agricultural College.

GUELPH, August 15th, 1895.

BREWER'S GRAINS FOR DAIRY COWS.

During the past season, one of the patrons from whom we purchase milk for cheese experiments commenced feeding brewer's grains to his cows. Soon after, a peculiar flavor developed in the milk, in the curd, and more particularly in the cheese. Our cheese-maker, Mr. Stratton, went to see the person about it, but he did not cease feeding the grains until after my return from Europe, September 12th. As a consequence, part of our August cheese, and most of the September had a flavor like yeast. This flavor continued for nearly two weeks after the feeding of the grains was discontinued, and I would warn all factory men and all patrons against allowing any of these grains to be fed to cows giving milk for cheese or butter-making. It is one of the worst flavors I ever experienced in cheese, and experts who have sampled them pronounce the flavor a peculiarly bad one.

FLY-TRAP AND PREPARATIONS TO KEEP OFF FLIES.

We have tried the various preparations that have been recommended to ward off flies from cattle, but have found them somewhat troublesome to apply, as well as expensive and some of them useless. In addition, the strong smelling compounds, such as fish oil and carbolic acid, coal oil, etc., are apt to give a flavor to the milk when applied in the stable. Where these are used, I would recommend that they be applied *after* milking, so that the odor would pass away more or less before the next milking time.

During the past season, we have been using the Guthrie fly-trap, and it has given good satisfaction. At first, we had considerable difficulty in getting the cows to go through; but later, after they became accustomed to it, they were anxious to go through and were eager for their turn. The trap of 1894 we could not recommend. We suggested some improvements, which have been made on the trap of 1895, and it works well. But it must be admitted that a great many flies were left to annoy the cows, notwithstanding the large number caught in the trap.

FARM BUTTER-MAKING.

Co-operative Dairying Best. The co-operative or factory system is the best system for the mass of farmers, yet there are many who, from choice or necessity, will manufacture dairy goods on the farm. The product made will be chiefly butter, though some find that fancy cheese, and soft cheese find a ready home market at remunerative prices. Wherever practicable, we advise adopting co-operative dairying, as "creamery" butter and prime factory cheese will supplant the "dairy" butter and cheese in the near future, except under special circumstances.

The Dairy Herd. Select cows that attain a standard of 6,000 pounds of milk, 600 pounds of cheese, or 250 pounds of butter in a year, and keep none below this standard. This can be done only by weighing and testing the milk of each cow in the herd and not by guessing at the capacity of each cow. A *few* good cows are more profitable than many poor ones, and more profitable than a few good ones and more poor cows. Buy good cows if they can be purchased for $35 to $45, but as a rule they must be bred. If it is not desired to engage in the breeding of pure bred cattle, select the best grade or native cows in the herd and mate them with a pure bred male of a large milking or butter strain. He will usually be found to belong to one of the *dairy breeds*. Heifers bred in this way, if properly cared for, are likely to make excellent cows. Good heifer calves for the dairy may be raised on *sweet*, *warm*, skim-milk, together with some boiled linseed, oilcake, meal, clover hay and a few roots, after getting a start on the first milk from the dam and afterwards whole milk for about two weeks. These heifers should drop their first calves at from two to two and a-half years old. Aim at having some fresh cows each month in the year, as they will tend to keep the flavor of milk and butter up to the standard. This plan will also furnish material for a continuous dairy, which is much more satisfactory and remunerative than a dairy which closes down part of the year.

Feeding. A succession of soiling crops in addition to pasture should be ready for summer use, and it may pay to feed some bran or other meal. A mixture of pease, or vetches and oats, in the proportion of two bushels of oats to one bushel of pease or vetches, sown at three different periods of about ten days apart, and at the rate of two to two and a-half bushels per acre, is a safeguard against drouth and a shortage of milk. Corn will come in after this crop. For winter feeding, corn silage is the cheapest bulky food. Some clover hay, with mangels, sugar beets, or carrots, and six to ten pounds of meal a day, in addition to the corn silage, will maintain the milk flow. Swede turnips or turnip tops should not be fed to milking cows unless the persons who eat the butter like this "turnipy" flavor. For the general market keep turnips out of the ration.

Care of the Cows. Cows should have plenty of pure water and access to salt at all times. Stables and cows need to be kept clean. Proper ventilation of the stable is important. Brushing and carding will pay. Land plaster and whitewash should be freely used—the one in the gutter and the other on walls and stalls. KINDNESS should be the rule in the treatment of dairy cows. Endeavor to make the cow comfortable and she will endeavor to make her owner comfortable. A motto of the dairyman is breed, feed, weed, and hustle.

Dairy Utensils. As many as possible of these should be made of tin, containing no seams or crevices. A dairy thermometer (glass) is a requisite. Procure the best utensils, as they will save labor. A brush should be used in washing nearly all dairy utensils. Any vessel which has milk in it, should first be washed in luke-warm water, then in hot water, then scalded, and placed in the sun and fresh air. Woodenware should also be thoroughly washed with a brush, scalded, and then aired, but not left in the sun long enough to crack or warp. Below is a list of most of the utensils needed for farm butter-making, together with the probable cost:

A barrel or box churn, size to suit herd	$3 50	to	$7 00
A lever or roller worker	2 00	"	5 00
A butter mould—size, one to two pounds	45	"	3 00
A shipping box, with ice box in centre and wooden trays	3 00	"	4 50
A thermometer (glass)	20	"	50
A salt sieve (hair)	30	"	75
A pair of scales, to weigh quarter ounces	3 50	"	5 00
A buttermilk strainer—size two to four quarts—with perforated tin bottom, fine mesh	25	"	50
A butter ladle	20	"	40
A cream pail (tin, with handles on sides and tin stirring spoon)	1 00	"	1 50
Creamer cans and box for cold water (eight cows)	5 00	"	20 00
A cream separator (ten or more cows)	100 00	"	150 00
A brush for cleaning utensils	20	"	30
A supply of washing soda or borax			
A supply of good butter salt, per sack	70	"	1 60
Butter color, if thought advisable to use it, per bottle or per gallon	25	"	3 50
Parchment butter paper per 1,000 sheets	1 40		
Babcock milk tester (four bottles)	7 00		

The Dairy—Man or Women. He or she must be clean, neat and tidy. Everything in and about the dairy should be a model of cleanliness. Business ability and good judgment are also requisites of the successful dairy manager.

Milking. The cow's udder needs to be brushed before commencing to milk. Milking should be done quickly and with regularity. It pays to "strip" the cows, and thus secure all the milk, as the last portion is rich in butter fat. Straining is best done at once after milking, by using a fine wire strainer and two or three thicknesses of thin cotton.

Creaming. There are three methods of creaming now in general use: shallow pan, deep setting, and separator. Which system will be best, depends upon circumstances. If a small number of cows are kept and no ice, nor spring water below forty-five degrees is at hand, then small shallow pans will be best. For a larger number of cows—up to ten—and where ice can be obtained, deep setting in cans about eight inches in diameter and about twenty inches deep will be satisfactory. With ten or more good cows, use a cream separator, and we would recommend buying one which has a capacity of at least 500 pounds (50 gals.) of milk per hour. When tired of turning by hand (which will be in a short time), power may be attached with good results. We have found the tread power satisfactory for running the separator at our barn.

Shallow pan setting needs much space, pure air, a moderate to cool temperature, and skimming at from twenty-four to forty-eight hours—before the milk becomes thick.

For deep setting, it is important to cool the milk to a temperature of forty-five degrees or below. Skim at the end of twelve hours in summer and twenty-four to thirty-six in winter. The cans may be submerged, or surrounded by water as high as the milk in the cans. They may be skimmed from top or by drawing off the skim-milk at the bottom. Where the separator is used, have the temperature of the milk from eighty-five degrees to ninety-five degrees, the speed of the machine full and constant, and the feed regular. Test the skim-milk and note if there is any loss of fat. Secure the cream quite thick, and cool immediately to about fifty degrees. Keep all cream about this temperature until sufficient is obtained for a churning, then warm to ripening temperature by means of a water bath. Stir the cream while it is being warmed by the use of a tin stirrer.

Ripening Cream. The ripening temperature will vary with the seasons, cows, and kind of cream. The temperature should be such that the cream will ripen in twenty-four hours with or without a "starter." A "starter" may be made by heating some skim-milk from a fresh cow to ninety degrees the day before the cream is to be set to ripen. Throw away the top portion of the thick skim-milk and add to the cream from two to ten per cent. of the finely broken "starter." Stir it well into the cream, and leave it undisturbed until twenty to twenty-four hours after, when it should be ready to churn. The buttermilk may be used for "starter," so long as it is of good flavor. Give the cream a good stirring before putting it into the churn.

Churning. A simple box or barrel churn we find the best. To prepare it for churning, first scald and then cool. Strain the cream into the churn and it will prevent white specks in the butter. If coloring is used, it should be put into the cream before commencing to churn. The churning temperature will vary a great deal. Thick separator cream may be churned at fifty degrees. Thinner cream may be churned at fifty-six degrees to sixty degrees in summer, and up to seventy degrees, as the season advances. Have the temperature such that the butter will come "firm" in from twenty to forty minutes. Close covered churns must be ventilated two or three times during the first ten minutes of churning. When the butter "breaks," add a quart or more of water to the churning for each pail of cream. The temperature of the water added at this stage should vary according to season—cold in hot weather and warmer in cool weather. The object is to assist separation of butter from the butter-milk, and to temper the granules of butter. If the water is too cold in winter, it will prevent the grains forming the proper size. The churn should be stopped when the grains of butter are about the size of small wheat kernels. The butter-milk may then be drawn off through a strainer, or the granular butter may be dipped out of the butter-milk by means of a sieve, which is the Danish practice.

Why Butter Does Not Come. The chief reasons are:

1. The temperature is not right—usually the cream is too cold in the churn.
2. The cream may have been kept too long.
3. The cream of a "farrow" or "stripper" cow may be the cause of the trouble.
4. The cream may be too thin—get rid of some of the skim-milk.
5. The cream may be too thick—add a little skim-milk or water.
6. The churn is too full.
7. The maker is incompetent.

The process of churning is the packing together of tiny fat globules, and anything which hinders this tends to prevent churning.

Washing Butter. Where a highly flavored, short-keeping butter is wanted, do not wash at all. For prints to be eaten in a week or two, wash once, and for tub butter, to insure keeping quality, washing twice, or until the water comes away "clear," is a safer practice. Do not leave the butter standing too long in the water, as it will spoil the flavor.

Salting and Working. Fine butter salt (the use of coarse, lumpy salt is not advisable) at the rate of half an ounce to one ounce to the pound of butter may be sprinkled on the granular butter in the churn or on a worker. Some salt with strong brine. If salted in the churn, a portion or all of the working may be done by revolving the churn slowly after allowing the salt time to dissolve. Expert butter-makers may work butter once. Others will succeed better by working twice. Work by pressure and avoid a sliding or grinding motion. When the "streaks" have disappeared, the butter is firm and waxy in texture, and the excessive moisture is removed, it is then worked sufficiently.

Printing and Packing. For immediate use, the "print" of various sizes is a desirable package. It should be wrapped in good parchment butter paper. The tub, firkin, or cube package, is best to pack butter in for export, or if it is to be kept. The butter should be solidly packed in the tub, then be covered with butter cloth or parchment circle and a quarter to a half an inch of salt paste to exclude the air. Brine should be added from time to time. Keep in an even temperature. Prepare these wooden packages by soaking for a day or two in brine, then scald, and cool, and line with parchment paper.

Marketing. Do not trade good butter for dry goods and groceries at (for you) starvation rates of exchange. If possible, secure customers in a village, town, or city and send them your best-make regularly. Selling to a reliable commission house or groceryman (for cash) is a good way to market. A suitable shipping box with ice-chamber is necessary to send butter any distance in hot weather. Have a brand for your butter and sell none but the best with your brand on it. If a churning goes wrong, sell it for what it is worth without branding.

EXCURSIONS.

As usual, we had a large number of excursions in June and July, and many visitors during the whole season. We have endeavored to make the visits of these persons pleasant and instructive by running the cream separator, testing milk, churning, making cheese, and giving addresses on dairy topics. We trust soon to have the various implements of the dairy properly named, with capacity and chief points suitably printed, that visitors may be better instructed as to the uses of the various machines used in dairy work.

CORRESPONDENCE.

The correspondence has been quite heavy during the year. A great many writers make inquiries that often require considerable time to answer. Several have replied acknowledging assistance received from advice given in letters from the Dairy Department. A supply of bulletins and pamphlets covering the common troubles of the dairy make this work very much lighter than it otherwise would be.

NEEDS OF THE DAIRY DEPARTMENT.

1. A man in the dairy stable and piggery to do experimental work in feeding and to assist in milking and other work so far as his time will permit.

2. A continuation of the Dairy School on a smaller scale throughout the year for the benefit of cheese and butter-makers. Quite a number have come to the dairy during the past year and stopped for a short time to pick up any new things in dairy work. This should be encouraged to a greater extent. The month of June might be devoted to special classes in farm butter-making and experimental work for the benefit of students in both butter and cheese-making.

3. A system of cold storage or a refrigerator suitable for storing experimental cheese and butter. This is needed very badly as we have no suitable place at present for storing cheese and butter made during the experimental season.

4. A system of ventilation for the cheese-curing room and for the dairy stable.

5. A curing room that can be kept moist and cool for the curing of fancy cheese The cheddar curing-room is wholly unsuited for the latter class of cheese.

All of which is respectfully submitted.

H. H. DEAN,
Professor of Dairying.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, December 31st, 1895.

PART VII.

REPORT OF THE AGRICULTURIST.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my third annual report. Though I must confess that the work accomplished during the past year has, in some respects, fallen considerably short of what I had expected, still, certain important preparatory steps have been taken in the direction of developing the work in which I am especially interested.

My work may be most conveniently reported under five heads: farmers' institutes, lectures, correspondence, bulletins and experimental work.

Farmers' Institutes. From January 2nd until January 22nd, 1895, accompanied by Messrs. L. Patton, Oxford Mills, and M. McNabb, Cowal, I attended institute meetings in the counties of Frontenac, Leeds, Grenville, Dundas and Stormont. As a report of these meetings has already appeared in the *Report of Farmers' Institutes of Ontario*, it is unnecessary to say anything further regarding them.

Lectures. The lectures to students have followed very closely the course outlined in the College Circular. The work during the present College year is somewhat different, however, from that of previous years, owing to the fact that the third year work has been divided into special departments, and that agriculture and dairying comprise one of these departments. During the full term just closed, the third year students have devoted the time allotted to agriculture, to practical work in judging cattle, sheep and hogs. The remainder of the year will be devoted to the study of pedigrees, principles of breeding, the scientific principles which underlie the various operations of soil, tillage, etc., the different branches of agriculture being discussed much more fully than was possible during the first two years of the student's course.

It is my intention, if the plan meets your approval and the approval of the Minister of Agriculture, to arrange for practical work in experimental feeding, for the third year students who take agriculture as their special department. Such an arrangement would occasion some extra expense; but, as a means of education, I believe it would be well worth the money expended. However, for reasons which appear in another part of my report, I fear it will be impossible to give the present class the benefit of such training.

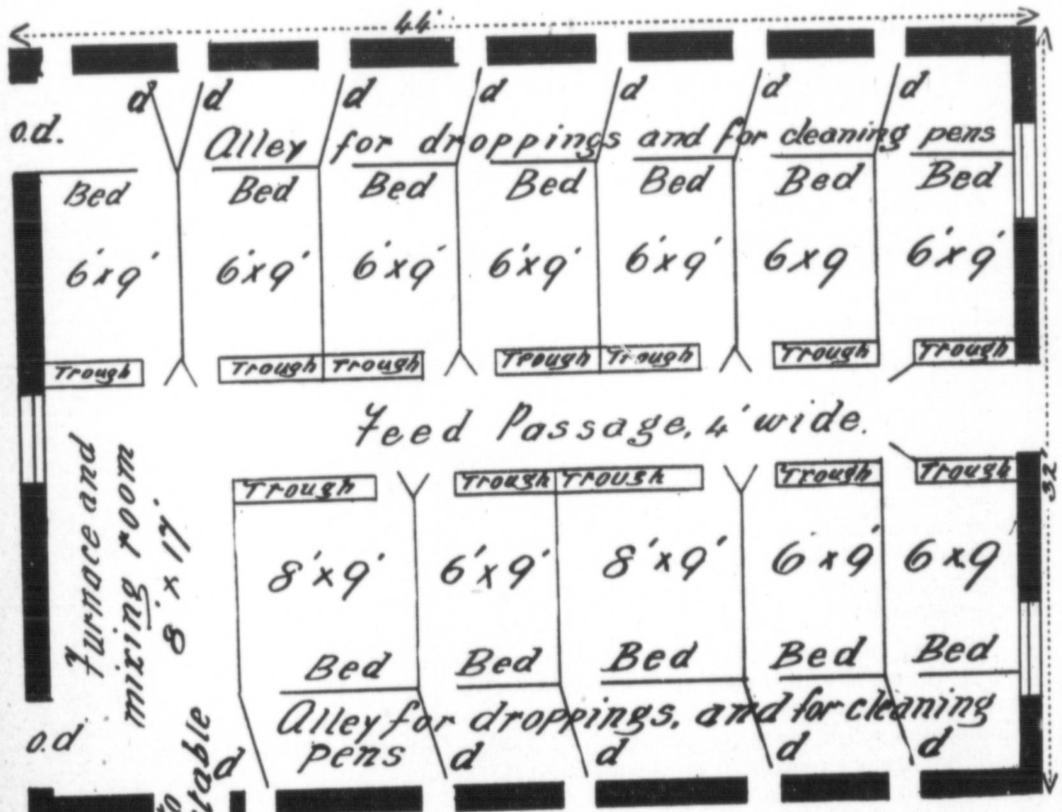
The new live-stock class-room is comfortable, commodious, and well adapted to the purpose for which it is intended. With such improved facilities, I hope to be able to make the study of live stock still more interesting and profitable to the students.

Correspondence. During the year, a great many letters have been received, containing inquiries regarding almost every department of farm work, though the greatest part of them concern stock feeding. To answer these questions satisfactorily requires considerable labor and careful thought, and constitutes a work of such importance and responsibility, that I have thought it not unworthy of this brief mention.

Bulletin. During the past summer, Mr. Harrison and myself prepared a bulletin on some of the more important grasses found in Ontario. The bulletin is designed for the student and the farmer ; and, in addition to a full botanical description of each grass, it contains notes on the utility of the different grasses, together with brief notes on the cultivation of grasses in general. Moreover, the bulletin is illustrated with excellent plates of the grasses mentioned.

Experimental Work. In last year's report, I stated that I expected to commence a number of experiments in stock feeding, during the present year. A small grant was asked for the purpose of fitting up suitable buildings, and the work of preparation was commenced early in the spring. A building which was already on the ground, has been partially fitted for the accommodation of cattle and sheep, and a new building has been erected, but not yet completed, for an experimental piggery. The College carpenter has had so much other work on hand, that, as yet, he has been unable to complete the buildings in question. For these reasons, no work in experimental feeding has been commenced, nor is it possible, as previously mentioned, to give the third year students practical work in experimental feeding.

A plan of the experimental piggery is given below :



PLAN OF EXPERIMENTAL PIGGERY.

The building is 44 x 32 feet. The walls are composed of gravel and Queenston cement, and are one foot thick, thus making the building 42 x 30 ft. inside. The main feature of the plan is the four foot alley which runs next to the wall on each side of the building. This alley contains doors (marked *d.*), which are hinged to the partitions between the pens, and fasten to the wall. Thus the hogs have free access to the portion of the alley opposite their respective pens, and may use it for their droppings, thereby keeping clean the part which contains their trough and bed. When it is required to clean the pens, the doors are swung back against the partitions, shutting the hogs into the pen which contains the trough, and leaving a continuous passage from one end of the building to the other. A wheelbarrow can be taken into the passage, or alley, and the manure wheeled outside through the doors marked *o. d.* The drainage is towards the manure alleys. The floor is of cement, but planks are laid on the cement over those portions intended for the beds, thus raising the beds two inches above the rest of the floor. The pens are made small to accommodate small lots for experimental feeding.

In concluding my report, I wish to express my appreciation of the comfortable office provided for me in the Experimental Building. My department is now better equipped than ever before, and I shall endeavor to take advantage of improved conditions, and render the more effective service which they demand.

I have the honor to be, Sir,

Your obedient servant,

G. E. DAY,

Agriculturist.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, December 31st, 1895.

REPO

To the President

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V. BULLETIN

VI. MEETINGS

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PART VIII.

REPORT OF THE HORTICULTURIST.

To the President of the Ontario Agricultural College :

SIR,—I have the honor of presenting herewith the report of the Department of Horticulture, for the year 1895.

With fruitgrowers generally, the year has been in many respects, an unfavorable ne, yet from the varied nature of the work here, I am glad to be able to report progress.

The year's work in this Department can be reported on most conveniently under the following headings :

I. TEACHING.

II. MANAGEMENT OF THE HORTICULTURAL DEPARTMENT.

III. INSPECTION OF FRUIT EXPERIMENT STATIONS.

IV. CO-OPERATIVE FRUIT TESTING.

V. BULLETIN PUBLISHED.

VI. MEETINGS ATTENDED.

I. TEACHING.

It has been our endeavor during the year, to make all students, under our charge, roficient as possible, in both the theory and practice of Horticulture. Instruction s been given by means of lectures in the class-room and practical work in the orchard, rden and greenhouse.

The course of lectures, as outlined in the College Circular, covers as fully as is ught practical, the subjects of Fruit Growing, Vegetable Gardening, Floriculture and ndscape Gardening. These lectures have been given twice a week throughout the ater portion of the year, to the second year students. Beginning with the fall term, tures have also been given to the students of the first year. Upon the revision of course of study for students of the third year, in which they now have the opportun- of devoting special attention to one or more of the branches of study taken up here, dvanced course in Horticulture has been arranged with special lectures, reading and ratory work.

During the past year special attention has been given to practical work. We find that the best way of making a student understand any particular operation is to allow him to perform that operation himself. Accordingly, two afternoons a week, have been devoted to such work as the pruning of apples, pears, raspberries, currants and gooseberries; pruning, training and trellising grapes; practising the different methods of grafting on hard and soft wooded plants; preparing spraying mixtures; originating new varieties by hand pollination; germinating and testing seeds; transplanting seedlings; potting and handling house plants, etc.

Much interest has been taken in this work. In an accompanying illnstration, may be seen a section of the class in Horticulture busy at the work of hand pollination, upon tomatoes and petunias growing in the Horticultural laboratory.

II. MANAGEMENT OF THE HORTICULTURAL DEPARTMENT.

The work of this Department, aside from teaching, is of a varied character. It embraces the care and management of: (1) The orchards and fruit plantations; (2) The Vegetable garden; (3) Lawn and grounds; (4) Arboretum and tree clumps; (5) The greenhouses. All of these are made use of, as far as possible, to give instruction to students; and the work in them is conducted so as to be an object lesson for both students and visitors.

Orchards and Fruit Plantations.

On account of the unusually late, severe and prolonged frosts in the spring, the fruit crop here, as in all other inland parts of the country, was almost an entire failure. Not only the young fruit and blossoms were destroyed, but in many cases the leaves and young wood were killed as well. Happily such seasons are not of frequent occurrence; and when they do come, there are always some of the more favorably located sections of the country, which are able to furnish the much needed supply of fruit.

Although the trees this year bore little more than disappointment, they were as carefully attended to as usual, in the hope of better returns in years to come. They were kept well cultivated up till midsummer, when the ground was sown to millet to help make up the shortened supply of fodder for farm stock. This crop, coming on late in the season, interfered little or none with the growth of the trees, and gave a fair return from the land for the season's work. Careful attention was given to spraying, to hold in check fungous diseases. In the spring, before the buds opened, all fruit trees were sprayed with a solution of copper sulphate, 1 pound to 25 gallons of water. Before the blossoms appeared and again after they had fallen, the trees were sprayed with the Bordeaux mixture, made according to the following formula; copper sulphate, 4 pounds; lime, 4 pounds; water, 50 gallons. These sprayings were given for the purpose of preventing fungous diseases on the foliage, as well as on the fruit, should there be any. At each of the later sprayings, 4 oz. of Paris green were added to the mixture to destroy all leaf-eating insects. On account of the comparative exemption from apple-scab and other fungous diseases this year, the effect of these sprayings with copper sulphate was not so noticeable as in other years; yet they were a safeguard, and, no doubt, were of some use. The Paris green in the mixtures, however, was quite effective in keeping in subjection the tent, red-humped and yellow-necked caterpillars.

Early in June, when the beetles of the flat-headed borers were active, the trunks of all young fruit trees were washed to prevent these insects depositing their eggs. The wash was made by adding to a thick paint-like solution of soft soap, enough crude carbolic acid to give it a strong smell, which is offensive to these beetles. Besides preventing the attacks of the borers, this wash gives a clean, thrifty appearance to the bark of young trees.

Grape vines were most seriously injured by the spring frosts. Owing to the unusually warm weather for two or three weeks preceding the frosts, the vines had made a growth of a foot or more in length. All of this was destroyed, and in most cases the old wood was seriously injured as well. At the time, it was doubtful if it would not be better to cut the vines off at the surface of the ground and allow them to start afresh from the roots. As an experiment, half of the vines were so cut down and the remainder left untouched. Those cut down made a strong growth, which was directed by summer pruning into such canes as were needed to form new vines. In most cases, good vines were formed, but it will really take another year to make full sized vines again. They will, however, be in better shape by that time than those not cut back. The latter made a very irregular growth, and although most of them made a few strong canes, which should bear fruit another year, yet they will never make well shaped vines till started afresh from the bottom.

Currants and gooseberries were well formed at the time of the frosts, and only that fruit borne in the centre of the bushes and well protected by the leaves, remained on and came to maturity.

The fruiting wood on the raspberries was not so seriously injured by the frosts as the new canes coming from the ground. The blossoms had not yet appeared and therefore escaped injury. The crop from these was a good one, the fruiting season being considerably lengthened by timely showers.

From the strawberry plantation set out a year ago last fall, a good crop of fruit was expected this year. The vines were covered during the winter, with a heavy mulch of coarse stable manure, which was left on until growth commenced in the spring. It was then raked off and tramped down as a mulch between the rows. During the warm weather in the early part of May, the plants made a vigorous growth and at the time of the frosts were out in full bloom. The crop, consequently, was materially lessened ; only those plants having strong fruiting crowns, sent up a second lot of blossoms.

A new plantation of strawberries was put out this year in the vegetable garden, the intention being to bring strawberries into our regular rotation of garden crops. This plantation includes 123 varieties, many of which are new in Ontario. The blossoms this season were picked off to throw all the vigor of growth into the plants. Previous to planting, the ground was deeply sub-soiled and well worked. The planting was done in the spring, as early as the ground could be got ready, and, notwithstanding the severe drouth which followed, very few of the plants failed. With frequent and clean cultivation during the summer, the growth was remarkable. After the ground had frozen hard this fall, the plants were covered with a heavy covering of coarse stable manure. The coarsest of this will be raked off in the spring and left between the rows for a mulch. It is expected that some valuable information may be obtained next year as to the productiveness of all these different varieties grown under the same conditions.

It is the intention of this Department to devote more attention to fruit growing. This is a branch of the work here which needs developing. With a view to extending the orchards and fruit plantations, field number thirteen has this summer been thoroughly underdrained. This field contains twenty acres, about four acres of which was four years ago planted to fruit. The remainder will be taken up, as required, for growing and testing whatever fruits can be grown in this section.

The Vegetable Garden.

A year ago this fall, the vegetable garden was thoroughly underdrained, and the benefit of this was very noticeable in the spring. The lower parts of the garden for years past have been too wet in the spring to be worked at the same time as the higher parts. This year, the whole garden was plowed from top to bottom by the 18th of April, and it worked up as mellow as an ash-heap. With the spring plowing, the ground was subsoiled. The subsoil plow, following in the furrow of the surface plow, worked the soil about ten inches deep. This brought to the surface many large stones, which were removed, and eight or ten waggon loads of smaller ones were also picked off during the summer. In this way, the vegetable garden has been put into a much better condition for the cultivation of the various vegetable crops.

A rotation of crops in the garden we think quite as important as a rotation of crops on the farm. On account, however, of the greater variety of crops grown in the garden, some of which are grown only in small quantities, a systematic rotation of garden crops is more difficult to arrange. The advantage of a rotation has been clearly shown in the garden here in the case of onions, which are commonly supposed to improve by being grown repeatedly on the same ground. For the past twelve or fifteen years, it is said, onions have been grown here on the same ground, and year by year they have become smaller and smaller, until last year they would not average much more than one and one-half inches in diameter. This year they were grown on an adjoining piece of land, and given the same attention as usual, the results being that the bulbs are double the size they were last year. One of the men declared, "They are the finest onions I have seen here for the last nine years."

The rotation which we are trying to establish at present, is as follows:

1. Strawberries, a new plantation of which will be put out every spring, and cropped two years.

2. Potatoes, tomatoes and corn, gross feeders, which can readily make use of the decaying organic matter in an old strawberry bed.

3. The various garden crops grown for their roots or bulbs; as beets, carrots, onions, parsnips, salsify and turnips.

4. The legumes and cucurbits; as, peas and beans, cucumbers, citrons, melons and squashes.

5. Cabbage, cauliflower and celery.

This may have to be varied occasionally to suit the requirements, but a systematic rotation will be aimed at, and more fully carried out as soon as it can be definitely ascertained just what area will be necessary to grow a sufficiency of each kind of garden crop.

The yield from the various garden crops this year, notwithstanding the severe drouth in the early part of the summer, was very fair—an ample supply to meet all the needs of the College.

The Lawn and Grounds.

Among the many duties devolving on this Department, is the care of the lawn and grounds. On account of their extent, considerable labor is required to keep these, at times, in first-class condition. An effort has been made to do this, however, and we think we have been fairly successful. During the period of rapid growth, in spring and early summer, the horse and hand-mowers were in constant use, to keep the lawn smooth and well shorn. The grass edges bordering the drives and flowerbeds were trimmed and kept neat. The soil about the trees and shrubs was repeatedly hoed and kept in a mellow condition. Fresh screened gravel was added to many of the drives, and these also were gone over frequently with the hoe and rake to keep down grass and weeds.

Every year considerable labor has been required to repair and fill up gullies washed in the sides of the drives during heavy rains. Some permanent improvement has been effected this year in the way of paving the east side of the main drive leading to the College. The paving is done with small cobble stones, and extends from the border [illegible] feet into the drive. This has proved effective as was shown after the heavy fall rains. The work will be continued next year, until all drives needing it will be done in this manner.

Another permanent improvement was the erection of a low, neat, wire fence between the lawn and north end of the vegetable garden. We do not, as a rule, believe in erecting fences, and have been endeavouring to do without them as much as possible.

after a couple of serious inroads into the garden by the cattle of careless neighbors, we were obliged to do what no one in a Christian neighborhood should have to do—fence against our neighbor's cattle.

Much permanent improvement has also been made in the grounds surrounding the dairy and poultry buildings. In various places where it was required, they have been levelled and either sodded or seeded. The drives have been graded and gravelled and put in an attractive condition.

Arboretum and Tree-Clumps.

We have here on the College lawn and in the various tree-clumps scattered about the place, a very fine collection of the varieties of trees and shrubs which will thrive in this section. Much of the value of this collection, as a means of instruction, heretofore has been lost, because the trees have not been labelled. A start has been made this year towards supplying this need. Preparatory to securing labels, the trees and shrubs had to be identified, and a list made of the varieties growing. In some cases considerable difficulty has been experienced in doing this, on account of the scarcity of bloom this year, after the severe frosts of May. But as opportunity offered, the work has progressed, and a list as complete as could be made this year, has been prepared. Much valuable assistance in this work was given by Mr. D. W. Beadle, of Toronto, an experienced nursery man and botanist, who spent a week here helping us during the summer. The labels we intend using have to be ordered from London, England, and it is expected that they will be on hand ready for use next spring

In the spring about two hundred Austrian pines, which were becoming crowded in the nursery, were taken up and transplanted in the corners of the fields in various parts of the farm, so as to vary the landscape with clumps of evergreen.

The trees in the forestry plantation were trimmed and kept well cultivated during the season. Many of these were seriously checked by the late spring frosts; but on the whole, they have made a very fair growth, and in a few years will so shade the ground that cultivation will be unnecessary.

The Greenhouses.

In last year's report we described at length our six different greenhouses, and gave an account of the work carried on in each. The work during the past year has been continued with increased vigor, and large additions have been made to our list of varieties.

The celluloid labels described in our report last year have stood well and have given good satisfaction. The work of labelling with these has continued as new plants have been introduced. Some of them may be seen in the illustration of chrysanthemum blooms.

Since we have had electric cars between the city and the College, there have been crowds of visitors every day to see the greenhouses. From the Guelph *Mercury* we clip the following account of a reporter's visit, at the time of the chrysanthemum display:

"In these days, when autumn has bereft Flora of her adornment in the garden and the fields, it is refreshing to look on her beauty in the conservatories. At this time the conservatories of the O. A. College are visited by hundreds of people from the city and surrounding country to gaze on the wealth of nature's beauty, garnered from every clime, which they contain. Under the guidance of Mr. Hutt, the Horticulturist, a reporter, on Wednesday afternoon, had the pleasure of spending an hour amidst the beauty and wealth of the conservatories.

The display of chrysanthemums is better this year than in any previous year. They have now over one hundred varieties, twenty of which are new varieties selected from the prize list of the chrysanthemum show at Toronto last fall. They have some of the largest and fullest blooms that they have yet grown. These are obtained by training to a single stem, allowing only one or two buds to bloom. Some of the largest will measure about eight or nine inches in diameter. Recently a great deal has been done towards introducing the feathered and anemone-centred varieties, on account of their oddity and unusual beauty. A number of them are among the recent introductions. The shades and colors of these are innumerable and indescribable, and can only be appreciated when seen. The single stem blooms are now at their best, but the general display in the conservatory will be at its best in another week, when the bloom will last for four or five weeks. The grouping and arrangement of the flowers in the conservatory is tasteful and artistic, reflecting credit on Mr. Hutt, and his florist, Mr. James. The tall, graceful chrysanthemums at the back from a bank of bloom, set off by the smaller and variously tinted geraniums in the foreground. The palms and other tropical plants in the centre of the conservatory give a faint idea of a tropical forest.

In the tropical house a chief feature of attraction is a banana bearing a truss of fruit. These, when ripened on the tree, are much more juicy and appetizing than the dry, mealy ones picked green and shipped to us from the south. In this house, too, is also found a number of the economic plants, such as the cocoanut, the ivory-nut (from which ivory buttons are made), the coffee tree, pepper tree, sago palm, etc. There were also observed a number of nice orchids, but they have not yet attained full bloom.

In the intermediate houses are now being raised a host of vigorous plants which will keep up the succession of bloom after the chrysanthemum bloom is over. A large number of lily bulbs are rooting, which will make a fine display next Easter.

In the Horticultural Laboratory the plants are growing with which the students will carry on their experiments and laboratory work during the winter. Among these are a fine lot of strawberries coming into bloom. From these it is expected to produce by hybridizing, new varieties.

A whole forest of young geraniums, coleus, etc., are being started in the propagating house to make plants for bedding next spring.

In the forcing hours there is a beautiful collection of roses and carnations from which out flowers are obtained in the winter. Later on in the season this house will be devoted principally to the forcing of vegetables, such as radish, lettuce, cauliflower, and tomatoes, the space under the bench being utilized for growing mushrooms and rhubarb."

III. INSPECTION OF FRUIT EXPERIMENT STATIONS.

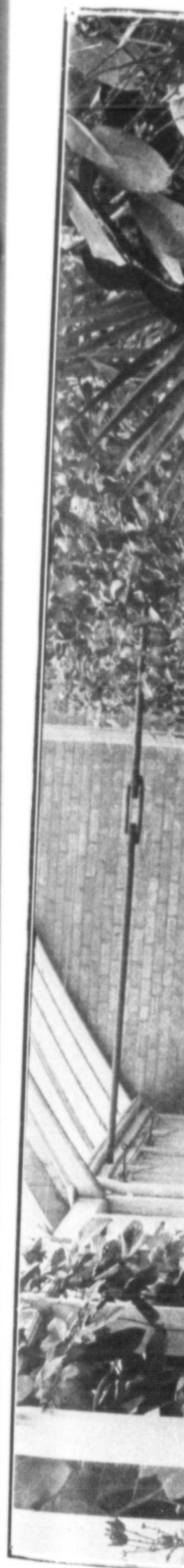
The system adopted last year, of testing both old and new varieties of fruits by means of fruit experiment stations in various parts of the Province, has this year assumed more definite form, and promises fully to meet the requirements of Ontario fruit growers.

It has been my pleasant duty to visit and inspect, during the summer, all of the stations already established. Each station was visited at the most opportune time for taking note of the particular kind of fruit grown there. At every station, I am glad to say, good work is being done, and valuable information is being gained, which will be given to the public in the annual report of the stations.

In company with Mr. L. Woolverton, Secretary of the Ontario Fruit Growers' Association, I also visited a number of other places in different parts of the Province, where it is thought desirable that other stations should be established, our object being to learn as much as possible about the fruit interests of these sections, and find competent fruit growers to undertake experimental work.

BOTANICAL LABORATORY AND GREENHOUSES.

STUDENTS PRACTISING HYBRIDIZATION IN HORTICULTURAL LABORATORY.



VIEW IN COLLEGE CONSERVATORY.

A FEW CHOICE CHRYSANTHEMUMS.

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The following is a brief report on visits to the stations established last year:

THE WENTWORTH STATION.

May 23rd, 1895. Visited the Wentworth station, where Mr. Murray Pettit, Winona, is making a speciality of grapes. Found everything under good cultivation and well cared for. Spraying with copper sulphate solution had been done before the appearance of the foliage, and also with the Bordeaux mixture before the appearance of blossoms.

The severe frosts of the previous two weeks had killed the new growth on the young vines at the north end of the place; the large vineyards, however, at the back and more under the lee of the mountain, had escaped with little or no injury. Pears and plums also at the front were seriously thinned out by the frost, while a block of one hundred greening apple trees, close under the mountain, was white with bloom.

The plot of ground devoted to the planting of new varieties, was in first-class condition and the young trees and vines were doing well.

September 25th. Visited Mr. Pettit again at the height of the grape harvest, when all hands were busy picking, packing and shipping grapes. In most parts of the vineyard, the vines were heavily laden and presented a magnificent sight. From the twenty acres in bearing, Mr. Pettit estimated the crop would be between sixty and seventy tons. This was being disposed of at the rate of about two tons per day, shipped mostly to regular customers or retail dealers in various parts of the province. In this way, Mr. Pettit realizes much better prices than by shipping to commission men in the large and usually over-stocked markets.

Owing to the light crop of fruit in all parts of the country, except where it was protected from frosts by the proximity of some mountain or large body of water, the prices this year are unusually good; and fruit growers in such favored sections are making up for the low prices obtained in other years, when fruit has been abundant.

THE SOUTH-WESTERN STATION.

September 26th. Visited the station at Leamington in Essex County, where Mr. W. W. Hillborn is making a specialty of peaches and strawberries. Our visit to this station last year was on the 15th of June, during the strawberry season; this year we deferred it till September, to see it at the time of peach harvest.

Although peaches are grown to a certain extent all over this county, they are most extensively grown along a narrow ridge of land in the southern part of the county, running parallel with the lake shore. "The Ridge," as it is called, is about five or six miles long, and varies from half a mile to a mile and a half in width. The soil is a light, dry, sand, so dry in fact, that for the last two years, the strawberries growing on it have, in many cases, been killed out during the hot weather of midsummer. Its peculiar adaptability, however, for peaches makes it valuable, and in consequence of this being the only section in Ontario where the peaches were not injured by the spring frosts this year, the price of land along "The Ridge" has risen nearly $20 per acre.

Mr. Hillborn has about 100 acres planted with peach trees, and expects to put out twenty-five acres more next spring. As yet, most of the trees are young and not in bearing. From five acres bearing this year, he picked about 900 baskets, which were sold by contract for eighty-four cents per basket.

He has now under test over one hundred varieties, about forty of which will be bearing next year. Full reports as to the value and productiveness of these varieties will be given from year to year in the annual reports, so that valuable information for peach growers may soon be looked for from this station.

The Georgian Bay Station.

On August 29th, after a couple of days spent among the fruit growers about Walkerton and Port Elgin, and a sixty-mile ride across the country on a bicycle, we reached our plum experiment station at Clarkesburg. By taking note of orchards along the road, the influence of the waters of the Geo'gian Bay upon the climate in that section might readily be seen. In all of the orchards inland, and in many places up to within a mile or so of the shore, the spring frosts had destroyed the blossoms and there was little or no fruit. Along the bay shore, however, many orchards might be seen laden with fruit, and in some cases the branches were propped with poles to enable them to bear their load.

The orchards of Mr. John Mitchell, our experimenter at Clarkesburg, being a couple of miles from the bay, had suffered somewhat from the frosts, and were bearing about half a crop. The varieties of apples most heavily loaded were Kings, Baldwins, Ribston Pippins, Cayuga Redstreaks and Greenings. Northern Spies, had not bloomed at all. Duchess of Oldenburg, which were then all harvested, had been a good crop and had brought two dollars and fifty cents per barrel in St. Mary's and Stratford.

Plums, of which fruit Mr. Mitchell is making a specialty, were seriously injured by the frosts. Those varieties which had escaped uninjured and were bearing heavily, were Lombards and Duane's Purple. The fruit of these was finding ready sale at $1.25 per basket. Mr. Mitchell has about 500 thrifty young plum trees in bearing, and in the new plot devoted to variety tests, thirty-seven varieties were planted this last spring. Three trees of each. Besides these, he is testing a few of the hardier varieties of peaches, pears and cherries.

Mr. Mitchell is a thorough cultivator, sprays his orchards carefully for insects and fungous diseases, and takes a lively interest in the fruit industry of his section.

The Simcoe Station.

August 30th. Visited the Simcoe Station, where Mr. G. C Caston, of Craighurst, is testing hardy varieties of apples, pears and cherries, and some of the small fruits. Craighurst being somewhat inland, the fruit in this section was seriously injured by the spring frosts. In Mr. Caston's apple orchard there was about a quarter of a crop. The varieties bearing most heavily were: Wealthy, Spitzenburg, Baxter, Golden Russett and Talman Sweet. Some young Wealthy trees were very heavily laden, proving the hardiness and productiveness of this variety.

Good cultivation and thorough spraying, such as Mr. Caston gives his orchard, may accomplish wonders in most seasons in producing fine fruit, but in seasons like this where the frost takes everything, cultivation and spraying can avail nothing, except to keep the trees in a vigorous, healthy condition for future crops. It was on account of the scarcity of fruit in Mr. Caston's orchard this year, that he was unable to make the display at the Toronto exhibition which he otherwise would have made.

Among his young apple and pear trees planted this spring there was not a failure, all of them at the time of our visit showing a good growth. The currant and gooseberry bushes planted this spring were also doing well. Mr. Caston has yet a number of Russian varieties in the nursery row, ready for planting another year.

The Bay of Quinte Station.

September 4th. We arrived at Trenton, and after wheeling out four miles on an uphill dusty road, we reached the home of Mr. W. H. Dempsey, the manager of the fruit experiment station for this section. Mr. Dempsey's specialty is apples. His orchard covers about forty acres; nearly all of the trees of which are in bearing. Mr. Dempsey and his father, the late P. C. Dempsey, always had a taste for originating and testing new varieties, and, on this account, Mr. Dempsey's orchard probably contains a greater number of varieties than any other apple orchard in Ontario. He has growing over 150 varieties, twenty-three of which are carefully described and reported on in last year's report.

The spring frosts, so injurious in most places, had done very little damage here. It was estimated that his crop would be over 1,500 barrels, and, as most of the apples this year are of unusually good quality, the greater part of the crop will be A1 marketable fruit.

To enable him to pack and ship his fruit to advantage, Mr. Dempsey has built a large, two-story fruit house, the walls of which have been made frost proof, so that apples may be stored in it all winter and sold in the best markets.

"Maplehurst" Fruit Farm.

When giving an account of visits to the different fruit experiment stations already established, and which we expect in time to contribute valuable information to Ontario fruit growers, it may be well to mention "Maplehurst," the fruit farm of Mr. L. Woolverton, Secretary of the Ontario Fruit Growers' Association and editor of *The Canadian Horticulturist*; for probably no other fruit farm in the province has afforded so much information to fruit growers as that of the editor of *The Horticulturist*. "Maplehurst" is about a mile west of the village of Grimsby, and consists of a one hundred acre strip of land about a mile long, running from the mountain to the lake. It embraces a great variety of soils, from a light, loamy sand to a heavy clay. This, in connection with the wonderfully favorable climate and shelter of the mountain, makes it well adapted to the production of all kinds of fruits grown in the province, and all of these are grown there more or less extensively, as the entire farm is planted with fruit.

Besides growing fruit for profit, Mr. Woolverton plants largely every year as a student of horticulture. Nearly every new fruit promising to be of any value is given a trial. Last spring about 130 new varieties were planted, embracing pears, peaches, plums, apricots, cherries and grapes. By planting annually in this way and keeping careful records, Mr. Woolverton, as editor of *The Horticulturist*, is enabled to advise his readers with authority as to the merits of new fruits constantly being brought before the public. His collection of varieties of cherries is one of the largest in the Province, and it is hoped we may glean valuable information from his reports on these.

Proposed New Stations.

The following notes are on visits made to different persons, with a view to finding suitable places for new stations:

Martin Burrell, St. Catharines, Lincoln County.

Visited May 25th, 1895. Situated four miles west of St. Catharines and half a mile from the lake. Farm of twenty-five acres, seventeen acres in fruit. Soil very variable, from light loam to heavy clay, partly rolling. The following fruits are being grown: Four acres or about 1,000 peach trees in bearing, of twelve varieties; two acres peaches newly planted; 200 pear trees, mostly in bearing, of twelve varieties; 150 cherry trees, six varieties, mostly early Richmond; fifty quince trees, of two varieties; 800 grape vines, about twelve varieties; about half an acre of strawberries and other small fruits; few apples.

Mr. Burrell is an energetic young man, enthusiastic in fruit growing. He takes an active part in the local farmers' institutes, and has made for himself a reputation as a thorough going fruit grower.

Stanley Spillet, Nantye, Simcoe County.

July 9th, 1895. Three miles north of Lefroy station and twelve miles south of Barrie.

Lot of two and a half acres, but more can be bought from an adjacent farm.

Soil, a moist, sandy and clay loam, well adapted to growing gooseberries. Land all well underdrained, heavily manured and thoroughly cultivated.

The following fruits are grown: gooseberries, raspberries and strawberries, and a few trees of plums, pears and cherries. Most of the ground is devoted to growing gooseberries, of which he has about 700 bushes of about twenty different varieties. A plot of new varieties put out this spring.

His Champions were remarkably prolific and his Downings very large. All had been sprayed. Mr. Spillet uses a small Clarksburg pump on a barrel mounted on a hand cart. Has also used flowers of sulphur for mildew. His bushes are planted six by four feet and trained in the bush form.

Mr. Spillet is an elderly man and has taught in the neighboring rural school for thirty years, but is resigning this year. He is a careful, reliable man, enthusiastic in gooseberry growing, and should make a good experimenter. Was busy when we called making drawings of the different varieties of berries.

He grows plants every year for E. D. Smith of Winona.

Rev. E. E. Stevenson, Freeman, Halton Co.

Mr. Stevenson is a Methodist minister, now stationed at Freeman, near Burlington. Nearly all of his strawberries, however, are grown on the fruit farm of his father near Guelph, which he visits frequently. Mr. Stevenson has all his life been growing and testing everything new in the line of strawberries, and is without doubt the best authority in the Province on the varieties of this fruit. He has about two hundred varieties under test, forty-two of which were reported on in last year's report. He is also giving attention to the production of new varieties by artificial pollination.

A. E. Sherrington, Walkerton, Bruce Co.

August 27th, 1895. Short distance from G. T. R. station, outside town limits, on land 160 feet above the town. Has a farm of seven acres, but expects to buy more. Soil chiefly clay loam and uniform. Most of the farm planted with apples and plums. Has about 240 apple trees in bearing, seven or eight of the leading varieties. Some of the newer varieties top-grafted. Plums, about forty-five trees, about twelve varieties. Pears, about thirty-five trees, mostly Bartlett, Flemish Beauty and Duchess. About half an acre in strawberries and raspberries.

Mr. Sherrington is an intelligent, progressive man; and, being an apple buyer, is well acquainted with the fruit interests of his section. He says that in 1893 about 40,000 bbls. of apples were shipped out of that section. He has also a large apiary managed according to modern methods.

A. W. Peart, B.A., Burlington, Halton Co.

August 31st. Farm about one and a quarter miles east of Burlington station and about one and a half miles from lake shore. One hundred and fifty acres of land, twenty of which are in fruit. Soil variable, from a gravel to a clay loam.

There are under cultivation the following fruits:

Apples. Ten acres, 400 trees, twenty-eight varieties, mostly in bearing.

Pears. Three hundred trees, about eight varieties of young trees coming into bearing

Grapes. Three acres, twenty-two varieties, just in bearing.

Peaches. Fifty trees, three varieties.

Plums. Six acres, twenty varieties, young or coming into bearing.

Currants. One acre, six or eight varieties.

Other small fruits grown for home use.

The whole farm and all the fruits are under first-class cultivation. Mr. Peart has been spraying for the past ten years, and his trees and vines are nearly all well loaded with a fine crop of fruit.

Personally Mr. Peart is a man of exceptional qualities. He is a graduate of Toronto University, and is a progressive and very energetic fruit grower. He is a careful observer and an exact experimenter on his own account. He is public spirited and posted in the fruit interests of his locality. He is at present Secretary of the Burlington Horticultural Society, which he helped to organize, and President of the County Farmers' Institute.

The Burlington district is one of the leading fruit districts of the province, and has carried off the prize for district exhibition from Toronto for a number of years. At the time of the World's Fair at Chicago, this district contributed largely to the grand display of fruit made by Ontario. The fruit sent from Burlington to Chicago was gathered and shipped at the expense of the local Horticultural Society.

R. L. Huggard, Whitby, Ontario Co.

September 3rd. Farm about half way between the town and G. T. R. station.

Property in two blocks of ten and twenty-five acres, some distance apart. The ten-acre block is nearly all in fruit, and he expects to buy more land adjoining. Soil, a clay loam, uniform and well drained.

The following fruits are being grown.

Apples, about 100 trees in bearing and a number of young ones coming on, about forty-five varieties, generally two trees of each variety.

Pears, about 400 trees, mostly six years old and coming into bearing, others newly planted, about fifty varieties.

Plums, about three hundred trees, most of them coming into bearing and some older, about fifty varieties.

Grapes, about thirty varieties, one or two vines of each, not very profitable in this section.

A few small fruits, such as currants, raspberries, etc.

Orchard under fair cultivation and well sprayed with Bordeaux and kerosene emulsion. Some trees top-grafted. Mr. Huggard is of about middle age, enthusiastic in fruit growing, intelligent and energetic. Acts as agent for Messrs. Stone & Wellington.

E. C. Beeman, Newcastle, Durham Co.

September 3rd. Farm one and a half miles west of Newcastle and three miles east of Bowmanville. Sixty-eight acres of land bordering on the lake. About twenty acres in fruit. Soil, a rather heavy clay loam, draining toward the lake.

The specialty at this place is pears. Of these Mr. Beeman has about thirteen acres, mostly in bearing. He has some of the largest pear trees to be found in the country. Some old Flemish Beauty trees will yield this year six or eight barrels each.

He had growing at one time nearly 250 varieties of pears, but many of these blighted, and he has now about 150 varieties, and generally three or more trees of each variety.

Apples, about thirty varieties, 150 old trees and about 270 younger trees coming into bearing. Many of them top-grafted with new varieties.

Plums, about 200 trees, newly planted, of fifty varieties.

Grapes do not succeed well here, but he has about thirty varieties, two vines of each.

Small fruits only for home use.

Mr. Beeman is a man of about sixty years of age. A very careful, thorough and painstaking fruit grower, well read and posted in the fruit industry generally. Has been spraying for the past ten years. The effects of spraying were very marked on his large Flemish Beauty pear trees. Sprayed trees were loaded and perfectly clean. On an unsprayed tree close by the fruit was cracked and covered with scab.

His young orchards Mr. Beeman keeps well cultivated, but his older pear trees are kept in sod to avoid blight. The grass is mowed and left as mulch and the ground manured as well.

Nearly all of his trees are loaded with fruit, which he grades properly and ships to Montreal in barrels.

HAROLD JONES, MAITLAND, GRENVILLE CO.

September 5th. Two miles from Maitland, seven miles east of Brockville and five west of Prescott. Farm consists of 265 acres, bordering on the St. Lawrence river. Soil, clay and clay loam, best along river front, somewhat rocky at the back of place.

Mr. Jones has about six acres of apple orchard, four acres of trees thirteen years old, nicely in bearing. Had 400 barrels grown this last year.

Two acres of old orchard rather rough. One hundred and seventy-five new trees put out last year. Altogether about fifteen varieties. The greater portion of the trees are Fameuse.

Bearing orchard is kept in sod and manured heavily. Has been sprayed carefully with Bordeaux mixture.

Mr. Jones is about thirty-five years of age, intelligent and enthusiastic in fruit growing. Visits Mr. Craig, of Ottawa, every year and keeps posted as to insect enemies; is fighting the case bearer in his orchard under the direction of Mr. Fletcher. He is public spirited and holds office in a number of benevolent societies.

IV. CO-OPERATIVE FRUIT TESTING.

In connection with the Experimental Union, we have been sending out, during the past two years, a number of varieties of small fruits for co-operative testing. The following is a list of the tests undertaken this year:

Strawberries—Wilson, Bubach No. 5, Williams and Bederwood—twelve plants of each.

Raspberries—Marlboro', Cuthbert, Shaffer's Colossal and Golden Queen—six plants of each.

Black raspberries—Souhegen, Gregg, Palmer and Tyler—six plants of each.

Currants—Fay's Prolific, Victoria, Raby Castle and White Grape—three plants of each.

Gooseberries—Houghton, Downing, White Smith and Industry—three plants of each.

The supply being limited, twenty lots of plants were sent out for each of the five tests. As yet no results can be given. A further account of the work, however, will be found in the Experimental Union Report at the end of this volume.

V. BULLETIN.

The following bulletin was prepared at the request of a number of the fruit growers of York Co., and was published as a special bulletin from the Department of Agriculture, Toronto.

Planting and Caring for Young Trees in an Apple Orchard.

One of the first requisities to successful orcharding is to begin well. This bulletin briefly outlines for the guidance of intending planters some of the chief points which should be considered.

Location and Exposure. In selecting the site for an orchard, two of the main things to be sought for are exemption from late spring and early autumn frosts, and shelter from the prevailing high winds. The locations least subject to injurious frosts are those bordering on large bodies of water, and, in the interior, the high lands. It is important to plant apple trees on the highest land available. If the elevation is not more than ten feet above the general level of the adjacent land, it affords an advantage in allowing the cold air to sink into the lower levels, and lessens the danger from frosts, which often do great injury when the trees are in bloom. One of the worst locations is a sheltered valley in which there is little or no circulation of air, and into which the sun shining makes it the hottest spot during the day, and the cold air settling into it from the higher elevations, makes it the coldest spot during the night.

A free circulation of air is very desirable in an orchard, and a full exposure is better than shutting it in too closely, yet it is advisable to have an orchard somewhat sheltered from the full force of the prevailing winds. These, in most parts of the country, come from the southwest. The shelter therefore should be on on that side, and may consist of a strip of woodland, or a belt of Norway spruce put out at the same time as the orchard, or better than all, would be to have the orchard planted on a hillside having a northern or northeastern exposure. Such a location and exposure is least subject to sudden changes of temperature, drouth, and the prevailing high winds.

The Soil and its Preparation. Apples may be successfully grown on a great variety of soils, from a moderately light sand to a heavy clay. The best soil, however, is a deep, open, clayey loam, which should be well drained either naturally or artificially. In addition to this, it should be moderately rich and retentive of plant food, for it is impossible to raise good fruit on poor soil.

To prepare the land for planting, it should be plowed deeply in the fall and put in good condition in the spring, as if prepared for a hoed crop. If the subsoil is a hard clay into which the roots of the trees cannot readily enter, it should be loosened by means of a subsoil plow. When it is not convenient to prepare the whole ground in this way, do a strip at least five or six feet wide where each row of trees is to stand; or, when planting, dig the holes much wider and deeper than would be otherwise neccessary for planting.

Distance Apart for Planting. It is impossible to state any particular distance apart for planting, which would be suitable for all conditions. The rule should be to allow space enough so that when the trees are full grown, the tops will yet be a few feet apart. This allows the free admission of sunlight, so neccessary in producing well colored fruit. The ultimate size of a tree will depend much upon the variety, and the soil on which it is grown. Varieties such as the Ben Davis of Ontario, for instance, require much less room than large growing varieties, such as the Greening or Baldwin, while a tree of any given variety will grow much larger or smaller than usual according as it is grown on richer or poorer soil. The best guide to intending planters is to observe the distances apart of full-grown thrifty trees in the neighborhood. These will be found to vary with different varieties in different sections all the way from twenty-five feet in the case of the smaller growing varieties to forty feet in the case of those varieties that spread. The average distance will be about thirty feet. It will be better to keep them a little too far apart rather than too close together.

ARRANGEMENT OF TREES. There are several methods of arranging the trees in an orchard. The one usually adopted is the square; most used no doubt because many do not know of a better. By this arrangement, the trees are planted in rows the same distance apart each way, four trees forming a square. A much better plan is what is known as the hexagonal. By this system fifteen per cent. more trees can be grown per acre without the least bit more crowding—no small item when we consider that the profits per acre are increased accordingly. By the hexagonal arrangement, the trees in the second row are set alternating with those in the first; six trees forming a hexagon and enclosing a seventh in the centre. To ascertain the correct position for the first tree in the second row, and consequently the distance apart of the rows that way in the orchard, take two strings the same length as the distance apart at which the trees are to be planted, fasten the end of one to the first and that of the other to the second stake in the first row, then stretch the free ends out till they meet, and this point will mark the position for the first tree in the second row.

Whichever method of arrangement is adopted, the trees should be set in perfectly stright lines, the first tree, no matter which way we look, hiding every other tree in the row. Crooked rows are not only an eyesore; but, during cultivation, they endanger the lives of the trees, as well as the morals of the man who has to cultivate them. To assist in getting the rows straight, the position of each tree should be marked by a little stake before the holes are dug. Then, when planting, use a "planting board." This may be five or six feet long and six inches wide, with a notch in one side at the middle, just large enough to let in the trunk of a small tree, and a hole at each end at equal distances from this notch. When a hole is to be dug place this notch about the stake and put a peg through each hole at the end. The board may then be taken up and the hole dug. When the tree is to be planted, replace the board over the pegs and place the tree in the notch. It will thus stand in exactly the same position as the stake which marked the hole.

FERTILIZATION OF BLOSSOMS. That the blossoms of a tree may "set" or become fruit, they must be fertilized with pollen from their own or some other tree. It has long been known, however, that nature abhors self-fertilization, and that she resorts to various modifications of the flower to prevent it and thus secure if possible cross-fertilization. Bees and other insects flying from flower to flower are the chief agents in distributing the pollen and bringing about cross-fertilization.

In accord with this, many varieties of apples have been found to be more or less self-sterile—that is, their pollen does not properly fertilize their own blossoms, although it may be quite potent on the blossoms of some other variety. Recent experiments conducted by the United States Department of Agriculture have clearly shown this to be the case with many varieties of pears and even those varieties which are self-fertile were found to bear larger fruit and more of it, when fertilized with pollen from some other variety.

In planting an orchard, therefore, while it is well to avoid planting a multiplicity of varieties, yet it is important to avoid planting too large a block of any one variety.

TRANSPLANTING. There is quite a diversity of opinion as to the proper time for planting trees. It may be done in either spring or fall, when the tree is dormant. As a rule, however, planting in early spring is the safest in our climate.

If, when the trees arrive from the nursery, it is not convenient to plant them at once, they should be "heeled in" by placing the roots in a trench and covering them with mellow soil, well packed, to prevent their drying out. Never allow the roots to be exposed to the sun or wind any more than can be helped.

No matter how carefully a tree has been taken up, its roots are always more or less mutilated and broken. All such injured roots and broken ends should be cut back with a smooth cut to sound wood. That a newly planted tree may flourish, it is necessary that a balance should exist between the roots and tops of branches, consequently when transplanting, the tops should be cut back to correspond with the roots that remain.

The whole should be dug wide enough to allow the roots to be extended freely in all directions, and deep enough, that, after a few inches of surface soil have been filled into the bottom, the tree will then stand about the same depth as it stood in the nursery. Spread the roots out carefully in their natural positions and cover them with moist, mellow surface soil. When the hole is about half filled, get in and tramp the earth firmly about the roots. Omitting to do this is one of the most frequent causes of failure in transplanting. If watering is necessary, a pailfull may then be added, but this is seldom necessary except in a very dry time. The remainder of soil being filled in and tramped firmly; a couple of inches on top should be left loose and untramped. This acts as a natural mulch, checking the evaporation of moisture from below.

MULCHING. When the tree is planted, spread around it as far as the roots extend, or a little beyond, a five or six-inch covering of coarse stable manure, or other loose material which will act as a mulch. This is particularly necessary in a dry soil or in a dry season. It prevents baking and cracking of surface soil and consequent escape of soil moisture from below, and at the same time maintains a uniformity of heat and moisture which is highly favorable to the formation of new roots.

CULTIVATION AND CROPPING. One of the most important factors in determining the profits from an orchard, is good cultivation. Sod should never be allowed around young trees. For the first five or six years, some hoed crop, such as roots, potatoes, beans, or corn, may be grown in the orchard. The cultivation required to grow these profitably will keep the ground in good condition for the trees, while such crops will yield a return from the land until the trees themselves begin to bear. Never sow a grain crop in a young orchard, unless a strip, at least as wide as the height of the trees, is left on each side of the rows and kept well cultivated.

The roots of a tree generally extend as far below the ground laterally as the top spreads above it, and they should be the sole occupants of the ground as far as they extend. Cropping between the rows, therefore, must gradually decrease as the trees increase in size, and should be discontinued altogether as soon as the trees fully occupy the ground.

Cultivation about the trees should never be so deep as to interfere with the roots. Shallow, level cultivation is much safer than plowing. By using the spring-tooth cultivator to loosen the ground, and the broad-share cultivator to keep the weeds down, plowing may profitably be dispensed with altogether.

Cultivation should commence in the spring as soon as the ground is fit to work, and be continued as often as necessary until about the middle of August. If cultivation is stopped at that time, the trees are more likely to stop growing and ripen their wood, so that it will not be injured by severe freezing. The frequency of cultivation necessary will depend much upon the soil and season. The aim should be to keep the surface soil loose and open, so that it will act as a natural mulch and enable the trees to withstand the injurious effects of drouth at any time.

MANURING. Manuring an orchard in order to obtain good crops of fruit is often just as necessary as manuring a field to get a good crop of corn or roots. In a young orchard, where hoed-crops are grown, the manure applied to grow these profitably will be all that is required by the young trees, as they will get their share of it. The vigor of the hoed-crop will be a good indicator of the quantity of manure necessary for the trees. In older orchards, where there is no cropping, the annual growth of the new wood is the best guide in applying manure.

As a general fertilizer, nothing is better than barnyard manure, but should be withheld where the new growth is excessive or where the wood growth is at the expense of fruit.

Unleached wood ashes are a specific fertilizer for fruit trees, as they contain all the inorganic elements necessary to produce both tree and fruit. Unlike barnyard manure, they tend to promote fruitfulness rather than excessive wood growth, and may safely be applied at any time.

In applying fertilizers of any kind, never bank them about the trunk of a tree, but spread them evenly all over the ground as far out as the roots extend.

PRUNING. One of the first things to be considered in pruning a young orchard is the height at which the heads should be started. Some prefer low heads, and others high heads. Either extremes should be avoided. From four to four and a half feet is a convenient height for apple trees. To have them all alike, cut them back to the desired height when young. Three branches are enough to leave to start the head. Space these evenly, and direct new growth whenever necessary by cutting back to a bud pointing in the direction you wish the new branch to take. The ideal pruning consists rather in directing growth than in cutting out what has grown. Thin out the new shoots as may be required, to keep the head from becoming too crowded. Cut out any branches that cross or rub each other, and keep the top symmetrical by cutting back branches growing too fast in any particular direction, as they are often inclined to do on the leeward side.

If an orchard is pruned regularly every year, as it should be, there need be no necessity for cutting out large limbs, and the pruning at any time will be very light. Light pruning may be done at any time during the summer, but for the general, annual pruning, this had better be done early in spring before the growth starts.

PROTECTING THE TRUNKS FROM BORERS. One of the most destructive insects to newly transplanted trees is the flat-headed apple-tree borer. The mature insect is an active little beetle, nearly half an inch long, which lays its eggs on the bark of the trees, generally on the southwest side. When the eggs hatches, the larva eats its way through the bark and feeds upon the sap-wood, sometimes entirely girdling the tree. When full grown, it is a pale, yellow, footless grub, over half an inch long, with a large flattened head. The presence of these pests in infested trees may readily be detected by the blackened and deadened appearance of the bark over the parts where the borers are at work.

When borers get into a tree, there is no other remedy than cutting them out with a sharp knife, or killing them in their burrows with a stout wire. But prevention is better than remedy, and the injury from borers can easily be prevented. To do so, wash the trunks and larger branches with a mixture of soft soap reduced to the consistency of thick paint with a solution of washing soda. If just enough carbolic acid is added to give it a strong smell, it will be all the more repulsive to the beetles. This should be applied during the early part of June and again early in July when the beetles are most active in laying their eggs.

SPRAYING. The whole host of leaf-eating insects which feed on the apple tree, such as the Tent caterpillar, Red-humped apple tree caterpillar, Yellow-necked apple tree caterpillar, Fall web worm, Tussock moth, canker worms, etc., must be fought with Paris green, used at the rate of one pound to 250 gallons of water.

Other insects which suck the juices from the leaves and young wood, such as the aphis, tree cricket, and bark louse, must be destroyed by the kerosene emulsion. This is made according to the following formula: Hard soap half pound (or soft soap about half gallon), hot water one gallon, coal oil two gallons.

Dissolve the soap in the hot water, add the coal oil, then agitate by means of a force pump or syringe for five or ten minutes, until thoroughly mixed. If properly made, this, on cooling, will form a jelly-like substance, which, before using, should be diluted with about fifteen parts of water.

The apple scab fungus, which affects the foliage as well as the fruit, must not be allowed to weaken the young trees before they come to a bearing age. To hold this in check, spray before the buds open with a solution made of one pound of copper sulphate to twenty-five gallons of water; after the foliage appears, spray three or four times at intervals of ten days or two weeks with the Bordeaux mixture. This, as now used, is made according to the following formula: Copper sulphate (blue vitrol) four pounds, lime (fresh) four pounds, water fifty gallons or one coal oil barrel.

Dissolve the copper sulphate in a wooden vessel, or in the barrel on which the force pump is mounted. To do this quickly, hang it in a little cotton bag so that it will be just below the surface of the water in the barrel. In another vessel slake the lime, using plenty of water, then strain it through a bit of coarse sacking into the barrel containing the copper sulphate. Fill the barrel with water. If the lime is fresh and pure, it should neutralize all the acid in the copper sulphate solution. To test if this be the case, add to a small sample of the mixture a drop or two of ferrocyanide of potassium. If the lime is insufficient, this drop, when added, will turn brown. In that case, lime-water must be added until the test gives no brown coloration:

The Bordeaux mixture and the Paris green may with advantage be applied together, thus forming a combined fungicide and insecticide. To do so, add four ounces of Paris green to a barrel of the mixture.

All of these mixtures should be applied in the form of a very fine spray. The "Vermorel" and "McGowen" nozzles have so far been found to be the most effective and economical for this work. These may be attached to any good, strong force pump, of which a number of Canadian makes may be found advertised in the agricultural and horticultural journals.

Summary.

1. For an orchard, select, if possible, high land with a northern or northeastern exposure.
2. A well-drained, deep, open, clayey loam is best.
3. Work the land deeply and well previous to planting.
4. Plant far enough apart that trees will not touch when full grown.
5. The hexagonal arrangement of trees in an orchard admits of fifteen per cent. more trees per acre than on the square, without any more crowding.
6. To secure proper fertilization of blossoms, avoid planting together too large a block of any one variety.
7. When transplanting, keep roots moist and pack the earth about them firmly.
8. A mulch spread about newly transplanted trees maintains a uniformity of temperature and moisture favorable to the formation of new roots.
9. Give thorough, shallow, level cultivation.
10. Cropping between the rows must gradually cease as the trees increase in size.
11. Unleached wood ashes are one of the best fertilizers for fruit trees of all kinds.
12. Like all other fertilizers, they should be spread evenly as far out as the roots extend.
13. Prune regularly every year and direct growth rather than cut out what has grown.
14. Prevent injuries from borers by coating the trunks of trees with a soft soap, soda, and carbolic acid wash.
15. Spraying is often necessary on young trees, while not yet of a bearing age.
16. For leaf-eating insects, use Paris green; for sucking insects, kerosene emulsion; and for fungous diseases, copper sulphate solution and Bordeaux mixture.
17. The Bordeaux mixture and Paris green may be applied together with advantage.

VI. MEETINGS ATTENDED.

During the month of January, I attended farmers' institute meetings, and gave addresses on horticultural topics in fourteen localities in that portion of the Province known as Institute Division No. 8, as follows: Blackstock, Tamworth, Centreville, Napanee, Stella, Shannonville, Wellington, Demorestville, Grafton, Cobourg, Coldsprings, Orono, Salina, and Bowmanville.

Besides these, I attended also a farmers' institute meeting at Hespeler, and the annual meeting of the Ontario Fruit Growers' Association held at Woodstock.

Acknowledgments.

I beg gratefully to acknowledge the following donations to the Horticultural Department:

Mr. G. M. Beynon, Temperanceville, Ont. Australian tree seeds.

Goold, Shapley, Muir Co., Brantford, Ont. Spraying pump.

Mr. John Little, Granton, Ont. Strawberry plants.

Holmes & Holladay, Clarksburg, Ont. Spraying pump.

Mr. John Wells, Galt, Ont. Collection of varieties of begonias and coleuses.

Mr. E. G. Whiting, Cedar Dale, Ont. Dust gun.

Mr. G. H. Caughell, Aylmer, Ont. Strawberry plants.

Mrs. Jas. Munro, Thorold, Ont. Acacia seeds.

Mr. F. W. Hodson, O. A. C., Guelph, Ont. Seeds of North-West fruits.

Mr. P. B. Smith, Bermuda. Bermuda plants and seeds.

Miss Stannard, Guelph, Ont. Collection of tulip bulbs.

Prof. Saunders, C. E. F., Ottawa, Ont. Collection of fifty varieties of geraniums.

It gives me pleasure also to make mention of the efficient services rendered this Department by William Squirrel, gardener, and foreman of the outside work; and by Arthur James, florist, and foreman in the greenhouses.

Respectfully yours,

H. L. HUTT,
Horticulturist.

ONTARIO AGRICULTURAL COLLEGE
Dec. 31st, 1895.

PART IX.

REPORT OF THE BACTERIOLOGIST.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my first annual report.

In the month of January last, I received instructions from the President to visit the bacteriological laboratories of a number of universities in the United States. In compliance with this request, I first went to the University of Chicago, where Dr. Jordan, Professor of Biology, kindly showed me his laboratories and equipment, and explained that most of the bateriological work in that institution had relation to sewage, water and general hygienic problems. Leaving Chicago, I went to the University of Wisconsin, at Madison, where I stayed for about a week. Dr. Russell, Bacteriologist of that institution, gave me permission to attend his classes and practical demonstrations in pasteurizing and general lacteal bacteriology. The Professor intends to give special attention to dairy bacteriology; but class-room work at present engrosses most of his time. I gathered much information during the short time I remained, and then left for Wesleyan University Middletown, Conn., the seat of Dr. H. W. Conn's labors. The Doctor gave me an outline of his work and methods, and also the history of his now famous organism, Bacillus No. 41, a germ with which he claims to make butter of specially good flavor and keeping quality, without previous bacteriological treatment of the cream. On leaving Middletown, I paid brief visits to the Laboratories of Harvard and Yale, where bacteriological work of a general character is done. At the Harvard Medical School in Boston, extensive research is being carried on in medical bacteriology.

On returning, I had to wait some time for our pasteurizing apparatus, which had been ordered at Fort Atkinson, in Wisconsin. On its arrival a room was fitted up in the large dairy building, a short course of six lectures was delivered on the subject of dairy bacteriology, and practical instruction was given in pasteurizing milk and cream. The principals and scientific outline given in the lectures being thus practically illustrated in the work-room; but on account of insufficient material and lack of room, it was impossible to demonstrate to the students fully and as satisfactorily as would have been possible, had the proper laboratory facilities been at hand. Now, however, we have a new bacteriological laboratory, equipped with everything necessary for illustration and demonstration in the work of this important department of scientific research.

Chicken Cholera. During the month of March, Mr. Jarvis, the poultry manager, was much troubled with diarrhœa among his fowls. From the spread of the affection throughout one building, he was led to believe that it was contagious. He submitted the matter to me, and by careful examination of the fresh droppings, I succeeded in isolating a germ whose cultural characteristics were identical with those of the bacillus of chicken cholera (Pasteur). On further investigation, I discovered the same germ in the liver of a fowl which had died of the disease.

The germ isolated was short, with rounded ends, the poles staining more intensely with aniline colors, giving the germ a dumb-bell like appearance. The bacillus was found in the blood organs and excreta of the fowls.

The fowls affected, appeared dull and drowsy, the feathers were ruffled; and unless prompt measures were taken, death followed very quickly. On post-mortem examination, *hæmorrahagic duodenitis* was found and bacilli present as well as in the viscera. The birds affected were isolated and the pens were disinfected with carbolic acid. For treatment, etc., of this malady, see the report of the poultry manager.

GRASSES OF ONTARIO.

During the spring and early summer, our agriculturist, Mr. G. E. Day, and I spent some time in preparing a bulletin on grasses, which, it is hoped, will be of benefit to farmers and others throughout the province. The following reprint is included in this report for the information of those who did not get a copy of the original:

Introduction.

No one will question the correctness of the statement, that grasses are amongst the most useful plants grown on the farm; and there is no doubt that farmers should study them carefully and learn all they can about those which are suited to their different localities and to the particular branches of agriculture in which they are respectively engaged.

Ordinary works on botany say very little about grasses, and the great majority of young men know still less about even the most common varieties. Hence Messrs. Harrison and Day have prepared this bulletin and are sending it out in the hope that a considerable number of the young farmers of this Province may use it so as to get an exact and thoroughly practical knowledge of those grasses which may be grown in their respective localities.

The popular portions of the bulletin are very simple and can be easily understood by all readers, and the more scientific descriptions introduced in connection with the illustrations, are intended for use in Public and High Schools and for the guidance of young men who may be disposed to study the grasses closely, so as to become familiar with the form, name, and uses of each variety. James Mills, President.

A Brief Description of the Parts of Grasses.

Roots. The roots of grasses are usually *fibrous*; and the fibres of which they are composed extend downwards into the ground to a greater or less depth. The deeper they go, the better the plant withstands drouth and the more it impoverishes the soil. Sometimes the roots, being very numerous and very much branched, bind the soil into a matted turf; at other times, they creep along beneath the surface (are described as *creeping*) and throw up underground shoots, which root themselves, send up stems, and form new plants. These latter are very difficult to eradicate and are apt to become a nuisance. Hence it is not advisable to grow them unless they produce an exceptionally large quantity of nutritious food. Couch grass (*Agropyrum repens*) furnishes a good example of this undesirable kind.

Stems. The stems of grasses that rise above the ground are usually hollow and are technically called *culms*. These stems are generally cylindrical, as well as hollow; but they are sometimes compressed and flattened, as in the case of Canadian Blue Grass (*Poa compressa*) and a few others.

Further, the stems of grasses are divided at intervals by thickened, solid portions called nodes, or joints. These were formerly supposed to strengthen the stem; but, according to Hackel, their sole function is to lift up stems that have been beaten or trodden down The leaves, and sometimes the branches, start at these points.

The stem of grasses is divided by Lindley into three parts: (1) The lower part, which is procumbent and produces roots, but is itself distinguished from true roots by bearing scales and sending out not only roots, but underground branches called *rhizomes*, or *root stocks;* (2) the stem proper; and (3) the upper part (where the spikelets are attached) called the *rhachis.*

The stem often has at its base a bulbous formation, which contains a store of food to be used by the plant when specially required; as, for instance, in time of drouth.

The stem may be what is known as *erect, ascending, bending, decumbent* (reclining on the ground but rising at the top), *leafy*, when the leaf sheaths close around it, or *naked*, when there are no leaves on the upper portion.

The *rhachis*, or upper part of the stem, is described as *simple* or *branched, round* or *angular.*

Leaves. All leaves of grasses consist of two parts, the *blade* and the *sheath*; in a few tropical species, a *petiole*, or leaf-stock is also found. The upper part of the leaf is called the blade. It is long and narrow, with parallel edges, and is described as *linear.* The lower part, which folds around the stem, is called the *sheath.* It usually extends round so far that the two edges overlap each other; and, as it matures more quickly than the stem, its stiffer tissues serve as a protection to the culm in the earlier stages of its growth.

At the point of union between the blade and the sheath, there is often a small, thin, scale-like, membranous organ, called the *ligule.* It is a prolongation of the sheath; it always lies very close to the stem; and Schlechtendahl has suggested that its function is to keep water from getting in between the sheath and the stem.

The length and breadth of the blade vary considerably. Very narrow blades, such as those of Sheep's Fescue, are described as *awl-shaped;* and comparatively broad ones, as in ribbon grass, are spoken of as *sword-shaped.* In some instances, the apex of the leaf is *acute;* in others, *tapering* or *blunt.*

There is one central rib running down the leaf, called the *mid-nerve* or *mid-rib*, and numerous finer ones running parallel on each side. The extremely strong mid-rib that is found in corn, sorghum, etc., gives especial firmness to the leaf. When there are no strongly marked ribs, the leaf is characterized as *flat;* and its surface may be *smooth, rough, downy*, or *hairy.* The margin is spoken of as *plane, downy, hairy*, or *serrate* (saw-edged).

By the position of the leaves on the stem of grasses, a character is afforded by which they may be easily distinguished from the sedges, a closely related family of grass-like plants. Beginning with any leaf on the stem of a true grass, one will find the next leaf exactly on the opposite side of the stem, and the next directly above the starting point. This arrangement of leaves is technically described as *distichous.* In sedges, however, the arrangement is three-ranked, *i. e.*, it is the third leaf from the first, which is directly above the first.

In the day time, the leaves stand out from the stem, with the upper surface turned upwards; but, at night, they lie quite close to the stem, and, according to Hackel, their surfaces are at an angle of ninety degrees from the position which they occupied during the day. These so-called sleep movements are due to the influence of light and are exhibited by many trees, as well as grasses; for example, some mimosas.

Other things being equal, the quality and quantity of the leaves of grasses determine their agricultural value.

Inflorescence, or the Arrangement of the Flowering Parts. The small, individual flowers of grasses are called *spikelets.* These together make up what is known as the *inflorescence*; and they are arranged in a dense, compact, or diffuse form.

When the flowers have no pedicels (or stalks) and are closely packed together on the axis, or stem of the plant, they form a *spike,* as in the case of Timothy or Meadow Fox-tail (Plate A. Fig 1). If the flowers are arranged on distinct, nearly equal pedicels, at intervals on the stem, the flower cluster is called a *raceme* (a somewhat rare form in grasses); but if they are on compound, branching pedicels, as in Blue Grass, they form what botanists speak of as a *panicle.* (Plate A. Fig. 14.)

If the pedicels are arranged in a circle round the stem, as in Red Top, they form what is called a *whorl;* if they are all on one side of the stem, as in Buffalo grass, Gramma grass, the inflorescence is said to be *one-sided* (Plate A. Fig. 7); if the spikelets are arranged cylindrically, as in Timothy, it is described as *cylindrically round;* if they droop, as in Fowl Meadow Grass, *Poa serotina* (Plate 20), it is represented as *nodding;* and if quite close together, as in Orchard grass (Plate A. Fig. 16), it is spoken of as *crowded.*

THE INFLORESCENCE OF GRASSES,

As indicated in the accompanying illustrations (Plate A)

Fig. 1. *Alopecurus pratensis* (meadow foxtail), showing dense spike.
Fig. 2. *Paspalum dilatatum,* showing elongated spike.
Fig. 3. *Hordeum pratense* (wild barley), showing a spike.
Fig. 4. *Agropyrum repens* (couch grass), showing a spike.
Fig. 5. *Elymus condensatus* (giant rye grass), showing a spike.
Fig. 6. *Bouteloua polystachya* (gramma grass), showing a spike.
Fig. 7. *Bouteloua oligiostachya* (gramma grass), showing a spike.
Fig. 8. *Panicum Crus-galli* (barnyard grass), showing a panicle.
Fig. 9. *Agrostis exarata* (variety of red top), showing a panicle.
Fig. 10. *Koeleria cristata* (a prairie grass), showing a panicle.
Fig. 11. *Distichlis maritima* (salt grass), showing a panicle.
Fig. 12. *Bromus secalinus* (chess), showing a panicle.
Fig. 13. *Hierochloa borealis* (Indian hay), showing a panicle.
Fig. 14 *Poa pratensis* (Kentucky blue grass), showing a panicle.
Fig. 16. *Dactylis glomerata* (orchard grass), showing a panicle.

Spikelet. The spikelet consists of three or more scales or bracts, called *glumes.* The first two of these, counting from beneath, are sterile and known as *empty glumes.* Some species, however, have but one of these empty glumes; and, in others, the second is only rudimentarily developed. The next glume above is called the *flowering glume;* and opposite to this, or between it and the axis, is generally placed a smaller and thinner scale, called the *palea* or palet. The mid-rib of either the glume or the palea is often prolonged beyond the end. This prolongation is called an *awn.* It may arise from the base or from any other part of the glumes or palea; and it is *straight, smooth, twisted, bent,* or *bristly,* and of every variety of length.

Opposite or inside of the palea, there are often present on the axis two small delicate scales called *lodicules.* These are much swollen with sap during flowering, and serve to open the flower and expose the stamens and pistil. In species in which they are absent, the reproductive organs extend above the glumes.

The peculiarities of the glumes and palea, as the number of nerves, and the texture of these scaly appendages, etc., furnish the chief means of distinguishing the different genera and species.

PLATE A.

DISSECTION OF THE FLOWERS OF GRASSES,

As indicated in the accompanying illustrations. (Plate B.)

Fig. 1. *Agrostis vulgaris* (red top), showing two spikelets, one closed, one opened.
Fig. 2. *Agrostis exarata* (variety of red top), showing two spikelets, one closed, one opened.
Fig. 3. *Sporobulus Indicus* (carpet grass), showing two spikelets, one closed, one opened.
Fig. 4. *Calamagrostis Canadensis* (blue joint grass), showing an opened spikelet.
Fig. 5. *Phleum pratense* (timothy), showing two spikelets, one closed, one opened.
Fig. 6. *Muhlenbergia diffusa* (Nimble Will), showing two spikelets, one closed, one opened.
Fig. 7. *Paspalum dilalatum*, showing two spikelets, one closed, one opened.
Fig. 8. *Paspalum læve*, showing two spikelets, one closed, one opened.
Fig. 9. *Aristida purpurea* (beard grass), showing spikelet.
Fig. 10. *Setaria setosa*, showing two spikelets, one closed, one opened.
Fig. 11. *Setaria glauca* (yellow foxtail), showing two spikelets, one closed, one opened.
Fig. 12. *Alopecurus pratensis* (meadow foxtail), showing two spikelets, one closed, one opened.
Fig. 13. *Holcus linatus* (velvet grass), showing two spikelets, one closed, one opened.
Fig. 14. *Deschampsia cœspitosa* (hair grass), showing two spikelets, one closed, one opened.
Fig. 15. *Poa serotina* (fowl meadow grass), showing spikelet and one flower.
Fig. 16. *Bromus erectus* (brome grass), showing spikelet and one flower.
Fig. 17. *Buchloe dactyloides* (buffalo grass), showing male and female spikelets.

Stamens. The reproductive organs of grasses, as of other plants, are called stamens and pistils. Each stamen consists of two parts; a *filament*, or slender stalk, and (attached to the upper end of the filament) an *anther*, or little sac (usually double), for holding the *pollen*, or fertilizing powder.

In grasses, the filaments are slender and distinct; and on the tip of each is a narrow anther, attached about the middle. The middle of the anther being the point of attachment, it swings to and fro on the filament. The movement of the anther aids materially in scattering the pollen; and, because of this movement, the anther in grasses is described as *versatile*. (See Plate B., figures 1 and 4.)

The pollen of grasses is very fine, spherical, and smooth, is discharged in abundance, and scattered by the wind. Cross-fertilization is the rule; but self-fertilization also takes place, as in the case of wheat.

Pistils. The pistil (or central organ of the flower) usually consists of three parts: the *ovary*, or seed-bearing sac; above this, one or more *styles*, or stalk-like prolongations; and on the top of each style, a *stigma*, or the part which receives the pollen. The style is sometimes very short or wanting altogether.

The pistil of grasses has from one to three styles, each surmounted by a stigma; and the stigmas are usually curved and feathery, giving abundant surface for catching the pollen from the anthers. (Plate B., fig. 12.)

The ovary in grasses is usually round or oval; the fruit is one-seeded; the husk, or pericarp, surrounds the seed; and the palea sometimes adheres to it.

The *embryo*, or young plantlet, lies beneath the skin of the seed, on the front side, at the base.

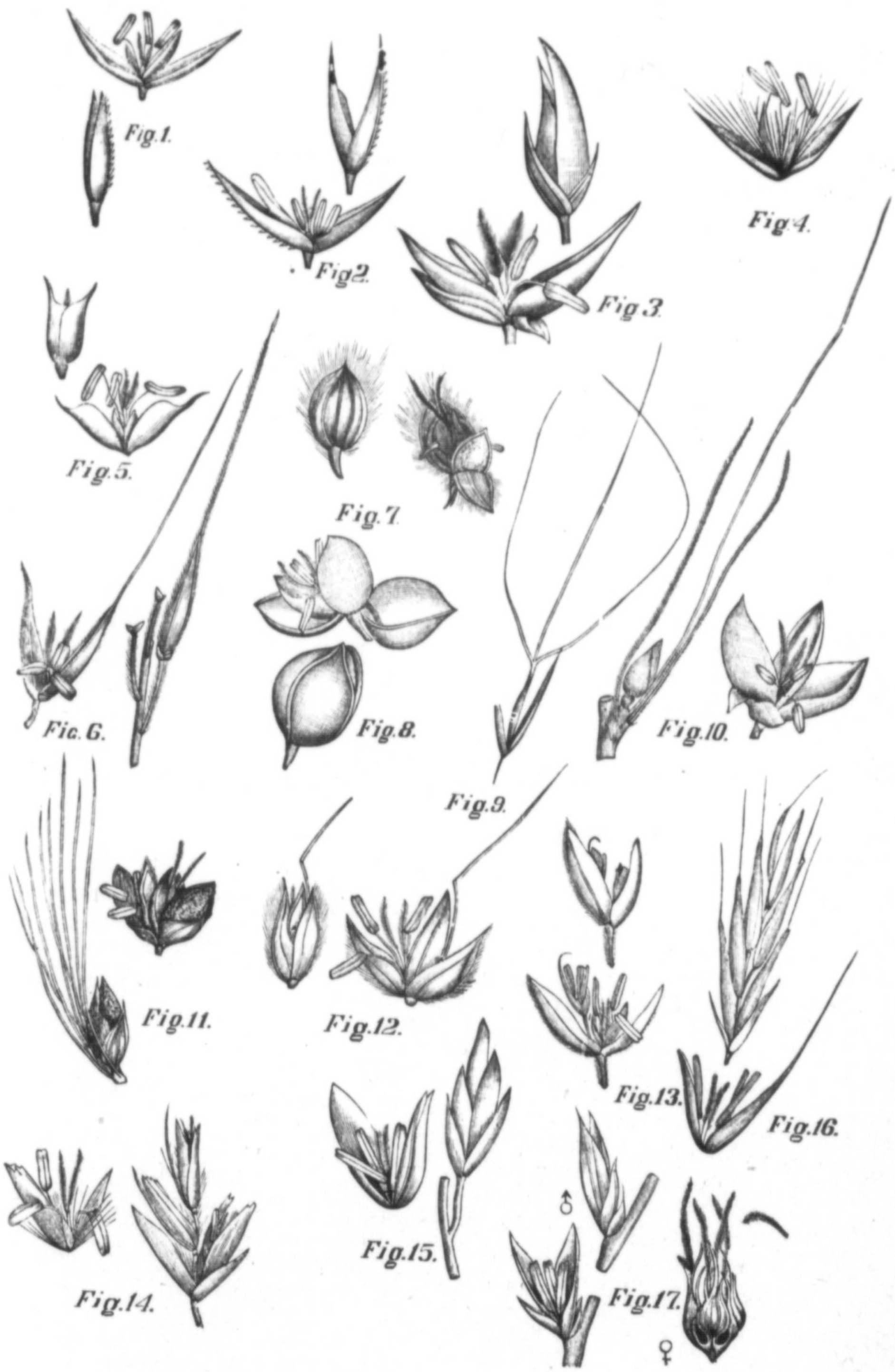
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PLATE B

VERY BRIEF BOTANICAL DESCRIPTION OF GRASSES, FOLLOWED IN EACH CASE BY NOTES ON THEIR AGRICULTURAL VALUE.

Phleum pratense. Linn —Timothy, Herd's Grass or Cat's Tail Grass. (Plate 1.)

Roots.—Perennial, fibrous.

Culms.—Tall, erect, and firm.

Leaves.—4 or 5 on stem, rather broad, roughish.

Inflorescence.—Long, cylindrical spike; densely many flowered.

Glumes.—*Empty,* The back fringed with hairs and tipped with a short bristle.

Flowering, Five-ribbed, notched on upper part, covered by outer glumes.

Palea.—Short and pointed, with margins delicately fringed.

Stamens.—Long, with feathery stigmas protruding from apex at flowering time.

Flowers, about beginning of July.

Timothy grows best on soils containing considerable humus, but gives very fair yields on a wide range of soils. For hay, it is one of our most valuable grasses, the product being of excellent quality, heavy, easily cured, and saleable at the highest price. But, for pasture, it is not first-class. The bulbs at the bases of the stems expose it to injury from vermin, insects and close grazing. It also suffers severely from drouth and, under the most favorable conditions, it affords only a scant aftermath.

Timothy yields a liberal crop of seed, which is easily threshed and cleaned. When sown alone, from 10 to 12 pounds of seed per acre is required.

PLATE 1. TIMOTHY (*Phleum pratense*).

Lolium perenne. Linn.—Ray or Rye grass, Perennial Rye grass, or Darnel. (Plate 2.)

Roots.—Perennial, fibrous, and sometimes producing running shoots.

Culms.—2 to 3 feet high.

Leaves.—Very leafy, flat, narrow, and pointed, dark green in color.

Inflorescence.—Spike like panicle, 6 in. or longer.

Spikelets —8 to 15 flowered, placed edgewise on stem, and arranged alternately on the axis.

Glumes.—*Empty*, outer one nearly as long as spikelet, or longer; inner one, usually lacking.

Flowering, rounded on back and acutely pointed.

Palea.—Short, 2 keeled (2 ridges.)

In general appearance the panicle resembles couch grass.

Lolium Italicum—Italian Rye grass, a long awn on the flowering glume, leaves broad and succulent, stem longer but more delicate, and lasting only 2 or 3 years, leaves lighter colored.

Lolium temulentum.—Distinguished from L. perenne by length of outer glume and long awns of flowering glume, has a bad reputation, as the seeds contain a narcotic principle, injurious to man and beast.

Of the rye grasses, Perennial grass is the best known. The name, however, is misleading, since, in this country, it cannot be depended upon to give a crop of more than one year, and is therefore entirely unsuitable for meadows or pastures that are required to stand for several years. It is a grass of good quality; and, on rich lands, it yields a fairly heavy crop of hay not much inferior to timothy.

PLATE 2. *Lolium perenne.* (Perennial Rye Grass.)

Dactylis glomerata. Linn.—Orchard grass, Rough Cock's foot. (Plate 3.)

Roots.—Perennial, fibrous.

Culms.—Stout and rough.

Leaves.—Rough, broadly linear, light green color, slightly hairy, flat and keeled. 5 to 6 in number.

Inflorescence.—Dense, branching panicle, lower part more open owing to length of 3-4 flower stalks, upper part more dense.

Spikelets.—Several flowered, crowded in one-sided clusters.

Glumes.—All herbaceous. *Empty*, smaller than flowering.

Flowering, ovate-lanceolate, and rough, with a short awn or point.

Palea.—2 toothed at summit, fringed at base.

Flowers—July 1-14.

Grows in dense tufts, and is very rank growing and hardy.

Orchard Grass is a very hardy perennial. It grows on almost any cultivated soil, but prefers a rich loam, and thrives in shaded locations better than any other cultivated grass It has a tendency to grow in tufts and to crowd out other grasses, but is nevertheless one of the most valuable varieties for pastures, as it grows early and late in the season, and remains green throughout the longest drouths. It also furnishes a good aftermath, and bears very close grazing. In the management of an Orchard grass pasture, it is a good plan to mow those parts which have not been closely cropped. When this is done, a fine growth of aftermath may be expected.

For hay, Orchard grass is not so highly esteemed as Timothy ; and when intended for this purpose, it should be cut in early bloom, or even before blooming.

When sown alone, about 24 pounds of seed per acre should be used.

PLATE 3. *Dactylis glomerata*, (Orchard Grass.)

Festuca elatior. Linn.—Taller or Meadow Fescue, English Blue Grass, Evergreen Grass, Randall Grass. (Plate 4.)

Roots.—Perennial, fibrous and deep.

Culms.—Smooth and erect.

Leaves.—Flat, broadish, long and abundant.

Inflorescence.—Narrow, contracted before and after flowering, short branches, somewhat one-sided.

Spikelet.—Crowded, 5 to 10 flowered.

Glumes.—*Empty*, shorter than flowering.

Flowering, 5 nerved, blunt, with rough awn at apex.

Palea.—Acute, green rib along each side, with hairy nerves.

Flowers—About end of June.

Grows in clumps or tufts, very variable.

Variety—*F. pratensis.* 1-3 ft. high, simpler or closer panicle of smaller spikelets, very liable to have ergot.

Tall Fescue and Meadow Fescue are really different varieties, but they are so similar in general characters that they may be treated as one. Meadow Fescue is somewhat earlier than Tall Fescue, and does not yield such a heavy crop. These two grasses are hardy perennials, grow on a great variety of soils, and are consequently suitable for all pasture mixtures. They yield a fairly heavy hay crop of good quality, but their chief use is for pasture.

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PLATE 4. *Festuca elatior*, (Meadow Fescue.)

Festuca ovina. Linn.—Sheep's Fescue, Pine Bunch Grass.
(Plate 5.)

Roots.—Perennial, deep, fibrous.

Culm.—Smooth and slender, 1-1½ ft. high.

Leaves.—Mostly radical, very narrow and convolute, growing in dense tufts from the roots, awl shaped, and dark in color.

Inflorescence.—One sided, short and more or less compound panicle, open in flowering, 2-4 in. long.

Spikelet.—3-8 flowered.

Glumes.—*Outer*, acute and narrow ; upper, 3 ribbed ; lower, 1 ribbed.

Flowering, lanceolate and roughish with short rough awn.

Palea.—Two teeth at summit, green ribs in margin.

Flowers—June 20-30.

There are many varieties of this grass, which do well even in very sandy soils.

Sheep's Fescue is a small variety with very fine leaves. It has little value unless for rocky pastures. There is another variety, called Hard Fescue, which is rather more valuable than the above, though neither of them is at all suitable for hay.

PLATE 5. *Festuca ovinc*, (Sheep's Fescue,)

Arrhenatherum avenaceum. R. & S.—Oat grass, tall oat grass, evergreen grass, meadow oat grass, false oat grass, tall meadow oat grass, grass of the Andes, French rye grass. (Plate 6.)

Root.—Perennial.

Culms.—Erect, rather stout, 2-4 ft. high, of dark green tint.

Leaves.—Broad and flat, about 4 or 5, rough on upper surface, gradually pointed. Ligule conspicuous and hairy on back; short hair on upper surface of blade and on other parts.

Inflorescence.—Elongated, loose, 6-10 in. long, drooping, branches unequal.

Spikelet.—Two flowered with rudimentary third flower, middle flower perfect, lowest flower staminate only, on short stalks.

Glumes.—Glume of lowest flower bearing a long bent awn below middle of back.

Outer, thin and transparent; *flowering*, green, 7-nerved.

Palea.—Linear, thin, and transparent, 2-nerved and 2-toothed.

Flowers—July 7-20.

Grows in loose tufts.

Tall Oat grass is a very hardy perennial. It grows early and late in the season, and will withstand long periods of drouth. Though somewhat bitter, stock eat it well, and it is therefore a suitable grass for permanent pastures, especially on poor lands. For hay, it should be cut as soon as it blossoms. If allowed to stand a very short time after it blooms, it becomes woody and makes very poor hay. It yields a good aftermath, and though not highly esteemed in Great Britain, it is deservedly popular in districts where the rainfall is comparatively slight.

In addition to the above, there is a Yellow Oat grass which is sometimes included in mixtures. It is a light cropper and is not likely to prove valuable in this country.

The seed of Tall Oat grass weighs about 14 pounds to the bushel, in the chaff, and when sown alone, about two bushels per acre is required.

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PLATE 6. *Arrhenatherum avenaceum*, (Tall Oat Grass.)

Poa pratensis. Linn.—June grass, Spear grass, Kentucky Blue grass, Blue grass,—English grass, smooth stalked Meadow grass, Green grass. (Plate 7.)

Roots.—Perennial running root-stock.

Culms.—Stems smooth, ligule short and blunt, $1\frac{1}{2}$ to 2 ft. high.

Leaves.—Abundance of long radical leaves, rather narrow and pointed.

Inflorescence.—Short, pyramidal, branches mostly in fives, loose spreading, 2-4 in.

Spikelet.—3-5 flowered, crowded, ovate, mostly on short stalks.

Glumes.—*Empty*, unequal, the first narrow and one nerved, the second broader and three-nerved.

Flowering, hairy on margin and keel, five-nerved tuft of cobwebby hairs at base.

Palea.—Short, *two-toothed.*

Flowers in June

There are a number of varieties of this grass, differing in agricultural importance. The chief merit of the grass lies in the abundance of the soft radical leaves.

It is one of the best known of our native grasses, and is most commonly called June grass. It is also one of the earliest grasses, and furnishes pasture of exceptionally nutritious character during the early part of the season, but does not withstand the summer drouths so well as many other grasses. As it usually finds its way into permanent pastures when the soil is suitable, it is seldom necessary to include it in seed mixtures for this purpose. It is an excellent grass for lawns, its running root-stocks and fine leaves forming a tough, velvety sward. Compared with timothy, its hay value is rather low.

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PLATE 7. *Poa pratensis*, (Kentucky Blue grass.)

Poa compressa. Linn.—Wire grass, English Blue grass, Smaller Blue grass Creeping Poa, Canadian Blue grass. (Plate 8.)

Roots.—Running root-stock, perennial.

Culms.—Hard and much flattened, 1-18 in. long, frequently bent at lower joints and then ascending.

Leaves.—Short, scanty, smooth. Bluish green in color, ligule small.

Inflorescence.—Dense and narrow, somewhat one-sided, 1-3 in. long, simple and contracted.

Spikelet.—Sessile, small, 4-6 flowered.

Glumes.—*Outer*, unequal, 3-ribbed.

Flowering, 5-ribbed.

Palea—Two-nerved, nerves rough, with short hairs.

Flowers—July 1-10.

Low habit of growth, flattened or compressed stems, contracted panicle, less creeping roots, furnish characters by which it is easy to distinguish it from Kentucky Blue grass.

Poa compressa is of little value for hay, owing to its small growth. What pasturage it affords is nutritious, and it will grow on very poor soil, such as sand, gravel, or hard clay.

PLATE 8. *Poa compressa* (Canadian Blue Grass.)

Agrostis vulgaris. With.—Red Top, Bent grass, Fine Bent, Fine Top. (Plate 9.)

Roots.—Perennial, creeping, interlacing and forming a dense sod.

Culms.—Tufted, and slender. Ligule short.

Leaves.—4 or 5, flat, narrow, and roughish.

Inflorescence.—Spreading after flowering, panicle with whorled branches.

Spikelet.—1-flowered.

Glumes.—*Empty*, equal, and longer than the flowering glume.

Flowering, very thin, awned on back, 3-5 nerved.

Palea.—Thin, minute, or none.

Flowers—July 1-10.

Red Top is a fairly hardy perennial, and is best adapted to rather low lands. It is most suitable for pasture mixtures or for lawns, though for the latter purpose probably *Agrostis canina* (Rhode Island Bent Grass) would be more suitable. It is not of much value for hay.

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PLATE 9. *Agrostis vulgaris* (Red Top.)

Alopecurus pratensis. Linn.—Meadow Foxtail, English Foxtail. (Plate 10.)

Roots.—Perennial, fibrous, and creeping.

Culms.—Upright, smooth, 2 in. high.

Leaves.—Upper leaf much shorter than its inflated sheath, 4 or 5 at even distance, rather broad and flat.

Inflorescence.—Stout, 1-2½ in. long, cylindrical spike. Awn conspicuously projecting.

Glumes.—*Lower*, acute, awnless, and hairy ;

Flowering, obtuse, awn rising from near the base, half its length twisted.

Palea.—None.

Flowers—June 7-20.

Resembles Timothy, but culm and leaves are shorter ; spikes shorter, broader, and softer ; plant less firm and rough.

Meadow Foxtail is a very early, hardy grass of good quality, used in mixtures for permanent pastures. It requires a rich soil in order to give satisfactory results, and takes several years to become established. It makes hay of good quality, but yields too light a crop and takes too long to become established, to be a profitable grass for this purpose.

Foxtail. (Plate 10.)

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PLATE 10. *Alopecurus pratensis* (Meadow Foxtail.)

Setaria Italica Kunth.—Italian Millet, Golden Millet, Leaf Tail Millet, Bengal Grass, Hungarian Grass. (Plate 11).

Roots.—Annual.

Culms.—Erect, 2-3 ft. high.

Leaves.—Long, broad, and flat.

Inflorescenece.—Spike-like panicle, nodding, yellowish or purple.

Glumes.—*Empty*, 3, the lower one small, the second smalier than the third;

Flowering, hardened.

Palea.—Thin.

Stamens.—Sometimes 4 in number.

The terms "Hungarian Grass" and "Millet" are so variably applied that they lead to hopeless confusion. There are a great many varieties in this family, and among the more valuable for cultivation may be mentioned Salzer's Dakota, Golden, Golden Wonder, and Pearl.

Millet requires a rich, warm soil. It forms a valuable "catch crop," that is, it may be sown late in the season to replace a crop that has failed. It should not be sown until the weather becomes warm, usually during June, though it may be sown much later. In preparing the soil, fine tilth is necessary. The quanity of seed used varies considerably but about 40 pounds per acre will be found satisfactory in most cases. When cut in early bloom, millet makes a fair substitute for hay. If allowed to stand until the seeds have formed, it draws much more heavily upon the soil, and the seeds are generally believed to have an injurious effect upon the kidneys of the animals to which they are fed.

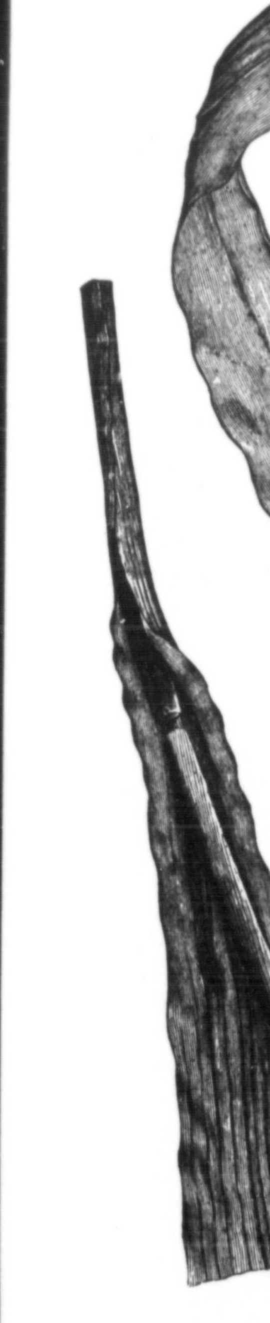

PLATE 11. *Setaria Italica.*

Anthoxanthum odoratum. Linn.—Sweet Vernal Grass, Sweet Scented Vernal Grass, Vernal Grass. (Plate 12.)

Roots.—Perennial, fibrous.

Culms.—Slender, 1 to $1\frac{1}{2}$ ft. high.

Leaves.—Hairy, flat and pointed, scant foliage.

Inflorescence.—Spike-liked, but having many very short, dense branches 2-3 in. long narrow and close.

Spikelets.—3 flowered, only the terminal one perfect, brown or tinged with green.

Glumes.—*Empty* glumes in two pairs, hairy, two-lobed and awned on back.

Flowering, small, smooth, and awnless.

Palea.—Short, three-nerved.

Flowers about end of June.

A low, sweet smelling perennial, the scent arising from a product called cumarin In Europe the scent is extracted and manufactured into perfume.

Odor appears when dry. It is used in grass *mixtures* in Great Britain, but does not appear to thrive in our climate.

PLATE 1

PLATE 12. *Anthoxanthum odoratum* (Sweet Vernal.)

Elymus Virginicus. Linn.—Wild Rye grass, Lyme grass, Terrell grass. (Plate 13.)

Roots.—Fibrous, perennial.

Culm.—Stout, 2-3 ft. high.

Leaves.—Leafy, 10-15 in. long, bread and rough.

Inflorescence.—Erect and rigid, 4-5 in. long.

Spikelet.—2-3 at each joint, all alike, and fertile.

Glumes.—*Empty*, lanceolate, very thick and course, strongly nerved, and bristle pointed; *Flowering*, shorter than above, thick, rounded on back, and having stiff awn.

Palea.—Shorter than its glume, 2-keeled, oblong, and blunt.

Flowers—July 10-20.

Abounds in marshes and along streams.

By the time it blooms the lower leaves are dead.

This grass is not suitable for seed mixtures on cultivated lands, but furnishes some food for stock in marshy places.

PLATE 13. *Elymus Virginicus* (Wild Rye.)

Deuxia Canadensis.—Beauv. (*Calamagrostis Canadensis*). Blue Joint, Small reed-grass, Sand grass. (Plate 14.)

Roots.—Perennial, creeping root stocks, spreads from underground stems.

Culm.—Stout, tall, erect, and smooth, up to 4 ft. high.

Leaves.—Flat when fresh, slightly hairy, 1 ft. long, long ligule, very leafy.

Inflorescence.—Open panicle, spreading, especially when flowering, purple tinged, 4-8 in. long.

Spikelet.—1-flowered, with a short hairy pedicel, supposed to be a rudimentary flower.

Glumes.—*Empty*, lanceolate and acute;

Flowering, delicately awned, having silky white tuft of hairs at base.

Palea.—Slim, smaller than its glume, and transparent.

Flowers—July 1-14.

Canadian Blue Joint is a valuable grass for low lands that cannot be drained, and grows on land that is too wet for red top. It is commonly found in "beaver meadows" and marshes, but may also be grown on cultivated land. It remains green after the seeds are ripe, and is relished by stock in all stages of its growth, affording a large amount of nutritious pasturage, and a fairly heavy crop of palatable hay.

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PLATE 14. *Calamagrostis Canadensis* (Blue Joint.)

Muhlenbergia Mexicana. Trin.—Drop Seed Grass, Wood Grass, Knot Root Grass.
(Plate 15.)

Roots.—Scaly, creeping, perennial.

Culms.—Upright, much branched, 2-3 ft. high.

Leaves.—Numerous, flat.

Inflorescence.—Contracted, densly flowered panicle.

Glumes.—*Lower*, awnless, sharp pointed, unequal.

Flowering, three nerved, acute, hairy at base.

Palea.—Very acute, smaller than its glume.

Flowers—about end of July.

This species is very serviceable in binding sand, with its strong creeping rhizomes. On rich land, it yields from two to three tons per acre of very fair hay, and affords considerable pasturage.

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PLATE 15. *Muhlenbergia Mexicana* (Drop Seed Grass)

Muhlenbergia glomerata Trin.—Spiked Muhlenbergia, Muhlenberg's Grass, Satin Grass, Wild Timothy. (Plate 16.)

Roots.—Hard and knotty with numerous firm scales.

Culms.—Upright, stiffly erect, hard, somewhat compressed, sparingly branched, 1·3 ft. high

Leaves.—Blades linear, 2-4 in. long, rough.

Inflorescence.—2-3 in. long, narrow, contracted, clustered spike, becoming looser below.

Glumes.—*Empty*, awned, nearly equal.

Flowering, twice length of the empty.

Palea.—Two-nerved, acute, and short pointed.

Flowers—about end of July.

This grass is frequently called "Wild Timothy" from the facts that the heads slightly resemble those of Timothy. It is noted for its late period of flowering. On low lands it yields considerable pasturage and hay of no mean quality.

PLATE

PLATE 16. *Muhlenbergia glomerata* (Wild Timothy.)

Muhlenbergia sylvatica. Torr. and Gray.—Bearded Satin Grass. (Plate 17.)

Roots.—Perennial, fibrous, scaly root-stock.

Culms.—Ascending, much branched, and spreading, 2-4 ft. high.

Leaves.—Leafy, flat, rather broad, and sharp pointed.

Inflorescence.—Dense, many flowered panicle, purplish color.

Glumes.—*Empty*, almost equal, bristle pointed, nearly as long as flowering.

Flowering, awn twice or thrice length of spikelet.

Palea.—Two-nerved, rough at apex.

Resembles *Muhlenbergia Mexicana*, but panicle is looser and bears a bristly aw
On low, rich land it is rather a heavier cropper than M. Mexicana

PLATE 17.

Plate 17. *Muhlenbergia sylvatica*, (Bearded Satin Grass.)

Glyceria Canadensis. Trin.—Rattlesnake Grass, tall quaking grass. (Plate 18.)

Roots.—Perennial.

Culms.—Stout, 2-3 ft. high, smooth.

Leaves.—Long, lower ones longer and broader than the upper ones.

Inflorescence.—Panicle, 8-9 in. long, large, spreading; branches, slender, long, and branching, mostly in threes.

Spikelets.—Oblong, 6-8 flowered, flattened.

Glumes.—*Empty*, 2, unequal, shorter than the flowering glumes.

Flowering, smooth, blunt apex, 5-9 nerves, prominent and parallel.

Palea.—Shorter than its glume, and two-nerved.

Flowers—in July.

Grows in tufts in wet places and along river banks. Forms good pasturage in wet meadows and makes fair hay. Also is a fine ornamental grass.

Plate 1

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Plate 18. *Glyceria Canadensis* (Rattlesnake Grass.)

Phalaris arundinacea. Linn.—Reed canary grass, Ribbon grass. (Plate 19.)

Roots.—Perennial, fibrous, strong, and creeping.

Culms.—Stout, smooth, and leafy, from 2-5 feet high.

Leaves.—6-10 in. long, $1\frac{1}{2}$ in. wide, flat, lanceolate; margins rougher than surface; ligule short and rounded above.

Inflorescence.—Long, dense spike, 3-6 in. long.

Spikelet.—One-flowered and fertile.

Glumes.—*Empty*, 4, the third and fourth being reduced to hairy rudiments; 2nd and 3rd obscured, nerved and hairy on back.

Flowering, one-nerved and awnless.

Palea.—Rounded, one-nerved.

Flowers—about end of June.

The ribbon grass of gardens, the leaves striped with white, is a variety of *Phalaris arundinacea.*

Suitable only for pasture on wet, swampy land. In the early stages of its growth it is eaten readly by stock, but becomes very woody when mature.

Pla

Plate 19. *Phalaris arundinacea* (Reed Canary Grass.)

Poa serotina, Ehrh.—False Red Top, Fowl meadow grass, Duck grass, Swamp wire grass. (Plate 20.)

Roots.—Perennial, running root-stock.

Culms.—Tufted, erect, slender, 2-3 feet high.

Leaves.—Narrowly, linear, soft and smooth.

Inflorescene.—Elongated panicle, tinged with dull purple, slender and nodding, branches in fives.

Spikelet.— 2-4 flowered, short stalked.

Glumes.— *Outer*, $\frac{1}{8}$ in. long, sharp pointed, rough on keel;

Flowering, very obscurely nerved, cobwebby at base, obtuse or blunt.

Palea.—Acute.

Flowers—July 1-12.

Stems remain green after seed is ripe.

Poa serotina has attracted considerable attention as a grass that will grow on very moist lands, or on lands that are occasionally flooded. Stock eat it readily, and when cut it makes hay of fair quality. It is perhaps worthy of more extended trial in mixtures for low, rich lands.

Plat

Plate 20. *Poa serotina* (Fowl Meadow Grass.)

Hierochloe borealis. Roem and Schultes.—Vanilla or Seneca grass, Holy grass, Indian Hay. (Plate 21.)

Roots.—Creeping, perennial.

Culms.—Erect, round, smooth, 1-2 ft. high.

Leaves.—Short blades, flat, broad, lanceolate, rough on upper surface; long sheaths.

Inflorescence.—Somewhat one-sided, spreading, pyramidal panicle, 2-5 in long

Spikelets.—Chestnut colored, ovate, and glossy, three-flowered.

Glumes.—*Outer*, equal, broad, acute, smooth.

Flowering, 5-ribbed, hairy.

Palea.—Two-nerved.

Stamens.—3 in the barren and 2 in fertile florets.

Flowers—May 15-30.

The plants when dry have a vanilla like odor, whence the first name; sometimes strewn before church doors on holy days, and used by Indians for making mats and baskets. In some places it has become a weed.

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PLATE 21. *Hierochloe borealis* (Indian Hay).

Panicum Crus galli, Linn.—Barnyard grass, Barn grass, Cock's foot, Large Crow foot grass. (Plate 22.)

Roots.—Annual, fibrous.

Culms.—Thick, stout, branching from base.

Leaves.—Very numerous, rather broad and flat, smooth but rough margined.

Inflorescence.—1-3 in. long, crowded spikelets in dense panicle.

Glumes.—*Outer*, 3, the first, broad and short, 3-nerved; the second and third, smooth, downy, the 2nd, 5-nerved, the 3rd, 2-nerved and awned.

Flowering, thin and transparent, smooth.

Palea.—Small and polished.

Flowers in August.

It grows in low rich land, and in the neighborhood of barns and dwellings. It is of very little agricultural value.

PLATE 2

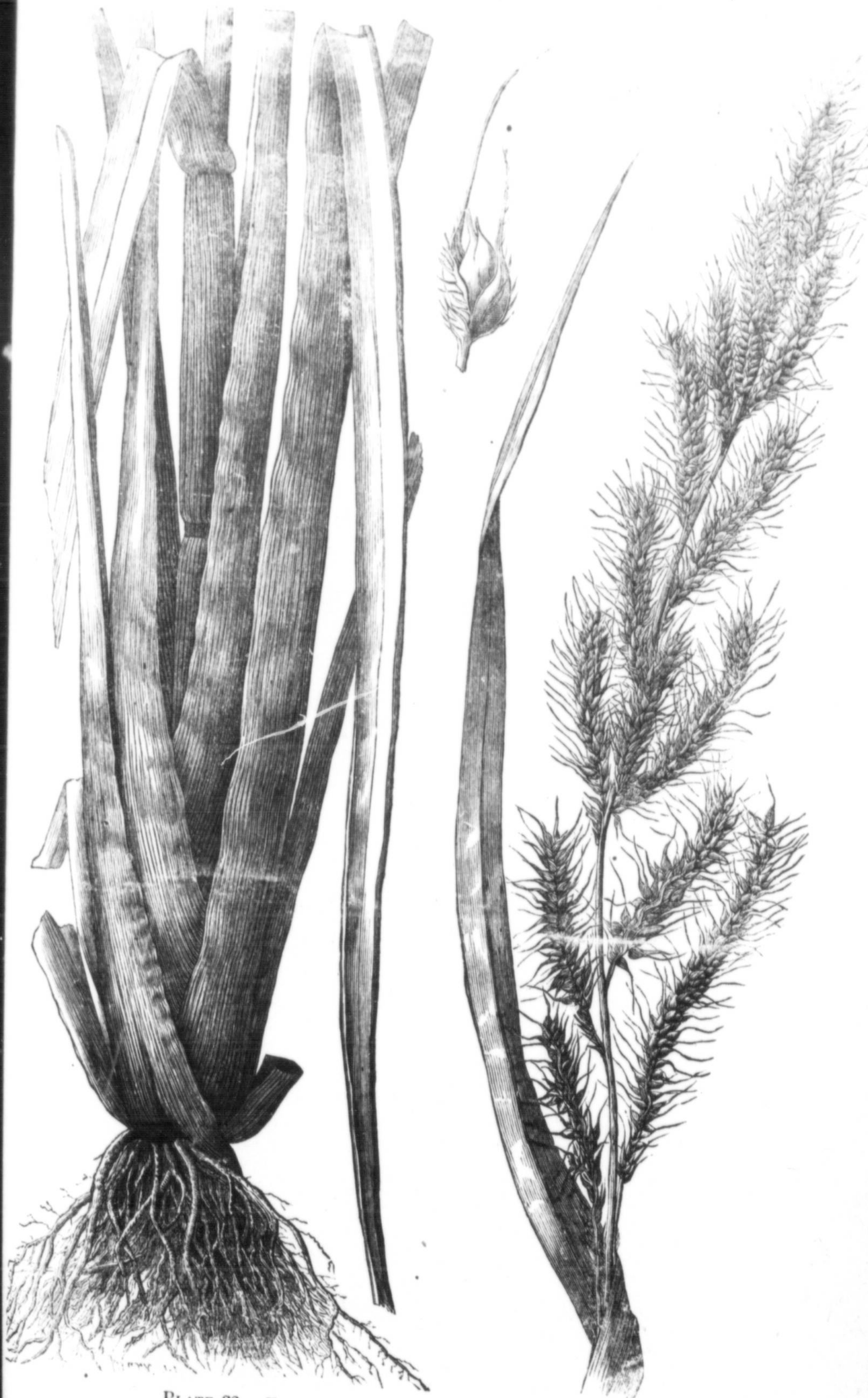

PLATE 22. *Panicum Crus-galli.* (Barnyard Grass.)

Agropyrum repens. Beauv.—Couch, Quitch, Quick, Quack, Quake, Scutch, Twitch Dutch, Dog, Wheat, Durfa, Devil's Grass. (Plate 23.)

Roots.—Perennial, creeping extensively, penetrating deeply into the ground, jointed root-stock.

Culms.—1-3 ft. high.

Leaves.—Flat, roughish above; upper ones broader than those springing from root.

Inflorescence.—Close, narrow spike.

Spikelet.—4-8 flowered, slightly notched stem, smooth.

Glumes—*Empty*, equal and opposite, 1-3 nerved.

Flowering, similar, pointed or awned, and with rounded back.

Palea.—Nearly as long as its glume, two marginal, green nerves.

Flowers—July 5-20.

Whatever value Couch Grass may have for pasture, its habit of taking and kee ing possession of the soil renders it extremely objectionable. It flourishes best in loam or humus soils, from which it is especially difficult to eradicate.

To destroy this grass, the cultivation should be such as to prevent its appearin above the surface. Hoed crops of various kinds, or a bare fallow, on which buck wheat may be sown and plowed under, will be found useful. A well manured an carefully cultivated rape crop is especially effective as a means of destroying this gras

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PLATE 23. *Agropyrum repens* (Couch Grass)

Bromus secalinus. Linn.—Chess, Cheat. (Plate 24.)

Roots.—Annual, fibrous.

Culms.—Simple, round, erect, and smooth, about 3 ft. high.

Leaves.—Broadish, flat, pointed, ribbed, rough on edges and under surface, downy above.

Inflorescence.—Spreading, drooping, little branched, diffuse panicle.

Spikelets.—Oblong-ovate, 7-10 flowered.

Glumes—Empty, unequal, acute, and awnless;

Flowering, shorter than palet, short awn or awnless.

Palea.—Two keeled, grain adhering to palea, strongly nerved, the nerves fringed with bristles.

Flowers—July 1-10.

"The idea that chess is degenerated wheat is erroneous and entirely without foundation. Chess seed will produce chess and only chess."

Chess is most commonly found among wheat and rye. The flour obtained from it is dark colored and narcotic. Care in the selection of seed grain and careful cultivation tending to prevent the maturing of these seeds are the chief remedies.

To the same order belong the brome grasses of which there are many varieties. Perhaps the best is *Bromus inermis* (Awnless Brome Grass), which is highly spoken of in some parts of the United States, but which is not sufficiently well known in Ontario to be pronounced upon.

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Plate 24. *Bromus secalinus* (Chess.)

Avena fatua. L.—Wild Oat. (Plate 25.)

Roots.—Annual, fibrous, thickened at base.

Culms.—Erect, simple, smooth.

Leaves.—Leafy, linear, flat and rough.

Infloresence.—Loose panicle, nodding, branched, and spreading.

Spikelets.—Pendulous and long.

Glumes.—*Empty*, large, long, and unequal;
Flowering, rounded on back, 5-11 nerved, bearing a bent awn and covered with long brown hairs.

Palea.—Shorter than its glume, ribbed, green along the margin, fringed at edge.

Flowers—in July.

Wild Oats are at home in any soil that will grow cereals, and they ripen their seeds among almost any cereal crop. The seeds possess wonderful vitality, some of them remain- ing buried in the soil for years and germinating as soon as they are brought under favor- able conditions.

From what has been said, it follows that on a field infested with wild oats, cereal crops should be dropped out of the rotation as far as possible; and hoed crops, soiling crops, hay and pasture should take their place. To get the land under grass, it should b fallowed during part of the season, the cultivation being frequent and shallow, to destro all seeds that may have germinated in the upper layer of soil. The land can then b sown with winter wheat and seeded, or with an early variety of barley, which should be cu on the green side. The treatment mentioned, is suitable for pasture land, or land whic has produced a hay or soiling crop during the fore part of the season.

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Plate 25. *Avena fatua* (Wild Oat.)

Setaria glauca. Beauv.—Foxtail, Yellow foxtail, Bottle grass, Puss grass, Pigeon grass. (Plate 26.)

Roots.—Perennial.

Culms—Erect, about 2 ft. high, rough; sheath smooth, ligule, a fringe of hairs.

Leaves.—Flat, quite rough above, and smoother on under surface.

Inflorescence.—Dense, close spike, cylindrical, bristly, and tawny yellow in color.

Spikelets,—Ovoid, below the joint are solitary or clustered bristles, resembling awns, 6-12 in cluster.

Glumes.—*Empty*, 3, lower one small and the second shorter than the third;

Flowering, transversely wrinkled.

Palea.—Thin.

Flowers in August.

It has very little agricultural value. It is a common weed in stubble, fallow, or root fields.

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Plate 26. *Setaria glauca.* (Yellow Foxtail.)

Composition of Grasses described in this Bulletin—Compiled from Dominion and United States analyses.

Species.		Stage of growth.	Fresh or Green material.						Water, free substance.				
Technical.	Common.		Water.	Ash.	Album-inoids.	Fibre.	Carbo-hydrates.	Fat.	Ash.	Album-inoids.	Fibre.	Carbo-hydrates.	Fat.
1 Phleum pratense	Timothy	Speared	71.35	2.05	3.30	7.22	15.03	1.14	7.37	12.63	25.98	50.03	3.98
2 "	"	Seed formed	64.59	1.56	2.80	10.80	19.22	1.00	4.38	7.96	30.48	54.31	2.86
3 Lolium perenne	Perennial Rye	In flower	79.40	1.59	2.12	6.22	10.17	.50	7.72	10.50	30.83	48.44	2.51
4 Dactylis glomerata	Orchard grass	Hay	14.30	6.87	7.49	22.33	46.96	2.05	8.02	8.74	26.05	54.80	2.39
5 Festuca elatior	Meadow Fescue	In flower	74.38	1.72	2.93	9.88	10.55	.54	6.73	11.44	38.61	41.08	2.14
6 Festuca ovina	Sheep's Fescue	Just before flowering	67.00	1.85	3.26	7.85	13.21	.83	5.60	9.90	23.79	58.20	2.51
7 Arrhenatherum avenaceum	Tall oat grass	Before flowering	62.30	2.99	3.31	9.17	20.71	1.52	7.93	8.78	24.33	54.93	4.03
8 Poa pratensis	Kentucky Blue grass	In flower	66.05	2.12	4.63	7.85	18.08	1.25	6.26	13.62	23.13	53.27	3.70
9 Poa compressa	Canadian Blue grass	After flowering	66.42	2.01	3.77	7.55	19.26	.98	6.00	11.41	22.31	57.17	3.10
10 Agrostis vulgaris	Red Top	In flower	61.40	2.81	4.29	8.50	21.93	1.11	7.27	11.02	22.02	56.82	2.87
11 Alopecurus pratensis	Meadow Fox tail	In flower	70.76	2.38	3.29	7.86	14.77	.93	8.39	11.49	28.72	48.27	3.11
12 Setaria Italica	Hungarian Millet	In flower	68.06	1.91	2.91	9.40	17.24	.48	6.00	9.13	29.44	53.93	1.51
13 Anthoxanthum odoratum	Vernal grass	In flower	78.80	1.50	2.01	4.37	12.61	.71	7.09	9.47	20.63	59.45	3.36
14 Muhlenbergia Mexicana	Drop Seed	Seed formed	49.78	2.39	4.64	14.92	27.59	.68	4.77	9.25	29.72	54.91	1.35
15 Elymus Virginicus	Wild Rye	In flower	68.38	1.26	2.62	11.34	16.01	.39	4.04	8.29	39.04	47.38	1.25
16 Calamagrostis Canadensis	Canadian Blue Joint	Seed formed	56.69	2.02	4.57	16.06	19.28	1.38	4.68	10.56	36.09	45.49	3.18
17 Glyceria Canadensis	Rattlesnake Grass	Hay	14.30	6.26	6.97	21.94	48.64	1.89	7.30	8.13	25.60	56.77	2.20
18 Muhlenbergia Glomerata	Wild Timothy	In flower	62.72	2.86	5.40	11.19	17.37	.46	7.67	14.50	30.03	46.56	1.24
19 Phalaris arundinacea	Reed Canary grass	......	67.55	2.22	5.39	7.35	16.62	.87	6.84	16.62	22.67	51.19	2.68
20 Poa serotina	Fowl meadow grass	In flower	67.57	2.18	3.93	11.83	13.54	.95	6.74	12.12	36.48	41.73	2.93
21 Hierochloe borealis	Indian Hay	In seed	75.32	1.64	4.93	6.14	10.68	1.29	6.63	20.00	43.25	24.88	5.24
22 Panicum Crus-galli	Barnyard grass	Hay	14.30	5.98	6.66	24.78	46.44	1.84	6.98	7.17	28.91	54.19	2.15
23 Agropyrum repens	Couch grass	In flower	72.88	2.02	4.54	8.15	11.57	.84	7.45	16.75	30.03	42.66	3.11
24 Bromus secalinus	Chess	Ripe	14.30	6.10	6.61	20.39	49.11	3.49	7.12	7.71	23.79	57.30	4.08
25 Avena fatua	Wild oat	Ripe	14.30	4.25	7.50	22.42	48.10	3.43	4.96	8.75	26.16	56.13	4.00
26 Setaria glauca	Yellow Fox tail	Seed	68.40	2.30	2.86	8.13	17.47	.84	7.94	8.52	21.94	58.54	3.06

General Observations in Conclusion.

In ordering grass seeds, it is always best to give the scientific as well as the common name of the varieties ordered. This is advisable in order to prevent mistakes, for frequently the common name is applied to different varieties by different people.

Grass and clover seeds form a common medium for the distribution of weed seeds, and it therefore becomes necessary for the buyer to exercise great care in his selection. Only responsible dealers should be patronized.

In the preparation of the soil for grass seeds, fertility, cleanliness, and fineness of tilth are of prime importance. It is the height of folly to sow grass seed on poor, dirty, badly cultivated soil. The cleaning crop should precede the grass, and it is just as unreasonable to expect a good crop of hay from poor soil as it is to expect a heavy crop of grain under like conditions. Also, the finer the state of tilth to which the land is worked, the larger is the percentage of grass seeds which will germinate, and the better able are the young plants to withstand the summer drouths.

Care should also be taken not to cover grass seed deeply. In light soils they admit of being covered more deeply than in clay, but in any soil light covering is in order. If a harrow is used after the seed is sown it should be a very light one; but rolling is usually sufficient.

The question of grass mixture is a very complicated one, and it is impossible to state which would be the most suitable mixture for all conditions. It is highly probable that the old standard mixture of timothy and clover will continue to be used in many districts for years to come. As noted before, however, timothy has many deficiencies as a pasture grass, and does not compare with orchard grass, fescue, or tall oat grass, for this purpose. Its great powers of remaining green during droughts, and the strong vitality of its seeds, render orchard grass particularly valuable for pasture.

Though no attempt is made to dictate regarding seed mixtures, it is perhaps not out of place to give a few examples. A mixture that has been used on the College Farm is as follows:

Red clover	6 lb.
Alsike	3 "
Timothy	4 "
Perennial Rye Grass	2 "
Total	15 lb. per acre.

This mixture is for meadows that are to be broken up at the end of the second year. The alsike clover not only gives variety, but, if there are any low places in the field, it thrives much better on the low land than the red clover. The value of perennial rye grass in the mixture is doubtful, and on many soils it may profitably be discarded; or, perhaps better still (if the land is to be pastured during part of the time), its place may be taken by orchard grass.

For permanent pastures, or lands that are to be pastured for several years, the following mixture was suggested by Mr. Zavitz, our Experimentalist, in the College Report for 1893:

Orchard grass	4 lb.
Meadow Fescue	4 "
Tall Oat grass	3 "
Timothy	2 "
Meadow Foxtail	2 "
Alfalfa	5 "
Alsike clover	2 "
White clover	1 "
Yellow clover	1 "
Total seed per acre	24 lb.

The foregoing mixture was not given by Mr. Zavitz as conclusive, nor is it offered here as such. On low, rather wet lands, or on land with a stiff clay subsoil, it would be little use to sow Alfalfa, and grasses could be selected to take its place. Thus a great many changes could be made in the mixture to suit the conditions under which it was to be sown, without materially altering its value.

For lawns, the following will be found a very satisfactory mixture :

Kentucky Blue Grass	5 lb.
Red Top	5 "
White clover	5 "
Total	15 lb. per acre

Rhode Island Bent *(Agrostis canina)* might be substituted for red top, or a less quantity of white clover might be used, according to the taste of the user.

As a rule, it is unsatisfactory to purchase any prepared seed mixtures. It is far better to deal with some reliable seedman, order seeds by their scientific as well as their common names, and prepare a mixture to suit oneself. By following this plan a person knows what he is getting ; but ready made mixtures frequently contain an abundance of trash, utterly worthless for the purpose intended.

Liquid Paris Green.

We also made some experiments with what is known as "Liquid Paris Green," sold exclusively by the Liquid Paris Green Co., of Toronto. This material appears to be the waste product obtained when making Paris green, and contains a considerable quantity of free acid.

We tested the mixture on tomato plants in one of the College greenhouses. The plants were from twelve to eighteen inches high, and were in vigorous growth. In applying the mixture, care was taken to have it evenly distributed. An atomizer was used in most cases ; and the results were as follows :

One part of liquid Paris green to	15	parts of water :	Plant was completely destroyed in eight hours.
" " "	20	"	" " "
" " "	25	"	" " "
" " "	30	"	" " "
" " "	40	"	" " "
" " "	50	"	Plant destroyed.
" " "	60	"	"
" " "	75	"	"
" " "	80	"	Plant badly burnt.
" " "	90	"	Only the younger leaves burnt.
" " "	100	"	Tips of young leaves burnt.

No higher strengths of the liquid Paris green were tried, as these results, together with the chemical tests, fully established the fact that there was a large quantity of acid present. In order to neutralize this, lime was added, till the mixture turned red litmus blue. This was sprayed on tomato plants, diluted thus :

One part of liquid Paris green and lime to	25	parts water :	Plant burnt.
" " " "	50	"	Plant all right.
" " " "	80	"	" "

The strongest mixture of the neutralized liquid, one to twenty-five was also applied to the foliage of gooseberry bushes, plum trees, and apple trees, with no harmful results. The outside tests upon fruit trees were, however, hardly satisfactory, as the frost of the nights of 14th, 15th, and 16th May, injured the foliage to such an extent, that it was hard to tell whether the frost had done the injury or the liquid Paris green. Even some time after the 16th May it was very hard to conduct reliable experiments in this locality, on account of the devastation of foliage by the frost. The following strengths were used on apple trees:

One part liquid Paris green to 40 water		All burnt the foliage badly
" "	50	
" "	60	
	75	

causing dark blotches on the leaves, where the mixture had collected in drops. In many places, the tissue of the leaf was completely eaten away, nothing but the nerves and mid rib remaining. The older leaves naturally showed more power of resistance than the younger ones.

The effect of the mixture upon the Forest tent caterpillar, (*Clisiocampa Sylvatica*) was also tried.

Liquid Paris green, one part to 100 parts of water, killed the caterpillar in two or three days. After eating a hearty meal, these caterpillars appeared quite sick, either keeping very still, or spinning a little web and remaining within till dead. The body shortened and swelled somewhat, and at the end of the third day all were dead.

Stronger mixtures, one to twenty-five and one to fifty, were also used, with like results. Control caterpillars, kept under the same conditions as those experimented upon but having unsprayed food, remained healthy and made good growth.

The Company on learning the results of our tests, proceeded to neutralize the liquid Paris green with soda ash, which gave the mixture a bright green appearance. This was applied, one part to fifty of water, also a strength of one to sixty, on potatoes. The plants were badly scorched and ultimately died. The same strength killed respectively ten per cent. and eight per cent. of the potato beetle. When neutralized with lime, however, it produced no harmful results on potato foliage.

No further experiments were carried on, as I left to attend the hygienic laboratory of the University of Michigan for part of the summer months. On my return, I had to see about the equipment, etc., of the Bacteriological Department. As the new laboratory was not finished till the beginning of December, I had not much time for further original work.

Fungous Diseases.

A circular letter was sent out to the florists of the Province, making inquiry as to whether they were troubled with fungous diseases in their greenhouses, and asking for specimens of affected foliage. A few sent answers to our questions; and experiments are now being conducted in our own greenhouses, to find a satisfactory remedy for these fungous pests.

Rose Mildew.

By the use of these two mixtures, the Carnation Rust and Rose Mildew have been kept well in check in our own houses. Also plants sent us by florists, which were literally covered with rust, have been much benefited by the treatment; and no sign of rust is manifest on the new growth. Of these two, the first seems to be the better for the Rust, although good results have ensued from the use of the potassium sulphide. The last, however, is to be preferred for roses, as it does not injure the bloom, even if the nozzle is held for a minute close to the flower.

By following out these simple methods much valuable bloom can be saved.

That the damage from such fungi is considerable, may be gathered from the fact that one grower estimated his loss from Rose Mildew to be between $400 and $700; another stated that his loss from the Carnation Rust last year was not less than $250.

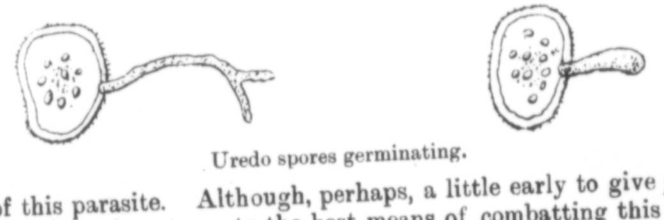
Further experiments are being carried on; and, as results are obtained, information will be given to the public.

Carnation Rust.

The Carnation rust, (*Uromyces carophyllinus*, Schrank) seems to be the most prevalent and injurious in the greenhouses throughout the Province. This appears as rusty blotches, which burst the skin, or epidermis, of the plant and scatter their spores in all directions. These, as soon as they touch other portions of the plant, immediately germinate and force their long tubular filaments, (*hyphar*) through the stomata, or minute openings of the leaves, penetrate the tissues, and thus sap the vitality of the plant. A camera lucida drawing, from a section of a leaf, is here given, which will explain the man-

Section through a Carnation leaf, showing the uredo spores *in situ*, and the mycelium made up of hyphal threads penetrating the tissues ; the growth of the fungus rupturing the epidermis.

a Uredo spores. *b*. Pedicels supporting the spores. *c*. Ruptured skin or epidermis of the plant. *d*. Hyphal threads passing between the *e*. Palisade cells of the leaf.



Uredo spores germinating.

ner of growth of this parasite. Although, perhaps, a little early to give *positive* informa tion from our own experiments as to the best means of combatting this pest, the follow ing mixtures appears to give good results ; but, in order to be successful, the sprayin should be done every week, or, at the longest, every ten days A knapsack sprayer wit Vermorel nozzle, is useful for spraying ; but, when only a few plants are to be treated, large atomizer may be used.

Mixture No. 1. Ammoniacal copper carbonate.—Copper carbonate, one ounce ammonia, about one pint, or enough to dissolve the copper carbonate ; and water, nin gallons.

If glucose is added to this mixture, it will stay on the leaves better, as all solutio used on the carnation, on account of the shape of the foliage, are apt to run and colle in drops at the base or tip of the leaf.

Mixture No. 2. Potassium sulphide, quarter of an ounce ; water, one gallon.

This seems to be very effective against the Rose Mildew (*Sphærotheca pannosa*, Wallr and, as it does not mark the foliage or the bloom, florists should give it a fair trial. Spra ng once a week, and, and in addition, painting the hot-water pipes with a mixture equal parts of sulphur and lime, will produce satisfactory results.

Class Room and Laboratory Work.

The recent increase of laboratory accommodation and equipment will enable us hereafter to give a much broader and more exact knowledge to our students. Since my course at Cornell University, many of the methods in vogue there have been used with much success and satisfaction here. I speak with special reference to vegetable histology. In order to place plant pathology on an equal footing, it will be necessary to purchase a herbarium of *cryptogamic* plants, to serve as a formation upon which to build a good collection. It takes considerable time, which, unfortunately is not at my disposal, to collect and classify such material. Should this be done, a good knowledge of cryptogamic botany could be imparted. Without such collection, the task of demonstration is almost impossible

The Library.

During the year, a number of valuable books have been added to the library; but it cannot even now be said that it is up to date. The necessity of having it considerably enlarged is more urgent now than formerly, as the change in the Third year course of study has widened the field of investigation and necessitated closer scientific research than heretofore. The amount voted for the library is entirely inadequate to meet these wants, especially as more than half the amount has to be expended on newspapers and periodicals for the reading room. At the Agricultural College in connection with Wisconsin University from $500 to $700 is appropriated annually for the library. At the Pennsylvania State Agricultural College, 720 volumes were added in 1895, and their library at present numbers some 11,000 volumes. Alabama has $600 voted for the purchase of new books, while the Massachusetts Agricultural College contains 17,000 volumes and adds 800 to 1,000 every year, and the librarian is given such powers, that "he never hesitates to purchase new books, and tries to keep each department balanced with the others." From these facts, it will be seen that we are somewhat behind in the matter of library, and it is to be hoped that a larger expenditure will be made in this very important part of our education equipment. We are adopting the card catalogue system.

About 500 volumes have been added to the library this year, a number of them being reports and herd books which were sent free. I wrote to all the Experiment Stations and Boards of Agriculture in the United States, requesting them to have our name placed on their mailing list, and asking them to supply us the back or missing numbers of their bulletins and reports. A great many of them very courteously sent when practicable, those numbers which were missing from our shelves. I wish to thank these stations, and I have also to thank the Rothamstead Station, England, for their valuable report; also Messrs. W. Atlee Burpee & Co., of Philadelphia, for their donation of several agricultural works. The following is a list of books added during the year 1895:

Agriculture	35	Agricultural Reports	130
History	36	Sessional Papers	40
Horticulture	10	Botany	42
Dairying	14	Veterinary Anatomy	4
Zoology	5	Chemistry	12
Bacteriology	24	Physics	9
Poultry	4	Entomology	3
Poetry	13	Herd Books	33
Roads	1	General literature	12
Theology	9	Fiction	12
Essays	10	Geology	2
Biology	6	Bookkeeping	1
Biography	15	Economics	5
Travels	8	Miscellaneous	8

Reading Room.

The following is a list of the papers, journals, and magazines which are received by the College, and are for the use of the students in attendance:

(a) *Sent free by the Publishers.*

Canadian Baptist, Toronto; Christian Guardian, Toronto; Canada Presbyterian, Toronto; Monthly Weather Review, Toronto; Presbyterian Review, Toronto; Sheep Breeder and Wool Grower, Chicago; Canadian Horticulturist, Grimsby; Canadian Entomologist, London, Ont.; Bee Journal, Beeton; Acton Free Press, Acton; Ontario Evangelist, Erin, Ont.; Evangelical Churchman, Toronto; Farmers' Review Chicago; Canadian Independent, Toronto; Rural Home Journal, Kentucky; Canadian Evangelist, Toronto; Canadian Bee Journal, Brantford; Poultry Journal, Beeton; Farmers' Home, Ohio; Farmers Review, Chicago; Swine Breeders' Journal, Indianapolis; American Swine-herd, Chicago.

(b) *Furnished by the College.*

Daily Globe, Toronto; Daily Mail and Empire, Toronto; Daily Mercury, Guelph; Daily Herald, Guelph; Rural Canadian, Toronto; Poultry Review, Toronto; Farmers' Advocate, London, Ont.; Nor'-West Farmer, Winnipeg; Breeders' Gazette, Chicago; American Garden, Greenfield, Mass.; Cultivator and Country Gentleman, Albany, N. Y.; Scientific American, New York; Live Stock Journal, England; American Dairyman, New York; Hoard's Dairyman, Ft. Atkinson, Wis.; Maritime Agriculturist, Sackville, N.B.; Garden and Forest, New York; Farming, Toronto; Review of Reviews, London; Microscopical Journal, Washington.

The library is open five hours each day at the times best suited to the convenience of the students; and, for services therein. I wish to express my indebtedness to Messrs. Doherty and Hodgetts, the former for looking after the issue, etc., of books, and the latter for catalogue work.

In conclusion, I have to thank you and the Minister of Agriculture for the enterprise and liberality with which you have planned and equipped the Bacteriological Laboratory; and I trust that the work done will justify the trouble and expenditure under this head.

Respectfully submitted,

F. C. HARRISON.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, December 31st, 1895.

PART X.

REPORT OF THE EXPERIMENTALIST.

To the President of the Ontario Agricultural College :

SIR,—I have the honor of submitting for your consideration the report of the experimental department of the Ontario Agricultural College for the year 1895. The work in this department during the past year has been, on the whole, satisfactory. A larger area has been devoted to purely experimental purposes than ever before; the number of field plots has been slightly increased; several new experiments of a practical character have been started; some new varieties of farm crops have been imported; and the number of packages of seeds and fertilizers distributed among the farmers of Ontario has been greater than that of any previous year. The aim in this work, however, is not so much to increase the number of the plots and the variety of the experiments as it is to repeat for several years, in a truly systematic way and with great care and accuracy, the experiments which have been undertaken. After a test has been conducted for a few seasons the reports are greatly increased in value when presented year by year, as they give not only the result of the test in the year reported upon, but also the accumulated results of the same test of the previous seasons. You will notice in the following pages of this report that a large number of our variety tests have been carried on for seven years in succession, and also that a number of tests in methods of cultivation, in methods of planting, in the application of fertilizers, etc., have extended over a period of from four to five years. In fact, we believe that an experiment is not worth starting unless it is worth repeating through a variety of seasons, in order to obtain valuable and reliable information therefrom.

We are pleased to observe that our work in the experimental department is being appreciated more and more as time goes on. This fact is made manifest by the increasing number of letters received from farmers, seedsmen, editors of agricultural papers, etc., throughout the country; by the large number of people who visit our experimental grounds each summer; and by the increasing demand for packages of seeds of leading varieties of farm crops by farmers in nearly all sections of Ontario.

EXPERIMENTAL WORK FOR 1895.

During the past season we had in all 2,005 plots devoted to experiments with various kinds of farm crops. These were divided as follows:

Grain	654	plots.
Roots	376	"
Potatoes	364	"
Fodder crops	450	"
Grasses and clovers	59	"
Miscellaneous crops	32	"
Work in connection with the Experimental Union	70	"

We have just passed through one of the severest seasons for experimental work since my connection with the experimental department, commencing in 1886. During the first two weeks of May there was frost at the College six separate nights, the thermometer reaching as low as ten degrees above zero. The mangel wurzel plants of the different experiments were nearly all from one to two inches high at the time of this frost and were completely destroyed. The mangel seed, therefore, had to be sown the second time. The frost also injured some of the spring grains as well, but not so seriously as to prevent their recovery to a large extent. Besides the drawback from the frost, there was also a large deficiency in the amount of rainfall during the growing season, especially during the months of April and June. Great care had to be exercised in preparing the soil, in order to secure uniformity in the germination of the seed for the various experiments; and in spite of all the care exercised, a few experiments with corn and roots will not be reported upon, because of the lack of a complete germination of the seed. Notwithstanding the unfavorable season, however, we are enabled to present in this report as large a number of successful experiments as in any previous year.

The Experimental Grounds.

The land now used for experimental purposes is in a compact block, about a quarter of a mile in length and slightly more than a quarter of a mile in width. As the grounds are nearly square, and as all roads run at right angles to one another, there has been no difficulty in dividing the land into a large number of plots, uniform in shape and size. Winding roads may be beautiful in appearance, but they are troublesome in grounds devoted to experimental work. Every one of the two thousand plots used during the past year was accessible by a waggon and team. There are upwards of five miles of driveways through the grounds, varying in width from eight to twenty-three feet. These driveways are required to handle properly the crops on the various plots at the right time, and also to allow the large companies of farmers who visit the grounds from summer to summer to pass between the different ranges of plots, read the names on the labels and examine the growth and character of the various crops under experiment. Not only are the ranges of plots separated by driveways, but the individual plots of all grain experiments are divided by paths, each forty inches in width. These paths keep the grain from mixing, permit the examination of each plot from all sides, and offer an easy method of harvesting the different crops separately.

The grounds referred to are situated directly at the rear of the main College building, and as there is a general slope of the land to the south-west an excellent view is obtained of nearly all the plots from the College buildings.

Clinton D. Smith, M. S., Director of the Experiment Station and Professor of Agriculture in the State Agricultural College, Michigan, when going through our trial grounds last summer, stated that he had visited twenty-two experiment stations, and he had no hesitation in saying that in magnitude and in systematic arrangement the experimental department of the Ontario Agricultural College was ahead of anything he had seen up to the present time.

New Experimental Building.

I wish to express my thanks to yourself and to the Minister of Agriculture for s clearly placing before the Government the necessity for a new experimental buildin Through your influence there has been erected on the College grounds an excellent buil ing for our work; and we are now prepared to do better work in the experiment department than at any time in the past. We have been much in need of this buildi for several years, and feel very grateful indeed that the Government has seen fit to ere one so well suited for our work. This new experimental building is situated on t College grounds, between the Convocation hall and the residence of the Experimentali and directly in front of the College barns. The front of the building is in a line wi the front of the College building, Chemical Laboratory and Convocation hall. The ma building is 70x45 feet, and will be nearly all used for experimental work. In the ba ment there are work rooms and storage rooms for fertilizers, grains, roots, potatoes, e The ground floor contains the office for the Experimentalist, a general office for worki up reports and for mailing purposes, a seed-testing room, a large work room, and a dark room for photography. The large hall on the second floor will be devoted to a permanent exhibit of experimental products, so arranged that visitors may inspect them at any season of the year. The building is made of white brick and is heated by steam brought through underground pipes from the main College building. During the past years farmers who visited the institution during the winter months had almost no opportunity of examining the different varieties of grain which are being tested in the experimental department. This has been a great disadvantage; but we hope soon to have many valuable object lessons for the farmers who visit the institution in the winter as well as during the summer months. Please accept my sincere thanks for giving us this opportunity of making our work of so much greater value to the farmers of Ontario.

Distribution of Seeds Throughout Ontario.

One of the most extensive systems of co-operative experimental work in agriculture to be found at the present time is the one established in Ontario. During the past year we distributed over 1,700 packages of grains, seeds and fertilizers to Ontario farmers. The varieties thus distributed were those which gave the best results in a number of years' trials in our experimental department. The whole system of co-operative experimental work is thus conducted in close connection, and in perfect harmony with our experimental work at the College. They go hand in hand; each made very much better by the help of the other. This work was started on its present plan in the spring of 1886, with twelve experimenters, who received grain and fertilizers, carried out the necessary instructions and reported at the end of the season. For the first two or three years the experiments were confined almost entirely to the ex-students of the Agricultural College; but, as many other farmers expressed a desire to join in the work, the invitation was extended to them also, and material was sent to those who applied on the condition that they would be careful to follow the necessary instructions and report the results of their tests after harvest. The work has steadily increased since its commencement, and during the past four years the demand has been so great that we have been unable to supply material to the full number of applicants. In 1891 there were 2,642 plots; in 1892, 5,688 plots; in 1893, 7,181 plots; in 1894, 7,721 plots; and in 1895, 9,179 plots used for these co-operative tests over Ontario.

The Ontario Agricultural and Experimental Union.

As the work of the experimental department of the College is most intimately connected with that of the Ontario Agricultural and Experimental Union, it might be well at this time to say a few words in regard to this Association. The chief objects of the Union are to cherish a bond of union among those who have been connected with the College; to establish a system of co-operative experimental work throughout Ontario; to invite the co-operation of the farmers in this work; and to hold an annual meeting at the College. It will be observed from what has already been stated that the co-operative work in agriculture throughout Ontario is done conjointly by the Ontario Agricultural and Experimental Union and the Ontario Agricultural College.

Mr. T. B Terry, Hudson, Ohio, who is well known throughout Ontario as a leading farmer and agricultural writer, attended the meeting last year, and afterwards wrote a lengthy article in the *Practical Farmer* of Philadelphia, dated January 5th, 1895, descriptive of the work of the Union. From this article we quote the following: "I was greatly interested in the work of the Union, and had a grand time. I think all of you can see the great value of these experiments when carried on at many points scattered all over the State for a term of years. I would like to see such a union established in every State of this country. It was encouraging to see an audience composed of such bright wide-awake young men. I feel particularly indebted to the Secretary for giving me a chance to see these things with my own eyes and hear them with my own ears." For the report of the annual meeting of the Ontario Agricultural and Experimental Union, held at the Agricultural College on December 12th and 13th, 1895, the reader is referred to the latter part of this volume.

THE FARM DEPARTMENT OF THE ONTARIO AGRICULTURAL COLLEGE.

The farm department is under the immediate charge of Mr. Wm. Rennie, Farm Superintendent, and is entirely distinct from the experimental department. The two departments, however, very frequently receive assistance from each other. All crops handled for experimental purposes and for distribution throughout Ontario come under the care of the experimental department; and the crops grown for feed and for sale are looked after by the farm proper. All parties desiring to carry on co-operative experimental work, should write to the Experimentalist; and all those who wish to purchase seed grain in quantity, should correspond with the Farm Superintendent.

All varieties of farm crops, such as grain, potatoes, corn, roots, etc., which were grown in the farm department during the past year, had first proven themselves to be varieties of special merit through several years' trials in the experimental department; and in many instances the seed of these new and promising varieties had been previously supplied to the farm proper by the experimental department.

EXPERIMENT STATIONS VISITED DURING THE YEAR.

I wish to thank you in this public way for giving me the opportunity of visiting several experiment stations during the past season. Early in July, when vegetation was luxuriant, I visited the experiment stations at Ottawa, Canada; Burlington, Vermont; Orono, Maine; Durham, New Hampshire; Kingston, Rhode Island; Storr's School of Agriculture, Connecticut; and Cornell University, New York State. I had a very pleasant and valuable trip throughout, and received nothing but courtesy at each of the above-mentioned institutions. I made a special study of the various lines of experimental work taken up at these different institutions; and I feel sure that the points gathered here and there will enable us to do better work at this institution. I might say that the Agricultural Experiment Station of Amherst, Mass., is one well fitted for doing excellent work; but I believe that none of the institutions are better equipped for experimental work in agriculture than our own institution is at the present time.

Besides visiting the above-mentioned agricultural experiment stations, I had an opportunity of visiting a number of seedsmen's trial grounds during the past season. Among the seedsmen visited were Jas. J. H. Gregory, Marble Head, Mass; Rossin, Boston, Mass.; Jas. Vick's Sons, Rochester, New York; and J. S. Pearce, London, Ont. Mr. Gregory is an enthusiast in his work and carries on many trials of various kinds on his extensive grounds north-west of Boston. Mr. Rossin has ten acres of land under glass houses, besides two or three good-sized farms which he uses for his work.

FARMERS WHO VISITED OUR EXPERIMENTAL GROUNDS DURING 1895.

A large number of farmers visit the Agricultural College annually, and pass throug and examine the work of the experimental department. We are pleased that agricultur ists are enabled to visit the institution and examine for themselves the experimental wor which is being carried on. We believe that this is increasing the interest in the report which are issued annually. The best time to examine the crops when growing on th plots, is perhaps during the month of July, just before the winter wheat is harvested, at that period none of the crops have been harvested, and nearly all have a fair growth although some are yet quite small. A great many of the visitors come to the College b tween the time of haying and harvest. During the month of June of the present ye thousands of farmers examined the crops which were under experiment at this plac There were only a few days during the month of June that the writer did not go throu the experimental grounds from one to five times each day with parties varying in numb from ten to 800 persons. The number and the variety of the questions asked duri those trips are known to none better than to the writer. The person who obtains t greatest advantage from the trip through our trial grounds is he who, with pencil a book in hand, spends some time in close examination of the different crops on the vari plots. A visitor can obtain a fair knowledge of our experimental work even without a guide, as nearly every plot is plainly labelled. We believe that many very valuable object lessons can be obtained even during a day's visit at the College in the month of June.

Exhibits.

It has been the custom of the experimental department to prepare an exhibit for the leading exhibitions during each of the past seven years. An exhibit of nearly all the varieties of grain and corn was made at Toronto and London in each of the years 1889, 1890, 1891, and 1892. In the year 1893 an exhibit was taken to Chicago and arranged in the Agricultural Hall of the World's Columbian Exposition; and, owing to the time required for this exhibit, no display was made in Ontario. During the past two years our work has been so heavy at the time of the fall shows, that we have been unable to exhibit at any of the fairs in Ontario, except the Central Exhibition at Guelph. In September last an exhibit was made at Guelph of particular varieties of grain, millet, corn, roots, and fodder crops; the product of one pumpkin seed, from which was obtained twelve large-sized pumpkins, making an aggregate weight of 616½ pounds; and also of one squash seed, which gave nine well-developed squashes, making an aggregate weight of 551 pounds. Throughout the exhibition a person was in charge, to give information in regard to the results of the tests conducted in the experimental department, and in regard to the course of instruction given at the College.

Publications of the Year.

During the year 1895, the following have been prepared by myself for publication by the Department of Agriculture: A bulletin on winter wheat; the annual report of the experimental department of the Agricultural College; and the annual report of co-operative experiments in agriculture in connection with the Ontario Agricultural and Experimental Union. The following articles have also been prepared for the newspapers throughout Ontario: "Summary report of co-operative experiments with winter wheat;" "Crimson clover in Ontario;" "Growth of rape at the Agricultural College;" and "The Ontario Agricultural and Experimental Union."

Meetings Attended.

Since the first of December, 1894, the writer delivered addresses at the Dominion Sheep Breeders' Association, the Central Farmers' Institute of Ontario, the Ontario Agricultural and Experimental Union, and Farmers' Institute meetings in eighteen localities throughout York, Ontario, Peterborough, Victoria, Northumberland and Perth counties. It is encouraging to find an increasing interest in the various agricultural meetings from year to year.

Correspondence.

As time goes on, the correspondence in connection with the experimental work is becoming greater and greater. During the past year a great many letters have been received and answered relating to a large variety of agricultural subjects. To give some idea of the magnitude of the correspondence in connection with this department, it might be stated that during one week in September no less than 459 letters were received. This was perhaps the greatest number received in any one week. The increasing number of letters sent to this department may be taken as one of the strongest evidences of the growing interest in our experimental work; and I may say that we are always pleased to answer such correspondence to the best of our ability.

Grain Experiments.

The plots devoted to grain experiments during the past year number in all six hundred and fifty-four. These varied in size from one-sixth to 1-100 of an acre, but the majority were uniform in shape, each being one-tenth links wide, by 100 links long, thus being exactly 1·100 of an acre. Great care is exercised in having the plots in the separate experiments of a uniform size and shape. In all instances, the plots are in the form of a rectangle, and a stake is driven in each of the four corners of every plot. In the majority of cases, the grain is sown broad-cast. When this is done, a line is run around the different plots, and the packages of grain are then sown upon their respective plots, inside of the inclosures made by the line. Notes are carefully taken during the entire season, of the crops grown upon the various plots. Each crop is harvested when in the proper condition. As there are so many experiments in grain growing, it is necessary, during the greater part of July and August, to have the work along several lines conducted systematically during the same period. For instance, it is necessary to take notes and perform the various duties of cutting the grain, hauling the grain to the barn, threshing the crops, and cleaning up the threshed grain simultaneously. We are, however, now very well equipped to carry on these various lines of work at the same time. We have a waggon with a rack made specially for the work, by which the crops from two plots can be drawn from the field to the thrashing bar in a single trip, without the varieties being mixed, and with the loss of any grain through shelling. In the loft of the experimental barn, we have a large weighing scale with a platform six feet wide, by twelve feet long; and, in nearly all instances, we are enabled to weigh the product of a whole plot at one time. The threshing is done by means of a small separator, which was made specially for our work. As the separator is run by a tread power, and both the machine and power are situated in the barn, thrashing can often be done when the weather is unfavorable, providing the crops from a number of the plots have been stored in the barn a day or two before. It is necessary to run the little separator nearly every day for several weeks during the time of harvesting.

During the past year, grain experiments have been conducted in testing varieties, dates of seeding, methods of cultivation, selection of seed, application of fertilizers, and in growing grain separately and in mixtures.

Experiments With the Varities of Grain.

A great deal of attention has been given to the testing of the various varieties of grain crops within the past seven years. When we remember that nearly five million acres of land in Ontario are devoted to grain crops annually, and consider the great value it would be to the farmers of Ontario to have their crops increased in even a very slight degree, by the introduction of new and valuable varities, we feel justified in devoting a considerable amount of attention to this very important line of experimental work. Not only have we brought together and grown on uniform plots, side by side, for a number of years in succession all the leading varieties of crops which can be obtained in Ontario but we have also imported leading varieties of grain from foreign countries, and have grown these in close proximity to our own Ontario varieties. Of nearly all kinds of grain we have been successful in obtaining a few foreign varieties surpass even the best of those obtained in Ontario, a fact which will be made evident by the study of the following pages of this report. Different varieties of grain have been imported from France, Germany, Italy, Sweden, Russia, England, Scotland, Switzerland, Hungary, Greece, Sicily, Egypt, Japan, New Zealand, England, Australia, and the United States. Of these Germany, France, New Zealand, and the United States have furnished some of the varieties which have given the best results in seven years' experiments.

In addition to growing varieties from Ontario and other places upon small-sized uniform plots situated side by side, the leading kinds are also grown on larger areas. The object of this is to increase the amount of seed of the leading varieties, for distribution throughout Ontario, and also to secure the seed to be used by the farm department of the institution. These large plots also assist in confirming the results of our experiments on the smaller lots. Besides growing the grain on the two different-sized plots, we put a certain number of kernels, usually fifty of each variety, in rows side by side. During the past season about 500 varieties of grain were sown in single rows of four links in length. This assisted us very much in our observations of the various varieties under experiment. For instance, if we notice a variety badly rusted on a small plot, we then examine the single rows; and if we find the same variety considerably rusted in this test as well as in the other, while those on both sides are free from rust, we are justified in concluding that this variety is liable to rust on our soil and in this locality. When we observe that a certain variety on the plots is becoming badly lodged, and also see that the same variety in the single rows shows weakness of straw, the two observations go to show the tendency of that variety towards weakness of straw. There are many other ways in which we can use the single row experiments in connection with the plot experiments, to obtain a more accurate and reliable knowledge of the various varieties under experiment. This method of investigation, when extended over a number of years, gives us reliable information regarding the various varieties of grain crops.

Barley, Comparative Test of Forty-one Varieties.

In 1895, forty-one varieties of barley were tested in the experimental department. Twelve of this number were six-rowed varieties, twenty were two-rowed, and nine were hulless. Eight of the varieties have now been gr wn in the experimental department for seven years in succession. In 1889, 1890, 1891, 1892, and 1893, thirty-seven kinds of barley were grown on the experimental plots side by side. After five years of careful testing, eleven of the leading kinds were selected, and the twenty-six varieties which had not given the best results were dropped out of the list. During the past year, we again dropped three of the eleven varieties grown for six years, so that we now have eight of the leading varieties grown for seven years, selected from thirty-seven varieties with which we started in 1889. We have also on our list six varieties which have been grown for six years. These are the best kinds among eight varieties which had been grown for five years previous to 1895. The varieties were all sown broadcast at the rate of 100 pounds of seed per acre, upon plots exactly one-hundredth of an acre in size. Equal amounts were sown on the different plots, seeding took place April 22nd and 23rd. The land, which might be termed average clay loam, was manured at the rate of twenty per acre of farmyard manure in the spring of 1894, and produced a crop of potatoes during that season. Each variety was harvested at its proper stage of maturity. The yields per acre have been estimated from the actual yield of the plots.

The barley crop was good during the year 1895, the six and two-rowed varieties giving an average yield of 57.5 bushels per acre. This yield surpassed that of 1894 by an average of about sixteen bushels per acre, and that of the average of the past six years by two bushels per acre. The weight per measured bushel for the past season was 53.5 pounds, which is exceedingly high for this part of the country. There is a great difference, however, in both yield of grain per acre and weight per measured bushel of the individual varieties. These facts can be readily ascertained by a careful study of the above table, where the yield per acre of both straw and grain, and the weight per measured bushel of each variety is given for the year 1895, and also for the average of the number of years in which each variety has been grown in the experimental department.

Within the past seven years no less than seventy-six varieties have been tested in the experimental department. Within the past two years, however, twenty-nine varieties have been discarded after five years' tests with each kind. The names of the varieties discarded in 1894 can be found in the College report for that year, on page 68, the varieties discarded during the present year are the Early Black from France, the Thanet from England, and the Improved Cheyne from England.

COMPARATIVE TEST OF THIRTY-TWO TWO-ROWED AND SIX-ROWED VARIETIES.

Varieties.	Seed obtained from.	Number of rows per head.	Results for 1895. Date of maturity.	Results for 1895. Weight per measured bushel.	Results for 1895. Straw per acre.	Results for 1895. Grain per acre.	Average results for number of years grown on plots. Weight per measured bushel.	Average results. Straw per acre.	Average results. Grain per acre.
				lbs.	tons	bus.	lbs.	tons	bus.
Grown for Seven Years.									
1. Mandscheuri	Russia	6	July 27.	51.66	2.05	73.10	50.89	1.83	63.09
2. Oderbrucker	Germany	6	" 24.	53.66	2.24	74.29	53 65	1.68	58.08
3. French Chevalier	France	2	Aug. 9.	54.88	1.95	66.86	52.39	1.91	55.87
4. Scotch Imroved	Ontario	6	July 22.	53.33	1.52	55.34	51.87	1.50	54.62
5. Empress	England	2	Aug. 8.	55.13	1.94	70.31	52.68	1.69	54.46
6. Common Six-Rowed	Ontario	6	July 24	54.00	1.44	58.92	52.53	1.42	52.43
7. Two-Rowed Italian	France	2	Aug. 6.	55.50	1.63	56.05	53.08	1.96	49.02
8. Kinna Kulla	Sweden	2	" 6.	53.88	1.78	48.63	51.94	1.78	48.03
Grown for Six Years.									
9. New Zealand Chevalier	New Zealand.	2	Aug. 7.	54.00	2.22	72.07	52.98	2.00	54.91
10. Mensury	Ontario	6	July 22.	53.50	1.49	60.74	51.51	1.40	53.56
11. Early Minting	England	2	Aug. 6.	55.00	1.75	59.38	52.64	1.88	52.72
12. Cape	New Zealand.	6	July 26.	49.50	1.35	43 55	47.68	1.39	52.31
13. Australian	Germany	2	Aug. 6.	54.75	2 22	59.51	53 20	1.86	52.17
14. Italian	Italy	2	July 31.	54.50	1.51	45.31	54.30	1.78	49.85
Grown for Five Years.									
15. Imperial Six-Rowed	Ontario	6	July 21.	53.33	1.91	84.83	52.23	1.57	63.11
16. Californian Brewing	United States.	6	" 26.	48.75	1.77	76.24	46.68	1.55	62.32
17. Six-Rowed Baxter's Improved	Ontario	6	" 24.	53.13	1.87	63.74	52.09	1.56	54.36
18. Californian Chevalier	United States.	2	Aug. 7.	55.00	2.96	66.28	52.26	2.14	54.2
19. Highland Chief	do	2	" 8.	55.00	1.71	58.97	52.84	1.73	52.37
20. Duckbill	Ontario	2	" 5.	54.50	1.67	46.16	52.76	1.69	49.81
21. Salzer's Californian Prolific	United States.	2	" 4.	54.00	1.60	51.89	52.77	1.65	49.20
22. Carter's Goldthorpe	England	2	" 12.	54.13	1.66	50.72	52.15	1.86	47.8
Grown for Four Years.									
23. Gold Foil Hansfords	United States.	2	Aug. 5.	55 00	1.81	65.20	52.74	1.96	52.0
24. Two-Rowed Canadian	Ontario	2	" 1.	54 13	1.59	51.37	52.65	1.63	44.8
25. Selected Canadian Thorpe	do	2	" 1.	53.25	1.63	50.91	51.73	1.65	43.2
Grown for Three Years.									
26. Four Rowed	United States.	6	July 28.	52.00	1.76	66.15	51.70	1.49	56.5
27. Vermont Champion	do	2	" 31.	55.25	1.61	53.71	53.96	1.72	50.1
28. Jarman's Selected Beardless	England	2	" 31.	55.00	1.92	61.84	51.87	1.92	49.4
29. Jarman's Golden Champion	do	2	Aug. 10.	53.66	1.79	55.63	50.91	1.71	42.2
Grown for Two Years.									
30. Scotch	United States.	6	July 26.	52.00	1.42	54.48	50.59	1.57	55
31. North-Western	do	6	" 26.	52.63	1.87	51.37	50 85	1.50	48.
32. Success	do	6	" 18.	48.50	1.43	35.41	48.07	1.44	37.

LEADING VARIETIES OF TWO AND SIX-ROWED BARLEY.

It will be observed by an examination of the foregoing table that the College h[as] been very successful in importing new varieties, which have made an excellent reco[rd] during the average of five or more years in the experimental department. Russia, Ge[r]many, France and New Zealand stand quite prominent in adding valuable varieties [for] cultivation in this province. It will be observed that the common six-rowed barley [of] Ontario is surpassed by several bushels per acre by some of the foreign varieties.

Mandscheuri. The Mandscheuri barley was imported from Russia by our College in the spring of 1889, and has been grown in the trial plots during each of the years since its importation. It is a six-rowed barley, and somewhat resembles the Mensury, which has been grown in Ontario and the United States for a longer period. Samples of the Mensury were obtained from different seedsmen in Canada and the United States, and were grown in our trial grounds for several years in succession, along with the Mandscheuri. We found that the Mandscheuri possessed longer heads, and had a more vigorous growth throughout, as well as surpassing in yield per acre, each of the samples of the Mensury barley which we secured. They were perhaps originally the same variety. In our experimental work the Mandscheuri which we imported from Russia gives considerably better all-round results than any samples of Mensury which we have been able to obtain in this country. Mandscheuri occupies first place in yield of grain per acre among all the varieties that we have grown at the experimental farm for seven years in succession, and it has given an average weight per measured bushel of about fifty-one pounds. Not only has it given the best yield among the varieties tested at our College, but, among five leading varieties distributed over Ontario for co-operative experimental work during the past four years, the Mandscheuri has headed the list in average yield per acre during each of those years. In 1895 it was selected by the experimenters, by whom it was grown, as their choice of all the varieties tested. The straw of this variety usually grows to a good length, and is not apt to lodge. It is about three days later in maturing than the Common Six-Rowed variety. It will be observed that the Mandscheuri has given an average of eleven bushels per acre more than the Common Ontario Six Rowed in the experiments of seven years. In 1892 the Mandscheuri and the Common Six-Rowed varieties were two among five sent out over Ontario for testing purposes; and when the average results were made up it was found that the Mandscheuri had given about ten bushels per acre more than the Common Six-Rowed on the farms upon which they were tested.

Oderbrucker. The second variety on the list in average yield per acre for seven years is the Oderbrucker, which was imported from Germany in the spring of 1889. This variety is not quite so stiff in the straw as the Mandscheuri, and has produced an average of about five bushels per acre less than that variety; but a very strong point in its favor is the heavy grain which it produces. During the past seven years it has given an average weight of 53.6 pounds per measured bushel of grain, as compared with 50.9 pounds given by the Mandscheuri. It is interesting to observe that the Oderbrucker and the Mandscheuri, which were tested over Ontario during the past year, gave almost the same relative results in yield per acre over Ontario, as in the College tests for seven years. The Mandscheuri gave an average of 35.3 bushels per acre, and the Oderbrucker an average of 29.7 bushels per acre in the co-operative tests, which is 5.6 bushels in favor of the Mandscheuri.

Two-Rowed Italian. Although the Two-Rowed Italian occupies a lower place in yield per acre than the French Chevalier or Empress, which are also two-rowed varieties, still the Two-Rowed Italian has in its favor several points not possessed by the other two kinds. The Two-rowed Italian is one of the stiffest-strawed varieties of all those that have been tested at the Agricultural College during the past seven years. It will also be observed that the grain is of an excellent quality, as the average weight per measured bushel for seven years is a little over fifty-three pounds, while that of the French Chevalier and Empress is 52.4 and 52.7 pounds respectively. The Two-Rowed Italian was distributed over Ontario during the past season and gave nearly as large a yield per acre as the Oderbrucker, although it was not quite so popular among the experimenters as either the Mandscheuri or the Oderbrucker. Among the two-rowed varieties the Two-Rowed Italian has made the best all-round record.

Imperial Six Rowed. The Imperial Six-Rowed barley, the seed of which was obtained in Ontario, has made a very good record indeed during the five years in which we have had it growing in the experimental department. It has produced a grain which has given on the average about 52.3 pounds per measured bushel. It is if anything a little earlier than the common six-rowed barley, and possesses a straw which weighs on the average about one-fifth of a ton more than that of the common variety.

Hulless Barley, Comparative test of Nine Varieties.

The Hulless barleys grown during the past year number nine varieties. They were sown on the same-sized plots, on similar soil, and at the same time as the two and six-rowed varieties which have been mentioned. The seed of the hulless varieties has been obtained from Hungary, Sweden, France, Germany, the United States, and Ontario.

Comparative Test of Nine Hulless Varieties of Barley.

Varieties.	Seed obtained from.	Number of Rows per Head.	Results for 1895.				Average results for number of years grown on plots.		
			Date of maturity.	Weight per measured bushel.	Straw per acre	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for six years.				lbs.	tons.	bush.	bs.	tons.	bush.
1 Black Hulless.......... ...	Ontario	6	July 26	63.25	1.83	54.90	63.53	1.61	**41.29**
2 Hungarian..................	Hungary	6	do 29	59.00	1.80	46.56	59.19	1.60	**40.41**
3 Guymalaya	Sweden	6	do 29	57.00	2.39	56.30	58.08	1.42	**39.93**
4 Large Skinned	France	2	do 22	60.63	2.05	51.72	60.11	1.55	**33.44**
5 Three-Rowed	Germany	6	do 29	62.50	2.01	46.20	60.83	1.29	**28.39**
Grown for three years.									
6 Guy Mayle	United States.	6	July 24	60.88	1.73	60.52	62.15	1.32	**47.07**
7 Purple	do	6	do 26	63.33	2.05	55 94	63 46	1.84	**46.45**
8 Winnipeg No. 2............	do	6	do 24	60.25	2.07	50.89	60.36	1.73	**42.22**
9 Smooth Hulless............	do	6	do 29	62.00	2.15	34.84	62.17	1.76	**36.17**

The average yield per acre of the nine hulless varieties tested in 1895, was 50.9 bushels, allowing the standard weight per measured bushel to be forty-eight pounds. The weight per bushel of the hulless barley, however, is much greater than that of all the six and two-rowed kinds. In 1895 the weight per measured bushel of the hulless varieties averaged sixty-one pounds.

Leading Varieties of Hulless Barley.

It will be observed from the foregoing table that the variety from Ontario heads the list in yield of grain per acre, but, in all-round results, varieties from Hungary, Sweden and United States have made good records, among those grown for three or six years.

Black Hulless. The variety of hulless barley which has been grown over Ontario for a number of years, and is known as the Black Hulless, now occupies the head place of the list in yield of grain per acre, among those grown for six years in succession. It has also given the heaviest weight of grain per measured bushel, the average for six years being 63.5 pounds. The greatest drawback to the Black Hulless is its exceedingly weak straw. A crop of this variety is very apt to be badly lodged, and at time of harvest the plants are frequently lying flat on the ground. On some soils, however, where there is not much trouble through the straw lodging, the Black Hulless might be grown very successfully for feed.

Hungarian. In 1889, the Hungarian barley was imported from Hungary and has now been growing for six years in succession in our trial plots. It possesses a very beautiful white grain, which, however, does not reach the sixty pounds per measured bushel. It usually stands up well, and where it has been grown over Ontario, has given fairly good satisfaction.

Guy Mayle. The Guy Mayle, which was presented to us through the kindness of the Experiment Station of Kansas, has given very good results indeed. During the three years in which it has been grown, it has given an average of forty-seven bushels per acre, and the grain has weighed a little over sixty-two pounds per measured bushel.

Comparative test of Forty-seven Varieties of Peas.

Varieties.	Date of maturity.	Results for 1895. Weight per measured bushels.	Results for 1895. Straw per acre.	Results for 1895. Grain per acre.	Average results for number of years grown on plots. Weight per measured bushel.	Average results for number of years grown on plots. Straw per acre.	Average results for number of years grown on plots. Grain per acre.
Grown for Five Years.		lbs.	tons.	bush.	lbs.	tons.	bush.
1 Early Britain	Aug. 12	61.75	1.04	39.56	60.25	1.22	**37.62**
2 White Wonder	" 5	64.50	1.11	41.40	63.12	1.09	**37.03**
3 Mummy	" 12	64.25	1.62	43.37	63.63	1.55	**36.45**
4 Field (New Zealand)	July 31	62.13	1.30	43.30	62.58	1.28	**35.64**
5 Brown (New Zealand)	Aug. 13	60.75	1.25	40.97	59.58	1.49	**35.05**
6 Prussian Blue	" 15	61.33	1.71	31.40	62.11	1.41	**33.66**
7 Princess Royal	" 7	60.75	1.18	36.35	60.21	1.20	**32.92**
8 Blue (New Zealand)	" 12	64.25	1.00	35.75	62.40	1.17	**31.73**
9 White Eyed Marrowfat	" 12	63.13	1.28	33.98	62.16	1.40	**31.35**
10 Black Eyed Marrowfat	" 12	61.88	1.00	29.13	61.46	1.34	**31.19**
11 Glory	" 5	62.50	1.51	49.58	61.33	1.29	**31.04**
12 Early Racehorse	" 7	60.50	1.22	34 27	62.43	1.24	**30.89**
13 Multipliers	" 14	62.13	1.71	33.13	61.89	1.59	**29.69**
14 Sweet Jessie	" 12	61.13	1.06	35.50	62.03	1.08	**29.66**
15 Hero of Reading	" 1	63.75	1.34	41.98	60.84	1.15	**28.17**
16 Perfection White	" 5	61.13	1.19	37.73	60.01	1.21	**27.53**
17 Selected Maple	" 5	60.13	.80	24.27	61.87	.71	**26.37**
Grown for Four Years.							
18 Tall White Marrowfat	" 12	62.88	1.49	42.72	61.59	1.68	**37.35**
19 Canada Cluster	" 13	63.25	1.50	32.47	62.31	1.63	**33.45**
20 New Canadian Beauty	" 12	61.33	1.32	35.87	61.74	1.39	**32.91**
21 Cleveland's Advancer	" 14	61.33	1.58	34.95	60.60	1.44	**32.41**
22 Royal Dwarf Marrowfat	" 13	62.00	1.59	37.97	60.79	1.55	**31.91**
23 Early June	" 13	62.00	1.50	38.23	62.44	1.45	**31.89**
24 Centennial	" 16	61.33	1.46	34.55	61.16	1.29	**31.87**
25 Golden Vine	" 13	61.25	1.17	31.88	61.77	1.46	**31.73**
26 McLean's Advancer	" 12	54.63	1.16	34.77	54.08	1.02	**31.17**
27 Scotchman	" 15	61.75	1.98	33.23	62.40	1.87	**30.74**
28 Prince Albert	" 24	61.50	1.77	40.10	61.70	1.57	**29.42**
29 Sword	" 13	61.33	1.58	40.78	61.87	1.44	**29.35**
30 Potter	" 12	60.13	1.54	41.10	60.77	1.27	**27.89**
31 Canada Field	" 19	61.33	1.40	36.53	61.11	1.35	**27.62**
32 Oakshott Field	" 28	54.25	2.25	38.33	53.70	1.60	**25.00**
33 Striped Wisconsin Blue	" 14	62.50	2.00	39.90	62.52	1.45	**23.80**
34 Pride of The North	" 5	63.00	1.07	25.22	59.69	1.03	**21.26**
Grown for Three Years.							
35 Chancellor	July 30	65.00	1.52	53.55	63.88	1.41	**38.88**
36 Egyptian	Aug. 19	63.00	.99	48.80	60.50	1.03	**38.03**
37 Nimble Taylor	" 13	60.50	1.56	49.55	59.05	1.31	**37.46**
38 William The First	July 31	59.75	1.35	46 62	59.56	1.12	**35.47**
39 Common Gray	Aug. 13	58.33	1.90	42.47	58.28	1.48	**34.61**
40 Fine Pod	" 13	60 25	1 53	43.98	59.04	1.40	**33.93**
41 D'Auvergne	" 1	65.00	1.43	44.95	62.50	1.16	**32.06**
42 Tall Turkish	" 7	61.88	1 17	41.82	61 02	1.23	**30.47**
43 White Imperial	" 13	59.00	2.04	44.62	60.65	1.37	**30.29**
Grown for Two Years.							
44 Improved Gray	Aug. 13	60.13	1.42	54.22	60.69	1.19	**38.83**
45 Crown	" 12	61.00	1.64	42.13	61.13	1.60	**34.19**
46 Coffee	" 15	59.00	2.04	36.02	60.13	1.64	**27.60**
Grown for One Year.							
47 White Hundredfold	....	61.75	1.78	52.30	61.75	1.78	**52.30**

Forty-seven varieties of peas were grown in the experimental department in 1895. Of this number, seventeen varieties have been grown on plots side by side for five years in succession, seventeen for four years, nine for three years, three for two years, and one for one year. Seed of all varieties was sown on the 24th of April upon plots exactly one one-hundreth of an acre in size. The soil on which the peas were grown during the past season was a clay loam, and the land had a gradual slope towards the south-west. Potatoes were grown on the same plots in 1894. The seed was put in with a grain drill, in order that it might be evenly covered The quantity of seed sown averaged from two to five bushels per acre, according to the size of the grain and the manner of growth of the various kinds. The yields per acre have been estimated from the actual results of the plots.

The yield of peas per acre during the past season was very good indeed, the highest yield being 53.5 bushels per acre, and the lowest 24.5 bushels per acre. The weight per measured bushel was also good during the past season, as we find that five varieties gave an average weight of over sixty-four pounds per measured bushel.

Leading Varieties of Peas.

As in the case of barley, we find that some of the foreign varieties have given very excellent results in comparison with those which have been grown in Ontario for a number of years. The best yielding variety among those grown for five years was one obtained from England, and the second best yielding variety was obtained from New Zealand, while the third is an Ontario variety.

Early Britain. The Early Britain variety of peas was imported from England in the spring of 1889, and in the average yield per acre of all the varieties grown successfully in our trial plots for five years in succession, it heads the list. The straw is of medium length; the pea is brown and a little flattened at the sides. The blossom is purple, and, when the plants are in bloom, the crop presents a very handsome appearance. It is about the same as Golden Vine in its time of ripening, but has given an average of over five bushels per acre more than the average of the Golden Vine during the four years in which the latter variety has been in our trial plots.

The Early Britain has not yet been sent out over Ontario for co-operative experimental work owing to the limited quantity of this variety in our possession.

White Wonder. Among a number of varieties of peas which were imported from New Zealand a few years ago, the White Wonder has made the best record, and stands second in point of yield of grain among all our varieties grown for five years. It is surpassed by the Early Britain by a little less than two-thirds of a bushel per acre. The grain is smooth and white, and is somewhat smaller in size than that of the Early Britain; and its weight per measured bushel, during the past five years, has been upwards of sixty-three pounds. It is about one week earlier than the Golden Vine in reaching maturity. The number of pods per plant of this variety averaged from seventeen to thirty-three, in 1895. This variety has not yet been sent out over Ontario in connection with the system of co-operative experimental work, owing to the supply of seed being too limited.

Mummy. The variety of peas obtained in Ontario which has given us the largest yield per acre, among the varieties grown for five years, is the Egyptian Mummy. This kind has made a very good all round record, its average yield per acre being over thirty-six bushels and its average weight per measured bushel being 63.6 lbs., which is one of the highest weights of the varieties which we have had under experiment. The straw also grows long and is of a rather coarse nature. In wet seasons the Egyptian Mummy shows a tendency to mildew to a considerable extent. The season of 1895 appeared to be well suited to the Egyptian Mummy variety as it gave a weight per measured bushel of upwards of sixty four pounds. In the co-operative work over Ontario during 1895 the Egyptian Mummy gave the highest yield per acre among four leading varieties which were tested on seventy-two different farms. The results however were very similar to those of the Prussian Blue variety, and these two might be considered as practically the same in regard to yield of grain per acre. The Prussian Blue however was rather more popular among the experimenters than the Egyptian Mummy.

Prussian Blue. It will be observed in the list that the Prussian Blue now occupies sixth place in the yield of grain per acre, among the varieties grown for five years. During the past season it did not do so well as a large number of other varieties. This seems to have been due partly to injury received from the frost in the early part of May, at which time the plants were about two inches in height. But the Prussian Blue variety has made a very good all round record during the past five years at the Agricultural college. In the co-operative experiments over Ontario, the Prussian Blue has been one of the four varieties sent out during each of the past three years, and it gave the largest yield per acre in 1893 and 1894, and during the past season it was surpassed to only a very slight extent by the Egyptian Mummy.

Chancellor. The Chancellor variety of peas, which was obtained from the United States three years ago, has made a very good record indeed, and during the past season has given the largest yield of grain of any variety under experiment, with but one exception. It has alse given the best average weight of grain per measured bushel of the varieties tested since 1889. The vines are of medium length and the pods are quite small The individual peas are perhaps the smallest in size of any variety that we have been testing. They are very smooth, white and round, and worthy of further trials.

Egyptian. One of the most peculiar varieties of peas that we have had any experience with is the Egyptian, or what is sometimes called the Brazilian coffee pea. The growth of this variety is upright, and the branches, which extend from the main stocks, are very numerous. The crop usually grows to a height of about one foot, and has blossoms which are beautiful and white. There is usually only one pea in each pod; but, during the past season, we found in many instances two, and in some cases three peas enclosed in a single pod. The grain is of large size and of a yellowish color. The straw is apt to be coarse, and is not relished by animals, but the grain should make good feed. It is claimed for this variety that the grain is one of the best substitutes for coffee.

Spring Wheat—Comparative Test of Fifty-two Varieties.

In the past seven years no less than seventy-nine varieties of spring wheat have been tested in the experimental department at the College. After growing twenty-two of those varieties during the years 1889, 1890, 1891, 1892, and 1893, thirteen of the less profitable kinds were dropped from the list, and the experiments were continued with the nine leading varieties. Among twenty-one varieties which were grown in 1890 for the first time and during each following year up to the present season, eleven of the poorest kinds were dropped from the list in the spring of 1895, and the ten leading varieties were again sown the past season. From this it will be seen that during the two years no less than twenty-five varieties of spring wheat have been dropped from our experimental list, after they had been tested for five years in succession. New varieties have been added year by year, and now the number of those under experiment is upwards of fifty. The varieties of spring wheat were all sown on the 20th of April, 1895, on plots exactly one one-hundredth of an acre in size. The land on which the spring wheat was grown produced a crop of roots in 1894. Before the roots were sown the land received a dressing of twenty tons of farm-yard manure per acre, which was the first it had received for at least six years. The grain was sown broadcast, and at the rate of 120 pounds per acre. The yields per acre have been estimated from the actual yields given by the plots.

The fifty-two varieties of spring wheat gave an average yield of 26.7 bushels of grain per acre during the past season. This is an intermediate yield between that produced by the spring wheat in 1894 and in 1893, as in the former year, the average was 30.3 bushels per acre, and in the latter 21.1 bushels per acre. When we consider that the old varieties of spring wheat appear to be failing in many parts of the province, we can but hope that some of the leading varieties imported from foreign countries, as well as some of the best in Ontario, may, under good cultivation, still produce fairly satisfactory yields.

COMPA[illegible]TIVE TEST OF FIFTY-TWO VARIETIES OF SPRING WHEAT.

Varieties.	Nature of head.	Results for 1895.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.
		Lb.	Tons.	Bush.	Lb.	Tons.	Bush.
Grown for Seven Years:							
1 Bart Tremenia	Bearded	63.00	2.26	46.35	62.85	1.81	**30.08**
2 Herison Bearded	"	62.50	1.56	28.85	63.20	1.97	**29.23**
3 Pringle's Champion	"	58.63	1.60	28.36	60.28	1.89	**27.15**
4 Saxonka	"	60.00	1 86	28.05	60.46	1.81	**25.58**
5 Konisburg	"	60.50	1.67	30.03	61.47	1.66	**25.11**
6 Holben's Improved	Bald	59.25	1.65	27.40	58.85	1.84	**24.70**
7 Summer	Bearded	59.00	1.58	28.91	58.00	1.77	**23.98**
8 Odessa Ghirka	Bald	61.50	1.74	31.28	59.88	1.87	**23.79**
9 Ordinary Bearded March	Bearded	60.00	1.39	26.04	58.18	1.77	**23.07**
Grown for Six Years:							
10 Wild Goose	Bearded	62.33	2.43	55.78	61.21	2.04	**35.90**
11 Red Fern	"	58.50	1.41	29.09	61.06	2 07	**32.67**
12 White Russian	Bald	57.63	1.90	31.64	58.97	1.97	**31.55**
13 Medeah	Bearded	61.00	2.26	43.02	60.96	1.73	**29.37**
14 Red Fife	Bald	59.00	1.83	32.24	61.32	1.87	**28.49**
15 Sorentino	Bearded	60.00	2.56	40.42	59.78	1.84	**28.05**
16 White Fife	Bald	59.25	1.82	31.12	61.32	1.68	**27.59**
17 Algiers	Bearded	57.13	2.04	39.58	58.00	1.85	**27.34**
18 Mountain	Bald	58.88	1.80	28.41	58.81	1.91	**25.85**
19 Colorado	Bearded	59.00	1.57	25.99	59.96	1.74	**25.09**
Grown for Five Years:							
20 McCarlin	Bearded	59.13	1.68	30.78	59.18	2.09	**28.40**
21 Manitoulin	Bald	58.88	1.66	31.46	59.71	1.72	**28.01**
22 Rio Grande	Bearded	60.13	1.81	30.39	59.51	1.91	**27.94**
23 Okanagan Valley Velvet Chaff	Bald	57.50	1.59	24.53	55 04	1.82	**27.01**
24 Saskatchewan Red Fife	"	58.33	1.21	21.25	59.44	1.66	**25.37**
25 Washington	Bearded	59.13	1.48	27 27	59.49	1.65	**25.16**
26 Salzer's Assiniboia Fife	Bald	59.33	1.22	23.46	59.19	1.50	**25.06**
27 Pringle's Defiance	"	60.00	1.00	19.22	58.81	1.39	**20.68**
28 Anglo Canadian	Bearded	59.50	1.05	17.53	55.12	1.51	**17.57**
Grown for Four Years:							
29 Wellman Fife	Bald	60.13	1.38	27.27	59.25	1.97	**29.90**
30 Lost Nation	"	60·33	1.32	26.93	59.66	1.95	**29.66**
31 Velvet Chaff Blue Stem	"	57.50	1.86	30 50	58.17	1.95	**29.24**
32 New York	Bearded	57.13	1.44	21.09	58.59	1.75	**25.36**
33 Manitoba Red	Bald	60.25	1.11	22.03	59 64	1.73	**25.14**
34 Haynes' Blue Stem	"	56 00	1.67	19.40	57.50	1.84	**25.08**
35 Dakota Marvel	"	57.25	1.44	23.65	57.33	1.76	**23.40**
36 Campbell's White Chaff	"	57.75	.87	16.04	55.09	1.39	**16.82**
Grown for Three Years:							
37 Blue Democrat	Bearded	60.00	1.89	33.80	59.65	2 02	**28.43**
38 Amythest	Bald	61.00	1.40	25.68	59.73	1.59	**24.45**
39 Champion Bearded	Bearded	59.88	1.54	25 26	59.13	1 83	**23.95**
40 Ontario	"	58.00	1.82	28 54	57.77	1.71	**22.94**
41 French Imperial	Bald	60.50	1.18	24.00	59 40	1.45	**22 53**
42 Early Scotch Bearded	Bearded	59.75	1.35	18.36	58.56	1.64	**20.69**
43 Scotch Fife	Bald	60.33	1.07	20.89	59.21	1.28	**18.72**
44 Canadian Club	"	59.79	.98	18.18	57.75	....	**18.15**
45 Niagara	"	60.00	.97	20.05	55.13	1.34	**15.88**
46 White Australian	"	58.00	.94	16.98	52.19	2.06	**11.92**
Grown for Two Years:							
47 Salzer's Marvel	Bald	57.25	1.28	18 91	58.16	1.64	**25.45**
48 May's Early Wonder	"	60.50	1.18	22.45	60.57	1.55	**24.43**
49 Cubana	"	60 00	.88	18 23	59.53	1.48	**24 64**
50 Pillsburg	"	60.25	.95	20.94	59.78	1.31	**24.33**
51 Red North Dakota	"	60.00	1.00	20.10	59.63	1.28	**23.39**
Grown for One Year:							
52 Manitoba Hard	Bald	60.25	.84	16.25	60.25	.84	**16,25**

HEAT.

...e results for number ...ears grown on plots.

Yield of straw per acre.	Yield of grain per acre.
Tons.	Bush.
1.81	30.08
1.97	29.23
1.89	27.15
1.81	25.58
1.66	25.11
1.84	24.70
1.77	23.98
1.87	23.79
1.77	23.07
2.04	35.90
2 07	32.67
1.97	31.55
1.73	29.37
1.87	28.49
1.84	28.05
1.68	27.59
1.85	27.34
1.91	25.85
1.74	25.09
2.09	28.40
1.72	28.01
1.91	27.94
1.82	27.01
1.66	25.37
1.65	25.16
1.50	25.06
1.39	20.68
1.51	17.57
1.97	29.90
1.95	29.66
1.95	29.24
1.75	25.36
1.73	25.14
1.84	25.08
1.76	23.40
1.39	16.82
2 02	28.43
1.59	24.45
1 83	23.95
1.71	22.94
1 45	22 53
1.64	20.69
1.28	18.72
....	18 15
1.34	15.88
2.06	11.92
1.64	25.45
1.55	24.43
1.48	24 64
1.31	24.33
1.28	23.39
.84	16.25

Leading Varieties of Spring Wheat.

Some of the best varieties of spring wheat are those which have been imported from other countries. France, Germany and Sweden might be named as supplying some of the varieties which have given the best all-round results.

Bart Tremenia. The Bart Tremenia variety of spring wheat was imported from Sweden by our College in the spring of 1889, and has been grown in the experimental department during each of the years since that date. It produces a long straw of rather a wiry nature. The grain is large but of a coarse quality, somewhat resembling that of the Wild Goose variety. Not only has the Bart Tremenia given the largest average yield of grain per acre among the different varieties grown in the experimental department for seven years in succession, but it has produced a grain which has given an average weight per measured bushel of nearly sixty-three pounds. The Bart Tremenia was distributed over Ontario as one of the five leading varieties for testing in 1895. It, however, did not do well over the Province, being surpassed in yield of grain per acre by the Herison Bearded, Red Fern and Pringle's Champion. Of the five varieties sent to experimenters it was the most unpopular this season.

Herison Bearded. The variety of spring wheat which stands second in yield per acre among the varieties grown for seven years is the Herison Bearded, the seed of which was imported from France by our College seven years ago. Not only has it given the largest yield of grain per acre, but it has also produced a grain which has given the largest average weight per measured bushel among all the varieties tested. Fifty-seven varieties of spring wheat were submitted to a deputation of the Dominion Millers' Association, and the Herison Bearded was selected as one of the nine first-class milling wheats. The kernels of this variety are small, being short and thick, and they are of a darkish red color. The straw grows to a fair length, and usually stands up well. The heads are of a club shape, and the kernels are very compactly arranged in the heads. The Herison Bearded has been distributed over Ontario for three years in succession as one of the Union varieties. In 1893 it occupied third place in yield per acre, and in 1894 and in 1895 it headed the list each year among the varieties sent out. In 1894 it gave an average of five bushels per acre more than the variety coming next to it, and during the past season it gave an average of three bushels per acre more than the average variety, which gave the second highest yield of grain per acre. The Herison Bearded was selected by the majority of the experimenters during the past season as being their choice among the five varieties which they had received.

Pringle's Champion. The third place in yield of grain per acre, among the varieties of spring wheat grown for seven years, is occupied by a German variety known as Pringle's Champion. This variety has given an average of two bushels per acre less than the Herison Bearded, and has produced a grain which weighs about three pounds per measured bushel less than the variety just mentioned. It was also selected by the Millers' Association as being one having good milling qualities. The straw of this variety is usually quite stiff, and the heads are of good length, nearly double those of the Herison Bearded in this respect, but at the same time the number of grains per head is usually less than that of the Herison Bearded. In 1895, Pringle's Champion had an average of 10.3 heads per plant, the Bart Tremenia 10.7, and the Herison Bearded 11.2. The experimenters over Ontario who received spring wheats during the past year found the Pringle's Champion to be one of the number for testing purposes. The average results for the season show this variety to occupy third place in yield of grain per acre, having about four bushels per acre less than the Herison Bearded.

Wild Goose. Although the Wild Goose variety of wheat is very coarse in quality, it is a good yielder, and heads the list, in that respect, among the varieties we have grown for six years in succession. In the trials of six years it has given an average of nearly thirty six bushels per acre, and the average weight per measured bushel has been upwards of sixty-one pounds. The Wild Goose has been grown for some time over Ontario; but it possesses a poor quality of grain and usually sells for less than other varieties of spring wheat.

Red Fern. The Red Fern variety of wheat is one of the best of those which have been grown in Ontario for a considerable length of time. It has produced an average of thirty-two and two-thirds bushels per acre in the average of six years' experiments, and the grain has overrun in weight per measured bushel, "the standard of Ontario," by a little over one pound. Red Fern has been surpassed, however, in the co-operative experimental work over Ontario for two years in succession by the Herison Bearded variety.

Experiments with Winter Wheat.

The following Bulletin on Winter Wheat was issued in August, 1895 :

One hundred and ninety-seven plots were used for winter wheat experiments at the Ontario Agricultural College during the past season. About one-half of this number was used for testing varieties, and the remainder for testing different dates of seeding, methods of seeding, selections of grain for seed, quantities of seed per acre, the yield and quality of wheat cut at different stages of ripeness, and the value of seed from wheat cut at different stages of maturity. This bulletin gives a concise report of the principal results of these tests, and it also gives the average results of some of the experiments which have been conducted for a number of years past.

Field Conditions. The plots used in 1895 for the winter wheat experiments were situated in the northern portion of the large experimental field which lies to the rear of the main College building. The land has a gentle slope to the south-west and its position is somewhat elevated. Hence it was considerably exposed to the cold winter winds, which were so prevalent last season. The soil, which is an average clay loam, was prepared on the bare fallow system, and received a coating of fifteen tons of farmyard manure per acre in 1894. The plots were all the same size, each containing exactly one-hundredth of an acre. The yields per acre have been determined by the actual yields of the plots.

Conditions of Season and Growth. The grain for the various winter wheat experiments was sown early in September. The germination of the seed was good, and the growth upon the different plots during autumn was quite satisfactory. There were very frequent, strong, cold winds during the winter, and the snow was so often blown from the plots that they were only very thinly covered during the greater part of the cold weather. As the slope in the land extends throughout the whole length of the plots, there was no chance for water to lie upon any part of them, but a considerable amount of sleet which came in the early spring, along with the influence of the cold weather, seriously injured many of the less hardy varieties. Between the 12th and 22nd of May, there was frost on six different nights, and on one occasion a minimum thermometer on the College grounds registered only twenty-two degrees above zero. This late spring frost checked the growth of the crop considerably, but did not seem to do much injury further than this.

The past year has furnished us an excellent opportunity for studying the comparative hardiness of the different varieties under test, and some valuable object lessons under this head were furnished the thousands of Ontario farmers who visited the College in the month of June and witnessed the work which is being carried on in the experimental department.

Varieties Tested. One hundred and two varieties of winter wheat were under test. The plots, as already intimated, were situated side by side and were exactly uniform in size. They were separated from each other by paths three feet wide. All the varieties were sown by hand at the rate of two bushels per acre, on September 6th, 1894, and the germination was quite uniform throughout. The varieties ripened between the 16th and 24th of July, which was about a day later than in 1894. The amount of rust and smut was small this season.

The following table gives the number of varieties tested and reported on within the past six years and also the average yields for each of these years:

Year.	Number of varieties grown each year.	Average weight of grain per measured bushel.	Average yield of—	
			Straw per acre.	Grain per acre.
		lb.	tons.	bus.
1890	15	60.0	2.4	30.9
1891	23	63.3	2.0	52.9
1892	44	60.5	3.2	42.6
1893	52	58.4	2.1	29.9
1894	80	60.8	4.0	46.7
1895	102	60.4	1.2	26.1

It will be observed that there are great variations in the average results for the different years as given in the above table. The highest record in quality and yield of grain was made in 1891. That year an excellent opportunity was given for a comparison of the different varieties when grown under climatic conditions very favorable for the best development of the plants. In the years 1892 and 1894, much valuable information was obtained in regard to the comparative strength of straw, as many of the varieties were badly lodged, while others, growing beside them, stood upright until ripe. In 1890, 1892 and 1893, there was a considerable amount of rust on our winter wheat; but, as many of the varieties were much more affected than others, we are enabled to make some valuable comparisons. Almost all the varieties came well through the winters from 1890 to 1894, but in 1895 many of them were very much winter-killed, while others, growing beside and between the injured ones, sustained little or no injury.

The varieties of winter wheat which are most desirable for cultivation in Ontario, are those which possess the greatest number of good and the least number of bad qualities. To compare the different varieties in this respect is the object of the present bulletin. From what is said in the preceding paragraph, the reader will readily understand that it is of great importance to have these experiments extend over a period of *several* years, in order to have the varieties subjected to various climatic conditions.

Characteristics and Yields of Varieties. The following table contains the characteristics and the yields of one hundred and two varieties tested during the past season. The horizontal rows give information regarding the different varieties, and the perpendicular columns furnish a means of comparing the characteristics and yields of the varieties with one another. Starting at the left hand side of the table, columns one and two give the numbers and names of the varieties; three and four refer to their characteristics; five, six, seven and eight give results for 1895; and nine, ten, eleven and twelve give average results for four, three and two years, or for one year, as indicated in column number two. Of the first fifty-three varieties mentioned in the table, we have grown some for six years, others for five years, and the remainder for four years; but, to allow a better comparison of the varieties, the average results of only the last four years are here presented.

The reader's attention is especially directed to the last column on the right hand side of the table, as this gives the average yield of grain per acre of each variety for the number of years reported upon, and the varieties are arranged in the table according to these average yields, starting with the highest and finishing with the lowest.

There is, perhaps, not a winter wheat grower in Ontario but is quite familiar with some of the varieties herein reported upon, as many of the old varieties have been tested along with the newer kinds. The following table furnishes an excellent opportunity for each farmer to compare the respective merits of the varieties which he has not grown, with those of the varieties with which he is familiar.

Characteristics and Yields of 102 Varieties of Winter Wheat.

Varieties.	Heads bearded or bald.	Color of grain.	Results for 1895. Condition of crop in spring of 1895.	Results for 1895. Weight per measured bushel.	Results for 1895. Straw per acre.	Results for 1895. Grain per acre (bus. 60 lbs.)	Average results for number of years reported upon as shown in first column to left. Amount of straw lodged.	Average results. Weight per measured bushel.	Average results. Straw per acre.	Average results. Grain per acre (bus. 60 lbs.)
Grown for four years:				lbs.	tons.	bus.	p. c.	lbs.	tons.	bus.
1 Dawson's Golden Chaff	Ba.	W.	very good	59.9	1.8	40.3	2	59.5	2.9	48.7
2 Early Red Clawson	Ba.	R.	good	58.8	1.6	39.9	51	58.4	3.2	45.5
3 Egyptian	Be.	R.	good	60.7	1.9	40.6	31	60.6	2.9	45.1
4 Golden Drop	Ba.	R.	medium	59.3	1.4	31.5	51	61.2	3.2	43.7
5 Surprise	Ba.	W.	good	57.4	1.8	35.4	22	58.6	2.9	43.0
6 Reliable	Be.	R.	very good	61.1	1.8	35.9	15	61.5	2.8	42.0
7 American Bronze	Ba.	R.	very good	60.6	1.9	38.9	2	59.1	3.0	41.9
8 Bulgarian	Be.	W.	good	60.6	1.3	28.7	19	61.3	2.6	41.3
9 Jones' Winter Fife	Ba.	R.	good	59.9	1.5	31.3	15	59.5	2.6	41.2
10 Golden Cross or Volunteer	Be.	R.	medium	60.9	1.8	36.4	27	60.3	3.2	40.6
11 Standard	Ba.	W.	good	59.9	1.7	40.3	14	58.3	2.8	40.5
12 Manchester	Ba.	R.	good	61.5	1.5	34.9	23	60.4	3.0	40.4
13 Red Velvet Chaff	Ba.	R.	very good	59.0	2.2	39.5	38	57.8	3.5	40.2
14 Bonnell or Landreth	Ba.	W.	good	59.9	1.8	38.7	29	58.7	3.1	40.0
15 Russian Amber	Be.	R.	medium	60.1	1.5	30.4	23	61.0	2.6	39.9
16 Walker's Reliable	Be.	R.	medium	60.5	1.1	28.0	26	60.8	2.7	39.0
17 Democrat	Be.	W.	good	62.3	1.2	29.3	17	61.5	2.3	38.8
18 Winter Pearl	Ba.	W.	good	62.3	1.7	35.0	16	61.2	2.5	38.6
19 Seneca or Clawson	Ba.	W.	good	59.3	1.7	33.8	29	58.9	3.0	38.6
20 Red Lion	Be.	R.	good	59.5	1.7	33.7	68	60.7	3.3	38.5
21 Martin Amber	Ba.	W.	good	61.9	1.5	32.7	37	60.3	2.9	38.2
22 Canadian Velvet Chaff	Ba.	W.	good	57.6	1.5	29.1	16	57.2	2.6	37.7
23 Garfield	Ba.	W.	good	60.8	1.5	30.6	24	59.7	2.4	36.8
24 Hybrid Mediterranean	Be.	R.	very good	62.3	.9	22.0	35	60.9	3.1	36.8
25 New Monarch	Ba.	R.	good	59.6	1.5	29.8	25	60.1	2.8	36.7
26 Mediterranean	Be.	R.	medium	60.6	1.3	30.8	36	60.6	3.0	36.3
27 Manilla	Ba.	W.	very good	60.1	1.5	34.3	15	58.0	2.6	36.1
28 Lancaster	Be.	R.	very good	61.0	1.1	24.6	67	60.9	3.0	36.0
29 Rutherford	Be.	R.	medium	61.0	1.1	26.3	35	60.0	2.9	35.9
30 Rogers	Ba.	R.	very good	60.6	1.0	25.1	38	59.9	3.0	35.9
31 Fultz	Ba.	R.	good	62.2	1.1	25.0	5	62.4	2.1	35.3
32 Valley	Be.	R.	poor	60.1	.6	13.7	11	60.6	2.3	34.8
33 Monette	Ba.	R.	medium	60.0	1.2	27.2	20	59.3	2.4	34.6
34 Hybrid Diehl	Ba.	W.	medium	60.6	1.1	24.9	24	59.4	2.2	34.6
35 Genesee	Be.	W.	medium	60.0	.9	21.5	20	60.1	2.4	34.1
36 Scott	Ba.	R.	very good	61.3	1.4	34.2	13	60.1	1.4	33.6
37 Velvet Chaff	Be.	R.	medium	62.8	1.1	25.8	3	62.5	2.2	33.2
38 Longberry Red	Be.	R.	medium	60.3	.9	21.7	44	60.4	2.5	32.8
39 Deitz Longberry	Be.	R.	medium	61.6	1.1	26.0	24	61.8	2.4	32.5
40 Rumsey	Be.	W.	medium	60.0	.5	10.5	21	60.5	2.5	32.3
41 Red Wonder	Be.	R.	medium	61.8	.9	22.3	36	61.7	2.9	32.0
42 Fulcaster	Be	R.	medium	59.8	1.3	10.3	27	61.6	2.7	28.4
43 Red Russian	Ba.	R.	poor	61.4	......	21.8	5	60.2	2.3	27.9
44 Saumur	Ba.	R.	medium	57.1	1.0	23.7	13	53.5	2.2	27.1
45 Red Inversible	Ba.	R.	medium	59.9	.7	14.0	20	56.1	2.3	26.4
46 Spalding Red	Ba.	R.	medium	61.9	.7	19.1	22	58.8	2.3	26.2
47 Browick Red	Ba.	R.	medium	60.9	.9	26.5	13	54.8	2.2	25.2
48 Square Head	Be.	W.	very good	60.0	.7	16.0	17	59.2	.7	24.5
49 Regent	Ba.	R.	good	59.3	1.5	29.1	27	53.8	2.5	23.[illegible]
50 White Patanelle	Ba.	W.	very good	59.6	.5	6.2	11	53.4	2.4	21.[illegible]
51 Dividend	Ba.	R.	medium	58.8	.8	17.7	33	51.7	2.4	21.[illegible]
52 Galizien Summer	Ba.	R.	good	59.6	.8	16.6	23	55.1	1.7	20.[illegible]
53 Kessingland Red	Ba.	R.	medium	58.7	.8	20.7	13	51.2	2.0	20.[illegible]

Characteristics and Yields of 102 Varieties of Winter Wheat—*Concluded.*

Varieties.	Heads bearded or bald.	Color of grain.	Results for 1895. Condition of crop in spring of 1895.	Results for 1895. Weight per measured bushel.	Results for 1895. Straw per acre.	Results for 1895. Grain per acre (bus. 60 lbs.)	Average results for number of years reported upon as shown in first column to left. Amount of straw lodged.	Average results. Weight per measured bushel.	Average results. Straw per acre.	Average results. Grain per acre (bus. 60 lbs.)
				lbs.	tons.	bus.	p. c.	lbs.	tons.	bus.
Grown for three years:										
54 Stewart's Champion	Ba.	R.	very good	60.4	2.2	43.5	5	58.6	2.9	**38.9**
55 Early White Leader	Ba.	W.	medium	59.8	1.2	27.5	5	57.4	2.2	**38.2**
56 Soule's	Ba.	W.	good	58.8	1.4	31.5	7	56.9	2.6	**36.8**
57 South Sea	Ba.	W.	medium	59.4	1.1	23.8	3	59.9	1.9	**35.0**
58 Eureka	Ba.	W.	good	59.0	1.4	28.1	6	57.7	2.3	**34.3**
59 White Star	Be.	R.	medium	61.3	1.2	32.5	7	60.1	2.1	**34.0**
60 British Columbia	Ba.	R.	medium	60.9	1.1	24.4	.....	57.6	2.0	**28.4**
61 Treadwell	Ba.	W.	very poor	59.0	.5	11.3	7	59.1	1.8	**25.2**
Grown for two years:										
62 Early Genesee Giant	Ba.	W.	medium	61.3	1.4	36.4	8	61.1	2.7	**46.7**
63 Siberian	Ba.	R.	very good	61.8	1.8	36.6	18	62.4	3.0	**43.1**
64 Early Ripe	Ba.	R.	medium	61.9	1.3	27.7	21	61.7	2.8	**41.5**
65 Tasmania Red	Be.	R.	good	61.9	1.5	35.3	45	61.9	3.0	**41.2**
66 Jones' Square Head	Ba.	W.	very good	57.6	1.6	30.9	.....	59.0	2.4	**39.6**
67 Pride of Genesee	Be.	R.	medium	62.1	1.3	27.7	20	61.3	2.6	**39.6**
68 Turkish Red	Be.	R.	very good	62.3	1.5	31.7	23	62.3	2.6	**39.2**
69 Egyptian Amber	Be.	R.	good	61.9	1.3	32.1	33	61.1	2.9	**38.1**
70 McPherson	Ba.	R.	very good	61.1	1.5	28.3	15	61.7	2.7	**36.7**
71 Arnold's Hybrid	Ba.	R.	good	60.0	1.2	25.1	11	61.1	2.6	**36.7**
72 Imperial Amber	Be.	R.	medium	59.9	1.5	29.2	45	59.0	3.2	**36.3**
73 Poole	Ba.	R.	medium	59.6	.8	21.1	21	60.6	2.4	**35.9**
74 Zimmerman	Ba.	R.	medium	60.8	1.2	26.7	1	61.9	2.1	**35.5**
75 Geneva	Be.	R.	medium	63.2	1.2	30.0	34	62.4	2.7	**35.1**
76 Red May	Ba.	R.	medium	62.2	.8	20.4	10	62.4	2.4	**34.4**
77 Emporium	Ba.	R.	good	59.1	1.2	27.4	23	58.6	2.6	**34.3**
78 New Columbia	Ba.	R.	medium	58.8	.6	16.3	8	58.5	2.3	**33.2**
79 Simcoe Red	Be.	R.	very good	60.6	1.3	27.7	30	58.8	2.8	**33.0**
80 Tuscan Island	Be.	R.	medium	59.5	.9	20.3	33	59.7	2.4	**32.6**
81 Kentucky Giant	Be.	R.	medium	59.3	.8	18.4	35	58.9	2.4	**31.8**
82 Rudy	Be.	R.	poor	61.4	.5	13.9	39	60.5	2.2	**31.4**
83 Penquit's Velvet Chaff	Be.	R.	medium	61.9	.9	21.6	1	62.0	2.3	**31.0**
84 Bissell	Be.	R.	medium	61.2	.8	20.3	36	61.0	2.4	**30.2**
85 Andrew's No. 4	Be.	R.	medium	60.6	.7	17.1	24	60.3	2.6	**29.7**
86 Golden Tankard	Be.	R.	very good	60.9	1.1	25.9	46	60.2	3.2	**28.7**
87 Currell	Ba.	R.	medium	60.9	.8	20.2	20	61.2	2.5	**28.7**
88 Currell's Prolific	Ba.	R.	medium	60.6	.8	19.6	25	61.1	2.6	**28.2**
89 Hindostan	Be.	R.	medium	60.4	.5	11.7	23	61.0	2.3	**28.2**
90 Bullard's Velvet Chaff	Ba.	R.	very poor	58.6	.2	3.5	.....	60.8	1.3	**17.6**
Grown for one year:										
91 Michigan Amber	Be.	R.	very good	61.8	1.4	35.5	.....	61.8	1.4	**35.5**
92 Giant Square Head	Be.	W.	good	60.1	1.4	33.4	.....	60.1	1.4	**33.4**
93 White Bearded	Be.	W.	good	58.9	1.3	31.8	.....	58.9	1.3	**31.8**
94 Silver Star	Ba.	W.	good	61.7	1.3	27.8	.....	61.7	1.3	**27.8**
95 Amherst Isle	Be.	R.	medium	59.9	1.1	25.0	3	59.9	1.1	**25.0**
96 German Emperor	Ba.	R.	good	59.8	1.2	24.2	.....	59.8	1.2	**24.2**
97 Hunter's Wheat	Be.	R.	medium	60.9	1.0	22.4	.....	60.9	1.0	**22.4**
98 Pride of Illinois	Ba.	R.	good	60.2	1.0	21.5	.....	60.2	1.0	**21.5**
99 Long Amber	Ba.	W.	medium	59.0	.8	13.8	.....	59.0	.8	**18.8**
100 Kalina	Be.	R.	good	60.1	.8	17.6	.....	60.1	.8	**17.6**
101 Mealy	Ba.	R.	medium	60.4	.6	12.1	.....	60.4	.6	**12.1**
102 Nonpareil	Be.	W.	very poor	59.2	.4	7.4	.....	59.2	.4	**7.4**

The varieties given in the preceding table were obtained from Ontario, the United States, Germany, France and Russia. Thirty kinds were imported from Europe by the College in the spring of 1889, and have been carefully tested in our plots; but, owing to lack of hardiness, twenty of the number have been discarded. The remaining ten have been grown for the past six years in succession, but are among the poorest yielders reported upon in this bulletin. All our leading varieties of winter wheat, therefore, have been obtained from either Canada or the United States. Mr. A. N. Jones, of Newark, N.Y., has been instrumental in introducing some very excellent varieties, among which the Early Red Clawson, American Bronze, Jones' Winter Fife and Early Genesee Giant are prominent. It is, however, to Mr. Robert Dawson of Paris, Ont., that we must give credit for Dawson's Golden Chaff, a variety which has made the highest average record of all the varieties tested at this station during the past four years.

Bald and Bearded Varieties. Of the one hundred and two varieties grown in 1895, fifty-six possessed bald heads and forty-six bearded heads. During each of the six years past, the bearded varieties gave a heavier weight per measured bushel than the bald sorts, but in yield of grain per acre the bald wheats came first in four out of the six years. In making up this comparison, varieties possessing very short beards were classed as bald wheats.

The following table gives the comparative results of the bald and the bearded varieties for 1895, and for the average of six years:

Periods.	Average results of bald varieties.			Average results of bearded varieties.		
	Weight per measured bushel.	Yield per acre.		Weight per measured bushel.	Yield per acre.	
		Straw.	Grain.		Straw.	Grain.
	lbs.	tons.	bush.	lbs.	tons.	bush.
1895	60.0	1.2	27.1	60.8	1.1	25.1
Average of six years, 1890-1895	60.1	2.5	38.8	61.3	2.5	37.1

Color of Grain. Twenty-nine varieties of white wheat and seventy-three varieties of red wheat were tested during the past year. In five of the last six years, the red wheats gave a heavier weight of grain per measured bushel than the white varieties, but in 1890 the white wheats gave slightly the heaviest grain. The amber, bronze and golden wheats have all been classed as red.

The following table gives the comparative results of the white and the red wheats for 1895, and for the average of six years:

Periods.	Average results of white wheat.			Average results of red wheats.		
	Weight per measured bushel.	Yield per acre.		Weight per measured bushel.	Yield per acre.	
		Straw.	Grain.		Straw.	Grain.
	lbs.	tons.	bush.	lbs.	tons.	bush.
1895	59.9	1.3	27.5	60.6	1.1	25.6
Average of six years, 1890-1895	60.0	2.5	39.3	60.9	2.5	37.7

It will be seen from the above tables that the amount of straw in the average of six years' trials was the same from bald, bearded, white and red varieties of winter wheat. The bearded kinds produced the heaviest weighing grain and the white varieties gave the largest average yield of grain per acre.

Experiments in the Methods of Winter Wheat Growing.

The following concise reports are made upon different winter wheat experiments conducted in the same portion of the experimental grounds that was used for the variety tests. Some of these experiments extend over a period of two and some over a period of three years.

Different Dates of Seeding. During each of the past three years two or more varieties of winter wheat have been sown at three different times in the month of September. The following table gives the average yields for the three years occupied by this experiment:

Dates of seeding.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.
	lbs.	tons.	bush.
September 2-3	57.8	2.4	31.8
" 7-9	58.0	2.5	31.3
" 17-19	56.2	1.6	25.2

It will be seen that the seedings of the 7th and 9th of September produced results about equal to those from the seedings of the 2nd and 3rd. Such is not the case, however, when the results of the last dates are compared with those of either the first or the second, as they are considerably lower in every particular.

Methods of Seeding. An experiment in sowing winter wheat broadcast and with a grain drill has been conducted in duplicate during the past two years. The results show the yields of both straw and grain to be practically the same from sowing similar quantities of grain by the two methods; but, in weight of grain per measured bushel, the product of the drilled grain has been heavier than that sown broadcast in each of the four tests, the average difference being two-fifths of a pound.

Different Quantities of Seed per Acre. In 1894 and in 1895, two varieties of winter wheat were sown broadcast on small plots, at the rates of one, one and one-half and two bushels per acre. The largest yields of both grain and straw were obtained from the thickest seeding and the smallest yields from the thinnest seeding during each of the two years. The weight of grain per measured bushel was nearly the same from all the plots. To determine the proper quantity of winter wheat to sow per acre, in order to obtain the best results upon different farms, the individual wheat growers can best experiment for themselves, as so much depends upon the fertility of the soil and other conditions.

The Yield and Quality of Winter Wheat as affected by cutting at different stages of maturity. Five plots each of the Dawson's Golden Chaff and the Early Genesee Giant varieties of winter wheat, were sown upon the same date in 1893 and again in 1894. These two varieties reached the stage of maturity at which wheat is usually cut in Ontario, on the 19th of July, in 1894, and on the 18th of July in 1895. The two wheats were cut at five different periods during the two years, as follows: July 4th, July 11th, July 18th and 19th, July 26th and August 2nd. During both years, the greatest yield of straw was obtained from cutting on July 4th, and the heaviest weight of grain per measured bushel from cutting on July 18th and 19th. The yield of grain per acre was largest from the last cutting in 1894 and from the second last cutting in 1895. The lowest results in yield of grain per acre and in weight of grain per measured bushel, were obtained from the cutting of each variety on July 4th of each year.

Value of Grain for Seed as affected by cutting at different stages of maturity. Dawson's Golden Chaff and the Early Genesee Giant varieties of winter wheat were both sown on the same day in 1893, and a plot of each was cut on July 4th, 11th, 19th and 26th, and August 2nd, 1894. The first cutting took place about two weeks before, and the last cutting about two weeks after, that stage of ripeness at which winter wheat is usually cut. A quantity of seed of each variety was taken from each of the five different cuttings, and these ten equal amounts of grain were sown upon a similar number of uniform plots on Sept. 7th, 1894. In 1895, the plots were all harvested at one time, and, in the case of each variety, it was found that the largest yield of grain per acre was produced by the seed of the last cutting of the previous year, and the plumpest sample was produced from the seed of the second and third cuttings.

Selection of Seed. Several experiments are being conducted in the selection of grain for seed; but it will be some time before the most valuable results can be obtained from this line of experimental work.

CO-OPERATIVE EXPERIMENTS WITH WINTER WHEAT.

Fifteen varieties of winter wheat, which have been the most successful among all the varieties tested on our experimental grounds, have been distributed over Ontario within the past three years. These have been sent out in sets of five varieties each. Five thousand and eight hundred packages of winter wheat alone have been distributed during the three years, and comparative tests have been made upon more than eleven hundred Ontario farms. This system of co-operative experimental work was established by the ex-students of the Agricultural College; but, through repeated requests from other farmers, the invitation is extended to all interested persons to join in the work. The results have, on the whole, been very gratifying and the numerous experimenters have become much interested in the different experiments undertaken. For detailed reports of these co-operative experiments, the reader is referred to the Annual Report of the Agricultural Experimental Union which is printed along with the report of the Agricultural College. From among ten conclusions given in the report of last year regarding these co-operative experiments with winter wheat for 1894, the following two conclusions are quoted as being of interest in connection with the results given in this bulletin.

1. "Dawson's Golden Chaff gave the largest yield of grain per acre among the nine varieties tested over Ontario in 1894, as well as among the eleven varieties tested in 1893."

2. "Dawson's Golden Chaff was decidedly the most popular variety with the experimenters in both 1894 and 1893."

All the varieties of winter wheat distributed over Ontario each year are grown in duplicate in our Experimental Department on exactly the same sized plots that are used throughout the Province.

CONCLUSIONS.

1. The average results of winter wheat growing on the experimental plots for six years in succession are as follows: Weight of grain per measured bushel, 60.6 lbs.; yield of straw per acre, 2.5 tons; and yield of grain per acre 38.2 bushels.

2. Dawson's Golden Chaff gave the largest average yield of grain per acre among fifty-three varieties of winter wheat grown at the Ontario Agricultural College for four years in succession; also among nine leading varieties tested over Ontario in 1894, and among eleven leading varieties tested over Ontario in 1893.

3. The varieties which possessed the stiffest straw among fifty-three kinds of winter wheat grown for four years in succession, were Dawson's Golden Chaff, American Bronze, Fultz, Velvet Chaff, and Red Russian.

4. The varieties of winter wheat which proved the hardiest in 1895, among one hundred and two varieties tested, were Dawson's Golden Chaff, Stewart's Champion, Siberian, Jones' Square Head, Turkish Red, and McPherson.

5. When winter wheat was sown later than September 9th, the crop was much poorer than when the seeding took place on or before that date.

6. In 1895, the varieties of winter wheat possessing bald heads and white grain gave an average of 4.3 bushels of grain per acre more than the varieties possessing bearded heads and red grain; but, in average weight per measured bushel, the latter surpassed the former by 1.3 pounds.

Distribution of Seed for Testing Purposes.

In the following table will be found two sets of winter wheat varieties, which will be sent free, by mail, in half pound lots of each variety to farmers applying for them, who will carefully test the five kinds in the set which they choose, and will report the results after harvest next year. The seed will be sent out in the order in which the applications are received, as long as the supply lasts.

Two sets of winter wheat for Co-operative Tests.

Set 1.	Set 2.
Dawson's Golden Chaff.	Dawson's Golden Chaff.
Early Red Clawson.	Early Genesee Giant.
Jones' Winter Fife.	Pride of Genesee.
Surprise.	Bulgarian.
American Bronze.	Jones' Square Head.

Each person wishing one of these sets should write to the Experimentalist, Agricultural College, Guelph, *mentioning which set he desires*, and the grain, with instructions for testing and blank forms on which to report, will be forwarded free of cost to his address, until the supply of grain for distribution is exhausted.

Seed Wheat.

The Dawson's Golden Chaff and the Early Genesee Giant varieties of winter wheat were grown in the farm department in 1895. Limited quantities of these were offered for sale by the Farm Superintendent at $1.25 per bushel for the former and $1.50 per bushel for the latter.

Oats—Comparative Test of 90 Varieties.

When we realize that there were 2,373,309 acres devoted to oats in Ontario during 1895, we have some conception of the importance of this class of grain. There were nearly as many acres devoted to the growing of oats in this Province in 1895, as there were devoted to the growing of all other kinds of grain. The demand for new and promising varieties of oats is greater than that for any other class of spring grain. This is made manifest by the large number of applications which we receive annually for samples of oats for testing purposes. We are very pleased indeed that we have been successful in obtaining some excellent varieties of oats from foreign countries. These new varieties have not only proven themselves to be well suited to our land at the Agricultural College, but also for various soils throughout the Province. During the past four years the leading varieties of oats have been successfully tested on about five hundred Ontario farms.

In 1895, ninety varieties of oats were tested in the experimental department. The plots used for the oats were of exactly the same size, each plot being ten links wide by one hundred links long, thus making one-hundredth of an acre. The grain was sown broadcast at the rate of seventy-five pounds per acre, and the seeding of the varieties took place on the 25th of April The land on which the oats were grown was an average clay loam, which had been manured at the rate of twenty tons of farmyard manure per acre in the spring of 1894, after which it produced a crop of potatoes. The yields per acre are estimated from the actual yields of the plots.

OATS—COMPARATIVE TEST OF 90 VARIETIES.

Varieties.	Seed obtained from—	Color of grain.	Character of head.	Results for 1895. Date of maturity.	Results for 1895. Weight per measured bushel.	Results for 1895. Straw per acre.	Results for 1895. Grain per acre. Small grain.	Results for 1895. Grain per acre. Large grain.	Average results for number of years grown on plots. Weight per measured bushel.	Average results. Straw per acre.	Average results. Grain per acre.
					lbs.	tons	bus.	bus.	s.	tons.	bus.
Grown for seven years:											
1 Joanette Black	France	B	S	Aug. 14	37.00	3 00	26.00	90.69	36 01	2.73	87.65
2 Siberian (Russia)	Russia	W	S	“ 14	36.08	3.27	47.06	64.71	35.76	2.71	82.89
3 Waterloo	Germany	W	S	“ 14	38.88	3.36	30.15	108.82	32.03	2.65	81.68
4 Probsteier	“	W	S	“ 12	39.00	2.98	37.50	90.44	34.33	2.51	81.24
5 Danebrog	“	W	S	“ 13	39.24	3.21	30.88	99.26	33.63	2.52	81.09
6 Bavarian	Ontario	W	S	“ 14	38.12	3.50	41.91	97.07	31.85	2.81	79.71
7 Poland White	France	W	S	“ 10	40.12	3.42	41.18	75.74	37.89	2.55	79.19
8 Improved Besthorne	Germany	Y	S	“ 10	39.12	2.48	28.68	77.21	33.63	2.17	78.46
9 Georgian	“	W	S	“ 15	35.88	3.44	41.18	83.82	32.96	2.80	76.30
10 Yellow Gigantic	France	Y	M	“ 19	31.36	3.43	48.53	88.24	29.55	2.76	75.57
11 Egyptian	Ontario	W	M	“ 14	39.52	3.33	32.35	83 09	35.32	2.82	75.15
12 Black Poland	Scotland	B	M	“ 14	35.24	3.54	41.91	80.88	30.23	2.93	72.81
13 Black Champion	Ontario	B	M	“ 14	35.00	3.50	34.56	85.29	29.94	2.62	71.43
14 Rosedale	“	W	M	“ 12	40 00	3.33	30.88	75.74	34.46	2.94	70.08
15 Black Tartarian	Scotland	B	M	“ 14	35.00	3.66	41.91	83.82	31.99	2.85	69.69
16 Victoria White	“	W	S	“ 10	43.36	3.17	27.94	72.06	39.61	2.68	68.49
Grown for five years:											
17 Vick's American Banner	United States	W	S	Aug. 13	37.76	3.29	36.03	101.47	32.34	2.40	88.28
18 White Schonen	Ontario	W	S	“ 13	38.64	3.21	38.24	91.91	33.00	2.40	87.85
19 Magnet	“	W	S	“ 15	34.00	4.44	46.32	86.76	31.42	2.82	86.13
20 Wide Awake	“	W	S	“ 14	39.24	3.58	26.47	102.94	34.26	2.48	85.68
21 Danish	New Zealand	W	S	“ 14	35.00	3.61	38.24	97.07	23.43	2.41	84.47
22 Golden Giant	Ontario	Y	M	“ 24	32.00	4.10	45.59	86.76	29.02	2.63	83.41
23 White Mane	“	W	S	“ 14	34.52	4.79	43.38	80.88	32.37	2.85	82.98
24 Holstein Prolific	“	W	S	“ 14	36.52	3.38	36.03	90.44	32.62	2.29	82.52
25 Giant Swedish	“	Y	M	“ 22	32.52	4.18	47.79	91.91	29.49	2.71	81.26
26 Early Calder	“	W	S	“ 14	34.24	3.50	38.24	70.59	32 76	2.52	77.80
27 Giant Yellow	United States	Y	S	“ 14	41.24	3.51	25.74	73.53	35.22	2.37	73.56
28 Early Gothland	Ontario	W	M	“ 14	39.12	3.01	30.88	69.85	35.94	2.45	71.89
29 Clydesdale	“	W	S	“ 9	43.36	2.73	22.79	81.62	38.30	2.64	70.51
30 White Belgian	“	W	S	“ 9	44.12	2.96	43.38	55.15	38.02	2.44	69.88
31 Black Mane	“	B	M	“ 13	35.00	3.16	38.97	70.59	30.31	2.53	68.84
32 White Swiss	United States	W	M	“ 12	39.88	3.23	39.71	57.35	35.78	2.43	68.64
33 Japan	“	W	S	“ 8	44.00	2.67	33 09	71.32	39.29	2.47	67.87
34 Carter's Early Black	England	B	M	“ 14	35.12	3.29	44.85	72.79	30.27	.....	67.38
35 Early Archangel	Ontario	W	S	“ 9	41.76	2.84	36.03	68.38	33.40	2.32	67.33
36 New Rosedale White	“	W	M	“ 12	39.00	3.25	27.21	72.06	36.10	2.30	65.10
37 Carter's Royal Cluster	England	W	S	“ 9	44.00	2.89	31.62	70.59	39.27	2.31	64.40
38 Victoria Prize White	“	W	S	“ 6	45.44	2.88	26.47	69.12	40.74	2.13	61.32
39 Canadian Triumph	Ontario	W	S	“ 9	44.52	2.70	23.53	57 35	40.34	2.17	61.23
40 Black Glen Rothern	“	B	S	“ 26	35.92	4.26	38.97	63.24	32.21	2.96	60.16
41 Rennie's Prize White	“	W	S	“ 7	45.24	2.92	22.06	70.59	40.27	2.09	59.98
Grown for four years:											
42 Joanette (new French seed)	Ontario	B	S	Aug. 15	37.12	3.23	24.51	90 93	34.88	2 61	79.8[illegible]
43 Baltic White	United States	W	S	“ 13	40.76	2.82	27.21	82.36	36.22	2,49	74.3[illegible]
44 Abyssinian	Ontario	W	M	“ 12	40.64	3.00	23.53	68.38	36.76	2.71	69.5[illegible]
45 American Beauty	“	W	M	“ 12	39.64	2.62	27.94	61.03	26.23	2.49	66.7[illegible]
46 Thousand Fold	United States	W	M	“ 12	39.52	2.74	27.21	61.76	35.56	2.49	63.4[illegible]
47 Badger Queen	“	W	S	“ 5	44.36	2.31	22.06	56.62	39.62	2.51	60.3[illegible]
48 Wilson's White Prolific	“	W	M	“ 12	39.12	2.58	21.32	51.47	32.84	2.21	60.0[illegible]
49 New Wonderful	Ontario	W	S	“ 5	45.00	2.44	26.47	54.41	39.38	2.31	59.0[illegible]

OATS, COMPARATIVE TEST OF 90 VARIETIES.—*Continued.*

Varieties.	Seed obtained from—	Color of grain.	Char cter of head.	Results for 1895. Date of maturity.	Weight per measured bushel.	Straw per acre.	Grain per acre. mall grain.	Large grain.	Average results for number of years grown on plots. Weight per measured bushel.	Straw per acre.	Grain per acre.
					lbs.	tons	bus.	bus.	lbs.	tons.	us.
Grown for three years:											
50 Green Mountain	United States	W	S	Aug. 12	38.24	2.70	30.15	78.68	33.11	2.19	**77.35**
51 New American	"	W	S	" 13	38.52	2.89	32.35	83.82	33.12	2.35	**76.98**
52 High Bred	"	W	S	" 8	41.24	2.90	32 35	72.06	38.56	.....	**76.89**
53 Lincoln	"	W	S	" 12	39.36	2.71	25.74	77.94	35.35	2.36	**76.68**
54 Improved American .	"	W	S	" 13	39.12	2.77	29.41	78.68	33.79	2.29	**74.96**
55 Black Beauty........	"	B	S	" 8	35.52	2.53	36.76	57.35	33.71	2.39	**74.77**
56 New Zealand........	"	W	S	" 13	39.52	2.49	25.00	73.53	32.93	2.22	**73.26**
57 South Carolina Black	"	B	S	" 15	38.52	2.88	33.09	64.71	34.76	2.59	**68.33**
58 Royal Prize Cluster..	England	W	S	" 7	45.24	2.84	30.15	66.18	40.14	2.40	**67.43**
59 Pringle's No. 6	United States	W	M	" 26	35.00	4.10	38.24	70.59	32.96	2.81	**67.30**
60 Rust Proof	"	W	S	" 8	43.24	2.80	23.53	73.53	35.68	2.43	**67.14**
61 Excelsior..	"	W	S	" 12	37.12	3.30	33.09	64.71	32.73	2.47	**66 15**
62 Jarman's White Monarch.............	England	W	S	" 7	42.36	2.85	28.68	65.44	38.23	2 36	**63.83**
63 Challenge	Ontario	W	S	" 13	37.24	3.17	20.59	58.09	38.01	2.66	**63.61**
64 North Star..........	United States	W	S	" 9	42.24	3.05	25.74	68.38	38.49	2.40	**61.22**
65 Jarman's Black Defiance	England	B	M	" 24	29.52	4.11	28.68	52.94	29.51	2.60	**59.32**
66 Texas Rust Proof....	United States	D	S	....	32.52	3.11	34.56	61.75	30.75	2.46	**55.55**
Grown for two years:											
67 Peerless	Ontario......	W	S	Aug. 13	37.76	3.40	39.71	98.53	34.16	3.15	**101.39**
68 Surprise	United States	W	S	" 14	37.64	3.34	33.82	85 29	34.94	3.30	**96.15**
69 Negro Wonder	"	B	S	" 9	34.76	3.23	48.53	66.18	34.26	2.89	**92.65**
70 Bonanza King	"	W	S	" 12	38.88	2.93	38.97	88.97	36.04	2.43	**92.65**
71 Bolton	"	W	S	" 10	37.88	3.12	39.71	81 62	34.88	2.59	**90.17**
72 Hull	Ontario......	W	M	" 19	34.76	3.35	54.41	70.59	33.38	2.91	**85.86**
73 Pride of America	United States	W	M	" 10	38.24	3.16	40.44	71.32	37.34	2.95	**85.66**
74 Improved White Russian	"	W	M	" 19	35.64	2.99	48.53	72.06	34.00	3.04	**84.28**
75 Australian Square Head	"	Y	M	" 16	34.00	3.17	47.06	77.21	32.28	2.82	**83.55**
76 White Swede.... ...	"	W	M	" 19	35.76	3.21	50.00	70.59	34.78	2.98	**79.69**
77 Mammoth Cluster ...	"	B	M	" 14	35.36	3 23	40.44	70.59	31.43	2.63	**72.43**
78 Red Tamworth	Ontario......	D	S	" 19	33.76	2.74	33.82	68.38	32.38	2.27	**68 94**
79 Lousinee	"	W	S	" 12	35.24	1.40	19.12	36.03	34.58	1.50	**56.90**
80 Salzer's Great Northern	United States	W	S	" 12	37.00	.93	13.24	27.94	34.76	1.45	**49 64**
Grown for one year:											
81 Nameless Beauty	United States	W	S	Aug. 10	36.76	2.92	44.85	77.21	36.76	2.92	**122.06**
82 New Siberian	"	W	S	" 12	36.12	3.39	48.89	71.33	36.12	3.39	**120.22**
83 New Electric........	Ontario......	W	S	" 10	37.64	2.72	36.76	78.68	37.64	2.72	**115.44**
84 White Bedford	United States	W	S	" 10	36 24	3.02	41.18	71.32	26.24	3 02	**112.50**
85 Black Diamond......	Ontario	B	S	" 12	36.52	2.79	44.85	67.65	36.52	2.79	**112.50**
86 Mexican Gray	United States	mix	S	" 8	35.24	2.86	41.91	63.24	35.24	2.86	**105.15**
87 White Superior Scotch	"	W	....	" 3	43.36	2.63	29.41	68.38	43.36	2.63	**97.79**
88 Danbings	"	W	S	July 27	37.76	1.83	41.18	58.88	37.76	1.83	**97.06**
89 Royal Doncaster	"	W	S	Aug. 19	37.88	3.10	34.56	58.09	37.88	3.10	**92.65**
90 Prolific Side Oat	"	W	M	" 10	38.52	2.85	27.94	61.76	38.52	2.85	**89.70**

The oat crop during the year 1895 was excellent; the straw was long, the heads were well filled, and the grain was plump. There was but little trouble with the rust; but some of the varieties contained a considerable amount of smut. The heavy storm

previous to the time of harvest caused a large number of the varieties to be very badly lodged. The average length of the straw varied from thirty-four and a half to fifty-seven inches.

Within the past seven years one hundred and fifty-seven varieties of oats have been tested in the experimental department. Of this number seventy-nine were grown for five years in succession previous to the spring of 1894, at which time seventeen of the best varieties were selected for further tests, and sixty-two varieties were discarded. When it is mentioned that sixty-two varieties were discarded, it should be clearly understood that those sixty-two were not all poor varieties; but they were not among the leaders, and it is the leading varieties that we are after. Information in regard to the comparative standing of all the varieties is very important, as it gives farmers a chance to compare varieties with which they are not familiar, with those of which they have had a certain amount of experience. Besides the sixty-two varieties which were discarded in the spring of 1894, there were also three varieties discarded in the spring of the present year.

Leading Varieties of Oats.

Among the seventy-nine varieties of oats which were tested for the first time in our experimental department in 1889, are those from a large number of foreign countries which have a climate somewhat similar to that of Ontario. The countries which have furnished us with some of the best varieties are France, Russia and Germany. All the varieties that could be obtained throughout Ontario were included in the seventy-nine previously mentioned.

Joanette Black. Among all the varieties that we have grown for seven years in succession in the experimental department, the Joanette Black has given the largest average yield of grain per acre. This variety was imported from France six years ago last spring. It possesses a very short straw and a black grain, which is exceedingly thin hulled. It is one of the greatest oats to stool that has come under our observation at the Agricultural College. The grain ripens medium early, and if allowed to get very ripe, is apt to shell considerably. As the grain possesses a very thin hull, there is usually a considerable amount hulled during the process of threshing. The Joanette variety seems well suited to strong, rich soils, which usually produce a large amount of straw, but, upon those lands which generally produce short straw, the Joanette oats may be considered a failure. It is, therefore, a special oat, being exceedingly well adapted to some soils in Ontarto.

It will be observed in the foregoing table that the Joanette oats have given the largest average yield of grain per acre, among all the varieties grown for seven years in succession at the Agricultural College. Beside giving an excellent yield per acre, it has also produced a grain which has given an average weight of a little over thirty-six pounds to the measured bushel. When we remember that this oat also possesses an exceedingly thin hull, we can see plainly that there is a large amount of grain of a very excellent quality. Although the straw is generally quite short, still, as it stools so much, the average amount of straw for seven years is about two and three-quarter tons per acre, which is as much as that of many of the other varieties.

In the co-operative experiments over Ontario, the Joanette has occupied third place in yield of grain per acre, among six leading varieties distributed over Ontario during each of the past four years in succession. In 1895 it produced 54.9 bushels per acre in the average results of the tests successfully conducted upon seventy-eight Ontario farms. The average yield of straw was 1.4 tons per acre. The Joanette and Oderbrucker stood second in popularity among the six varieties tested, as reported by the different experimenters.

Siberian. Previous to the spring of 1894, sixty-one varieties of white oats were grown in the experimental department for five years in succession, and the leading varieties among these sixty-one have now been grown for seven years, with the Siberian at the head of the list in point of yield per acre. This very excellent oat was imported by our College from Russia in the spring of 1889. It possesses a long straw, spreading head white grain and thin hull. The crop usually stands up well, and is generally but little affected by rust. In 1895, there was an average of 14.6 heads per plant, which was one of the best varieties in this respect. The Joanette, however, produced an average of over twenty heads per plant. The grain of the Siberian has weighed on an average thirty-five and three-quarter pounds per measured bushel; and, as this is also a thin hulled variety, the grain furnishes a large amount of food of excellent quality. A deputation from the Oatmeal Millers' Association selected the Siberian as one of the best among one hundred and eight varieties submitted for their inspection.

For four years in succession the Siberian has headed the list in yield of grain per acre in the co-operative experiments throughout Ontario. In 1892, it gave the largest yield of grain per acre in the tests of the six varieties grown on one hundred and twenty-five Ontario farms; in 1893, the highest in the average of the tests on one hundred and five farms; in 1894, the highest in the average tests on one hundred and twenty-one farms; and in 1895, the highest avarage yield on seventy-eight different farms. This makes for the Siberian a very high record. If we were asked to name the best all-round variety of oats in Ontario at the present time, we would point out the Siberian as the one which had given the highest all-round record in our experimental work, both here and over Ontario.

Waterloo. The Waterloo variety of oats, which was obtained from Germany, has proven to be a very good yielder, giving an average of eighty-one and two-third bushels per acre in seven years' experiments. Perhaps its weakest point is the light weight of the grain, as during the average of seven years, the weight per measured bushel is only a little over thirty-two pounds. It is four pounds per measured bushel less than that of the Joanette, and three and three-quarter pounds per measured bushel less than the Siberian. The straw grew to an average height of about fifty inches during the past season. The average number of heads per plant during 1895 was twelve, ranging from six to seventeen.

Bavarian. Among fifteen varieties of Ontario oats which helped to make up the seventy-nine varieties which were grown between 1879 and 1894, the Bavarian stands at the head of the list in yield per acre of the Ontario varieties. It has now been grown in this Province for about twelve years, and previous to its introduction here it had been grown in the State of New York for about five years after its importation from Bavaria. It is a white oat with spreading head, and possesses a good average straw and a grain of good quality. In the co-operative experiments over Ontario in 1895, it occupied second place among six varieties tested on seventy-eight different farms. In 1894, however, it occupied fourth place in average yield per acre among six varieties sent out during that year, and successfully tested on 121 Ontario farms. In weight per measured bushel, it has given an avarage of a little less than thirty-two pounds in the average of seven years' tests at the Agricultural College. This is one of the weakest features of this oat. The Bavarian was imported about the same time as the Joanette and the Siberian.

Egyptian. Of all Ontario oats which have been grown for seven years, the Egyptian has given the best results among those which are pretty generally known throughout the Province. This variety, however, gave an average, during the seven years, of 12.5 bushels per acre less than the Joanette, and 7.7 bushels per acre less than the Siberian. In average weight of grain per measured bushel, the Joanette has surpassed Egyptian by about two-thirds of a pound, and the Siberian has surpassed it by about one-third of a pound. In every one hundred pounds of Egyptian oats, there are about forty pounds of hull; in the same quantity of Joanette oats, twenty-six pounds of hull, and in the Siberian, about thirty pounds of hull.

Poland White The Poland White variety of oats was imported from France, and occupies seventh place in point of yield of grain among all the varieties grown for seven years. It is the best yielder of all the early varieties. The weight per measured bushel is nearly two pounds more than Joanette in the average of the seven years' trials. In the co-operative experiments over Ontario for the last three years, it has occupied an intermediate place, but during 1895 it came at the bottom of the list in yield of grain per acre among the six varieties distributed.

Vick's American Banner. A quantity of Vick's American Banner oats were obtained from the United States five years ago, and has been grown in our trial grounds each year since that date. During the five years which it has been grown, it has given an average of 88.28 bushels per acre. The Joanette, during the same length of time, has given an average of 94.03 bushels per acre, and the Siberian 92.37 bushels per acre. The Joanette gave an average of five and three-quarter bushels per acre more than Vick's American Banner, and the Siberian an average of 4.01 bushels per acre more than the Banner. Vick's American Banner gave about four pounds per measured bushel less than the Joanette Black, and upwards of three pounds per measured bushel less than Siberian in the results of the experiments for the number of years that these varieties have been tested at the Agricultural College.

Beans—Comparative Test of 13 Varieties.

During the year 1895, thirty-two plots were devoted to the growing of beans. The experiment was purely with varieties planted at two different dates. One set of sixteen varieties was sown on the 3rd of June, and a duplicate was sown on the 24th of June. There were five rows of each variety sown in each experiment. The rows were three rods, seven and a third feet in length, and were three links, or nearly twenty-five inches, apart. The land on which the beans were planted received a coating of farmyard manure at the rate of twenty tons per acre in the spring of 1894, and produced a crop of green fodder the same year. The yields per acre were estimated from the actual results of the plots.

Varieties.	Weight per measured bushel.			Yield of grain per acre.			
	1894.	1895.	Average.	1893.	1894.	1895.	Average.
	lbs.	lbs.	lbs.	bus.	bus.	bus.	bus.
California Pea	62.38	64.94	63.66	28.8	16.60	10.57	18.66
Small White Field	65.06	62.50	63.78	24.6	14.17	15.89	18.22
Prolific Dwarf Tree	64.81	64.13	64.47	27.3	12.64	14.40	18.11
Boston Pea	64.50	64.19	64.35	22.3	15.21	16.48	18.00
Medium or Navy	60.38	65.32	62.85	17.7	19.87	12.70	16.76
Yellow Soy	59.13	56.33	57.73	20.4	15.56	12.30	16.09
Yellow-Eyed or Boston Favorite	59.50	61.50	60.50	17.3	4.48	11.00	10.93
Giant Dwarf Wax	52.44	51.66	52.05	15.8	9.10	6.81	10.57
Marrowfat	62.88	63.63	63.26	5.9	7.78	16.79	10.16
Edamaine	59.00	57.75	58.38	7.6	6.94	7.79	7.44
Royal Dwarf Kidney	60.06	59.63	59.85	....	17.71	9.94	13.83
Yosemite Mammoth Dwarf Wax	58.19	....	....	7.2	6.26	....	6.73
Snowflake	....	63.13	....	....	....	13.35	13.35

Besides the varieties mentioned in the foregoing table two varieties of horse-beans and one variety of cow-peas were also grown, but they did not reach the stage of maturity sufficient to thrash. It will be observed that the Marrowfat variety of beans gave the largest yield of grain per acre, the Boston Pea bean second largest, and the Small White Field bean the third largest yield per acre in the results for 1895. During the average of three years, however, the California Pea heads the list in yield of grain per acre. The highest average weight of grain per measured bushel was given by Prolific Dwarf Tree and Boston Pea varieties of beans, and the lowest average weight per measured bushel was produced by the Giant Dwarf Wax variety.

Spring Grain—Influence from Stirring the Surface Soil during the Growing Season.

In the spring of 1895, nine varieties of spring grain were grown on plots one hundred and eighty links long by one hundred links wide. Each of these plots was again divided into four equal-sized sections, so that in all there were thirty-six plots. On eighteen of these we used the Zephaniah Breed weeder weekly during a term of about six weeks. When we started to use the weeder, the grain was about two inches in height; and when we quit it was approaching the condition of heading. This weeder is made something after the style of an ordinary hay rake. The teeth scratch the ground and thus stir the surface soil. The results of the use of this implement during the past year show but very little influence from the use of the weeder. The raked land produced thirty-four pounds of grain per acre more than the unraked. No definite conclusions can, therefore, be drawn from this experiment until it is repeated for a number of years.

Beans—Different Dates of Seeding.

The sixteen varieties of beans which have been reported upon were planted at two different dates, namely, on June 3rd and June 24th. The size of the plots, etc., were described under the heading of varieties. As we have conducted this experiment for only one year, the results are not nearly so valuable as they would be if the experiment had been made for a number of years. It may, however, be continued in future.

Dates of seeding.	Weight per measured bushel.	Yield of grain per acre.
	lbs.	bus.
June 3rd	62.46	11.78
June 24th	61.73	4.31

It will be observed that the seeding of June 3rd gave nearly three times as large a yield per acre as the seeding on June 24th. The weight per measured bushel from the beans of the first seeding was about three-quarters of a pound more than that of the last date of seeding. It will be remembered that for each of these dates the average of all the varieties tested is herein given. The germination of the beans was about equal in the two seedings.

Buckwheat—Comparative Test of 3 Varieties.

On June 10th, 1895, three varieties of buckwheat were sown on the experimental plots at the Agricultural College. This was the second year that these varieties had been grown for experimental purposes. The plots were one hundred and sixtieth of an acre in size, and the land produced a crop of grain in 1894. The buckwheat was sown broadcast at the rate of one bushel per acre. The yields per acre have been estimated from the actual results of the plots:

Varieties.	Weight per measured bushel.	Yield of straw per acre.		Yield of grain per acre.	
		1895.	Average, two years.	1895.	Average, two years.
	lbs.	tons.	tons.	bus.	bus.
Japanese	46.2	2.2	3.7	19.1	19.7
Silver Hull	50.0	2.6	2.9	11.5	12.3
Common Grey	47.0	2.0	2.6	10.3	11.62

It will be observed in the foregoing table that the yield of buckwheat per acre in 1895 was very similar in amount to the average of the two years of the experiment. Silver Hull gave the heaviest weight per measured bushel, being two pounds over the standard, while the other two varieties were a little under the standard in weight per measured bushel. The Japanese has a decided advantage over the Silver Hull and Common Grey in yield of grain per acre, producing one-half as much again as either of the last mentioned varieties. The Japanese is a strong growing variety and produces large angular grain. The Silver Hull variety produced a grain smaller in size than the Japanese, but very plump and of a beautiful silvery appearance.

WINTER RYE—COMPARATIVE TEST OF THREE VARIETIES.

In the autumn of 1894, three varieties of winter rye were sown in the experimental department. The seed was sown broadcast on the sixth of September, at the rate of two bushels per acre. The plots were one-hundredth of an acre in size. The soil was the same as that used for the varieties of winter wheat previously described.

Varieties.	Weight per measured bushel.		Straw per acre.		Grain per acre.	
	1895.	Average 2 years.	1895.	Average 2 years.	1895.	Average 2 years.
	lbs.	lbs.	tons.	tons.	bus.	bus.
Common	57.3	56.1	3.4	4.3	46.5	51.24
Pennsylvania	58.2	56.6	3.0	4.1	39.5	51.19
Finland	58.2	....	3.0	....	36.1	......

The common and the Pennsylvania varieties of rye have been grown for two years in succession and the average results from these two varieties are very similar indeed. The Finland rye gave an average of over ten bushels per acre less than the common variety. It will be observed than the yield of rye for both years was large, as the records show that there was over four tons of straw per acre, and upwards of fifty bushels of grain produced by each variety.

SPRING RYE—COMPARATIVE TEST OF TWO VARIETIES.

In the spring of 1895, two varieties of rye were obtained and sown side by side for a comparative test. This is the first year that these varieties were grown in the experimental plots. They were sown on plots of one one-hundredth of an acre in size on April 20th. Two bushels of seed per acre were used and it was sown broadcast.

Varieties.	Weight per measured bushel.	Yield per acre.	
		Straw.	Grain.
	lbs.		bus.
Prolific Spring Rye	58.3		52.2
Dakota Mammoth Rye	59.5		51.4

The results show that the two varieties came out very close in point of yield of grain per acre, the Prolific Spring rye surpassing the Dakota Mammoth by less than one bush per acre. The weight per measured bushel of the Dakota Mammoth however surpassed that of the Prolific Spring rye by over one pound, which would perhaps more than counterbalance the extra yield of the Prolific Spring variety.

Grain Sown in Mixtures.

For three years past, oats, wheat, barley, and peas have been grown separately and in various combinations for the production of grain and straw. The combinations consisted of six mixtures with two kinds of grain used in each case, four mixtures with three kinds of grain used, and one mixture with all four kinds of grain used together. There were eleven mixtures in all and four varieties of grain grown separately. These were all sown in duplicate, upon plots one-hundredth of an acre in size, making in all thirty plots. The grain was sown broadcast on April 25th. Beans were grown upon the land in the summer of 1894, and no manure has been applied for several years.

Mixtures.	Yield of straw per acre.				Yield of grain per acre.			
	Sown separately.		Sown in mixtures		Sown separately.		Sown in mixtures	
	1895.	Average 3 years.	1895.	Average 3 years.	1895.	Average 3 years.	1895.	Average 3 years.
	tons.	tons.	tons.	tons.	lbs.	lbs.	lbs.	lbs.
Barley and peas	1.20	1.19	1 20	1.35	2,205	1,629	1,817	1,488
Peas and wheat	1.25	1.25	1.28	1.37	1,701	1,378	1,445	1,185
Wheat and oats	1.09	1.51	1.12	1.57	1,457	1,472	1,736	1,755
Barley and oats	1.04	1.43	1.32	1.73	1,961	1,723	2,312	2,216
Wheat and barley	1.00	1.15	1.16	1.29	1,610	1,295	1,784	1,380
Peas and oats	1.29	1.48	1.52	1.79	2,052	1,797	2,008	1,872
Barley, peas, and wheat	1.15	1.21	1.24	1.49	1,839	1,436	1,693	1,516
Peas, wheat, and oats	1.21	1.41	1.48	1.79	1,736	1,539	1,895	1,758
Barley, wheat, and oats	1.04	1.43	1.41	1.73	1,676	1,521	2,033	2,019
Barley, peas, and oats	1.18	1.37	1 49	1.72	2,072	1,716	2,227	2,064
Barley, peas, wheat, and oats	1.14	1.34	1 58	1.77	1,831	1,550	2,169	1,952

It will be observed in the table that the grains when sown in mixtures gave larger yields of grain per acre in nine out of eleven reports in the average for three years. It will also be observed that in the average of three years' experiments, *barley and oats* mixed before seeding gave larger yields per acre than any other crops sown separately or in combination. The lightest average yield of grain per acre was produced by a combination of peas and wheat. In yield of straw per acre, the grain which was sown in mixtures gave as large or larger returns in each of the eleven experiments during each of the three years in which this experiment has been conducted.

Spring Grains—Selection of Seed.

A great deal has been said and written in regard to the selection of our domestic animals in order to produce animals for special uses. Men have had their ideals of horses, cattle, sheep and hogs, and have worked for years in breeding along certain lines, in order to bring their animals as near as possible to these ideals. Great improvements have been made in this way in all kinds of farm animals; and, as a result, we find some very excellent breeds which usually produce their offspring nearly true to type. Not only has this work been carried on by a few talented men who have had special capabilities for such work, but much has been accomplished by stock-breeders as a class. Careful and successful stockmen take much pains in the selection of the animals which they handle in order to obtain the greatest practical results along the lines on which they are working.

It seems strange that there has been so little care exercised in the selection of seed for the farm when there has been so much care given to the selection of the farm animals, and with such good practical results. Some individuals have made the selection of grain a prominent feature and have had good success in their efforts. It cannot be denied, however, that farmers in general devote altogether too little attention to this very important feature in connection with their farm operations. The experimental department at the College is doing a considerable amount of work in the selection of seed for farm use; and it is the intention to extend this work to a considerable extent by the careful selection of seed and by cross-fertilization of the varieties that have already proven the most successful among those grown for a number of years in succession in the experimental department. A considerable amount of advantage has already been shown to result from the selection of seed during the last seven years in a general way, and during the past four years in special experiments conducted with direct objects in view. During the past season thirty-four plots were devoted to experiments in the selection of spring wheat, oats, barley and peas, and the majority of these are reported upon in the following pages. These were conducted in the central part of our experimental field. The land was plowed the previous autumn and was thoroughly cultivated in the spring before the seeding took place. Owing to pressure of work the seeding did not take place until the early part of May; but the plots of each experiment were sown on the same day in every instance. The grain was sown broadcast on plots one hundred and sixtieth part of an acre in size. The yields per acre are estimated from the actual yield of the plots.

Barley—Selection of Seed.

Large plump, small plump, shrunken and cracked barley were sown on experimental plots in 1894 and in 1895. The small plump was sown on two plots during each of these years; upon one plot the same weight was used as that of the large plump seed, and on another the same number of grains was used as was sown of the large plump grain. The same can also be said of the shrunken grain. The two plots with the small grain, as well the two plots with the shrunken grain, were averaged during each of the years. The same weight of cracked grain was used each year as was used for the large plump selection.

Selections.	Weight per measured bushel.		Yield of straw per acre.		Yield of grain per acre.	
	1895.	Average 2 years.	1895.	Average 2 years.	1895.	Average 2 years.
	lbs.	lbs.	tons.	tons.	bus.	bus.
Large plump	49.0	49.8	1.44	1.40	38.2	42.5
Small plump	48.3	49.0	1.24	1.36	35.3	38.5
Shrunken	47.7	48.7	1.15	1.23	33.1	34.6
Cracked	46.5	48.4	1.00	1.28	30.0	32.5

It will be observed by the above table that the large plump gave the best results in yield of straw per acre in weight per measured bushel, and in yield of grain per acre in both the results for 1895 and for the average of two years. The shrunken grain gave an average of about nine bushels per acre less than the large plump grain in the average of the experiments for two years.

Spring Wheat—Selection of Seed.

When selecting the large plump seed, great care was exercised to have grains of a uniform and symmetrical type throughout. The kernels selected under the heading of "Shrunken" were usually of good size, but were quite angular on their surface owing to a lack of full development. The small plump seeds were apparently good in every way except being small in size. In weight of grain per measured bushel the large plump seeds gave nearly three-quarters of a pound more than the produce of the shrunken seed in the average of three years. There is quite a marked advantage in favor of the large plump seed in yield of grain per acre for 1895 and for the average of three years.

Selections.	Weight per measured bushel.		Yield of straw per acre.		Yield of grain per acre.	
	1895.	Average 3 years.	1895.	Average 3 years.	1895.	Average 3 years.
Large plump seed	61.5	60.14	1.65	1.32	31.6	21.9
Small plump seed	61.4	60.91	1.27	1.03	21.7	17.4
Shrunken seed	61.2	59.50	1.34	1.06	25.8	17.9

It will be observed that in the average results for 1893, 1894 and 1895 the large plump seed gave four and a half bushels per acre more than the small plump grain which has an increase of about twenty per cent. Shrunken seed produced four bushels of grain per acre less than the large plump seed in the average of three years, during which time these experiments have been conducted. Not only is there an advantage in the weight of grain per measured bushel and in grain per acre, but it will be seen that in the yield of straw per acre the large plump seed produced about one-third more straw than was produced by the small grain. There was also nearly as great a difference in the yield of straw between the shrunken seed and the large plump seed.

Sound and Cracked Peas for Seed.

Selections.	Yield of straw per acre.				Yield of grain per acre.				
	1892.	1893.	1895.	Average 3 years.	1892.	1893.	1894.	1895.	Average 4 years.
	tons.	tons.	tons.	tons.	bus.	bus.	bus.	bus.	bus.
Whole peas	1.54	1.01	1.16	1.24	25.9	19.8	18.8	48.5	28.3
Cracked peas	.86	.27	.60	.58	12.2	4.4	.8	20.0	9.4

For four years in succession we have sown plots with whole peas and with peas which have been cracked by the machine. The same weight of grain was sown in every instance. The results are exceedingly interesting and should be carefully noted. It will be seen by the foregoing table that in every instance the whole peas gave much larger returns than cracked ones in yield of both grain and straw. There was not one of the four years in which these experiments were conducted, but the yield of grain was more than doubled from the whole peas as compared with cracked ones. In the average of the experiments of 1892, 1893, 1894 and 1895, the whole peas gave 28.3 bushels per acre and the cracked peas 9.4 bushels per acre. These plots when growing were exceedingly interesting and were observed by a great many farmers during the last season. One day in the month of June, while a company of farmers were looking at these two plots growing side by side, a gentleman said that that was a grand object lesson for him as he was in the habit of getting his peas thrashed by a machine and then sowing the thrashed grain, and he thought perhaps one-third of the peas were cracked. He had considered that if the germ was not in one-half it would be in the other half and would grow all right. He said that in the future his plan would be to clean carefully out the cracked peas and feed them to his hogs and sow none but those which were whole. Is it not a fact that a great many farmers thrash their peas with a machine and sow a proportion of cracked grain each spring? It would be far more economical for them to feed the cracked grain instead of sowing it to rot. In 1894 only seven per cent. of the cracked peas grew; and in 1895 only about twenty per cent. were seen to germinate.

Buggy Peas for Seed.

In 1894 and in 1895 peas were selected, each of which had been partially eaten by the pea bug, (*Bruchus pisi*). In 1894 a very small pea was used for this experiment, and only twenty-four per cent. of the peas sown germinated. In 1895, however, a larger variety of peas was selected for this test and evidently the ravages from the bug did not effect such a large percentage of the germs as forty-five per cent. of the grains germinated. Consequently in the average tests of two years, 34.5 per cent. of the grains which were sown, germinated. It would be well for those who are sowing peas to watch closely the soundness of the grain which they sow, as buggy peas would be much better fed to animals than sown, as a bushel of buggy peas contains about three-quarters as much feeding material as a bushel of sound peas; and if used for seed, only about one-third will be of any value, according to the results of the experiment. As a portion of the buggy pea has been removed, the young plants produced will not be so strong and vigorous as those grown from sound peas. This fact has been quite visible in the plots used for this experiment.

Selection of Seed—White Oats.

In 1894 and in 1895 experiments were conducted, in which large, plump, medium and small size grains were used, and also double grains. It is often observed, especially in a poor season, that a small oat will be enclosed inside the hull of a larger grain. On examination, the grain would at first sight appear to be made up of a single kernel, but on further inspection, it will be found that the apparent kernel is in reality made up of two grains enclosed by the one covering. With this seed there are double as many grains sown as in any of the other selections Exactly equal numbers of grains were selected for each of the other plots in both years. In 1894, 8,160 grains were sown on each plot and in 1895, 7.900 grains were sown on each plot.

Selections.	Wheat per measured bushel.		Yield of straw per acre.		Yield of grain per acre.	
	1895.	Average 2 years.	1895.	Average 2 years.	1895.	Average 2 years.
	lbs.	lbs.	tons.	tons.	bush.	bush.
Large plump	35.0	36.1	1.28	1.29	65.9	58.[illegible]
Medium	34.2	35.7	1.20	1.33	63.4	52.[illegible]
Small	34.2	36.1	1.42	1.43	62.2	47.[illegible]
Double	34.7	36.2	1.28	1 35	58.8	48.[illegible]

It will be observed in the foregoing table that large, plump seed gave the largest yield of grain per acre in 1895, and also in the average of the two years' experiments. The medium-sized seed came second in point of yield per acre. In the average of two years' experiments, we find that the large seed gave an average of eleven bushels per acre more than the small seed.

Selection of Seed for Two Years in Succession.

In 1895 barley, spring wheat, oats and peas were grown from seed selected from the crops produced in 1894, which were also produced from selected seed. It was found, however, that the peas were not all true to name, some of the smaller ones being not of the same variety as the largest ones which were selected. This part of the experiment is, therefore, not reported upon. In order to give a good idea of the results from the selection of seed during the second year, the average number of grains per ounce in each selection of seed is given in the following table :

Class of grain.	Average number of grains per ounce of crop from seed.		
	Large plump.	Small plump.	Shrunken.
Barley	600	704	807
Spring wheat....................	958	1137	1023
Oats	1143	1161	1196

It will be observed that the largest grains in every instance were produced from the large, plump kernels, which were sown. In the barley experiment the shrunken grain produced smaller kernels, than the small plump; but in the spring wheat exactly opposite is the case, the small plump grains producing smaller kernels than the shrunken. In the case of the oats, the results from the three selections are not very different, but they all point in the one direction, namely, that the best grain sown produced the best grain in the succeeding crop. This work will likely be continued for several years, until a large amount of valuable information can be gathered along this important line of investigation.

Selection of Seed—Joanette Oats.

For three years in succession, we have carried on an experiment with the Joanette variety of oats, endeavoring to glean some information in regard to the cause of the tendency of black oats to become lighter in color, when grown in Ontario for several years; the germination of oats from which the hull has been removed by the separator as compared with the germination of oats with the hull on; and the tendency of oats sown with the hull on to produce a crop of grain less liable to be hulled in the thrashing than the previous crops. In carrying on this experiment, we have used seed from the crop of the different plots of the previous year. As it has been found to be the tendency of the Joanette oats to become very badly hulled in thrashing, this particular variety was selected for this experiment. In the past two years exactly the same number of grains were sown upon each plot, there being nine thousand one hundred and fifty-seven grains sown upon each plot in 1894, and seven thousand three hundred and one sown upon each plot in 1895. The grain was sown broadcast on plots one hundred and sixtieth acre in size.

Selection.	Number of grains per ounce. 1895.			Weight of grain per measured bushel.			
	Total.	Hulled.	Not hulled.	1893.	1894.	1895.	Average 3 years.
				lbs.	lbs.	lbs.	lbs.
...e plump	1,288	146	1,142	32.3	34.5	32.9	33.2
...t	1,330	132	1,199	30.3	32.8	31.1	31.4
...lled	1,358	252	1,105	33.8	34.9	33.4	34.0

Owing to some trouble from sparrows destroying a small amount of the grain after being shocked, the yield of grain from the different plots cannot be given during the present year. We have, however, examined the grain, and found the results to be quite interesting. It will be observed that the grain produced by sowing large plump seed possesses heavier kernels than that produced from the sowing of light grain. The greatest amount of hulled grain was produced from the crop raised from the hulled seed. It took eleven hundred and ninety-nine kernels from the crop produced by sowing light seed to weigh an ounce, as compared with eleven hundred and forty-two kernels obtained from the crop produced by the large plump grain. In weight per measured bushel, we find that we have obtained the same comparative results during each of the three past years. From sowing hulled kernels, we obtained the heaviest weight of grain per measured bushel; from sowing the large plump kernels we obtained the next heaviest weight of grain per measured bushel; and from sowing light kernels, we obtained the lightest weight of grain per measured bushel. There was a difference of about two pounds per measured bushel of grain from large plump kernels, as compared with the light kernels, in the average of three years' experiments.

Spring Grain, Different Dates of Seeding.

Barley, peas, spring wheat, and oats were sown on six different dates in the spring of the present year, starting on April 18th and finishing on May 25th. The experiments were conducted in duplicate in every case by using two varieties of each of the kinds of grain mentioned. This makes the fifth year in which this experiment has been made; but, owing to unfavorable weather at the proper times of seeding, we were compelled to drop the experiment entirely for one year, and partially in one or two of the other seasons. We, however, have results of seeding on three of the dates mentioned, for four different years.

In 1895, forty-eight plots were devoted to this experiment, the plots being one hundredth of an acre in size in every instance. The land on which the experiment was conducted lay somewhat low and had received farmyard manure at the rate of twenty tons per acre in the spring of 1894, during which season it produced a crop of roots. The grain was sown broadcast and at the same rate of seed per acre as was used in the variety tests. The yields per acre in the following table have been estimated from the actual results of the plots for the past season;

Results from Sowing Grain at Six Different Dates in 1895.

Dates of Seeding.	Weight per measured bushel					Yield of grain per acre.				
	Barley.	Peas.	Sp. Wheat.	Oats.	Average.	Barley.	Peas.	Sp. Wheat.	Oats.	Average.
April 18	52.38	61.25	60.63	36.13	52.60	46.63	32.60	22.30	101.85	51.[illegible]
April 22	52.88	61.32	59.75	34.75	52.18	46.75	35.65	17.03	109.29	52.[illegible]
May 1	49.75	62.13	59.88	34.88	51.66	42.71	41.93	16.72	99.74	50.[illegible]
May 9	45.63	62.32	60.38	33.13	50.37	38.15	43.70	15.68	92.29	47[illegible]
May 18	49.13	61.63	60.63	33.25	51.16	33.08	38.68	12.13	67.09	37[illegible]
May 25	43.00	61.69	61.25	31.50	49.36	23.19	37.50	14.48	73.32	37[illegible]

It was previously mentioned in this report that between the 12th and 23rd of May of the present year there were frosts at the Agricultural College on eight separate nights, the thermometer reaching as low as ten degrees below freezing point on the night of May 20th. At this time the grain sown on the 18th and 22nd of May was all growing nicely, and that sown on May 1st could be seen growing above the ground. We, therefore, have some interesting results to record this season, in showing the effects of quite severe and continued frosts upon four kinds of young growing grain crops.

It will be observed from the above table, that the largest yields of grain per acre of spring wheat, were obtained from the first seeding; of barley and oats from irst seeding; and of peas from the fourth seeding. The increases and decreases are quite egular throughout, except in the case of the last two seedings. It will be observed that he barley and peas gave larger yields per acre from the seeding of May 18th than that f May 25th, while exactly the opposite is the case with spring wheat and oats. In the verage of the four grains sown, the seeding of April 22nd, gave the highest yield of rain per acre, and that of April 18th, the second highest. There was a gradual decrease n the average yield of grain per acre, from the second to the last dates of seeding. In weight of grain per measured bushel, it will be observed that the oats gave the largest weight from the first seeding, the barley from the second seeding, and the peas from the fourth seeding. The average weight per measured bushel of the spring wheat from the different dates of seeding is rather peculiar and different from that of other years. As it will be observed that the heaviest grain was produced on May 25th and there was a gradual decrease in weight per measured bushel up to the first date of seeding, at which time it equals that of the fifth seeding. The results, however, are very similar with the two varieties of spring wheat used in this experiment. To show how very careful the results of these experiments are worked up, it might be mentioned that two varieties of each kind of grain were used, and all weights were carefully determined by two individuals independent of each other; and where any difference occured between the two weighings, the grain was weighed the third time.

The following table gives the results of four kinds of grain sown on three different dates for four years in succession:

Dates of seeding	Average weight per measured bushel.				Average yield of straw per acre.				Average yield of grain per acre.			
	Barley, 4 years.	Peas, 3 years.	Spring wheat, 2 years.	Oats, 4 years.	Barley, 4 years.	Peas, 3 years.	Spring wheat, 4 years.	Oats, 4 years.	Barley, 4 years.	Peas, 3 years.	Spring wheat, 4 years.	Oats, 4 years.
April 21-22	50.02	60.05	60.13	33.81	1.16	1.20	1.23	1.88	35.81	33.75	18.31	67.87
May 1	48.08	61.25	59.44	33.04	1.22	1.27	1.06	1.74	35.05	36.34	14.61	65.15
May 9	45.62	61.93	58.54	30.72	1.10	1.16	.92	1.50	26.17	33.51	11.14	58.75

The results in the above table should be of much value, as the experiments extend r a period of four years, and they cover pretty thoroughly the period of sowing the leadg kinds of grain in a climate somewhat similar to that of Guelph. If early sowing has marked influence in increasing the yield and the quality of grain in Wellington county, is quite likely the rule will hold good in other sections of the Province, although exactly e same dates might not be applicable in all places. It will be observed that the barley, ring wheat, and oats gave the heaviest weight per measured bushel from the first seedg, and there was a gradual decrease in this respect in the second and third dates of eding. In respect to the peas, however, such is not the case, as the heaviest grain was oduced from the seeding of May 9th, the second of May 1st, and the lightest of April st and 22nd. There is also a gradual decrease in the amount of grain per acre of barley, ring wheat and oats, when we compare the results of the second and third dates of seedg with those of the first. It should be carefully observed, however, that the peas gave average of nearly three bushels per acre more from the seeding of May 1st than from e seeding on the 9th of May, or of April 21st and 22nd. The reader will observe that ere was only about nineteen days from the first to the last dates of seeding; but there s a decrease of about ten bushels per acre of barley, seven bushels per acre of spring eat, and nine bushels per acre of oats, from the last date of seeding as compared with e first.

Spring Grain—Drilling *vs.* Broadcasting.

In the spring of 1895, barley, peas, spring wheat and oats were sown both with a drill d by hand on plots lying side by side. There were two varieties of each kind of grain d for this experiment, thus making sixteen plots in all. The plots were one-hundredth of an acre in size in every instance. Seeding took place on April 19th. The land on which this experiment was conducted lay low, and produced a crop of roots in the year 1894, before which it received a dressing of twenty tons per acre of farmyard manure. The following are the results of the experiment :

Methods of seeding.	Yield of straw per acre.		Yield of grain per acre.	
	1895.	Average for 2 years.	1895.	Average for 2 years.
	tons.	tons.	bushels.	bushels.
Broadcast	2.03	1.96	53.23	49 42
Drilled	1.86	1.91	51.07	48.69

In 1893 the drilled grain gave about three quarters of a bushel per acre more than that which was sown by hand. In 1895, however, the broadcasted grain gave an average of over two bushels per acre more than the drilled. It must be remembered that the date of seeding was very early, this experiment being one of the very first that was undertaken. The ground at that time contained plenty of moisture, and was likely cold underneath. Hence the broadcast grain had the advantage of getting the full benefit from the surface soil, which would be warmed by the sun during the day. Had the grain been sown some days later the results might have been considerably different. In the future this experiment will likely be made by sowing at different dates, in order to see the influence from the two methods of sowing at times when the ground is likely to be in somewhat different conditions.

POTATOES AND ROOTS.

The number of plots devoted to experiments with potatoes and roots during the year 1895 was 740 These were almost equally divided between the two, there being 376 plots of roots and 364 plots of potatoes. The land upon which the potatoes were grown had not produced a crop since it was broken up, it being comparatively new land. The land devoted to the root experiments had been cropped for a good many years. The crops in the variety tests were one-hundredth of an acre in size, with but a very few exceptions. Besides the experiments with varieties, a large number of tests were made in the methods of cultivation and in the selection of seed with both potatoes and roots.

POTATOES—COMPARATIVE TEST OF 184 VARIETIES.

Thirteen new varieties of potatoes were introduced and grown in the trial grounds in 1895 for the first time. This makes in all 184 varieties which were grown during the past season. The seed of the different varieties which we now have under experiment was obtained from Nova Scotia, Prince Edward Island, Quebec, United States and Ontario. Twenty-three of the varieties have been grown for six years in succession, and sixteen for five years ; but, to bring all these varieties into the same table for the sake of comparison, the reports for only the last five years are included in the following summary results. This makes thirty nine varieties grown for five years in succession upon plots side by side. The varieties were all grown on new land without any manuring The varieties were planted on May 30th and 31st on plots one hundredth of an acre in size. Each plot consisted of three rows, four rods in length, the rows being a little less than twenty-six inches apart. Fifteen pounds of each variety were used in every instance, and the potatoes were so divided that there were exactly 198 sets of each kind planted. The land was drilled with a double mouldboard plow, and the potatoes were placed four inches below the surface of the land. Flat cultivation was used throughout, and the application of Paris green solution was used three times to destroy the potato beetles The crop was removed from the ground with a two horse potato digger. The marketable and unmarketable potatoes were divided by means of a Pease potato sorter. The potatoes were weighed very soon after being dug. The yields pere acre were estimated from the actual results of the plots.

POTATOES—COMPARATIVE TEST OF 184 VARIETIES.

Varieties.	Result for 1895. Amount of scab, 100=most, 1=least.	Result for 1895. Yield of marketable potatoes.	Result for 1895. Yield of whole crop.	Average results for the number of years grown. Percentage of whole crop marketable.	Average results for the number of years grown. Weight of 30 representative potatoes	Average results for the number of years grown. Yield of potatoes per acre.
Grown for five years:		bush.	bush.		bush.	bush.
Empire State	26	245.00	261.25	94.67	12.78	204.66
Thorburn	44	225.83	235.83	93.99	13.00	181.51
Summit	43	183.95	205.42	89.37	11.89	179.36
Tonhocks	23	152.92	194.58	79.43	7.39	176.35
Convoy	18	234.17	252.50	87.93	9.46	175.56
Sweet St. Vernal	17	203.75	228.33	87.78	9.63	169.58
Beauty of Hebron	26	214.58	237.50	90.08	9.08	168.79
Woodbury White	27	220.42	248.33	85.78	8.94	168.60
Late Rose	39	212.08	236.25	88.67	9.40	167.95
Rural New Yorker No. 2	43	236.67	252.50	92.22	11.40	164.35
Rose's New Invincible	41	257.08	271.67	92.16	11.08	162.44
Early Sunrise	21	148.75	173.33	88.36	9.40	162.14
Badger State	28	219.17	241.67	87.38	10.19	161.66
Green Mountain	60	265.42	284.58	91.19	14.40	160.98
White Elephant	50	240.83	256.69	90.81	11.39	159.36
Advance	10	189.17	217.92	82.01	8.33	159.01
Early Rochester	32	228.33	245.00	87.77	9.64	158.[illegible]8
Minister	43	207.50	220.42	93.97	11.26	158.25
Early Oxford	16	170.00	195.00	83.58	7.69	157.73
Early Mane	30	151.25	172.08	83.26	8.59	157.46
Early Puritan	25	182.50	202.92	89.58	10.83	157.05
Early Rose	19	188.75	214.58	85.24	9.26	155.91
Thunderbolt	12	185.42	201.67	80.55	8.70	155.57
Pootaluck	31	149.17	177.08	86.31	9.26	154.81
Daisy	35	185.83	225.83	86.58	8.64	154.29
Silver King	31	222.08	243.75	80.52	8.70	153.69
Rural Blush	31	210.83	234.17	89.79	15.51	151.87
Hoffman	16	173.33	189.58	79.88	7.94	150.78
Kosh Konong	20	161.25	172.92	87.49	9.64	142.43
Crown Jewel	39	169.58	202.92	84.90	9.96	142.08
Dakota Red	35	203.33	219.58	90.28	8.50	140.87
Putnam	23	180.00	202.08	76.76	8.33	140.84
Hatton's Seedling	34	164.58	198.33	78.13	8.08	138.58
Early Dominion	20	158.33	166.25	84.10	8.89	138.36
Ohio Junior	10	154.17	161.25	88.87	9.83	137.84
Early Ohio	33	140.83	157.92	84.44	8.51	133.16
Rosy Morn	30	150.42	172.50	82.08	7.53	124.19
Queen of the Valley	21	156.67	173.33	86.74	9.65	123.95
Stray Beauty	26	143.33	164.58	81.45	6.20	116.40
Grown for four years:						
Burbank's Seedling	19	234.58	255.42	83.83	9.00	199.58
Early Everett	25	191.25	217.08	84.77	8.95	188.34
Morning Star	21	287.50	310.83	82.16	8.28	185.33
Early Gem	23	196.25	204.58	89.93	10.51	184.06
Hotel Favorite	28	207.50	232.92	83.29	9.20	182.60
Island McDonald	35	226.25	252.08	89.18	11.20	180.61
The Dandy	28	197.08	223.75	81.28	8.76	180.42
New Queen	30	200.83	212.08	83.85	12.06	178.76
Landreth's State of Maine	23	255.00	280.00	79.29	7.95	178.46
King of the Roses	13	170.83	198.75	81.36	9.26	178.03
Edwards	19	245.00	267.50	87.15	9.69	176.38
N. B. & G. Co's Grand Mogul	60	227.08	249.17	92.07	9.34	176.25
Everett's Seedling	33	191.67	226.25	79.48	7.95	175.45
Delaware	33	261.67	277.92	88.00	9.14	175.31
St. Patrick	25	189.17	211.25	86.27	9.63	174.67
Thorburn's Extra Early	23	152.50	188.33	76.57	7.94	173.35
State of Maine	24	232.50	247.92	91.59	9.08	172.45
Watson's Seedling	31	180.42	214.58	80.00	8.38	172.

POTATOES—COMPARATIVE TEST OF 184 VARIETIES.—*Continued.*

Varieties.	Result for 1895. Amount of scab, 100=most, 1=least.	Result for 1895. Yield of marketable potatoes.	Result for 1895. Yield of whole crop.	Average results for the number of years grown. Percentage of whole crop marketable.	Average results for the number of years grown. Weight of 30 representative potatoes	Average results for the number of years grown. Yield of potatoes per acre.
Grown for four years.—*Con.*		bush.	bush.		bush.	bush.
58 Mammoth Pearl	14	166.67	175.00	88 53	9.63	**172.20**
59 Molly Star	15	144.58	162.92	81.17	8.95	**171.67**
60 Alexander's Prolific	33	250.00	262 50	85.85	9.53	**171.54**
61 Wilson First Choice	32	247.92	275.83	80.26	8 34	**171.27**
62 Polaris	23	154.17	180.83	80.93	8.45	**170.85**
63 Harbinger	11	195.83	277.08	59.44	7.14	**169.76**
64 White Star	32	140.42	146.67	90 57	12.76	**169.67**
65 Burpee's Extra Early	16	158.33	195.00	77.13	6.96	**168.95**
66 The Ideal	21	171.67	202.92	79.37	7.31	**167.82**
67 Paris Rose	23	154.58	185.00	73 55	7.53	**167.30**
68 Early May Flower	21	174.17	210.83	7[illegible].39	7.33	**165.54**
69 Halo of Dakota	39	160.42	200.42	8[illegible].36	7.40	**165.29**
70 Dempsy's Seedling	14	183 33	206.67	83.16	8.63	**163.57**
71 Vick's Perfection	23	153.33	182 08	86.90	8.46	**162.80**
72 Munroe's Co. Prize	38	166.67	188.75	83.92	10.14	**162.46**
73 May's Imperial	23	155 83	168.33	85.20	9.25	**161.87**
74 Red Australian	28	161.25	177.92	88.81	8.51	**161.55**
75 Early Market	39	180.42	190-42	91.34	9.26	**161.13**
76 White Lily	28	204.58	227.50	83.17	9.01	**160.11**
77 Landreth's Alliance	19	197.92	227.50	88.11	9.90	**159.80**
78 Early Essex	16	172.92	205.42	80.64	8.20	**159.57**
79 Vick's Champion	12	176 67	189.58	89.86	10.08	**157.19**
80 Mount Carbon	7	172 92	186.25	84.98	9.21	**157.08**
81 Chautauqua	18	182.50	196.67	89.65	9 39	**166.88**
82 Chicago Market	3	163.75	181.67	82.40	8 64	**156.28**
83 Bell A. C	17	220 00	228.33	88.65	9.50	**156.37**
84 P. E. I. Early Rose	3	167.08	181 67	89.22	9.45	**156.06**
85 Bowley's Northern Spy	33	190.00	207.50	86.71	9.75	**155.12**
86 The Rosedale	14	174.58	190 00	83.12	8 34	**155.10**
87 Garnets	20	250.42	161.67	87.41	10 09	**153.95**
88 Extra Early Vermont	16	195.83	208.33	83 68	9.20	**153.65**
89 Landreth's Garfield	16	166 67	204.17	76 27	7.56	**153.55**
90 Negro	73	67.08	155.42	58.21	5 38	**152.31**
91 Eureka	47	119 58	147.50	78 59	7.71	**151.55**
92 Prince Albert	18	154.58	173.33	79.83	8.13	**149.39**
93 Sunlet Star	23	115 00	145.83	75.18	7.95	**148 63**
94 Rose Seedling	23	186.25	195 42	93.21	11.33	**147.59**
95 Snowflake	23	115.42	196.67	55.34	5.09	**146 80**
96 Hopeful	34	195.83	207.08	86.18	9.81	**146.80**
97 Royal Adelaide	6	192.50	205.00	88.10	9.33	**145 05**
98 Snow Queen	30	155.83	195.83	73.38	6.83	**145.00**
99 Chas. Downing	24	103.33	183.33	56.74	4.96	**143.21**
100 Vaughan	12	145 42	155 83	90.23	10.03	**139.92**
101 Lady Finger	10	84.17	179 58	42.68	5.19	**138.25**
102 McIntyre	23	154.58	176.25	84.36	9.34	**135.41**
103 Pearce's Prize Winner	14	67.08	85.42	83 62	9.06	**93.08**
Grown for three years:						
104 Pearl of Savoy	28	247 08	255 00	95 99	16 50	**242.3**[illegible]
105 American Wonder	28	247.50	275.00	89.75	12 35	**242 0**[illegible]
106 American Giant	33	220.83	235.42	93.08	13.92	**236.9**[illegible]
107 Columbus	24	260.42	275.83	91.64	12.92	**236.6**[illegible]
108 Burpee's Superior	16	246.25	267 92	88.78	11.00	**228.7**[illegible]
109 Bill Nye	34	220 83	243.75	88.52	10 50	**218.6**[illegible]
110 Early June Eating	23	212.08	223.33	90.06	13.17	**206.8**[illegible]
111 Early Pontiac	30	172.50	201.25	83 54	8.10	**205.3**[illegible]
112 Scotch Regent	35	204 58	223 75	83.66	9.50	**205.2**[illegible]
113 Keiser	26	195.00	203.33	93.40	10 83	**204.4**[illegible]
114 Nebula	23	156.67	185.00	83.73	12.77	**200.5**[illegible]

POTATOES—COMPARATIVE TEST OF 184 VARIETIES.—*Continued.*

Varieties.	Result for 1895.			Average results for the number of years grown.		
	Amount of scab, 100=most, 1=least.	Yield of marketable potatoes.	Yield of whole crop.	Percentage of whole crop marketable.	Weight of 30 representative potatoes	Yield of potatoes per acre.
		bush.	bush.		bush.	bush.
Grown for three years.—*Con.*						
115 Improved Rose	10	181.25	193.75	89.89	11.00	**198.86**
116 Early Harvest	12	159.58	183.33	88.35	9.83	**197.08**
117 Montana Wonder	9	203.75	230 00	79.63	10.35	**196.11**
118 Early Yorker	18	194.17	211.25	88.56	12 42	**195.55**
119 Arizona	39	167.08	177.08	88.26	12.77	**195.53**
120 Early Six Weeks	33	175.42	200 00	84.52	9.92	**194.99**
121 Rochester Rose	21	185.83	196.67	92.76	12.18	**194.87**
122 Granger	8	204.33	225.42	87.11	10.18	**194.30**
123 General Gordon	10	210.83	222.92	94.90	12.58	**188.83**
124 Bruce's White Beauty	16	167.50	190.00	83.19	8.92	**187.23**
125 Timpe's No. 4	27	163.33	174.17	89.31	11 85	**186.41**
126 North Pole	17	128.75	148 33	83.59	9 83	**185.84**
127 Golden Harvest	17	159.17	175.42	86.62	10.27	**184.31**
128 Van Orman's Earliest	5	164.17	187.08	84 72	8.67	**182.64**
129 Six Weeks	10	139.17	145.83	92.69	11.23	**181.94**
130 The Freeman	6	149.58	185.00	80.26	8.52	**180.29**
131 Steele's Earliest of all	22	137.50	158.33	85.90	8.83	**179.88**
132 The People	5	188.75	199.17	91.14	11.18	**178.45**
133 Beauty of Beauties	20	150.42	162.50	88.53	10.50	**178.06**
134 Early Norther	10	112.92	127.50	91.13	11.43	**176.39**
135 Reid's Eighty-Six	7	157 92	183.75	83.99	10.42	**176.13**
136 Potentate	31	129 58	133.75	89.52	12.92	**173.06**
137 Parson's Prolific	11	124.17	136.25	89.25	11.08	**166.66**
138 Seneca Beauty	15	164.17	170.83	97.15	16.68	**166.54**
139 World's Fair	38	120.42	133.33	85.64	9.58	**166.12**
140 Browall's Seedling	6	133.33	145.83	91.82	13.17	**165.72**
141 Ontario	4	161.25	182 92	86.73	12.17	**164.03**
142 Pride of Ireland	12	112.92	123.33	90.27	11.27	**162.37**
143 Manitoba Rose	8	167.08	186.25	89.07	10.42	**159.31**
144 Maggie Murphy	10	185.42	185.83	94 25	13.33	**153.56**
145 Columbian Peach Blow	5	155 00	176 25	77 35	8.33	**150.30**
146 Great West	12	144.58	165.00	82.46	10.92	**149.03**
147 Howe's Premium	13	127.92	139.17	90 28	7.88	**144.58**
148 Eyeless	14	97.08	154.58	66 73	7.42	**136.25**
149 New Satisfaction	13	107.08	127.08	72 57	8.35	**126.41**
Grown for two years:						
150 Great Divide	20	225.00	254.58	92.39	11.63	**301.04**
151 Troy Seedling	16	257.50	277.92	94.42	14.38	**297.30**
152 Irish Daisy	17	197 50	217.50	92.59	14.25	**264.38**
153 Adirondack	6	229.17	247.92	93.41	11.75	**242.50**
154 Hartzell's Seedling	7	228 33	247.08	95 15	14.50	**241.67**
155 Snow Drop	13	192 50	232.92	84.83	13.13	**238.34**
156 Pride of the West	6	203.33	225.42	92.34	14 63	**226.67**
157 Pride of the Market	7	193.75	207.50	95.05	12.88	**224.59**
158 Clay Rose	5	170.83	185.42	94 49	18.13	**218.34**
159 Pride of the Table	2	186.25	200.83	94.65	15.63	**215.21**
160 Clark's Nonesuch	7	177 08	188 75	96 00	15.63	**208.96**
161 Salzer's Prize Taker	7	111.66	129.17	89.22	11.88	**202.50**
162 Russell's Seedling	4	160.83	184 17	89.10	10.50	**199 38**
163 Victor Rose	7	157.50	168.33	95.33	18.63	**199.17**
164 Governor Rusk	4	125.42	159.58	86.62	11.00	**196.67**
165 Restaurant	7	171 25	188 33	92.85	13.75	**189.79**
166 Bell's Stray Beauty	2	157 50	170 42	92 75	8.25	**181.45**
167 Vanguard	2	105.00	128 33	87.08	12.38	**181.04**
168 Wilson's Stray Beauty	22	145 00	160 42	89 60	9 13	**172.40**
169 Vick's White Gem	15	167.50	189 58	88 50	12.63	**170 00**
170 Silver Dollar	22	93.75	123.75	85.77	9.25	**152.71**

POTATOES—COMPARATIVE TEST OF 184 VARIETIES.—*Continued.*

Varieties.	Result for 1895.			Average results for the number of years grown.		
	Amount of scab, 100=most, 1=least.	Yield of marketable potatoes.	Yield of whole crop.	Percentage of whole crop marketable.	Weight of 30 representative potatoes	Yield of potatoes per acre.
Grown for one year:		bush.	bush.		bush.	bush.
171 Governor Forsaker	14	230.42	265.00	86.95	12.50	265.00
172 Fillbasket	19	231.67	251.67	92 05	16 00	251 67
173 Rose of Erin	28	240.00	245 83	93 56	16 50	245.83
174 Burnaby Mammoth	17	206.67	227.92	90.68	14.25	227.92
175 Early White Prize	18	178.33	210.42	84.75	11.50	210.42
176 Early Advancer	21	168.75	206.25	81.82	11.25	206.25
177 Lee's Favorite	19	175.42	203.33	86 27	11.25	203 33
178 Early Pride	17	157.50	198.75	79.25	11.00	198.75
179 Michigan Blues	6	180.00	192.50	93.51	12 75	192 50
180 Dreer's Standard	20	160.00	191.25	83.66	12.50	191.25
181 Rot Proof	10	158.33	174.17	90.91	14 75	174.17
182 Irish Cups	4	121.25	148.33	81.74	8.50	148 33
183 Earliest Known	3	124.58	137.92	90.33	11.00	137.92

The year 1895 gave us a very good yield of potatoes, although they were considerably affected with the scab. There were less than a dozen rotten potatoes in the entire crop, of which there was about four acres in the experimental department. Some of the best varieties were originally obtained from Ontario and the United States.

Empire State. It will be observed from the foregoing table that the Empire State stands at the head of the list in the yield of potatoes per acre among thirty-nine varieties, grown for five years in succession. It gave an average of 204.7 bushels per acre, which is about twenty-three bushels per acre more than the next highest yielding variety. Not only is the Empire State an excellent yielding variety, but it is also a potato of good quality, being one of the best in this respect among thirty leading varieties which were tested by three judges who did the work independently of each other. The Empire State has given an average of 94.6 per cent. of its crop as marketable potatoes in the results of four years. In the co-operative experiments over Ontario during the year 1895, the Empire State also stands at the head of the list among six leading varieties successfully tested upon fifty-two different farms, with an average of 205 bushels per acre. It will be remembered that the Empire State stood the highest in the average yield per acre in the average of thirty-eight co-operative experiments over Ontario in the year 1894. The Empire State and the Pearl of Savoy gave the largest amount of marketable potatoes over Ontario in 1895.

Thorburn. The Thorburn variety of potatoes stands next to the Empire State in yield per acre for five years. It is also a good potato for table use, and is a little earlier than the Empire State. It was considerably more affected with the scab during the past year than the variety already described. Thorburn has not yet been sent out for co-operative tests.

Summit. The Summit variety has made a very good record, but appears to be not quite so good in quality as the Empire State. It is also a little below the average of Empire State in the yield per acre, and in the percentage of the crop which is marketable. The Summit was one of the six varieties sent out for co-operative tests over Ontario in 1894, and occupied fourth place in the average yield per acre during that year. It was also one of the six varieties distributed during the present year, and occupied fifth place in the average of the fifty-two successfully conducted experiments, producing twenty-four bushels per acre less than the Empire State. It also occupies a lower place than Empire State in percentage of crop marketable and in table quality.

Tonhocks. The Tonhocks is a new variety obtained from the United States in the spring of 1891. It is one of the best yielding among the early varieties, producing only three bushels per acre less than the Summit. The potatoes are much smaller in size than many of the other varieties, but we usually find that the early kinds of potatoes produce tubers of much smaller size than those which mature later.

Pearl of Savoy. Among the varieties of potatoes which we grew for the first time in our plots in 1893, and which have now been tested for three years in succession, the Pearl of Savoy stands the highest in the average yield of tubers. It will also be observed that this variety possesses a large amount of marketable potatoes, the average of the three years being nearly ninety-six per cent. of the whole crop. In the co-operative experiments over Ontario, during the past year, it stands fourth in the yield of potatoes per acre, and in 1894 it occupied second place in this respect.

American Wonder. The American Wonder has been grown in our trial plots the same length of time as the Pearl of Savoy, and occupies second place in the yield of potatoes per acre. It is a new variety and was obtained in the United States. This variety is sometimes called the American Wonder and sometimes Vick's American Wonder. It is late in maturing, and has usually twice as many small potatoes as the Pearl of Savoy. It was distributed over Ontario for co-operative experimental work for the first time in 1895, and stands third in the yield of potatoes per acre in the average of the successfully conducted tests on fifty-two different Ontario farms. When tested in the autumn of the year immediately after harvest, the table quality of the American Wonder was reported upon as not being quite equal to the other varieties under experiment. The best in table quality of those tested in 1895, was the Burpee's Extra Early.

Great Divide. Among the newer varieties of potatoes, the Great Divide has made a very fine record indeed, giving an average of over 300 bushels per acre for two years, with nearly ninety-three per cent. of its crop as marketable potatoes. This variety has not been tested yet in our co-operative work, nor has the table quality been closely determined in comparison with some of the older varieties.

Potatoes—Different Depths of Planting Seed Tubers.

For five years in succession, potatoes have been planted one, three, five and seven inches deep in the experimental department. During the past year, Vick's American Wonder, Great Divide, Stray Beauty, and the Freeman varieties of potatoes were used for this experiment, each one of which was planted at the four different depths mentioned. The experiment was also conducted with four varieties in 1894; and with two varieties during each of the years 1891, 1892 and 1893. There has, therefore, been no less than fourteen separate tests made in connection with this one experiment. In 1895, each plot consisted of one row, four rods in length. The nature of the soil and the method of preparation were the same as for the variety tests. The potatoes in the experiment were all planted on June 4th. The following table gives the average results for 1895, and for the five years in which this experiment has been conducted:

Potatoes.—Different Depths of Planting Seed Tubers.

Depths of planting.	Results for 1895. Depth of new potatoes in the soil.	Results for 1895. Number of potatoes exposed to the sun per 100 hills.	Results for 1895. Yield of whole crop per acre.	Average yield per acre for 1891-2-3-4-5. (14 separate tests.)
	inches.			
One inch	1.5	18.3	143.13	**200.21**
Three inches	3.4	3.0	148.75	**208.35**
Five inches	4.4	.0	149.06	**217.52**
Seven inches	4.9	.0	144.69	**212.58**

In the five years' experiments in planting potatoes at one, three, five and seven inches deep, the largest average yield per acre of potatoes was obtained from planting five inches deep; the second largest from planting seven inches; the third largest from planting three inches, and the lightest yield per acre from planting one inch deep. It will be noticed that the potatoes planted five inches deep in 1895 gave the largest yield of crop, and those planted one inch deep gave the smallest yield. The best yield per acre was obtained from planting seven inches deep in 1891 and 1892, five inches deep in 1894 and 1895, and three inches deep in 1893. It must be remembered that these are the results from the soil of this farm, which may be termed an average clay loam, and which is fairly well underdrained.

It was observed that a few of the potatoes from the shallowest plantings were exposed to the sun, and an accurate account was made during the past year in order to find out the exact quantity of potatoes that was injured from being sunburned. It was found that in those from planting one inch deep, there were eighteen potatoes which were exposed in 100 hills of crop. The potatoes which were planted three inches deep had three potatoes exposed to the sun in each hundred hills of crop, while those planted five inches and seven inches deep contained no sunburned potatoes. It was also found that the potatoes planted seven inches deep produced a crop which was on the average four and three-quarter inches below the surface, while in the case of planting the sets only one inch deep the crop was on the average of one and a half inches below the surface.

Potatoes—Different Methods of Preparing Seed.

This experiment has now been conducted for four years in succession, for the purpose of ascertaining the effect of different methods of preparing seed tubers for planting. The experiment was conducted in duplicate in 1892 and in 1893, and in triplicate during each of the past two years. In 1894 and 1895 three varieties of potatoes were used each season. The quantity of seed per acre varied according to the manner of preparing the seed. The quality and preparation of the soil was the same as that used for the comparative tests of the different varieties previously mentioned. Each plot consisted of one row, one rod long. The rows were three and one-third links apart, or a little less than twenty seven inches. The potatoes were planted on June 4th in 1895. Great care was exercised in the selection of the potatoes for the various plots in this experiment.

Preparations.	Percentage of whole crop marketable.		Yield of whole crop per acre.		Yield per acre less seed used.	
	1895.	Average 4 years, 1892-3-4-5.	1895.	Average 4 years, 1892-3-4-5.	1895.	Average 4 years, 1892-3-4-5.
			bus.	bus.	bus.	bus.
Large, whole, one foot apart	84.09	82.12	403.33	340.21	101.67	143.39
" two feet "	88.23	87.24	279.58	251.67	128 75	150.81
" three " "	86.86	89.37	218 75	204.61	119.02	140.37
Medium, whole, one foot "	84.23	84.79	317.08	278.73	181.57	190 14
" two feet "	90.85	90.03	264.17	217.62	196.40	173.32
Small, whole, one foot "	91.20	89.31	208.33	208.36	185.83	182.13
Medium, cut in two, one foot apart	80.43	85.49	213.33	196.67	149.38	151.22
Medium, two eyes in a piece, without seed ends, one foot apart	94.88	92.53	97.50	143.36	71.85	125.93
Medium, one eye in a piece, without seed ends, one foot apart	96.70	92 33	75.83	88.03	59.42	77.80
Medium, seed ends, one foot apart	91.46	87.33	34.17	92.46	28.63	86.28

The largest yield per acre in this experiment was produced from planting large-sized whole potatoes one foot apart in each of the four years that the experiment has been conducted. As a large amount of seed, however, is required for this method of planting, we find that if the amount of seed used is subtracted from the total yield per acre, the best average yield is produced from planting medium sized whole potatoes one foot apart. In 1895, however, the largest average yield, after the seed was subtracted from the whole crop, was given by the medium-sized whole potatoes planted two feet apart in the rows.

The highest percentage of marketable potatoes in the average of four years' trials was produced by planting sets with one and two eyes in the set; and the lowest per cent. of marketable potatoes was produced from large whole potatoes planted one foot apart. This experiment has been very interesting to witness during the growing season in each of the past four years, as the tops of the plants seemed to grow in close proportion to the size of the sets planted, the largest sets producing the largest tops, and the smallest sets producing the smallest tops.

Potatoes—Selection of Seed for Two Years in Succession.

In 1894 an experiment was conducted similar to the one already described under the heading of: Potatoes, Different Methods of Preparing Seed. In this experiment, large, medium and small-sized whole potatoes were planted side by side, and the crop was carefully harvested and stored in a cool cellar. In 1895, large, medium and small-sized potatoes were selected from the produce of large, medium and small potatoes planted the previous year. We thus had large-sized potatoes selected from a crop of large potatoes; medium-sized potatoes selected from a crop of medium potatoes, and small sized potatoes from a crop of small potatoes. Besides these, we also made a selection of very small potatoes from the produce of small potatoes grown in 1895. The term "small potatoes" in these experiments means those about one and a half inches in diameter, and the term "very small potatoes" means those of an average of about three-quarters of an inch in diameter.

Seed selected.	Percentage of whole crop marketable.	Weight of 30 largest potatoes.	Amount of seed used.	Yield per acre.	
				Whole crop.	Whole crop less seed used.
		lbs.	bus.	bus.	bus.
Large whole potatoes	85.78	9.81	36.56	129.69	93.13
Medium whole potatoes	88.02	8.94	25.24	112.19	86.95
Small whole marketable potatoes	89.31	5.75	8.51	49.69	41.18
Small whole unmarketable potatoes	84.44	3.44	1.60	14.06	12.46

The large whole potatoes produced more than eight times as many bushels of crop as the very small potatoes, and nearly three times as many as the small whole marketable potatoes. The large whole potatoes produced the largest amount of large tubers, and the very small, or unmarketable, produced the smallest-sized tubers.

Potatoes—Planting Sets of Different Sizes with one Eye in each Set.

In 1895, an experiment was conducted for the first time in which potato sets one-sixteenth, one-eighth, one-quarter, one-half, and one ounce, and also two ounces in size, were planted side by side. Each set contained only one eye. The object of this experiment was to ascertain the effect of the size of the seed tubers on the crop produced. The experiment was conducted in duplicate. Each plot consisted of one row four rods long. The potato sets were planted on June 12th and were covered to a depth of four inches. The soil was the same as that of the variety tests. The following gives the results:

Weights of the potato sets planted.	Percentage of sets that grew.	Percentage of whole crop marketable.	Weight of 30 largest potatoes.	Yield of whole crop per acre.
			lbs.	bus.
Each set containing 1-16 ounce and 1 eye	.76	....	....	2.50
" " " 1-8 " " 1 "	4.55	83.33	7.50	3.75
" " " 1-4 " " 1 "	6.06	85.00	8.50	12.50
" " " 1-2 " " 1 "	39.39	87.21	9.00	53.75
" " " 1 " " 1 "	59.09	90.00	10.75	93.75
" " " 2 ounces " 1 "	87.12	91.75	12.63	158.75

The results in the above table are very interesting indeed. It will be observed that the smallest pieces planted made a very poor growth. This was likely owing to the exceedingly dry weather. Apparently the smallest pieces did not have enough nourishment to give them a start in growth. The largest-sized potatoes were produced from the largest potato sets, and the size of the potato in the crop decreased in the same order as the decrease in size of the potato sets planted.

Potatoes—Planting Sets of Equal Size with a Varying Number of Eyes in Each Set.

During the past year, an experiment was carried on in the experimental department in order to obtain some information in regard to the influence of the number of eyes on pieces of potatoes as affecting the succeeding crop. Potato sets of one ounce in size were used throughout, and on number one plot, the sets contained one eye in each piece; on number two plot, two eyes; on number three plot, three eyes; on number four plot, four eyes; and on number five plot, five eyes. This experiment was also conducted in duplicate, on land similar in character and cultivation to that used for the variety test. The potatoes were planted on the 12th of June. The following table shows the results:

Pieces of potatoes planted.	Average yield of potatoes from each. Set.	Average yield of potatoes from each. Eye.
	ozs.	ozs.
Each potato set containing 1 ounce and 1 eye	6.9	6.9
" " " 1 " 2 eyes	7.0	3.5
" " " 1 " 3 "	6.5	2.2
" " " 1 " 4 "	6.5	1.6
" " " 1 " 5 "	7.3	1.5

The reader will notice, by referring to the foregoing table, that the sets produced very similar results regardless of the number of eyes on each set. This experiment tends to show that a greater influence is exercised by the size of the potato sets planted, than by the number of eyes in each set. This experiment will likely be repeated for a number of years.

Potatoes—Influence of Plaster and Lime when Sprinkled on Fresh Cut Sets.

When seedsmen send potato eyes by mail to customers, it is often their custom to sprinkle the pieces with plaster. It is also the custom of some farmers to sprinkle their newly cut potatoes with plaster or lime immediately before planting. An experiment was started in 1894, in order to ascertain the influence of the plaster and lime when sprinkled over freshly cut potatoes for seed. The experiment was repeated during the present year in the same general way as the experiment in 1894. The sets for the experiment during the present year were divided into six lots with an equal number in each lot, and in such a way that all the lots were the same weight. Two of the lots were then sprinkled with plaster, two lots were sprinkled with lime, and the remaining two were left unsprinkled. The sets were kept in the cellar three days before planting. Just before planting these six lots, six other lots were prepared in exactly the same way, and all were planted in one day. Each plot consisted of one row, four rods in length. Planting took place on June 5th, and the same methods of cultivation were used in this experiment as in the experiment with the variety tests previously mentioned.

Preparation of sets.	Percentage of potatoes marketable.	Weight of 30 largest potatoes. 1895.	Weight of 30 largest potatoes. Average 2 years.	Yield of whole crop per acre. 1895.	Yield of whole crop per acre. Average 2 years.
		lbs.	lbs.	bus.	bus.
Potatoes sprinkled with plaster	89.51	10.81	19.97	184.69	291.83
" " " lime	85.92	10.88	19.63	177.50	285.94
" not sprinkled	88.52	10.56	17.97	168.75	240.42

The result of this experiment was quite similar in 1895 to that of 1894. The potatoes sprinkled with plaster gave the best results; those sprinkled with lime second best; and those not sprinkled the poorest, during each of the two years. The potatoes sprinkled with lime gave an average of over fifty bushels per acre more than those not sprinkled.

The results of the potatoes sprinkled with plaster and lime, three days before planting, seemed to give no better results than those cut and sprinkled with lime and planted immediately, when compared with the potatoes which were not sprinkled at all. The average yield per acre of all the tests with potatoes cut on the day of planting was about twenty bushels per acre more than the average of those which were cut three days before planting. These confirm the results of past experiments, in showing that larger yields per acre have been realized from potatoes cut and planted immediately, than from those cut and allowed to remain from three to five days previous to planting.

Potatoes—Planting Single Eyes from Different Parts of the Seed Tubers.

We not unfrequently hear the remark that the seed end, or small end, of potatoes should be removed and not used for seed. An experiment has now been conducted for two years in succession, in order to determine whether each separate eye in the seed end of a potato has as much value for planting as single eyes, from other parts of the same potato. To determine this, a uniform lot of potatoes were selected, and single eyes were cut from the seed end, from the middle, and from the stem end of the tubers. Great care was used in preparing the sets for this experiment. Each potato was usually divided into nine parts, and three pieces were taken from the seed end, three from the middle, and three from the stem. One eye was left in each of the pieces, and the pieces were all made of exactly the same weight. The experiment therefore is purely a test of the comparative value of the eyes, taken from different parts of the potato. Planting took place on the 8th of June. The potato sets were planted one foot apart in the rows, and were covered to a depth of four inches. Flat cultivation was used throughout, as in the case of the other potato experiments. The following table gives the results of this experiment:

Parts of the potatoes used.	Percentage of crop marketable.	Weight of 30 largest potatoes.		Yield of whole crop per acre.	
		1895.	Average 2 years, 1894-5	1895.	Average 2 years, 1894-5
		lbs.	lbs.	bus.	bus.
Seed end of potato	93.60	10.92	19.40	71.67	215.11
Middle of potato	92.13	11.25	19.17	74.17	224.59
Stem end of potato	88.80	9.08	18.50	52.08	211.98

The eyes from the different parts of the potato gave the same comparative results in yield per acre in 1895 as in the average results for the two years that this experiment has been conducted. The largest average yield of potatoes was obtained from the eyes taken from the middle of the tubers; second largest taken from those of the seed end; and the poorest from those taken from the stem end. In per cent. of crop marketable, it will be observed that the eyes from the seed end of the potato gave the best results. It must be remembered, however, that single eyes were planted in every instance, and not as is usually done by planting the whole number of eyes in the seed end of the potato.

Potatoes—Different Dates of Seeding.

Five varieties of potatoes were planted on May 4th, May 23rd, and June 13th, on plots side by side. The soil on which this experiment was conducted grew a grand crop in 1894, and was plowed in the autumn of the year and also in the spring. The potatoes were planted to a depth of four inches, and there was one row four rods long of each variety, planted at each of the three dates mentioned. The results of the experiment are as follows:

Dates of seeding.	Total yield per acre.	Yield of marketable potatoes.	Weight of 30 largest potatoes.
	bush.	bush.	lbs.
Seeded May 4th	320.25	296.50	14.25
Seeded May 23rd	268.25	235.75	10.05
Seeded June 13th	264.75	240.50	11.35

The earliest seeding gave the largest average yield of total crop; the second date gave the next largest yield; and the last date of seeding gave the smallest. As 1895 was an exceedingly dry season, the results of another year might be different.

Submitting Seed Potatoes to Different Exposures Three Weeks Previous to Planting.

An experiment has been conducted for two years in succession, in which potatoes were carefully and evenly divided into different lots and placed in different degrees of light and heat for three weeks before they were planted; some being placed in a dark cellar, others in the cellar in front of a window, others on a barn floor, others in the greenhouse immediately below the glass, and others in the open air. Those placed in the dark cellar grew long tender sprouts, while those placed in a warmer temperature produced short and green colored sprouts. Part of the potatoes kept in the dark cellar were planted with their sprouts removed, and part with their sprouts still attached to the tubers. The potatoes were distributed to their respective places on June 7th, and the planting took place on June 28th. The following table gives the results for 1895, and also the average results for the two past years:

Places where the potatoes were kept for 21 days before planting.	Percentage of crop marketable.		Weight of 30 largest potatoes.		Yield of whole crop per acre.	
	1895.	Average 2 years.	1895.	Average 2 years.	1895.	Average 2 years.
Potatoes in root cellar in dark, sprouts off	44.12	70.76	4.63	9.07	106.25	257.50
Potatoes in root cellar in dark, sprouts on	60.73	79.37	5.88	13.44	119.38	311.26
Potatoes in root cellar in light, sprouts on	67.39	83.06	5.25	12.07	115.00	301.25
Potatoes in barn in light, sprouts on.	64.46	81.63	6.50	13.94	151.25	346.25
Potatoes in greenhouse in light, sprouts on	54.74	76.01	5.00	10.57	118.75	274.38
Potatoes in open-air, sprouts on	22.58	61.29	3.25	9.75	58.13	64.07

The largest average yield of potatoes per acre for the two years was obtained from those which had been placed in the light, on the barn floor, for three weeks before planting; and the second largest yield was produced by the potatoes kept in the dark cellar, and the long succulent sprouts allowed to remain on the seed when planted. The poorest yield during both years was obtained from potatoes exposed to the open air and subject to all the changes of the weather. It was noticed that the potatoes which were allowed to sprout and the sprouts left undisturbed were a few days earlier than those from which the sprouts had been removed.

POTATOES—APPLICATION OF FERTILIZERS.

For four years in succession an experiment has been conducted in applying commercial fertilizers to land producing a potato crop. In 1892 and 1893, the potatoes were grown in the field to the south-east of the College building, and which was rather low in aspect. In 1894 and 1895 this experiment was conducted in the central part of the experimental field, which lies north-east of the College building. The land where the experiments have been conducted during the last two years is more elevated than that used previously. No manure had been applied to the lands for several years previous to the experiment of 1895. The plots were one-hundredth of an acre in size. The drills were four rods long, and were three and one-third links apart. Potato sets were planted one foot apart in the drills, and fifteen pounds of potatoes were used for each plot. A row of potatoes was planted between each two plots, and were left unfertilized. The potatoes were all planted on May 11th, and the fertilizers were sown in drills, after the tubers had been dropped, but before they were covered. Nitrate of soda and muriate of potash were used at the rate of 160 pounds per acre, unleached wood ashes at the rate of 800 pounds per acre, and all the other fertilizers at the rate of 320 pounds per acre. The yields per acre have been estimated form the actual results of the plots.

Fertilizers.	Average percentage of crop marketable, 2 years.	Average weight of 30 best developed potatoes, 2 years.	Yield of whole crop per acre.	
			1895.	Average 4 years, 1892-3-4-5.
		lbs.	bush.	bush.
Royal Canadian	86.35	12.75	107.92	**155.87**
Potato manure	85.07	11.75	100.83	**141.43**
Superphosphate (animal)	85.01	12.75	102.50	**135.12**
Bone and potash	85.42	12.57	119.17	**136.24**
Sure Growth	79.45	12.38	124.58	**133.98**
Superphosphate (mineral)	84.44	12.50	115.42	**130.87**
Reliance	84.53	12.50	101.67	**126.66**
Muriate of potash	86.48	11.63	107.50	**127.23**
Pure Bone Meal	79.36	12.13	87.50	**121.49**
Capelton	80.00	12.07	71.67	**113.45**
Nitrate of soda	73.14	10.94	35.42	**104.27**
Wood ashes	85.26	13.07	94.17	**116.71**
Victor	86.64	12.88	118.33	**119.70**
No fertilizer	85.30	13.13	99.17	**110.45**

From the foregoing table it will be observed that the Royal Canadian fertilizer has given the best yield of potatoes per acre in the average of four years' experiments. Although the Royal Canadian fertilizer did not produce the highest yield per acre in 1895, it was one of the five fertilizers which gave the best results. The Potato fertilizer has given the second highest yield of potatoes per acre in the average of four years, but the same time has given a yield of over fourteen bushels per acre less than the Royal Canadian. The best results during the past year were obtained from the Sure Growth fertilizer, which supplies nitrogen, potash and phosphoric acid, as also does the Royal Canadian and the Potato manure previously mentioned. The unfertilized plot has given an average of over forty-five bushels per acre less than the Royal Canadian fertilizer for the length of time that this experiment has been conducted. Nitrate of soda, Pure Bone Meal, and Sure Growth fertilizers produced the largest average of small potatoes in the results of two years' experiments. The crop of potatoes was increased 98.8 per cent. in 1892, 57.1 per cent in 1893, 17 per cent. in 1894, and 8.8 per cent in 1895, by the application of 320 pounds of the Royal Canadian fertilizer. This fertilizer costs about $38.00 per ton.

Potatoes—Rural Trench System.

The rural trench system has been adopted in the United States, when growing potatoes in competition for large yields. By this method trenches are made from ten to twelve inches in width, and about a foot in depth, by completely removing the soil. The soil is then returned to the trenches from which it was removed and the potatoes are planted in the soil thus returned. A test of this system, in comparison with our usual method of cultivation, was made on duplicate plots in 1894 and on triplicate plots in 1895. Each trench was dug to the depth of one foot, and was made ten inches in width. The rows were four rods long and three feet apart, and the potatoes were planted about four inches below the surface of the soil. Two plots received farmyard manure at the rate of twenty tons per acre. Two plots received potato fertilizer at the rate of one thousand pounds per acre, and two other plots a combination of farmyard manure and potata fertilizer. The manure and fertilizer was mixed through the entire lot of soil, which was removed from and placed back in the trenches. Two plots of trenches were left unfertilized and the remaining two plots were planted according to our ordinary method in planting our varieties.

Fertilizer.	Amount of fertilizer used per acre.	Yield of whole crop per acre.		
		1894.	1895.	Average, 2 years, 1894-95.
		bus.	bus.	bus.
Farmyard manure..........	20 tons.................	403 34	337.94	370.64
Ordinary method	....	335.27	367.56	357.42
Royal Canadian and Manure	1,000 lbs. R.C. + 20 tons M	360 02	336 11	348.07
No fertilizer.	....	312 82	318.39	315.61
Royal Canadian fertilizer...	1,000 lbs	329.54	300.05	314.80

It will be observed from the foregoing table that the largest average yield per acre in 1895, was produced from our ordinary method of cultivation, and in 1894 from farmyard manure used in the trenches. The average results for two years show that the largest yield of potatoes was produced from the farmyard manure, and the lowest from the application of fertilizer under the rural trench system. These results seem a little peculiar, but it might be that all the soil being removed from the trenches in the spring of the year immediately before planting, caused too much of the subsoil to come into contact with the growing potatoes. Had the trenches been made in the autumn of the year better results might have been obtained.

Swede Turnips—Comparative Test of Sixty-eight Varieties.

Varieties of Swede turnips have been grown during the past season to the number of sixty-eight. The seed was secured from seedsmen in England, United States and Canada. Twenty-nine of these varieties have now been grown in our trial grounds for five years in succession; other newer varieties were obtained for the first time in 1892, and others in 1893, 1894 and 1895. The soil on which the sixty-eight varieties were grown during the past season was what might be termed an average clay loam. The land grew a crop of winter wheat in 1894, and was manured this spring at the rate of twenty tons of farmyard manure per acre. The land was plowed early in the autumn and again before seeding. Light ridges were made with a double mould-board plow at a distance of three and one-third links apart. There were three drills of each variety, the drills being four rods in length. Seeding took place on June 19th. Great care was exercised in thinning the roots, which were left at an average of ten links apart in the drill.

SWEDE TURNIPS—COMPARATIVE TEST OF 68 VARIETIES.

Varieties.	Results for 1895. Soundness of roots.	Results for 1895. Yield of tops per acre.	Results for 1895. Average weight per root.	Results for 1895. Yield of roots per acre.	Average results for number of years grown. Yield of tops per acre.	Average results for number of years grown. Average weight per root.	Average results for number of years grown. Yield of roots per acre.
Grown for five years:		tons.	lbs.	tons.	tons.	lbs.	tons.
1 Hartley's Bronze Top	good	7.48	1.40	14.65	6.18	1.91	21.39
2 White Swede	medium	7 50	1.55	14.25	6.60	2.25	20.29
3 P. W. & Co's. Imperial Prize Purple Top	"	4.48	1.42	13.08	6 24	2.30	19.89
4 Our Selected Purple Top	medium to poor.	4.80	1.48	12.75	4.94	2.25	19.65
5 Skirving's Swede	medium	5.08	1.46	12.20	5.86	2.16	19.64
6 Carter's Imperial Hardy	"	5.65	1.44	12.58	6.04	2.19	19.56
7 Carter's Prize Winner	"	4.95	1.27	11.60	5.89	2.13	19.48
8 Sharpe's Improved	"	5.65	1.47	15.05	5.07	2.05	19.41
9 Knowfield	"	6.78	1.60	16.45	5.34	2.14	19.15
10 Sutton's Champion	medium to poor.	5.25	1.62	13.38	5.24	2.23	19.08
11 Westbury's Improved	"	4.68	1.61	13.10	6.34	2.15	19.07
12 Hazard's Improved	medium	5.01	1.33	11.05	5.33	2.26	19.05
13 Bangholm	medium to poor.	5.25	1.51	12.30	5.97	2.16	18.94
14 Marshall's Purple Top	medium	4.28	1.43	6.88	5.46	2.28	18.89
15 Hall's Westbury	medium to poor.	5.75	1.66	14.10	4.93	2.09	18.82
16 Highland Prize Purple Top	medium	7.18	1.59	16.33	6.19	2.10	18.80
17 Drummond's Imperial	"	5.40	1.55	14.78	5.70	2.10	18.49
18 Green Top	"	5.45	1.37	11.50	6.68	2.11	18.45
19 East Lothian	"	5.60	1.38	12.88	5.55	2.08	18.33
20 King of Swedes	medium to good.	6.20	1.39	13.23	5.69	2.07	18.30
21 Laing's Improved	medium to poor.	5.80	1.20	11.13	5.80	1.96	18.08
22 Carter's Elephant	medium	7.23	1.64	14.00	5.87	2.12	17.97
23 Maston's Purple Top	"	6 05	1.72	15.50	5.48	1.97	17.73
24 Marquis of Lorne Purple Top	medium to poor.	6.88	1.71	13.85	5.51	2.06	17.59
25 Budlong White	medium	4.25	1.43	14.50	4.22	1.81	17.45
26 Royal Norfolk Purple Top	good	6.00	1.11	9.53	4.89	1.97	17.14
27 White Sweet Russian	medium	10.13	1.34	12.98	6.39	1.86	16.93
28 White Rock	"	5.85	1.39	11.25	4.84	1.84	16.67
29 Ashcroft's Purple Top	"	3.33	1.67	7.78	4.67	2.01	15.66
Grown for four years:							
30 Queen of Swedes	medium	5.50	1.52	13.88	5.71	2.08	20.17
31 Crimson King	"	6.50	1.70	16.45	5.94	2.09	19.78
32 Shamrock Swede	"	5.80	1.59	15.40	6.03	2.02	19.16
33 Rennie's Prize Purple Top	"	6.40	1.76	15.20	6.06	2.14	18 90
34 Laidlaw's Improved	medium to poor.	5.60	1.62	14.95	5.62	1.97	18.84
35 Aroostock's Ruta Baga	"	5.88	1.36	12.28	5.93	1.80	17.61
Grown for three years:							
36 Kangaroo	medium	6.95	1.82	17.50	6.46	2.31	22.01
37 N. E. & G. Co's. Prize Winner	"	6.18	1.65	15.35	6.38	2.18	20.05
38 Jarman's Improved King of the West Purple Top	medium to good.	6.63	1.81	16.45	6.49	2.14	19.63
39 Scottish Champion	medium	6.25	1.49	14.15	6.50	2.00	19.40
40 Jumbo or Monarch	"	7.40	1.74	14.75	6.56	2.11	19.08
41 Bloomsdale	medium to good.	5.25	1.33	11.00	6.40	2.02	19.07
42 Hurst's Monarch	medium	5.98	1.63	13.03	6.12	2.09	19.00
43 Improved Long Island	medium to good.	5.85	1.63	13.18	5.55	2.02	18.62
44 Maule's Heavy Cropping	good	6.45	1.52	14.35	6.04	1.99	18.21
45 Thorp's Improved Shipping	medium	4.88	1.27	12.05	5.29	1.76	16.61
46 White French	"	6.83	1.32	11.05	6.91	1.80	16.35

SWEDE TURNIPS—COMPARATIVE TEST OF 68 VARIETIES.—*Continued.*

Varieties.	Results for 1895.				Average results for number of years grown.		
	Soundness of roots.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for two years:		tons.	lbs.	tons.	tons.	lbs.	tons.
47 Buckbee's Giant	medium	6.15	1.72	15.00	7.85	2.44	22.98
48 Halewood's Bronze Top	medium to poor.	4.93	1.56	14.00	5.54	2.08	19.68
49 New American Yellow	medium	5.08	1.71	13.00	5.73	2.19	18.93
50 Keith's Green Top	"	5.60	1.57	12.70	6.58	2.12	18.38
51 Dreer's Improved Purple Top	"	4.53	1.49	13.48	4.77	1.92	18.37
52 Crosse's Improved	medium to good.	7.75	1.50	12.75	7.75	1.91	17.68
53 Improved American Purple Top.	medium	6.70	1.66	13.75	6.20	2.00	17.00
54 Mammoth Russian	"	5.00	1.41	12.70	5.18	1.76	16.38
55 Skirving's Liverpool	"	5.50	1.40	10.23	5.68	1.91	16.29
56 Burpee's Breadstone	medium to poor.	6.00	1.47	14.08	5.10	1.73	16.04
57 American Breadstone	medium	4.08	1.16	9.25	3.84	1.50	12.80
58 Sweet German	medium to good.	3.70	1.25	12.10	3.24	1.37	12.73
59 Burpee's Improved Purple Top	medium	5.23	1.56	14 05	6.87	1.07	9.72
Grown for one year:							
60 Simmer's Champion Purple Top	medium to good.	6.05	1.60	15.90	6.05	1.60	15.90
61 White Giant Purple Top	medium	6.03	1.58	15.05	6.03	1.58	15.05
62 Pearce's Standard	"	5.60	1.50	14.78	5.60	1.50	14.78
63 Fulcaster White Fleshed Purple Top	medium to poor.	6.65	1.63	14.05	6.65	1.63	14.05
64 Perfection Purple Top	medium to good.	5.03	1.53	13.88	5.03	1.53	13.88
65 Improved White Russian	"	6.15	1.64	13.88	6.15	1.64	13.88
66 Mammoth Siberian	medium	5.20	1.51	12.45	5.20	1.51	12.45
67 Ferry & Co's. Improved Yellow.	medium to good.	3.90	1.34	11.70	3.90	1.34	11.70
68 Waite's Eclipse Hybrid	....	5.35	1.47	9.58	5.35	1.47	9.58

The average yield of the Swedes in 1895 was much lower than the average for the past five years, which was evidently owing to the very dry weather during the growing season. The roots made very poor headway for a considerable length of time.

Hartley's Bronze Top. It will be observed that Hartley's Bronze Top still occupies first place in the average yield per acre of all the varieties that have been grown since 1890. This is a good quality Swede and usually grows quite uniform. In the co-operative experiments over Ontario during the past season Hartley's Bronze Top and Carter's Elephant gave practically the same results, and stood the highest among the Swede turnips which were distributed.

White Swede. The White Swede stands next to Hartley's Bronze Top in the average yield of roots per acre; this variety, however, is quite variable in yield from year to year In 1893, seed of this variety was sent to experimenters, over Ontario, and in the average results of five varieties of turnips on nineteen different farms, it came at the bottom of the list in yield per acre, giving about one hundred and forty bushels per acre less than Hartley's Bronze Top.

Kangaroo. The seed of the Kangaroo variety was obtained in England, and in yield per acre, this variety now occupies first place among the eleven varieties grown for three years, with an average of twenty-two tons per acre. In 1895, this variety stands at the head of the list in yield roots per acre, giving a total amount of seventeen and a half tons.

Buckbee's Giant. For two years in succession, Buckbee's Giant has made a very good record, although in 1895 it was surpassed in yield by ten other varieties.

SWEDE TURNIPS—THINNING PLANTS IN THE DRILL.

An experiment has been conducted for four years in succession, in which Swede turnips have been left unthinned, and have been thinned to four, eight, twelve, sixteen, and twenty inches between the plants in the drill. The experiment was conducted in duplicate during each of the four years. In 1895, the plots were one-hundredth of an acre in size. Carter's Elephant variety was used for the experiment. The soil was an average clay loam, and was manured at the rate of twenty tons per acre in the fall of 1893, since which time it has grown a crop of winter wheat. Slight ridges were made with a double mould-board plow, and the seed was sown on June 20th. The plants were thinned when about two inches high, and were left at the distances required:

Distance between Roots in the drill	Yield of Tops per acre.		Average weight per root.		Yield of roots per acre.	
	1895.	Average 4 years.	1895.	Average 4 years.	1895.	Average 4 years.
	tons.	tons.	lbs.	lbs.	tons.	tons.
Unthinned	4.28	6.50	.27	.32	6.04	11.69
4 inches	3.80	....	.55	..	8.29	.....
8 do	2.98	5.40	.99	1.49	6.65	17.92
12 do	2.93	5.16	1.40	1.91	6.08	15.92
16 do	2.40	4.16	1.29	2.40	5.43	15.68
20 do	1.88	4.44	1.35	2.63	4.44	13.96

Unfortunately we are unable to give the average results for four years, from the plots which contained the plants that were thinned to a distance of four inches apart. We notice that the lightest average yield was produced from the unthinned plot, and the best from the plot thinned to only eight inches. As the distance between the plants increased, the average yield per acre decreased, but there was an increase in the average weight per root. The yield in 1895 was light, owing to the exceedingly dry weather.

SWEDE TURNIPS—DIFFERENT DISTANCES BETWEEN THE DRILLS.

The test was conducted in duplicate in 1892, 1893, 1894, and 1895. The roots were all thinned to a distance of ten inches apart in the row. The preparation of the land, including manuring, etc., was the same as that mentioned in the experiment with thinning plants in the drills. The seeding took place on June 21st.

Distance between drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1895.	Average 4 years.	1895.	Average 4 years.	1895.	Average 4 years.
	tons.	tons.	lbs.	lbs.	tons.	tons.
20 inches	3.68	5.33	1.10	1.50	9.23	16.90
26 do	2.62	5.18	.98	1.82	5.30	15.56
32 do	2.54	4.90	1.01	1.99	4.74	14.30

It will be seen that the largest average roots were obtained from the drills situated thirty-two inches apart; the second largest from those situated twenty-six inches apart; and the smallest from those only twenty inches apart. The largest average yield per acre, however, was from the drills twenty inches apart; the second largest from those twenty-six inches apart; and the lowest yield per acre from the drills having thirty-two inches between them. The results in this table should be considered in conjunction with those in the last table where the drills were the same distance apart, but there was a difference in the thinning of the plants in the drill.

Fall Turnips—Comparative Test of 43 Varieties.

Varieties.	Results for 1895.						Average results for number of years grown.		
	Soundness of roots.	Color of flesh.	Color of skin.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for Five Years:				tons.	lb.	tons.	tons	lb.	tons.
1 Jersey Navet	poor	white	green	5.70	2.21	22.65	6.36	2.59	23.90
2 Early American Purple Top	"	"	purple	4.10	1.86	19.55	5.84	2.35	22.80
3 Early Purple Top Munich	"	"	"	3.50	1.75	15.75	3.96	2.25	21.32
4 Purple Top Mammoth	"	"	deep purple.	4.88	2.15	18.80	6.56	2.4[illegible]	21.10
5 Greystone Improved	medium	"	"	5.50	2.04	19.35	7.55	2.51	20.73
6 Red Globe Norfolk	medium-poor	"	"	6.35	1.92	18.70	6.86	2.26	20.40
7 Pomeranian White Globe	poor	"	white	5.85	2.13	18.35	7.73	2.24	20.24
8 Red Top Strap Leaf	very poor	"	green	4.28	1.65	12.35	4.63	2.10	19.27
9 White Stone	poor	"	white	4.75	2.40	18.95	4.70	2.17	17.75
10 Orange Jelly	medium	yellow	yellow	4.75	1.79	14.35	4.41	1.88	15.41
11 Golden Ball	medium-poor	"	"	3.60	1.71	11.95	5.14	1.76	14.07
12 Yellow Aberdeen Purple Top	medium	"	purple	6.60	1.80	16.65	6.20	1.64	13.83
13 Yellow Aberdeen Green Top	medium-poor	"	green	6.95	1.78	10.70	5.51	1.64	12.64
Grown for Four Years:									
14 Imperial Green Globe	medium-poor	white	green	5.20	2.10	10.50	5.16	1.77	14.39
15 Purple Top Hybrid	good	yellow	purple	5.30	1.78	13.83	5.31	1.48	11.39
Grown for Three Years:									
16 Cow Horn	medium	white	green	4.30	2.27	12.48	4.99	2.37	20.79
17 Green Barrel	"	"	"	6.25	1.78	17.40	6.65	2.11	20.65
18 White Flat Dutch Strap Leaf	poor	"	purple	4.00	1.82	18.65	5.63	1.97	20.21
19 Jarman's Improved Green Top Yellow Scotch	good	yellow	green	4.95	1.97	15.75	6.54	2.08	19.34
20 Jarman's Selected Green Globe	good	white	"	5.95	2.18	23.60	5.24	1.93	19.06
21 Yellowstone	very good	yellow	"	3.68	1.99	15.25	4.46	2.06	18.91
22 Yellow Montgomery	poor	"	purple	5.55	1.61	15.30	7.66	1.90	18.82
23 Early White Model	medium-poor	white	white	5.20	2.13	16.00	4.73	2.06	18.07
24 Sutton's Imperial Green Globe	medium-good	"	green	5.00	2.18	20.80	5.01	1.89	18.05
25 Extra Early Milan	poor	"	reddish	2.48	1.85	16.15	2.14	1.86	17.92
26 Jersey Lily	medium	"	purple	6.65	2.10	11.35	7.75	2.15	17.17
27 White Six Weeks	very poor	"	white	4.10	1.83	19.50	4.83	1.82	17.17
28 Dales' Hybrid	medium-good	yellow	green	10.20	1.94	12.13	8.29	1.64	13.86
29 Amber Globe	good	"	"	4.90	1.93	12.35	5.55	1.70	13.85
30 Fosterton Hybrid	good-very good	"	"	6.40	1.88	16.45	6.57	1.51	13.67
31 Early Maltese	very poor	"	"	4.45	1.55	12.05	4.01	1.44	13.24
32 Carter's Champion Green Top Scotch, or Aberdeen Hybrid	good	"	"	7.63	1.29	12.85	6.38	1.18	10.50
33 Seven Top	"	white	white	5.70	.63	6.30	6.80	.78	7.49
Grown for Two Years:									
34 White Egg	medium	white	white	4.65	2.10	22.10	8.05	3.00	29.18
35 White Lily	"	"	"	4.80	2.03	19.85	7.43	2.32	22.74
36 Milk Globe	poor	"	purple	9.25	2.23	21.20	11.75	3.31	22.35
37 Early La Crosse	medium-poor	"	"	6.00	2.50	24.45	9.67	2.11	20.58
38 All Gold	good	yellow	green	8.25	1.92	15.68	7.75	1.91	16.64
39 Orange Sweet	medium	"	greenish-yel	5.75	1.77	10.78	7.40	1.88	14.97
40 Small Berlin	good	white	white	.15	.26	2.18	.38	.30	2.47
Grown for One Year:									
41 Red Top White Globe	poor-very poor	white	purple	3.86	2.39	24.00	3.86	2.39	24.00
42 Our Selected White Globe	"	"	white	10.28	2.35	21.83	10.28	2.35	21.83
43 Yellow Globe	good	yellow	green	4.35	1.91	18.38	4.35	1.91	18.38

In 1895, forty-three varieties of fall turnips were grown upon our experimental plots; thirteen of this number have now been grown for five years in succession; two, for four years; eighteen, for three years; seven, for two years; and three, for one year. Fall turnips sometimes go under the names of White and Yellow Fleshed turnips, and also under the name of Soft turnips. The land upon which this test was made in 1895, grew a crop of winter wheat in the previous year, and was manured at the rate of twenty tons of farmyard manure per acre in the spring of 1895, before being plowed for the turnips. The plots were one-hundredth of an acre in size. Each plot consisted of three rows fourteen rods in length; the rows were all three and one-third links apart. The seed was sown on small ridges. Seeding of the varieties took place on June 20th. When the plots were about two inches high, they were thinned to a distance of ten inches apart in the drills. At the time of harvest, the number of roots was taken as well as the weights of the roots, and the tops were also all carefully weighed. The yields per acre have been estimated from the actual results of the plots.

The seed of the varieties of fall turnips was principally obtained from England, the United States, and Canada. The yield per acre in 1895 was not quite equal to that of the average of the past five years. A careful study of the foregoing table will enable a person to obtain some useful information in regard to the respective merits of the different varieties under test. Not only are the results given for 1895, but also the average for the number of years that the roots have been grown.

Jersey Navet. The Jersey Navet variety stands at the head of the list in yield of roots per acre among the thirteen varieties grown for five years in succession. It has a white flesh, a green skin, and a top which is rather heavier than the average of all the varieties. This variety is cultivated largely in England for garden purposes; but, in our comparative trials, where the roots are all thinned to an equal distance apart, the Jersey Navet has produced a very excellent yield. In the co-operative experiments over Ontario the Jersey Navet occupied first place in the average yield per acre, among five varieties distributed in 1893 and also in 1894; and stood second in yield per acre in the co-operative tests of 1895. This variety was very highly spoken of by a large number of the experimenters who have given it a practical test.

Early American Purple Top. The Early American Purple Top variety stands second in yield per acre among the thirteen varieties grown for five years, but has given a little over a ton per acre less than the Jersey Navet. The early American Purple Top was also distributed over Ontario in connection with the co-operative work. In the average of eighteen successfully conducted experiments in that year, the Early American Purple Top was surpassed in yield per acre by the Jersey Navet by about two-thirds of a ton.

Greystone. The Greystone variety, which has been grown in Ontario for a number of years, and which is perhaps the best known variety of fall turnips in the Province, stands fifth in yield per acre among the thirteen varieties grown for five years in succession. It has given an average of a little over three tons per acre less than Jersey Navet, and the tops are a little larger than those produced by that variety.

Imperial Green Globe. Among the varieties of fall turnips which grow rapidly and are of a beautiful round shape and smooth skin, the Imperial Green Globe appears to be one of the best. From our knowledge of this variety, it appears to be one which would be well adapted to supply the early market.

Fall Turnips—Thinning Plants in the Drill.

For four years in succession an experiment has been conducted in leaving Swede turnips unthinned, and in thinning the plants to four, eight, twelve, sixteen and twenty inches inches in the drills. The experiment has been conducted in duplicate in each of the four years. The land used for this test in 1895 was manured in the autumn of 1893, when it was sown with winter wheat. The soil was an average clay loam, and had a gradual slope to the north-east. The plots were exactly one-hundredth of an acre in size, there being six rows, each two rods in length in each plot. The seeding took place on June 20th.

Distance between plants in the drill.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1895.	Average 4 years.	1895.	Average 4 years.	1895.	Average 4 years.
	tons.	tons.	lbs.	lbs.	tons.	tons.
Unthinned	4.65	11.59	.42	.33	12.70	15.37
4 inches	3.13	7.71	.76	1.04	14.33	23.88
8 "	3.23	7.23	1.38	1.87	14.68	23.77
12 "	3.70	6.98	1.95	2.68	12.79	22.51
16 "	3.17	6.75	2.14	3.33	11.52	21.77
20 "	3.25	6.26	2.34	3.62	10.63	19.38

It will be observed in the above table that the largest average yield of roots per acre in the tests for four years was from thinning the plants to four inches apart in the drill. As the distances between the drills increased, the average yield of roots per acre decreased, and the average size of the individual roots increased. If we compare the thinnings of four and twenty inches, we find that those thinned to twenty inches apart produced roots which were more than three times the size of those which were thinned to four inches apart; but those which were thinned to four inches produced an average of four and a half tons more than those thinned to twenty inches. It will be noticed that the yield of tops per acre is very large from the unthinned roots. It therefore resolves itself into a question of whether it is desirable to grow a large yield and have small-sized roots, or to grow a smaller yield and have roots of a larger size. This can best be determined by the individual farmer according to his respective needs of land and help.

Fall Turnips—Different Distances Between Drills.

An experiment has been conducted for two years in succession in sowing fall turnips in drills twenty, twenty-six and thirty-two inches apart. There were ten drills in each plot of the different distances mentioned above, and the experiment was conducted in duplicate during each of the years 1894 and 1895. The soil, manuring and cultivation were the same as for the experiment in thinning fall turnips at different distances in the drills as mentioned previously. The seeding took place on the 21st of June. The plants were thinned to a distance of ten inches apart when about three inches in height.

Distance between drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1895.	Average for years 1894-1895.	1895.	Average for years 1894-1895.	1895.	Average for years 1894-1895.
20 inches	3.76	6.75	1.70	2.07	13.82	22.49
26 "	4.19	6.68	1.55	2.33	10.69	20.96
32 "	3.72	6.78	1.57	2.62	8.85	19.39

The largest average yield of roots per acre was obtained from drills which were twenty inches apart, and the largest average roots were produced upon the drills which were thirty-two inches apart. As the drills increased in distance apart, the yield of roots per acre showed a corresponding decrease, but the comparative size of the roots showed a corresponding increase.

Sowing Turnips and Rape Seed at Different Depths.

An experiment was conducted in 1895, in which both turnip and rape seed were sown one, two, three and four inches deep. Both experiments were conducted on duplicate plots. Each plot consisted of one row, four rods in length. An exact number of seeds was used in every instance, and they were sown at such distances in the row as it was desirable to have the roots.

Depth of planting seed.	Yield of crop per acre.	
	Swede turnips.	Rape.
	tons.	tons.
1 inch deep	10.7	19.4
2 inches deep	9.9	14.4
3 inches deep	4.5	14.6
4 inches deep	1.7	10.5

The above table shows the advantage of sowing the seeds but one inch in depth, as compared with sowing two, three and four inches deep. The principal difference in the yield per acre seemed to be produced by the difference in the germination of the seeds. That which was sown one inch deep germinated better than that which was sown deeper.

Mangels—Comparative Test of 55 Varieties.

In 1895 there were fifty-five varieties of mangels grown on plots one-hundredth of an acre in size Of this number twenty-eight have been grown for five years in succession, seven for four years, twelve for three years, six for two years, and two for one year. The land on which the mangel seed was sown was quite similar to that used for the carrots, and was considerably lower in aspect than that used for the Swede and fall varieties of turnips. The soil was plowed in the autumn, and received a coating of twenty tons of farmyard manure per acre in the spring before the mangels were sown. The seeding of the mangels took place on the 30th of April, and the germination was very good indeed. The young plants were about one and a half inches high at the time of the severe frosts in the early part of May. The crop was completely frozen off, and the varieties were all sown a second time about the middle of May. The plants were thinned to ten inches apart in the drill.

The yield of mangels during the past season was a little larger than the average for the past five years, the highest yield per acre being nearly forty-one tons and the lowest six and a half tons. The average weight per root in 1895 was a little over three and a half pounds, and the smallest less than two-thirds of a pound. There were in all about twenty varieties of the long red roots, all of which were somewhat similar to one another in general characteristics.

Evans' Improved Mammoth Saw Log. The Evans' Improved Saw Log variety of mangels now heads the list in yield per acre and among the twenty-eight varieties grown for five years in succession. Not only has this variety given a large average yield of roots per acre, but it will be noticed that the yield in 1895 was very high. The plot was admired by many. The roots were quite uniform in size, all being large. In the co-operative experiments over Ontario in 1895, the Evans' Improved Mammoth Saw Log mangel was one of the five varieties under test. In average results of the fifteen successfully conducted tests during the past year, the Mammoth Saw Log gave the largest yield of roots per acre.

Improved Mammoth Long Red. This variety stands second in yield among those grown for five years, but it has given an average of nearly twenty-six bushels per acre less than the Evans' Improved Mammoth Saw Log during the number of years that both of these varieties have been tested. It was also one of the five varieties tested over Ontario in 1895, and came second in point of yield in the average results. It gave about twenty six bushels per acre less than the Improved Mammoth Saw Log in the average of these co-operative tests.

MANGELS—COMPARATIVE TEST OF 55 VARIETIES.

Varieties.	Color of roots.	Results for 1895. Average length of root.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Average results for number of years grown. Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
		inches	tons.	lbs.	tons.	tons.	lbs.	tons.
Grown for Five Years:								
1. Evans' Improved Mammoth Saw Log	Red....	16.30	8.61	3.57	40.95	4.96	2.45	26.50
2. Improved Mammoth Long Red....	"	14.00	6.50	2.92	32.90	4.49	2.25	24.76
3. Carter's Champion Yellow Intermediate	Yellow.	9.90	8.25	2.76	31.00	3.54	2.28	24.43
4. Elvetham Long Red	Red....	13.80	5.45	2.62	29.65	4.66	2.00	23.39
5. Steele Bros. Long Red Selected....	"	14.30	5.10	2.41	27.30	4.17	2.15	23.19
6. Norbitan Giant	"	14.30	5.45	2.66	29.90	4.28	2.17	23.08
7. Carter's Mammoth Long Red......	"	13.60	5.63	2.32	24.15	4.44	1.99	21.45
8. Yellow Obendorf................	Yellow.	11.50	3.70	2.41	27.30	3.30	1.87	21.16
9. Eiffel Tower....................	Red....	12.30	6.48	1.85	20.30	3.74	1.93	20.50
10. Mammoth Red Intermediate	"	11.10	2.68	1.99	22.23	3.24	1.85	20.50
11. May's Mammoth Long Red.........	"	12.80	4.40	2.32	26.05	4.17	1.81	20.14
12. New Monarch	"	13.00	4.13	2.08	23.10	3.53	1.78	20.08
13. Colossal Long Red...............	"	13.30	3.73	2.05	22.43	3.58	1.85	19.94
14. Giant Holstein..................	"	13.20	4.10	2.15	24.35	3.76	1.85	19.88
15. Chirk Castle....................	"	13.40	4.05	2.12	23.55	3.16	1.71	19.03
16. Oblong Giant Yellow.............	Yellow.	11.20	3.00	1.54	16.80	2.48	1.75	18.20
17. Long Oxhorn	Red....	13.60	3.95	1.89	20.35	3.43	1.69	17.50
18. Yellow Oval-Shaped Giant	Yellow.	10.00	2.40	1.88	21.20	1.94	1.62	17.28
19. Carter's Warden Orange	"	7.80	1.90	1.70	19.78	2.88	1.52	16.55
20. Mammoth Golden Giant	"	9.50	1.85	1.53	17.18	2.78	1.51	15.72
21. Yellow Globe	"	6.80	1.60	1.44	16.75	2.67	1.78	15.26
22. Red Globe......................	Red....	6.10	2.15	1.53	17.20	2.37	1.47	15.18
23. Golden Tankard	Yellow.	7.90	1.83	1.36	15.10	1.93	1.36	14.44
24. Clark's Devon Orange Globe	"	5.80	1.78	1.72	15.25	1.90	1.41	14.34
25. Fisher Hobb's Orange Globe	"	6.20	2.38	1.32	12.18	1.92	1.36	13.67
26. Long Yellow	"	12.40	1.43	2.60	9.75	2.09	1.70	12.97
27. Oblong Giant Red	Red....	10.30	1.50	1.50	10.10	1.80	1.73	12.53
28. Kinver Yellow Globe	Yellow.	7.10	3.25	.62	6.50	2.01	1.20	12.40
Grown for Four Years:								
29. Sutton's Mammoth Long Red......	Red....	11.50	2.00	1.16	13.45	3.33	1.46	15.24
30. Canadian Giant	"	11.60	2.13	1.15	13.00	2.87	1.27	13.16
31. Berkshire Prize Yellow Globe......	Yellow.	6.30	1.43	1.31	14.08	1.55	1.25	12.72
32. Gate Post	Red....	11.40	2.60	1.16	12.48	2.65	1.26	12.54
33. Beck's Champion Globe	Yellow.	5.90	1.35	1.05	11.85	2.02	1.22	12.41
34. Sutton's Golden Tankard..........	"	6.90	1.40	1.01	11.10	1.95	1.17	12.02
35. Sutton's Yellow Intermediate......	"	7.40	1.25	1.10	13.00	1.52	1.12	11.61
Grown for Three Years:								
36. Giant Yellow Intermediate........	Yellow.	10.80	2.70	1.55	17.05	2.53	1.54	15.84
37. Yellow Leviathan	"	11.10	2.53	1.51	15.95	2.42	1.52	15.62
38. English Prize	Red....	12.20	3.50	1.62	18.10	2.88	1.42	14.83
39. New Eschendorf.................	Yellow.	6.80	2.03	1.36	15.43	1.89	1.39	14.46
40. Yellow Ovoid	"	8.70	2.53	1.38	15.20	2.49	1.36	14.15
41. Ward's Oval....................	"	10.30	2.63	1.46	16.75	1.99	1.27	13.64
42. Sutton's Yellow Globe	"	5.70	1.40	1.25	13.75	1.65	1.63	13.62
43. Jarman's Giant Long Red	Red....	11.40	2.70	1.05	10.75	2.90	1.27	13.16
44. Olive-Shaped Red	"	6.70	2.15	1.41	14.10	2.06	1.26	12.86
45. Jarman's Giant Intermediate	Yellow.	7.00	1.20	1.01	10.63	1.21	1.19	11.81
46. Jarman's Selected Golden Tankard.	"	5.50	1.40	1.09	11.20	1.67	1.41	11.35
47. Jarman's Model Yellow Globe	"	7.20	1.60	.97	10.18	1.65	1.23	10.72
Grown for Two Years:								
48. Thorp's Own Yard Long	Red....	12.20	3.40	1.46	14.55	4.18	1.69	17.48
49. Jumbo.........................	"	11.40	3.10	1.42	15.83	2.80	1.60	16.37
50. Dignity	"	12.70	3.55	1.42	16.23	3.15	1.44	14.67
51. Carter's Warden Prize Yellow Globe	Yellow.	7.00	1.55	1.27	13.6[illegible]	2.03	1.38	14.05
52. Thorp's Own Champion Yellow Intermediate	"	7.20	2.45	1.29	12.93	1.90	1.40	13.87
53. Webb's New Kinver Yellow Globe.	"	6.70	1.30	1.17	12.88	1.23	1.25	13.19
Grown for One Year:								
54. Effurt Model....................	Yellow.	10.00	2.80	1.30	14.90	2.80	1.30	14.90
55. Long White	White..	16.10	3.13	1.27	13.93	3.13	1.27	13.93

Mangels—Different Distances Between the Drills.

This experiment has now been conducted for four years in succession, and it has been carried on in duplicate each year. The mangel seed was sown on May 2nd, and the plants were not large enough to be destroyed by the severe frosts. The land received a dressing of twenty tons of farmyard manure per acre in the spring of the present year. The plants were thinned to a distance of ten inches apart in the drill.

Distance between drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1895.	Average, 4 years.	1895.	Average, 4 years.	1895.	Average, 4 years.
	tons.	tons.	lbs.	lbs.	tons.	tons.
20 inches	2.18	3.78	1.35	1.71	8.85	20.43
26 inches	1.98	3.91	1.45	1.98	7.95	18.68
32 inches	1.98	4.05	2.25	2.40	9.06	18.11

As in the case of the Swede turnips and the fall turnips, we notice that the largest average yield of roots per acre is from the closest drills, and the smallest yield is from the drills widest apart. The results for 1895, however, vary slightly from this general rule, as the largest yield is from the mangels on the drills thirty-two inches apart.

Carrots—Comparative Test of 45 Varieties.

Forty-five varieties of carrots were tested in the trial grounds during the summer of 1895. Twenty-three of this number have been grown for four years in succession, eleven for three years, nine for two years, and three for one year. The yield of roots per acre was not so high in 1895 as in the average of the past four years. The plots on which the carrots were grown were each ten links wide by one hundred links long, making each plot one-hundredth of an acre in size. The land was quite uniform throughout. The seed was sown in drills nearly twenty-seven inches apart on April 30th. When the plants were about three inches in height they were thinned to an average of four inches apart. The thinning was done very carefully, the number of roots left being counted in every instance.

An average yield per acre for four years of nearly thirty tons of carrots is a very good record; this has been the yield of the best varieties. It will be noticed that the varieties which made the best records in the average of four years are all white cone-shaped carrots, which are somewhat similar in size, shape and general appearance.

Pearce's Improved Half-Long. This variety has given the best average yield of roots per acre among twenty-three varieties grown for four years in succession. During the past season it was surpassed in yield per acre by twelve other varieties. It is a fine-shaped root, and one easily removed from the ground (which we consider a very great advantage) as compared with the Large White Belgian and other long, slender kinds.

Steel Brothers' Short White. This variety resembles very closely the one already described, and in the average of four years has given a little less total yield of crop per acre. The individual roots, however, have been a little larger in average size than those of Pearce's Improved Half-Long variety. In the co-operative experiments over Ontario, the Improved Short White has been distributed with four other varieties for four years in succession, and has given the largest average yield of roots per acre during each of these four years.

Guerande. The Guerande variety is one that is often used for garden purposes. It is short and very thick, and is exceedingly easy to remove from the land. On the whole, it has made a very good showing, but when compared with the first two varieties on the list, it has given an average of nearly ten bushels per acre less than these varieties.

Mammoth Intermediate Smooth. The Mammoth Intermediate Smooth, has been grown for two years in our trial grounds and has made a very fine record indeed. During 1895, it produced the largest yield of roots of any of the varieties under experiment.

TEST OF 45 VARIETIES OF CARROTS.

Varieties.	Color of roots.	Shape of roots.	Results for 1895. Yield of tops per acre.	Results for 1895. Average weight per root.	Results for 1895. Yield of roots per acre.	Average results for number of years grown. Yield of tops per acre.	Average results for number of years grown. Average weight per root.	Average results for number of years grown. Yield of roots per acre.
Grown for Four Years:			tons.	ozs.	tons.	tons.	ozs.	tons.
1 Pearce's Improved Half-Long	white	cone	3.45	11.27	17.08	7.82	15.07	29.49
2 Steele Bros.' Improved Short White	white	cone	4.55	10.98	17.15	7.78	15.11	28.74
3 White Green Top Orthe..........	white	cone	3.95	12.05	15.25	6.87	14.50	27.21
4 Mastadon	white	cone	4.10	11.92	18.25	6.64	13.82	26.90
5 Large White Vosges	white	cone	3.65	11.40	17.45	6.11	13.40	26.06
6 Simmers' Short White Vosges	white	cone	3.65	10.80	16.93	5.69	12.65	24.42
7 Sutton's Yellow Intermediate	yellow	cone	4.40	10.52	14.80	6.09	12.49	23.26
8 P. W. & Co.'s Improved, Giant White Wiltshire	white	cone	2.35	11.43	18.75	6.41	12.84	22.85
9 Large White Belgian	white	long	2.75	9.26	13.75	6.09	11.69	22.48
10 Danver's Orange	orange	cone	2.10	7.87	12.25	4.20	10.28	21.48
11 Giant Wiltshire	white	long	3.05	9.06	14.15	6.77	10.40	20.80
12 Mitchell's Perfected..........	red	m'dium long	2.85	10.32	15.45	3.77	10.22	19.92
13 Guerande..........	red	short	2.20	8.90	14.75	3.36	8.28	19.81
14 Carter's Orange Giant..........	orange	loug	3.40	13.29	18.75	4.27	12.25	18.78
15 French Intermediate	red	m'dium long	2.70	7.17	13.00	4.37	8.21	18.10
16 Scarlet Intermediate	red	m'dium long	2.80	9.07	13.75	3.82	8.93	17.72
17 Half-Long Stump-Rooted	red	m'dium long	1.80	7.38	13.50	2.63	7.97	17.18
18 James' Scarlet Intermediate......	scarlet	m'dium long	2.25	7.54	11.55	3.39	7.83	16.33
19 Long Red Surrey	yellow	long	3.15	8.52	13.45	4.07	7.85	14.97
20 Yellow Belgian	yellow	long	2.60	7.75	11.50	4.59	8.28	14.92
21 Sutton's Improved Intermediate..	red	long	.70	4.00	2.50	2.94	7.26	14.52
22 Long Orange	orange	long	3.95	8.00	11.75	5.78	7.20	14.05
23 Improved Large Long Red Altringham	red	long	2.05	6.08	8.40	4.20	6.93	12.97
Grown for Three Years:								
24 Rubicon Half-Long	red	short	1.85	8.87	14.55	3.46	8.63	16.93
25 Long Red St. Valery	red	long	2.55	9.45	14.85	3.45	8.90	16.87
26 Nichol's Improved Long Orange..	red	long	2.90	9 00	12.80	3.76	9.00	16.85
27 Nante's Half-Long Stump-Rooted	red	half-long ..	1.65	7.76	14.40	3.18	8.71	15.93
28 Chantenay	red	half-long ..	2.35	10.54	16.80	2.67	9.25	15.76
29 Half-Long Scarlet	red	half-long ..	2.05	7.83	13.45	3.22	7.52	15.65
30 Red Parisian Forcing	red	round	1.40	6.57	11.90	1.96	6.40	13.43
31 New Long Red Coreless..........	red	long	1.25	5.98	9.35	2.29	6.41	12.71
32 Small French Forcing..........	red	short	1.85	6.62	10.55	1.48	5.63	10.50
33 Jarman's Scarlet Green Top....	red	cone	.75	13.47	2.53	1.78	11.97	6.89
Grown for Two Years:								
34 Mammoth Intermediate Smooth..	white	cone	5.00	16.65	24.30	5.75	16.86	26.90
35 Iverson's Champion White	white	cone	5.55	17.43	21.45	6.18	17.34	25 65
36 Simmers' Giant White	white	cone	4.35	13.95	21.28	4.68	13.90	23.27
37 Improved White Belgian	white	long	3.80	10.96	19.15	4.68	12.35	21.60
38 Yellow Intermediate	yellow	long	5.50	13.53	20.50	7.52	14.77	19.63
39 Midsummer	red	m'dium long	2.65	11.03	18.40	2.93	10.33	18.77
40 Victoria	red	long	3.25	8 66	14.15	3.58	9.17	16.30
41 Yellow Giant..	yellow	long	4.10	10.34	15.35	3.95	10.61	16.00
42 Early Half-Long Carentian	scarlet	half long ..	.85	4.64	8.70	1.38	5.95	11.44
Grown for One Year:								
43 Thorpe's Own Short White	white	half long ..	2.70	9.58	17.28	2.70	9.58	17.28
44 Henderson's Intermediate..........	red	cone	3.75	10.13	16.15	3.75	10.13	16.15
45 Very Heavy Cropper	white	long	2.75	10.80	13.50	2.75	10.80	13.50

Carrots—Different Distances Between the Drills.

The seed was sown on May 2nd, and the plants when about two inches high were thinned to a distance of ten inches apart.

Distance between drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1895.	Average, four years.	1895.	Average, four years.	1895.	Average, four years.
	tons.	tons.	lbs.	lbs.	tons.	tons.
20 inches	4.87	6.47	.71	.76	24.17	28.73
26 "	4.81	6.27	.86	.89	24.73	27.24
32 "	3.89	5.59	.95	.94	20.48	22.77

It will be seen that there is a difference of about six tons per acre in favor of the drills twenty inches apart, as compared with those thirty-two inches apart. The weight per average root, however, on the drills thirty-two inches apart was about one-quarter larger than those on the drills twenty inches apart.

Sugar Beets—Comparative Test of 13 Varieties.

Sugar beets are grown to a limited extent for feeding purposes, and it is principally as a stock food that we have grown thirteen varieties on the trial grounds during the past year. Of these thirteen varieties, nine have been grown for five years in succession, three for two years and one for one year. The soil on which these experiments were conducted during the past season, was what might be termed an average clay loam, which was manured in the spring of 1895 with well rotted barn-yard manure, at the rate of twenty tons per acre. The land was slightly ridged with a double mould-board plow, the drills being made three and one-third links apart. Three rows, each four rods long, were devoted to each variety. The seeding took place on May 1st, but, owing to the severe frosts during the first half of May, the young plants were frozen off so badly that the seed had to be sown the second time, which was done during the latter part of May. Plants were thinned to ten inches apart in the drill.

Varieties.	Color of roots.	Results for 1895.			Average results for number of years grown.		
		Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for four years:		tons.	lbs.	tons.	tons.	lbs.	tons.
1 White Silesian	white	4.05	1.34	15.19	5.43	1.54	**17.97**
2 Red Top	reddish	2.75	1.37	15.40	4.10	1.49	**17.46**
3 Lane's Improved	white	3.60	1.38	16.20	2.69	1.40	**16.74**
4 White French	"	3.15	1.17	11.08	4.38	1.43	**16.29**
5 Austria Electorial Wohanka	"	3.45	1.35	15.80	5.12	1.29	**15.40**
6 Champion	reddish	2.90	1.06	11.15	3.39	1.28	**14.77**
7 Kleinwanzelben	white	3.70	1.17	12.58	5.07	1.22	**14.01**
8 Red Skinned	reddish	2.00	1.05	12.35	3.25	1.07	**12.43**
9 Improved Imperial	white	3.60	1.06	12.43	3.73	1.74	**10.58**
Grown for two years:							
10 Jersey	slightly red	1.95	1.29	15.13	4.25	1.44	**19.13**
11 New Danish Island	"	1.73	1.11	13.00	2.93	1.48	**18.73**
12 French Yellow	yellowish	3.10	1.15	13.20	3.48	1.22	**16.00**
Grown for one year:							
13 Green Top White	white	3.35	1.20	14.00	3.35	1.20	**14.00**

It will be observed that the White Silesian heads the list in yield of roots per acre, among the varieties grown for four years. It was, however, slightly surpassed in yield per acre by three other varieties during the past year. The White Silesian sugar beet was sent out with four varieties of mangels in a comparative test over Ontario in connection with the system of co-operative experimental work, and in the average of fifteen successfully conducted experiments over Ontario during the past season, it gave a smaller yield of roots per acre than either of the long, medium, or Globe varieties of mangels. It surpassed the Globe variety, however, in 1894.

PARSNIPS—COMPARATIVE TEST OF 4 VARIETIES.

Four varieties were obtained during the present year and grown side by side in our experimental grounds to find out which variety would be likely to give the best yield, and also to obtain a comparison between the yield of parsnips and that of other roots, when grown under similar conditions. The remarks regarding the soil, conditions, etc., are omitted at this time, as the conditions were similar to those for sugar beets.

Varieties.	Average weight per root.	Yield per acre.	
		Tops, 1895.	Roots, 1895.
	lbs.	tons.	tons.
Improved Long Smooth	.55	3.25	13.18
Improved Half-Long	.55	2.85	13.18
New Ideal Hollow Crown	.47	2.70	11.00
Magnum Bonum	.42	2.20	9 35

It will be observed that the two varieties standing at the head of the list gave exactly the same yields of roots per acre. Each of these varieties gave an average of nearly four tons per acre more than the Magnum Bonum. The roots of all four varieties were very nice and uniform.

SILAGE AND FODDER CROPS.

A considerable amount of experimental work has been devoted to the testing of various kinds of silage and fodder crops during the past few years. They include tests with fodder corn, millet, sunflowers, rape, grasses, clovers, sugar cane, etc.

CORN FOR FODDER, SILAGE AND GRAIN—COMPARATIVE TEST OF 131 VARIETIES.

During the past season one hundred and thirty-one varieties of corn have been grown in our experimental field. They have been tested in such a way that the reports should prove of great value to those who are desirous of obtaining information regarding leading varieties of corn for silage, dry fodder or grain. Of all the varieties now under investigation, fifty three have been grown for five years in succession, eight for four years, fifteen for three years, thirty for two years and twenty-five for one year. The seed of the majority of the varieties was obtained in the United States, while that of a number of the earlier kinds was obtained in Canada. By the suggestion and help of Prof. James, Deputy Minister of Agriculture for Ontario, a few of the very early varieties of corn, which have been grown for a number of years by the Indians in the north-western part of Ontario, were secured. The object of this is to obtain reliable information regarding the value and the characteristics of these varieties, and also, by experimental work, to find out whether there are any other varieties which will surpass them in the northern parts of this Province. It is the intention to endeavor, through selection and hybridization, to obtain as valuable varieties as possible for the northern sections.

The land on which the different varieties of corn were grown in 1895 produced a crop of oats the previous year, aud a crop of potatoes in 1893. No manure was applied to the land since the spring of 1893. The corn, therefore, was the third crop on the land after the application of the manure. The land was what might be termed an average clay loam, and was plowed in the autumn of 1894. In the spring of the present year it was thoroughly cultivated, before the corn was planted. All the varieties grown during the present year were tested on duplicate plots. The corn was planted in hills five links (39.6 ins.) apart both ways. Four plants were allowed to remain in each hill. The planting of all the varieties took place on May 23rd. The yields per acre have been estimated from the actual yields of the plots.

TEST OF 131 VARIETIES OF CORN FOR SILAGE FODDER OR GRAIN.

Varieties.	Kinds of corn.	Average results for 1895.					Average results for number of years grown.	
		Condition of grain when harvested.	Height of plants.	Number of ears per plot.	Yield of ears per acre.	Yield of whole crop per acre.	Yield of ears per acre.	Yield of whole crop per acre.
Grown for five years:			ins.		tons.	tons.	tons.	tons.
1 Chester County Mammoth	White Dent	Early Milk	109	130	1.72	21.9	1.30	**21.42**
2 Brazilian Flour	"	Water	102	99	.62	21.1	.45	**21.07**
3 Thoroughbred White Flint	"	Milk	97	133	2.56	21.9	1.94	**20.87**
4 Mammoth White Surprise	"	Early Milk	112	97	1.15	20.9	.91	**20.59**
5 Blunt's Prolific	"	"	113	104	1.23	21.3	1.23	**20.43**
6 Cloud's Early Yellow	Yellow Dent	Dough	101	116	2.96	20.7	3.31	**20.23**
7 Mastadon Dent	"	"	103	126	3.18	20.0	3.00	**20.02**
8 Virginia Horsetooth	White Dent	Milk	108	91	.84	20.5	.91	**19.41**
9 Mammoth Sweet Fodder	Sweet	Dough	84	145	2.65	19.6	2.50	**19.20**
10 Giant Prolific Sweet Ensilage	White Dent	"	97	133	2.65	19.2	2.29	**18.92**
11 Mammoth White Cob Ensilage	"	Early Milk	105	93	1.34	19.7	1.63	**18.87**
12 Red Cob Ensilage	"	Milk	104	126	1.83	19.7	1.83	**18.72**
13 Golden Beauty	Yellow Dent	Late Milk	105	103	1.59	18.5	2.22	**18.70**
14 Mammoth Southern Sweet	Sweet	"	103	130	1.71	19.2	1.61	**18.66**
15 Sheep's Tooth	White Dent	"	101	110	1.95	20.5	1.63	**18.47**
16 Hickory King	"	Milk	102	88	1.16	17.6	1.02	**18.35**
17 Salzer's Sup. Fodder Ensilage	"	"	104	91	1.29	19.6	1.69	**18.20**
18 Mammoth Cuban	Yellow Dent	Firm Dough	96	135	3.53	18.3	3.57	**18.04**
19 Improved Leaming	"	"	86	156	2.81	13.6	3.06	**17.87**
20 Horsetooth	"	Dough	97	130	2.39	18.6	2.91	**17.73**
21 Egyptian Sweet	Sweet	"	88	158	2.56	18.6	2.07	**17.45**
22 Centennial White	White Dent	"	96	....	1.86	14.0	2.90	**17.28**
23 Salzer's North Dakota	White Flint	Ripe	88	173	3.26	16 9	2.04	**16.98**
24 Hickox Sweet	Sweet	Dough	85	136	2.83	17.7	2.67	**16.85**
25 Evergreen Sweet	"	"	78	184	3.00	17.4	2.48	**16.83**
26 Tuscorora	White Flint	Firm Dough	82	158	3.89	18.0	3.19	**16.62**
27 Sweet Fodder	Sweet	Dough	88	144	3.09	19.4	1.69	**16.58**
28 Salzer's South Dakota	Yellow Flint	Firm Dough	80	142	2.44	16.2	2.87	**16.41**
29 Wisconsin Earliest White Dent	White Dent	"	90	146	4.08	15.6	3.78	**15.85**
30 Clark's County Champion	"	"	93	142	3.29	16.3	2.83	**15.77**
31 Stowell's Evergreen Sweet	Sweet	Dough	81	169	3.10	18.0	2.31	**15.77**
32 Large White Flint	White Flint	Firm Dough	84	152	3.49	16.2	3.22	**15.61**
33 Old Colony	Sweet	"	81	178	3.88	16.1	2.89	**15.28**
34 Late Mammoth Sweet	"	Dough	82	131	2.87	17.8	2.33	**15.20**
35 Pride of the North	Yellow Dent	Firm Dough	89	125	2.87	16.3	2.94	**14.89**
36 Compton's Early	Yellow Flint	Ripe	84	145	3.20	14.3	3.33	**14.83**
37 Longfellow	"	"	81	167	2.78	13.8	2.90	**14.61**
38 Early Butler	Yellow Dent	"	85	131	2.86	13.2	3.05	**14.49**
39 Angel of Midnight	Yellow Flint	"	81	179	2.90	13.3	2.86	**14.39**
40 100-Day Corn	"	Firm Dough	79	148	2.86	15.2	2.94	**13.72**
41 Golden Dent	Yellow Dent	Ripe	90	131	2.96	14.7	2.86	**13.47**
42 Early White Flint	White Flint	"	81	152	3.21	12.4	3 04	**13.13**
43 Wauskakum	Yellow Flint	"	76	154	2.89	11.3	2.91	**12.97**
44 Canada Yellow	"	Firm Dough	77	157	3.19	13.4	3.00	**12.94**
45 Early Adams or Burlington	White Dent	Ripe	84	130	2.38	12.8	2.66	**12.92**
46 Dakota Dent	Yellow Dent	"	83	142	2.79	12.1	3.08	**12.91**
47 Queen of the North	"	"	81	134	2.56	11.7	2.90	**12.74**
48 Self Husking	Reddish Flint	"	69	140	2.88	10.5	2.60	**12.31**
49 Minnesota King	Yellow Dent	"	75	159	3.23	11.7	3.12	**12.28**
50 Pearce's Prolific	Yellow Flint	Firm Dough	73	148	2 98	14.7	2.34	**12.24**
51 King of the Earlies	Yellow Dent	Dough	81	148	2.72	13.7	2.85	**12.15**
52 Crosby	Sweet	Ripe	68	207	3.30	13.3	2.74	**11.74**
53 Rideout or Mercier	Yellow Flint	[illegible]	71	137	2.63	12.4	2.85	**11.09**

LIST OF 131 VARIETIES OF CORN FOR SILAGE FODDER OR GRAIN.—*Continued.*

Varieties.	Kinds of corn.	Average results for 1895.					Average results for number of years grown.	
		Condition of grain when harvested.	Height of plants.	Number of ears per plot.	Yield of ears per acre.	Yield of whole crop per acre.	Yield of ears per acre.	Yield of whole crop per acre.
			ins.		tons.	tons.	tons.	tons.
Grown for four years:								
54 Giant Beauty	Yellow Dent	Late Milk	96	127	3.53	20.9	3.37	20.86
55 Dr. Woodhull	"	"	95	122	2.97	19.8	2.99	20.37
56 N. B. & G. Co's Giant Fodder.	White Dent	Milk	104	124	2.29	21.8	1.74	20.24
57 New Leaming	Yellow Dent	Firm Dough	92	145	3.76	18.6	3.27	18.07
58 Pride of Kansas	"	Milk	97	47	1.09	15.5	1.74	17.77
59 True Leaming	"	Dough	91	133	3.05	16.6	3.38	17.55
60 Wilson's White Prolific	White Dent	"	93	145	3.41	18.0	3.07	16.92
61 Silver Flint	White Flint	Ripe	65	148	3.09	12.0	3.14	12.45
Grown for three years:								
62 Peach Blossom Mam. Field	Pinkish Dent	Dough	100	84	2.51	18.4	2.78	20.20
63 Boone Co. White	White Dent	"	101	125	2.91	19.3	2.60	19.50
64 Champion White Pearl	"	"	91	133	3.09	19.3	3.29	19.34
65 Legal Tender	Yellow Dent	"	104	128	2.93	19.5	2.77	19.27
66 Kansas King	White Dent	Late Milk	102	122	1.67	19.1	1.72	19.22
67 Giant White Southern	"	Dough	99	131	3.03	18.8	2.52	18.93
68 Big Buckeye	Yellow Dent	"	108	126	3.02	18.5	2.75	18.47
69 Elephant Fodder	"	"	104	127	3.13	17.8	3.04	18.17
70 Iowa Gold Mine	"	Firm Dough	98	139	3.17	17.0	2.99	16.73
71 Queen of the Field	"	"	98	125	3.29	15.1	3.67	16.45
72 N. B. & G. Co's Rustler White Dent	White Dent	"	87	154	3.66	15.2	3.80	15.54
73 Red Blazed	Reddish Dent	Ripe	77	152	2.84	13.3	3.33	15.38
74 Farmer's Favourite	Yellow Dent	Dough	97	101	2.57	18.4	2.08	13.90
75 Dakota Queen	"	Ripe	88	147	2.89	12.4	3.39	13.24
76 Extra Early Huron Dent	"	"	92	160	3.20	12.4	3.28	13.01
Grown for two years:								
77 Nebraska White Prize	White Dent	Dough	89	135	2.94	18.1	2.95	18.73
78 Perfect Mammoth Ensilage	"	"	99	128	2.53	18.4	2.76	18.53
79 Paragon White Ensilage	"	Late Milk	101	100	1.29	18.3	2.10	18.07
80 Riley's Favourite	"	Dough	96	118	2.09	16.2	2.74	17.30
81 High Mixed	Yellow Dent	"	95	112	2.53	16.4	3.14	17.00
82 Golden Superb	"	"	94	101	1.92	17.2	2.50	16.73
83 Red Blaze	Reddish Flint	Ripe	85	157	3.34	14.3	3.41	16.69
84 White Prolific	White Dent	Dough	94	116	2.14	15.7	2.68	16.53
85 Champaign Co. Prolific	Yellow Dent	"	89	100	1.78	16.3	2.07	16.52
86 Yellow Western Horsetooth	"	"	92	116	2.21	16.2	2.70	16.25
87 Early California	"	"	91	113	2.18	16.2	2.40	16.15
88 Waterloo Extra Early Dent	"	"	90	101	1.86	15.7	2.31	16.10
89 90-Days Leaming	"	Firm Dough	87	120	2.38	15.4	2.76	15.94
90 Salzer's Early Giant White Dent	White Dent	"	91	139	3.30	14.2	3.83	15.68
91 Early White Cap Dent	"	"	92	104	2.09	13.7	2.84	15.28
92 Nebraska Mammoth Red	Red Dent	"	92	120	2.53	14.0	2.95	15.13
93 Canadian Dent	Yellow Dent	Ripe	88	125	2.47	12.7	2.87	15.00
94 Sangford	White Flint	Firm Dough	79	141	2.54	15.3	2.65	14.63
95 Wisconsin White Flint	"	"	81	156	2.82	15.4	2.67	14.43
96 King Philip	Reddish Flint	Ripe	81	151	2.81	10.4	3.45	13.47
97 North Star Yellow Dent	Yellow Dent	"	86	131	2.83	12.0	3.26	13.47
98 Hutt	"	"	77	149	3.53	12.7	3.68	13.38
99 Pride of Canada	Yellow Flint	"	79	167	2.59	13.5	2.67	13.17
100 Gold Medal Dent	Yellow Dent	Firm Dough	80	129	2.54	13.4	3.26	12.7
101 Smoky Dent	Reddish Dent	"	86	140	3.05	13.1	3.78	12.63
102 Squaw	Variegated Flint	Ripe	65	164	2.96	9.4	3.08	11.7
103 Red Glazed	White Flint	"	75	156	3.11	11.2	3.03	11.1
104 Dakota Gold Coin	Yellow Dent	"	76	155	2.99	10.9	2.87	10.7
105 Rawlings	"	"	73	155	3.15	8.2	3.26	9.1
106 Excelsior Yellow Dent	....	....	60	147	2.24	5.9	2.14	6.2

TEST OF 131 VARIETIES OF CORN FOR SILAGE FODDER OR GRAIN.—*Continued.*

Varieties.	Kinds of corn.	Average results for 1895.					Average results for number of years grown.	
		Condition of grain when harvested.	Height of plants.	Number of ears per plot.	Yield of ears per acre.	Yield of whole crop per acre.	Yield of ears per acre.	Yield of whole crop per acre.
Grown for one year:			ins.		tons.	tons.	tons.	tons.
107 Mexican June	......	......	91	....	......	20.9	......	20.90
108 Sale Mammoth	Sweet	Late Milk	81	136	2.63	17.9	2.63	17.90
109 Primitive	Yellow Flint	Milk	79	140	2.41	17.9	2.41	17.85
110 Golden Row	Yellow Dent	Dough	89	135	3.28	17.6	3.28	17.55
111 Old Cabin Home	White Dent	Milk	99	86	.75	17.2	.75	17.20
112 Dungan's White Prolific	"	Late Milk	98	110	2.20	16.9	2.20	16.90
113 Montgomery Golden King	Yellow Dent	Dough	90	114	2.41	16.2	2.41	16.20
114 Riley's Yellow Dent	"	"	100	112	1.97	15.7	1.97	15.70
115 Connecticut Giant Golden	White Flint	Ripe	79	141	3.04	15 5	3.04	15.50
116 Pride of Columbia	Yellow Dent	Firm Dough	90	133	2.83	15.1	2.83	15.10
117 Conqueror	"	Late Milk	91	88	1.54	14.7	1.54	14.70
118 Indian White Flour Corn (white cob)	White Flint	Firm Dough	77	156	3.75	14.7	3.75	14.65
119 Great Western	Yellow Dent	Ripe	90	140	2.84	14.4	2.84	14.40
120 Maumee Valley Yellow Dent	"	Firm Dough	94	129	2.84	14.4	2.84	14.35
121 Indian White Flour Corn (red cob)	White Flint	"	71	150	3.87	14.3	3.87	14.30
122 Langworth	White Dent	"	89	154	3.60	14.0	3.60	14.00
123 Golden Dew Drop	Yellow Flint	Ripe	82	163	3.25	13.9	3.25	13.88
124 Golden Prolific	Yellow Dent	Firm Dough	91	112	2.31	13.7	2.31	13.70
125 Dakota Sweet	Sweet	"	74	152	3.32	13.4	3.32	13.35
126 Hathaway's Yellow Dent	Yellow Dent	Ripe	90	141	3.26	13.2	3.26	13.15
127 Terrebonne	White Flint	"	56	123	2.45	12.3	2.45	12.30
128 Wisconsin Yellow Dent	Yellow Dent	"	84	135	2.86	11.1	2.86	11.10
129 Indian Blue	Variegated Flint	"	61	204	3.34	10.4	3.34	10.35
130 McColl	Black Flint	"	46	214	2.68	10.3	2.68	10.30
131 Will's Jehu 70-Day	Yellow Flint	"	51	155	2.48	6.9	2.48	6.85

By referring to Bulletin 56, issued by the Ontario Bureau of Industries, the reader will see that the area devoted to the growing of corn is rapidly increasing in Ontario. The acreage devoted to field corn in 1895, was 302,929 acres; and the average for the past four years was 242,259 acres. The acreage devoted to silage and fodder corn in 1895 was 148,899 acres, and the average of the past four years was 112,132 acres. This shows a much larger area devoted to corn for husking and for the silo in 1895 than in the average of the years since 1892.

We believe that the best variety of corn in nearly all circumstances, is the one that will produce the largest total weight per acre; that will produce the largest amount of grain per acre; and will mature in the locality where grown before the frosts come in the autumn of the year. In order to obtain accurate and valuable information on these points as well as on others regarding the varieties of corn, we have conducted a somewhat elaborate series of interesting experiments.

We refer the reader to the foregoing table, which contains the results of our corn experiments for 1895 and in some instances the average results for the number of years that the different varieties have been tested in our experimental department. The varieties are arranged in the list according to their total average yield of green crop per acre for the number of years grown.

Chester County Mammoth. It will be observed that the Chester County Mammoth variety of corn heads the list in average yield of green crop per acre, among fifty-three varieties which have been grown for five years in succession on our experimental grounds. This, however, is a very late variety and one not at all suited to Ontario.

Rural Thoroughbred White Flint. The third variety on the list in average yield per acre is the Rural Thoroughbred White Flint. This is also a late variety, the grain only reaching the milk stage by the middle of September in the average of five years' experiments. It is, however, a corn quite extensively grown in some of the sections of Ontario; and on light, warm, dry soils, it has frequently given very satisfactory results.

Cloud's Early Yellow. Among the heaviest yielding varieties of those tested for five years, Cloud's Early Yellow has given the best all-round satisfaction, as it is the earliest of all the heavy varieties, and it produces a large amount of ears per acre. In average yield of ears per acre, the Cloud's Early Yellow has been surpassed by only three other varieties, which are the Mammoth Cuban, Wisconsin Earliest White Dent, and Compton's Early. It is a yellow dent variety and grows to a good average height, being somewhat taller than the Thoroughbred White Flint. In the co-operative experiments over Ontario, during the past season, Cloud's Early Yellow and the Rural Thoroughbred were two among the six varieties distributed; and Cloud's Early Yellow gave about three-quarters of a ton per acre more than the Rural Thoroughbred White Flint. There was also four-fifths of a ton of ears per acre more from Cloud's Early Yellow than from the Rural Thoroughbred White Flint variety.

Mammoth Cuban. For the central part of Ontario, the Mammoth Cuban is one of the best varieties according to the results of our experimental work. It produced nearly as much as the Mammoth Southern Sweet variety, and is much earlier. In yield of ears per acre, the Mammoth Cuban is surpassed by only one other variety among the fifty-three grown for five years.

Improved Leaming. The Improved Leaming variety is one which comes in the same class as the Mammoth Cuban; but the Mammoth Cuban has given better all-round satisfaction than the Improved Leaming, as it has produced a greater quantity of ears per acre, and has also given a little higher total weight of green crop. In ripening, the Improved Leaming and the Mammoth Cuban are very similar. In the co-operative experiments over Ontario during the past year, the Mammoth Cuban gave an average of about three-quarters of a ton per acre of total weight more than the Improved Leaming, and it also gave an average of half a ton of ears per acre more than this variety.

Salzer's North Dakota. Of the early maturing varieties, Salzer's North Dakota has given us the best all-round satisfaction among the varieties tested for five years. It is a beautiful white flint corn, which is well suited for the central and does well in many of the northern parts of Ontario. It nearly always ripens well at Guelph. In the average of five years' experiments, it has produced nearly seventeen tons of green crop per acre. The Salzer's North Dakota is suitable for the silo, for dry fodder, or for the production of grain. It was one of the six varieties sent out over Ontario in the co-operative experiments of 1895, and in the average of twenty-nine experiments it produced the largest number of good ears and the smallest number of poor ears of the six varieties under test.

Compton's Early. The Compton's Early variety of corn has been grown over Ontario for a number of years, and is now fairly well known. It is a good variety, but in the southern and central parts of Ontario it does not produce a sufficient quantity of total green crop per acre as compared with a number of the other varieties. It is specially adapted to the production of grain, and, in the northern part of Ontario, is suitable for silage and fodder. It was also one of the varieties used in the co-operative experiments in 1895, and we found that it was surpassed in total green crop per acre, in yield of ears per acre, and in number of well developed ears by Salzer's North Dakota, which is also an early variety.

Fodder Corn—Different Distances Between Drills and Between Plants in the Drill.

This experiment was conducted for three years in succession previous to 1895. It consisted in planting a late, a medium, and an early variety of corn in drills, thirty, thirty-six, and forty-two inches apart, and leaving the plants at a distance of four, eight, and twelve inches in the drill. The crop was put in in triplicate in the spring of 1895, but owing to a lack of complete germination of the seed, the results of the experiment are not given for this season.

Fodder Corn—Seed Selected from Different Parts of the Ear.

An experiment was conducted in 1894 and in 1895 by planting grain taken from the small end, the middle and the large end of the ear, and also from the whole ear. The grain used for this experiment was grown in the experimental plots in 1894. The corn was planted in hills 36.9 inches apart both ways, and four plants were allowed to remain in each hill. The conditions of soil, manuring, cultivation, etc., were similar to those for the variety tests. The corn was all cut on the same day and weighed immediately upon being cut. The ears were then husked and weighed immediately after being husked.

Selection.	Yield of ears per acre.		Yield of whole crop.	
	1895.	Average, 2 years.	1895.	Average, 2 years.
	tons.	tons.	tons.	tons.
Small end of ear	3.08	3.18	13.20	13.83
Large end of ear	2.86	3.10	13.65	13.01
Whole ear	2.36	2.79	12.00	12.20
Middle of ear	2.23	2.98	10.70	12.15

It will be observed that the above table gives the results for 1895 and also for the average of the two past years. The results of the two years are somewhat different. The grain from the large end of the ear gave better results relatively in 1895 than in 1894, while those from the middle of the ear gave the best relative results in 1894. In the average of two years' work the results from the seed taken from the small end of the ear has made a very good record indeed, and one which is different from what many would expect. This experiment will likely be repeated for several years.

Fodder Corn—Selection of Seed.

For this experiment two varieties of corn were used in 1894 and three varieties in 1895. The corn was obtained from seedsmen during each year, and was supposed to be choice samples. From each of the samples used in 1895, a selection was made of large plump seed, of small plump seed, and of inferior seed. The inferior seeds were all whole, but were in most instances dark or mouldy at the germ. The corn was planted in hills 39.6 inches apart each way. Planting took place on May 29th. An equal number of grains was sown of each selection. The experiment with the inferior grain was not conducted in 1894. The sample packages from which the selections were made consisted of two pounds each.

Selections.	Yield of ears per acre.		Yield of whole crop per acre.	
	1895.	Average, 2 years.	1895.	Average, 2 years.
	tons.	tons.	tons.	tons.
Large, plump grains	7.9	5.33	16.9	16.65
Small, plump grains	6.7	4.52	12.8	14.10
Inferior grains	2.6	....	6.4	....

From an examination of the results of this experiment, it is found that the large plump grains produced the best results throughout, small plump grains the second best, and the inferior grains the poorest.

Fodder Corn Planted at Different Depths.

In the spring of 1895 Cloud's Early Yellow and the High Mixed varieties of corn were each planted one, two and three inches deep. The experiment was conducted in duplicate. An exact number of grains was planted in every instance, and no thinning of the plants took place. The conditions as to character of soil, the method of cultivation, etc., were exactly the same for this experiment as for the variety tests. Planting took place on June 1st, and the corn was cut about the middle of September, at which time it was weighed and also husked; and the ears were weighed immediately after being husked.

Depths of planting.	Yield of ears per acre.	Yield of whole crop per acre (green).
	tons.	tons.
1 inch deep	4.76	18.9
2 inches deep	4.96	20.3
3 inches deep	4.68	20.0

As this is the first year that this experiment has been made, no definite conclusions can be drawn, but the experiment tends to show that corn planted at a depth of two inches will give better results than that planted at one inch or three inches. The season and soil, however, will have much to do in determining the comparative advantage on the three depths of planting.

Millet—Comparative Test of 20 Varieties.

Varieties.	Average height, 1895.	Yield of crop per acre when first cut.	
		1895.	Average for number of years grown.
	ins.	tons.	tons.
Grown for four years:			
German or Golden	31	12.40	8.12
Salzer's Dakota	34	10.36	7.72
Golden Wonder	30	12.04	7.70
East India Pearl	24	8.64	6.15
Common	28¾	6.12	5.03
White French	28½	5.68	4.69
Red French	22½	4.70	4.02
Broom Corn	25½	4.20	2.79
Grown for three years:			
Hungarian Grass	26	6.28	5.48
Grown for two years:			
Magic	27½	10.42	7.41
Canadian	31	10.92	7.00
California	24	5 00	4.06
Hog Millet	23	3.76	3.18
Russian	24	3.64	3.02
Grown for one year:			
Holy Terror Gold Mine	27½	12.64	12.6
Japanese (cross gallis)	26	10.54	10.5
" (Millicum)	27	10.48	10.4
" (Italicum)	19½	10.32	10.3
Canary	27	9.60	9.6
Manitoba	30	4.04	4.0

Eight varieties of millet have been grown in the experimental department for four years in succession. Besides those grown for that length of time, one variety has been grown for three years, five for two years, and six for one year. The twenty varieties of millet were grown in duplicate; the seed of one set was sown on June 5th, and the seed of the duplicate test on June 10th. The plots were each one hundred and sixtieth of an acre in size in both sets of this experiment. The seed was sown broadcast at the rate of forty pounds per acre. We cut the crop just after it came into head, and weighed the product at once. The yields per acre have been estimated from the actual yields of the plots.

The yields per acre in 1895 were very good, the largest being upwards of twelve tons of green fodder per acre.

German or Golden. The German or Golden millet now occupies the highest place in yield of crop per acre among the eight varieties of millet that have been grown for four years in succession. Owing to its large yield during the present year the average has been considerably increased. Up to the present time the Salzer's Dakota has occupied first place in point of yield.

Salzer's Dakota. The Salzer's Dakota millet did not do quite as well in 1895 as in the previous years. The plants were not so vigorous. The seed of the Salzer's Dakota obtained in 1892 was very excellent, and produced a crop which we find it very difficult to surpass. We have a few ounces of the seed still on hand, and we are now trying to increase the quantity by careful growing. In the co-operative experiments over Ontario the Salzer's Dakota, Common, Golden Wonder and Hungarian Grass were distributed in 1895. The average results show that the Salzer's Dakota gave the largest yield over Ontario. This variety has now occupied first place in the co-operative experiments for four years in succession.

Sugar Cane, Broom Corn, Kaffir Corn, etc.

Twelve varieties of Sugar Cane, Broom Corn, Kaffir Corn, etc., were grown in the Experimental Department during the past year. Ten of these varieties were also grown in 1894. They were planted on plots one-hundredth of an acre in size on the 8th of June in drills five links apart, in much the same way as corn is often sown.

Varieties.	Kind of crop.	Average height.		Yield of heads per acre.		Yield of whole crop per acre.	
		1895.	Average 2 years.	1895.	Average 2 years.	1895.	Average 2 years.
		inches.	inches.	tons.	tons.	tons.	tons.
1 Fodder	Sugar Cane	70	78 0	.07	.06	15.65	**17.84**
2 Early Orange	"	67	70 0	.08	.08	13.13	**17.52**
3 Early Amber	"	66	76.5	.54	.43	13.65	**16.93**
4 White African	"	55	60.0	.0	.0	13.75	**15.63**
5 California Golden	Broom Corn	42	66.0	.90	1.25	8.95	**10.33**
6 Kaffir Corn	Kaffir Corn	47	50.5	.0	.0	10.50	**9.15**
7 Yellow Millo Maize	Millo Maize	54	53.5	.75	.90	8.80	**8.70**
8 Dwarf	Broom Corn	41	58.5	1.06	1.37	6.95	**8.13**
9 Improved Evergreen	"	44	63.0	1 10	1.69	7.20	**7.50**
10 Jerusalem Corn	Jerusalem Corn	49	52.5	.92	1.10	5.50	**5.40**
11 Early Minnesota	Sugar Cane	88	....	.68	....	13.25	....
12 Branching Doura	Branching Doura	52	....	.93	....	7.83	....
13 Early Japanese	Broom Corn	75	....	1.69	....	7.55	....

It will be observed that among the ten varieties which have been grown for two years in succession, the four varieties of Sugar Cane stand at the head of the list in average yield per acre. The Fodder Sugar Cane gave an average of 17.8 tons per acre in the two years' experiments. This variety also gave the highest yield of all the varieties tested during the present year.

Mixed Grains Grown for Fodder.

The interest in fodder crops is growing year by year, as the dairy and other industries which require an increased amount of animal food, are more largely developed in this Province. During the past four years we have sown oats, peas, barley and spring wheat separately and in various combinations, in order to find out which crop would be the most suitable for producing a large amount of valuable food to be used as green fodder or for hay. The experiment has been carried on in duplicate during each of the four years. The grains each year were sown separately and in various combinations, with two and three kinds of grains in each combination, and also in a mixture of all four kinds together. This would make in all fifteen plots in each set, or thirty plots in the duplicate experiments. The plots were each one-hundredth of an acre in size, and the seed was sown on April 26th. The land grew a crop of peas in 1894, and has not been manured for at least six years. The following table gives the average results of the grain grown singly and in the various combinations, as indicated in the table:

Crops.	Yield per acre of green crops grown separately.			Yield per acre of green crop grown in mixtures.				
	1894.	1895.	Average 2 years.	1892.	1893.	1894.	1895.	Average 4 years.
	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.
1. Peas and Oats	8.02	7.92	7.97	10.95	6.01	8.14	6.91	8.00
2. Barley and Peas	6.77	7.68	7.23	8.50	5.93	7.25	6.85	7.13
3. Barley, Peas and Oats	7.19	7.18	7.19	9.95	5.30	7.25	5.45	6.99
4. Barley and Oats	6.79	5.93	6.36	7.08	6.12	7.29	6.63	6.78
5. Peas, Wheat and Oats	6.73	6.43	6.58	8.20	6.94	6.46	5.28	6.72
6. Barley, Peas, Wheat and Oats	6.43	6.24	6.34	9.85	4.01	6.43	5.14	6.36
7. Wheat and Oats	6.10	4.81	5.46	7.58	5.28	6.64	5.48	6.25
8. Barley, Wheat and Oats	5.91	5.10	5.51	8.60	4.77	6.36	5.20	6.23
9. Peas and Wheat	6.08	6.56	6.32	7.95	4.48	5.89	5.64	5.99
10. Barley, Peas and Wheat	5.90	6.26	6.08	7.45	3.98	6.21	5.17	5.70
11. Wheat and Barley	4.85	4.57	4.71	6.15	4.81	5.20	4.65	5.20

The peas and oats have given the largest yield of green crop per acre in the average of four years. Not only does this combination make a good crop in regard to yield per acre, but it also produces a fodder of excellent quality, as the oats furnish an abundance of carbohydrates, and the peas a good quantity of albuminoids, thus forming a well-balanced ration. It will be noticed that peas are in the three highest yielding mixtures, and that wheat is in all mixtures which gave the poorest yield of green crop.

Peas and Oats Sown in Different Quantities for Fodder.

Mixtures of grain.	Yield of green crop per acre.				
	1892.	1893.	1894.	1895.	Average 4 years.
1. Oats 1 bushel, and Peas 3 bushels	11.35	6.32	7.79	9.21	8.66
2. " 2 " " 3 "	11.75	6.52	7.00	9.28	8.64
3. " 2 " " 1 "	11.55	6.28	6.89	9.68	8.60
4. " 1½ " " 1 "	12.10	4.88	7.21	9.40	8.40
5. " 1½ " " 2 "	11.85	5.88	6.54	9.30	8.39
6. " 1½ " " 3 "	11.40	5.72	6.46	9.58	8.29
7. " 1 " " 1 "	11.80	4.68	7.61	8.84	8.23
8. " 1 " " 2 "	10.75	4.18	7.79	9.65	8.09
9. " 2 " " 2 "	10.10	5.36	7.07	9.78	8.08

This experiment was conducted in duplicate plots in 1895, and has now been carried on for four years in succession. Different portions of peas and oats have been mixed together in such a way that some valuable information should be gleaned in regard to the best combinations for fodder purposes. The seeding in 1895 of one set took place on April 27th, and of the other set on May 8th. The seed was sown broadcast in every instance.

It will be noticed that the largest yield per acre for four years has been produced by sowing one bushel of oats and three bushels of peas combined. This mixture, however, is apt to lodge very badly, and we find that, all things taken into account, two bushels of oats and one of peas, or one and a half bushels of oats and one of peas mixed, is a very good combination for a crop which will yield well, usually lodge but little, and form a good quality of feed, and it forms a good combination of carbonaceous and leguminous plants.

Sunflowers—Comparative Test of 7 Varieties.

In 1895 seven varieties of sunflower seed were obtained from different seedsmen, most of them from the United States. The seed was planted in rows twenty-five inches apart on June 8th. The land was cultivated similar to that on which the corn was planted. The varieties were cut on the same day, and the results given were as follows:

Varieties.	Average height.		Yield of heads per acre.		Total yield per acre.	
	1895.	Average 2 years.	1895.	Average 2 years.	1895.	Average 2 years.
Grown for two years:	inches.	inches.	tons.	tons.	tons.	tons.
1 Helianthus Globosus	65	65.0	4.58	4.65	12.58	**10.63**
2 Texas Silver Queen	46	58.0	.23	2.72	4.83	**8.82**
3 Black Giant	64	58.0	3.05	3.97	9.10	**7.75**
4 Mammoth Russian Giant	59	58.5	1.98	3.19	5.93	**6.13**
5 Common	64	63.0	1.94	3.37	5.79	**5.42**
6 Double California	54	42.5	1.68	2.04	5.73	**4.87**
Grown for one year:						
7 Silver and Gold	39		.69		11.39	

The yield of sunflowers per acre in 1895 was greater than that of 1894. The foregoing table gives quite full information in regard to the production of the different varieties.

Fodder Crops—8 Varieties.

A very interesting experiment was conducted in 1895 with eight varieties of crops which should be fairly well suited for fodder purposes. The experiment was conducted with these eight varieties on both new and old land, and the results given below are the average of the duplicate experiments. The plots were one-hundredth of an acre in size in every instance. The seeding of one set took place on May 8th, and of the other on May 9th. The crops were harvested when in about the right condition for feeding purposes. They were carefully judged by six judges acting independently of one another. The nctes taken were carefully summarized and are given in column four of the table below. The feed from each variety was also taken to the stables and fed to the dairy cows to find out which ones was most relished by the animals.

Varieties.	Average height of crop.	Average yield per acre.	General appearance as a valuable crop for fodder purposes. 1=most. 10=least.	Relished by cattle when fed in the stable. 1=most. 10=least.
	inches.	tons.		
Rape	17.0	17.06	5	1
Yellow Soy Beans	22.8	11.26	8	3
Egyptian Peas	16.8	10.91	7	10
Grass Pea	38.9	10.43	1	2
Prussian Blue Peas	46.5	10.36	2	3
Tares or Vetches	29.0	10.16	2	2
Crimson Clover	14.0	7.58	4	1
Horse-beans	27.5	7.38	6	9

It will be observed that the rape gave the largest amount of green crop per acre, yielding nearly twice as much as any of the other varieties. The rape was also eaten very readily by the animals in the stable. The Egyptian Peas and Horse-beans appeared to be relished by the animals the least of any of the varieties in the experiment.

Rape—Comparative Test of 7 Varieties.

For two years we have grown a few varieties of rape on a small scale in our trial grounds. The seed of these varieties were kindly furnished by the Steele-Briggs Seed Co., Toronto. In each of the two years in which this experiment has been conducted, one row of each variety two rods in length, was sown.

Varieties.	Height of plants.		Kinds of plants.	Weight of ten best plants in 1895.
	1895.	Average, two years.		
	inches.	inches.		pounds.
Dwarf Essex	33	23.8	biennial.	7
Large Seeded Winter	24	20.5	"	10
Umbrella, large seeded	23	19.0	"	10
Dutch Rape, large seeded	22	17.0	"	5
White Flowering	19	15.8	"	2½
Yellow Flowering	16	16.3	"	3
Russian Summer, large seeded	36	37.5	annual.	4½

There are several of these varieties which resemble the Dwarf Essex, and it will be noticed that the Large Seeded Winter and the Umbrella Large Seeded produced larger average sized plants than the Dwarf Essex. As this experiment, however, was conducted with such small lots of seed, we are unable to glean little more than a knowledge of the characteristics of the different varieties under test.

Rape—Comparative Test of 2 Varieties.

The Dwarf Essex Rape is one which is used almost entirely for cultivation in Ontario, and in the Northern States. The Victoria variety was recommended very highly indeed by one of the American seedsmen as being a variety much superior to the Dwarf Essex. We sowed some of the seed of each of those varieties in duplicate plots the past year. Each of the plots was one-hundredth of an acre in size.

Varieties.	Yield of green crop per acre.
	tons.
Dwarf Essex	15.15
Victoria	14.55

The growth of the two varieties was quite similar throughout, although the Victoria seemed to be, if anything, a little taller. In average yield per acre, however, the Dwarf Essex has produced three-fifths of a ton per acre more than this new variety known as the Victoria.

Rape—Selection of Seed.

An experiment was conducted during the past year, in which a selection of rape seed was made from what might be considered an average sample of the seed on the market. The selection was large and plump seed, medium-sized seed, and small seed. The medium seed, however, was sound and whole, the large seed was carefully hand-picked and was choice in plumpness, etc. The experiment was conducted in duplicate. Exactly the same number of seeds was used for each experiment. Each plot consisted of one row, four rods in length. The following table gives the results of the experiments:

Selections.	Yield of green crop per acre.
	tons.
Large and plump seed	13.13
Medium-sized seed	9.23
Small sound seed	3.28

The large and plump seed shows a marked increase over the other selections in average yield of green crop per acre, as it produces about one-half as much again as the medium-sized seed, and over four times as much as was produced from seed of small size.

Rape—Thinning Plants to Different Distances in the Drills.

An experiment was conducted in 1895, in which the rape plants when about two inches in height, were thinned to different distances in the drills, the distances being, two, four, eight and twelve inches. The experiment was conducted on plots one hundredth of an acre in size, and the test was made in duplicate.

Distance between the plants in the row.	Yield per acre of green crop.
Two inches	14.45 tons.
Four inches	14.25 "
Eight inches	13.83 "
Twelve inches	11.23 "

It will be remembered that even the thinning to two inches apart is not at all close in comparison with the way rape is usually sown. There is the largest average yield from the plots which contain the plants closest together, and the smallest yield from the plots that contain the plants which are thinned to the greatest distance apart. The widest distance between the plants, however, gives an opportunity for the individual plants to become well developed, and a very fine crop is realized. We believe from what we have seen in connection with different experiments in rape growing, that the tendency throughout many parts of the Province is to sow the seed too thickly. About one pound per acre has given excellent results in our experimental department.

RAPE—METHODS OF CULTIVATION.

An experiment was conducted with rape in 1895 by sowing the seed broadcast, by sowing it in rows on the flat and cultivating between the rows; by sowing in rows on light ridges, and cultivating between the rows; by sowing in rows on light ridges and sub-soiling the ground at the time of seeding and afterwards cultivating the ground between the rows. The land upon which this experiment was conducted was an average clay loam which had been manured in the spring of 1893, at the rate of twenty tons of farmyard manure per acre, and had produced a crop of winter wheat in 1894. The rows were four rods in length, and twenty-six and two-fifth inches apart. The seeding took place on June 24th. The crop was weighed immediately on being cut. The yields per acre have been estimated from the actual results of the plots.

——	Yield of green crop per acre.
Sown broadcast	5.3 tons.
Sown in rows on the flat and cultivated	5.7 "
Sown in rows on light ridges and cultivated	5.5 "
Sown in rows on light ridges and sub-soiled at time of seeding	6,7 "

It will be noticed that the plots which were sub-soiled gave the largest average yield of green crop per acre. The yield of rape was light in every instance owing to the very dry weather. The lightest yield was produced from the broadcast sowing.

PUMPKINS AND SQUASHES—COMPARATIVE TESTS OF 9 VARIETIES.

Nine varieties of pumpkins and squashes were planted in the experimental department on May 25th. There were two hills of each variety. One hill was well manured and the other was left without any special manuring. In the well manured hills, only one-half were allowed to grow, while in the unmanured hills three plants were allowed to remain in each hill. As the weather was very dry, the hills were all watered three or

Varieties.	Yield of pumpkins and squashes from plants unmanured.	Yield from one vine of each variety well manured.
		lbs.
King of the Mammoths Pumpkin	138.0	618.0
Rennie's Yellow Mammoth Squash	88.0	552.0
Thorp's Mammoth Pumpkin	....	387.5
Mammoth Tours Pumpkin	51.5	358.0
Mammoth Bright Red Etampes Pumpkin	37.5	282.0
Rennie's Green Mammoth Squash	166.0	253.0
Buckbee's New Sandwich Island Pumpkin	47.0	200.0
Large Cheese Pumpkin	17.5	122.5
Centennial Field Pumpkin	116.0	82.5

pur times with water from an adjacent stream. The vines were not cut back, nor were ie plants fed in any way except by the manuring they received.

King of the Mammoth, which was obtained from the States, gave the largest yield. Upon the one vine which was well manured, there were twelve well-developed pumpkins; nd upon the one vine of the Rennie's Yellow Mammoth squash, there were also nine ell-developed specimens. The product of these two vines was shown at the Central Exhibition held in Guelph last autumn.

Clovers—Comparative Test of 9 Varieties.

In the spring of 1894, nine varieties of clover were sown in the experimental depart-ent. Barley was sown at the rate of one bushel per acre along with the clover. The eding took place on May 12th, 1894. No protection was afforded the plots during the st winter. Two crops of clover were produced by some of the varieties during the pre nt year. The following table gives the results for 1895:

Varieties.	Uniformity of the crop over the land.	Average height of plants.	Yield of freshly cut crop per acre: First cutting July 4th.	Yield of freshly cut crop per acre: Second cutting. October 22nd.
			tons.	tons.
khara or Sweet Clover	good	32	9.44	.08
cerne or Alfalfa	"	12	2.40	.96
ike	"	9	2.88	.00
nfoin	"	14	2 32	.00
g Red Rawdon	medium	10	1.84	.24
llow Trefoil	good	7	1.76	.00
mmoth Red	medium	10	1.24	.24
mon Red	medium	12	1.20	.24
ennial Red	medium	11	.92	.12

It will be observed from the above table that six out of the nine varieties of clover e a second crop. This, however, was very light in the case of most of the varieties. khara, or Sweet Clover, produced the largest average yield of freshly cut clover per e. This, however, is a very coarse plant and the hay is not relished by animals. It is d in some cases as a green manure. The Lucerne, or Alfalfa, stands second in total d of crop per acre during the past year. The red clovers came through the winter the est of all those mentioned in the foregoing table. The severe frosts in the spring cted the Lucerne or Alfafa, the most of any of the varieties. Had it not been for the s, the Lucerne would likely have produced three good-sized cuttings. The crop from plot was made into hay and then weighed in the dry condition. It is found very cult, however, to get the crops of all of the varieties cured uniformly, and the results e cured hay are therefore not given in the preceding table.

Crimson, or Scarlet Clover.

Trifolium Incarnatum.

Inquiries are frequently received from farmers throughout Ontario regarding the vation of Crimson or Scarlet Clover. When we consider that it is so successfully n in New Jersey, Delaware, Maryland, and a few of the other American States, and by some men of experience it is called the "mortgage lifter," can it be wondered our people are anxious to learn about its adaptability to the Province of Ontario? e have had four years' experience with Crimson Clover at our Agricultural College, the purpose of the writer to give in a few words the result of that experience. It t be well, however, to give first a short description of the plant and mention the uses hich it is put where most successfully grown.

Description of the Plant.

Crimson clover is an annual, producing seed and dying within one year after it is sown. If the seeding takes place in the spring the growth is rapid and the seed is produced during the same season, after which the plant dies. When sown in July, August or September, the growth is slow, and if the winter is not too severe, the plant lives till the following year when it completes its growth and ripens its seed. If the crop is pastured in the early spring the plants usually renew their growth and mature about the usual time. The blossoms grow to about two inches in length and are of a brilliant crimson color, which gives a beautiful appearance to a field of this clover when in full bloom. The roots grow very rapidly and penetrate quite deeply into the soil even when the seeding is done in the spring of the year.

Crimson clover is one of the leguminous crops, and investigations in this line tell us that it has the power of making use of the free nitrogen of the atmosphere, being somewhat similar in this respect to peas, beans and common red clover.

Utilization of the Crop.

In those parts of the country where Crimson clover is grown the most successfully, various uses are made of the crop. In some of the Eastern States it is grown very extensively for green manuring and for the production of hay and seed, and, to a limited extent, for pasture, soiling, and silage purposes.

The fact that the Crimson clover and other leguminous crops of a similar nature are able to make use of the free nitrogen of the atmosphere is of great importance, not only in the enrichment of the soil by the addition of this expensive element of plant food, but also in the production of animal food of high nutritive qualities, owing to the large amount of this same element, nitrogen, in its composition. A two-fold use of nearly the whole of the nitrogen of these leguminous crops may be taken advantage of by first feeding the crops to farm animals and then carefully saving the manure and returning it to the land for future crops.

Crimson Clover in Ontario.

Experience with Crimson clover in Ontario is still quite limited. During the present year, however, it has been tested for spring sowing pretty generally over the province through the medium of our Agricultural and Experimental Union. Last spring packages of seed sufficient to sow one-tenth of an acre each, were sent to one hundred and twenty-seven leading farmers throughout Ontario. The average results of the co-operative work go to show that in some sections the Crimson clover did exceedingly well, while in others it was a failure. The average height of the crop was 11.1 inches and the average yield of green crop per acre was 4.35 tons.

In four years' trials of sowing Crimson clover in the spring, at the Agricultural College, we have obtained an average of about $1\frac{1}{10}$ tons of hay per acre. When the seeding took place in April, May, or very early in June, the plants bloomed during the same season, after which they immediately died. Ten and fifteen pounds of seed per acre have produced about equally good results. The plants have reached an average height of from twelve to eighteen inches.

During the month of August of the present year, nine kinds of green crops were fed to cows in the stable, and it was found that rape and Crimson clover were the most palatable. In six determinations made this season, an average of thirty-one pounds of Crimson clover hay was obtained from the curing of each one hundred pounds of the green crop that was cut when in bloom.

Crimson clover, common peas, buckwheat, rape and spurry were sown separately on about two and a half acres of the experimental grounds early in May of the present year. With the exception of spurry, the crops grew luxuriantly and were admired by the thousands of Ontario farmers who visited the College in the month of June. The crops were all plowed under early in July, and winter wheat is now growing on the land. Interest will be taken next year in watching the effect on the wheat crop of the different kinds of manure used.

In the autumn of 1894 about three acres of winter wheat stubble land were sown with Crimson clover. The germination of the seed was good and the plants had reached a height of about two inches by the time winter set in. On examining the crop in the spring we found that only a few of the plants had survived the severe winter weather. It should be remembered, however, that winter wheat in an adjoining portion of the experimental grounds was killed during the same season much more extensively than that grown during any of the five years previous. The plants on a section of the land were allowed to ripen and the seed was carefully gathered for future growing, with the object of trying to ascertain if a plant can in time be produced that will be as hardy in Ontario as our winter wheat is at present. We invite the co-operation of farmers over the Province in the future testing of Crimson clover as a winter crop and would be pleased to receive the experience of any in regard to this plant. It would be a valuable addition to our list of crops if we could get a legume that could be grown on the land between harvest and the time of planting corn, potatoes, turnips, rape, etc., the following spring.

Grasses—Comparative Test of 21 Varieties.

On May 15th, 1894, thirty-one varieties of grasses were sown in our experimental plots. During the winter of 1894 ten of these were killed out so badly that the experiment with these varieties was discontinued. Twenty-one varieties came through the winter fairly well and have made a fairly good growth during the present season, when we consider the extreme dryness of the summer. The following table gives the particulars in regard to the yields of the different varieties :

Names of varieties of grasses. Common.	Names of varieties of grasses. Scientific.	Uniformity of the crop on the land.	Average height when cut.	Yield of green crop per acre.
			inches.	tons.
1. Lyme Grass	Elymus Virginicus	good	30	8.84
2. Western Rye Grass	Agropyrum tenerum	medium	27	8.76
3. Bearded Wheat Grass	Agropyrum caninum	good	30	6.80
4. American Lyme Grass	Elymus Americanus	medium	15	5.32
5. Fringed Brome Grass	Bromus ciliatus	poor	18	3.76
6. Soft Brome Grass	Bromus mollis	very good.	23	3.44
7. Awnless Brome Grass	Bromus inermis	good	24	3.16
8. Timothy	Phleum pratense	"	25	2.64
9. Tall Oat Grass	Arrhenatherum avenaceum	medium	24	2.60
10. Orchard Grass	Dactylis glomerata	good	11	2.32
11. Meadow Fescue	Festuca elatior	"	18	2.24
12. Rhode Island Bent	Agrostis canina	medium	14	1.40
13. Red Top	Agrostis vulgaris	"	15	1.36
14. Meadow Foxtail	Alopecurus pratensis	"	21	1.24
15. Perennial Rye	Lolium perenne	"	12	.92
16. Kentucky Blue	Poa pratensis	"	15	.84
17. Creeping Bent	Agrostis stolonifera	poor	13	.56
18. Fine Leaved Sheep's Fescue	Festuca ovina	medium	11	.40
19. Yellow Oat	Avena flavescens	poor	10	.32
20. Wild Timothy	Muhlenbergia glomerata	"	11	.28
21. Canadian Blue	Poa campressa	"	8	.20

It will be observed that some large yields were obtained from several of the varieties. Numbers one, two, three, four, five, and twenty are natives of Canada, and were obtained through the kindness of Mr. S. A. Bedford, Superintendent Experimental Farm, Manitoba. The Orchard Grass was very badly affected by the frosts in May, or it would likely have made a much higher record. Further work will be done along this interesting and valuable line of experimental research.

Permanent Pastures.

A considerable amount of experimental work has been devoted to the growing of grasses and clovers, both singly and in combination. In the spring of 1894, two mixtures of grasses and clovers for permanent pasture were sown in our experimental grounds. On one plot, the mixture which was recommended at this place in 1895 was used; and on the second plot, the mixture which was recommended in 1893 was sown. These were sown without any other crop during the first season. In 1895, we were enabled to cut two crops from each mixture. The following table gives the results of the two mixtures for the past season:

No. 1. Mixture recommended at O. A. C. in 1895.			No. 2. Mixture recommended at O. A. C. in 1893.		
Grasses or clovers.	Varieties.	Amount of seed used in mixtures.	Grasses or clovers.	Varieties.	Amount of seed used in mixtures.
		lb.			lb.
Grasses	Meadow Fescue	6	Grasses	Orchard Grass	4
"	Meadow Foxtail	3	"	Meadow Fescue	4
"	English Rye	2	"	Tall Oat Grass	3
"	Timothy	3	"	Timothy	2
"	Canadian Blue	4	"	Meadow Foxtail	2
"	Orchard	3	Clovers	Lucerne	5
"	Red Top	2	"	Alsike	2
"	Yellow Oat	2	"	White or Dutch	1
Clovers	Lucerne	4	"	Yellow or Trefoil	1
"	White	2			
"	Alsike	2			
"	Red	1			
"	Yellow	1			
	Total amount seed used.	35		Total amount seed used.	24

Yields during 1895.

Mixtures.	Average height of first crop.	Yield of green crop per acre.		
		First cutting, July 4.	Second cutting, Oct'r 22.	Total from the two cuttings.
	ins.	tons.	tons.	tons.
No. 1	24	5.12	2.88	8.00
No. 2	25	5.76	5.52	11.28

It will be observed that number two mixture produced a total yield of green crop of over three tons per acre more than that of number one mixture. There was, however, less seed sown on number two than on number one. In number one mixture some of the grasses are small, such as Canadian Blue, Red Top, and Yellow Oat. In number two the varieties of both grasses and clovers have proven to be quite hardy for this climate, and are all fairly good yielders. The Meadow Foxtail is perhaps the lightest yielder, but it is the earliest grass on the list. It will be interesting to watch the comparative results of these plots in future years.

SACALINE, (*Polygonum Sachalinense.*)

A great deal has been said and written about this plant by seedsmen in the United States and by a few of the seedsmen in Ontario. Up to the present time we know but very little of it in Canada. In the early spring of 1894, I wrote to the Agricultural Experiment Station in Iowa in regard to this plant, and they kindly furnished me with four roots; these I planted in my garden and watched them very closely. The plants grew to about eighteen inches in height in 1894. The growth in the spring of the present year was quite rapid, the plants having reached a height of one foot or more at the time of the May frosts, when they were frozen to the ground. In three or four weeks after the frosts, the plants again sent forth new growth, each reaching a height of about three feet during the summer.

Besides the plants secured in 1894, we obtained some roots and seed during the spring of the present year. The plants which grew from the roots reached a height of about two feet, and those from the seeds, a height of from six to ten inches.

MISCELLANEOUS CROPS.

Experiments were conducted during the past year in testing four varieties of peanuts, two varieties of Chicory, one variety of Flax, one of Hemp, one of Gorse, one of Chufas, one of African Goober, one of Swiss Chard, two of Kohl Rabi, and one of Upland Rice. Further experiments will be made with a number of these crops, and the results will be reported from time to time.

Respectfully submitted,

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec. 31st, 1895.

C. A. ZAVITZ,
Experimentalist.

FARM

To the President of the

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PART XI.

REPORT OF

FARM SUPERINTENDENT.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my annual report for the year 1895, and it affords me no little pleasure to be able to report that notwithstanding the unusually bad season (which was ushered in by a severe frost on the night of the 13th of May, followed by a long-continued and severe drouth), we have had a fairly prosperous year. Our crops were all good, with the exception of clover and fall wheat. These two crops were so injured that they only yielded about one-third of an average crop. Owing to the especially favorable weather in the early part of the season, the clover was coming into bloom when the frost cut it off as though it had been mowed, the heavier places suffering most. After the frost the frozen clover formed a thick, heavy mulch which prevented the air from reaching the roots and lower parts of the stem, which soon began to turn yellow. On noticing this, we horse-raked about twenty acres and found that it had a very beneficial effect.

We had intended to pasture number nine field (twenty acres), which was an old meadow, mostly timothy, but after the frost, number eleven (twenty-five acres) was pastured instead. We had nearly two tons per acre of good timothy hay from number nine, while the rest of our meadow, which was clover, yielded only about half a ton per acre.

Of grains, we have been growing only those varieties which have proved to be the best in the experimental department. In the beginning of March a price list is issued, which is sent to any farmer who applies for seed grain.

FALL WHEAT.

Our fall wheat was sown on field number twenty-one, on Lucerne clover sod from which one crop was cut. The second crop was allowed to grow up and was plowed under, and the land was thoroughly tilled before sowing. The wheat grew nicely till the May frost, which injured it very considerably, so that with the drouth following (which was especially disastrous to this field, owing to its high position and gravelly nature) the crop yielded only about ten bushels per acre. Three varieties were grown, viz., Dawson's Golden Chaff, Early Genesee Giant, and American Bronze. The two first named varieties yielded the best returns; so, profiting from last year's experience, we have sowed only these two varieties this year.

Spring Wheat.

Field number fourteen, which had been in roots the previous season, was sown on April 18th to 20th with three varieties of spring wheat, viz., Herison Bearded, Pringle's Champion, and Haynes' Blue Stem. The two former varieties were harvested on August 3rd to 5th and were a good crop; but, owing to the fact that we have not finished threshing yet, the yield cannot be accurately given.

The Blue Stem is a late variety, not being ready to cut until August 13th; and by this time fully one-half of it was broken down from the work of the Hessian fly in the lower joint, so that we have discarded it from our list for next year. We intend to sow only the Herison Bearded and Pringle's Champion.

Oats.

Two varieties of oats were grown, viz., the Siberian and the Poland White. The former is a superior oat both for quality and yield. They were sown on April 17th and 18th, were harvested on August 8th to 12th, and will yield fully seventy-five bushels per acre. The Poland White is an earlier oat, with shorter straw, and is not quite so productive. This variety was sown on 20th to 22nd of April, and harvested July 30th to August 1st.

Barley.

The Mandscheuri is so much more productive than any other variety, that we sowed no other this season. It was sown April 23rd, and harvested July 24th to 26th; and although it is not yet threshed, we estimate the yield this year at about forty-five bushels per acre

Peas.

In peas, the Prussian Blue has been the leading variety grown on the farm for several years. It is a vigorous grower and an abundant yielder. This year we have had an enormous crop which will yield not less than thirty-five bushels per acre. It was sown on April 24th and 25th and harvested on August 13th.

Corn.

Thirty-five acres were sown on 22nd to 26th of May, with four varieties of corn for ensilage, viz., Wisconsin Early White Dent, Mammoth Cuban, Hi[illegible] Mixed, and Leaming. The two first named varieties were most satisfactory, giving a fair good yield of well eared and well matured corn, nearly one-third of the total weight of ensilage from these varieties being ears. Cattle fed on such ensilage require very little grain. On the 15th of September we had several degrees of frost, which injured the corn somewhat, especially in the lower portions of the field. On the 16th we commenced cutting and finished on October 22nd, filling both silos. We put 250 tons into the dairy silo and 200 tons into the farm silo.

We sow our corn with the ordinary grain drill, stopping all the tubes but two, and thus leaving the rows forty-two inches apart. We sow about twelve pounds of seed per acre, as we find that thin seeding gives better ensilage. When the crop is comparatively thin we get a larger percentage of ears and the leaves on the lower portion of stalk remain green until cut.

Millet.

Seeing that hay would be a short crop owing to the May frost and the subsequent dry weather, we sowed millet on four acres of new land intended for rape, and also four acres in the orchard. It was sown on July 4th and 5th, and cut on September 23rd to 25th, and it yielded about two tons per acre of excellent hay.

Rape.

Five acres of rape were sown on the 21st of June, in drills twenty-five inches apart. We kept it thoroughly cultivated during the summer, and we had an abundant crop. About the 1st of September we commenced feeding; and up to November 1st it was fed to cattle, sheep, and pigs; after that date, only to the sheep. Instead of pasturing it, we cut and hauled it to the pasture field. We find that in that way there is less waste, and we know exactly how much we are feeding. About the 15th of November what remained of it was cut and piled up in large windrows from which it was fed right along until the middle of December.

Field Roots.

Field number one, containing twenty acres of clover sod, was plowed early in the fall of 1894. The land was then thoroughly cultivated, and about twenty loads per acre of barn-yard manure were spread on the surface late in the fall, and allowed to remain until spring, when it was plowed under, quite shallow, harrowed, cultivated with the spring-toothed cultivator, and again harrowed before drilling. Six acres of Yellow Intermediate and Mammoth Long Red mangels and two acres of Red Top Sugar beets were sown on April 26th and 27th in drills thirty inches apart, using a double mould-board plow and marker, and taking pains to have the drills as straight and even in width as possible, in order to facilitate the after cultivation. The seed germinated nicely, but was cut off with the frost on the 13th of May, so we were obliged to split the drills and re-sow them. The roots were harvested October 16th and 17th and yielded an average of 600 bushels per acre.

Turnips.

Five acres of the same field were sown on June 20th and 21st with the following varieties of Swede turnips, viz., Rennie's Prize, Bronze Top and Carter's Elephant. The yield of all three was about the same, averaging 600 bushels per acre, but the first two were of a better quality. The turnips were harvested on October 31st to November 2nd.

Potatoes.

Seven acres of potatoes were grown in the same field of the following varieties, viz., Burpee's Extra Early, Rose of Erin, Crown Jewel, Rural New Yorker, Empire State, and Pearl of Savoy. They were planted May 18th to the 22nd in drills thirty inches apart, with the sets one foot apart in the drill, the seed having been cut to two or three eyes per set. We planted them about five inches deep and covered with a double mould-board plow. In about ten days the drills were harrowed down and cultivated with Breed's weeder, which, together with the sulky cultivator, was kept constantly going among the corn, roots, potatoes, and rape. Neither the potatoes nor any of the hoed crops were hilled. They were all cultivated on the flat.

When harvesting we hauled the turnips and mangels directly to the cellar as they were pulled and topped. The potatoes were pitted in the field, covered lightly, and left there for ten days, when they were removed to the cellar, except those intended for seed, which were pitted in the orchard.

Twelve acres of fall wheat were sown on August 26th in field number five, from which a crop of peas had been taken. The land was cultivated with the spring-toothed cultivator as soon as the peas were off, then cultivated with the broadshare cultivator; and, as we only had a limited quantity of manure, it was applied to the higher portions of the field and plowed under lightly. It was then harrowed and sown with Dawson's Golden Chaff and early Genesee Giant, six acres of each. Grass seed was sown at the same time—three pounds red clover, three pounds Alsike, and four pounds timothy per acre. An additional five pounds per acre of red clover will be sown in the spring.

Cultivation of the Soil.

In the preparation of a seed bed for spring grain, the following system is carried out with very little variation: The land, which has been put in a very thorough state of cultivation the previous fall, is first harrowed, for two reasons; first, to make the wet spots dry out better, and, in the second place, to break and pulverize the dry crust which forms all over the drier portions. We follow the harrows with the spring-toothed cultivator, stirring the ground to a depth of three or four inches. After the cultivator comes another team, with the harrows; then the drill, after which we finish off with another stroke of the harrows. This work was all done with six teams, including the travelling dairy team and the two cart horses. We started on the 17th and finished on the 25th of April, having sown something over one hundred acres. The stones were gathered and the land rolled afterwards.

Fall Cultivation. Soon after haying, three teams were started plowing sod. About 110 acres were plowed. Half of this was rather dirty, with Canada thistle and other weeds; so, in order to get it thoroughly cleaned the harrows and cultivator were kept going until some of it was cultivated ten or twelve times, mostly with the broadshare cultivator, so that every plant was kept cut off, and every foul seed germinated and was destroyed. This land will be sown in the spring, without plowing. From the cultivation it has received, together with the action of the atmosphere in fall, and the snow and frost in winter, there should be a large amount of plant food available for the crop of next year. That portion of the pea stubble, not sown with fall wheat, was first cultivated with a spring-toothed cultivator. Then, instead of plowing we loosened the soil to a depth of six inches with a two-horse grubber. During the fall the land was cultivated twice, with a broadshare cultivator, to kill any weeds that might show themselves.

The corn and root ground was plowed lightly in the fall, in order to bury the roots of the former, and tops of the latter. Were it not for these obstructions, it would be advisable to use the two-horse grubber, instead of plowing under the soil that is in the best possible condition for the following crop.

The stones were then gathered off all the cultivated land, which meant weeks of labor for men and teams, student labor being employed largely for this work. The land is now in good condition for spring seeding.

All the fall wheat, spring wheat, oat, and barley crop, over ninety acres, was seeded with the following mixtures: seven pounds red clover, three pounds of alsike, and four pounds of timothy; and, notwithstanding the severe frost in May, and the subsequent drouth, we have a splendid catch on both high and low land.

To insure a catch the essential points were strictly adhered to, viz.: thorough preparation of the seed-bed, sowing the seed in front of the drill tubes, which insure the distribution of the seed between the rows of grain—a very important point. The grain should not be sown too thick. We sow less than one and one-half bushel per acre, of wheat, oats, and barley, and then, as a finishing touch, we go over the fields after harvest before the stubble is horse-raked, and sow a little seed on such spots as appear to need it. The late summer and early fall rains cause this seed to germinate, and it grows very rapidly. If this system is strictly followed out, it will be almost sure to give a good crop of clover.

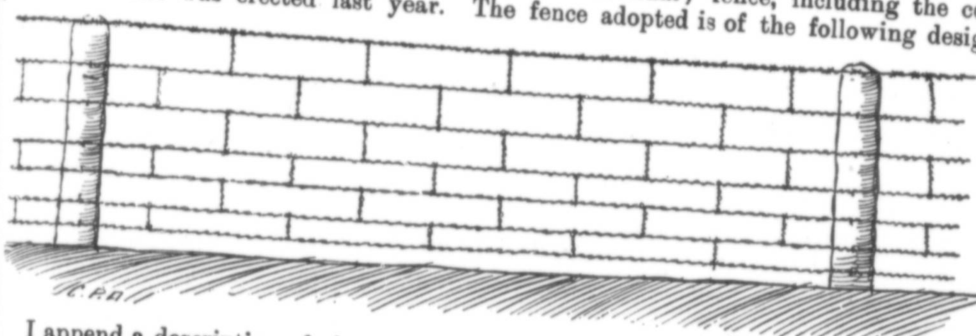
Cleaning the Land. In order to rid the farm of Canada thistles and other noxious weeds, nearly all the cross-fences (which were badly out of repair) have been removed and the land plowed and cultivated.

Besides removing what had been a breeding place for weeds, and at the same time facilitating cultivation, by giving us larger fields and long rounds, it is a decided improvement in landscape appearance. The farm, instead of being cut up into twenty fields as formerly, is now divided into five sections; three of these contain about ninety acres, each under cultivation, and the other two, fifty-five and forty acres respectively. These la two will be cultivated as one in the four year's rotation which is being pursued, viz.: first and second years, meadows and pasture ; third year, peas and hoed crops, including corn, field roots and potatoes ; fourth year, grains—wheat, oats, and barley, seeded down again with grass seed, principally clover.

Four of these sections contain a few acres of woodland each, which will be valuable as a resort for the cattle during the warm weather. It will be arranged to fence off what will be required for pasture, convenient to the woods, using a portable fence which is easily removed.

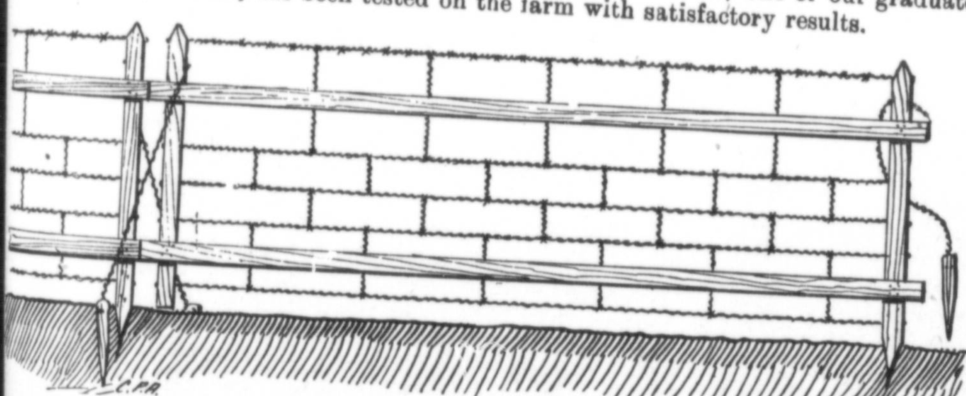
Fencing.

We have now constructed about four miles of boundary fence, including the completion of what was erected last year. The fence adopted is of the following design :



I append a description of the fence which accords very closely with my ideal of a arm fence, being cheap, durable, safe, and effective. It will turn sheep or hogs, as well as cattle. Round six-inch posts are set in the ground twenty feet apart. Owing to the olling nature of this farm, twenty feet is about the proper distance ; on a level, flat farm, they might be set much farther apart, which would materially reduce the cost of the fence. Seven strands of twisted, number twelve wire and stretched on the posts, six plain and one arbed wire being used, spaced as follows, starting at the bottom : 6,6,6,8,8,9, inches. Cross sections, or stay wires cut to the proper length, are then put on two and one-half eet apart, these are put on very securely with a hook made for the purpose. One man ays about twenty rods per day. These stay wires stiffen the fence and prevent the orizontal wires from spreading apart, so as that it will turn sheep or hogs, as well as attle, or, if desired, it can be made to turn even poultry. The cost of the fence is as ollows : posts nine cents per rod ; horizontal wire twenty-two cents ; cross sections seven ents ; and labor, including digging holes, setting posts, putting on cross sections, etc., ighteen cents. Total cost, fifty-six cents per rod.

A very convenient and durable portable fence, invented by one of our graduates, . H. Christian, B.S.A., has been tested on the farm with satisfactory results.



It is built in sections, twelve feet long, and nearly four feet high (more or less as ired). Each section contains about nineteen feet of lumber and four pounds of wire.

Each section consists of two head pieces one and one-half by three inches and four feet three inches long; and four horizontal pieces, one by three inches, and twelve feet long. The common cable number twelve twisted fence wire is used throughout, including the cross sections and braces.

Construction. The side pieces are nailed to the head pieces and project beyond them four inches, to form the connection, the two bottom pieces are eight inches from the bottom end of the heads; the upper pieces are twelve inches from the top of the heads and on opposite sides. This forms the frame-work of each section. The wires are then stretched, being secured by passing the wire through a three-eighth inch hole in the heads and driving a wooden peg in beside the wire. This holds them secure, while the ends may be turned down and fastened with a staple. The first wire is four inches above the bottom end of the heads, the second is twelve inches above the first, the third six inches above the second, the fourth seven inches above the third, and the fifth or top wire is eight inches above the upper wooden bar of the frame. The top wire is barbed. The cross sections are then put on, the ends being twisted around the wires with a hook for the purpose, the same as in the stationary fence mentioned above. The side pieces of the frame are then nailed together in the centre to hold them tight and secure.

Setting and securing the hurdles. The hurdles (or sections) are held in place by wire braces and pegs driven into the ground, as illustrated in the cut. These wire braces are four feet eight inches long, and fastened to the upper end of each head by a staple on the inside edge of the head. The pegs are made of hardwood sixteen inches long and one and one-quarter by two inches thick, the wire being secured to them by boring a quarter-inch hole through, near the top of the peg, passing the end of the wire through and twisting it round a short piece of wire, thus forming a cross which is not liable to split the peg. On one end of each hurdle is an extension, sharpened at one end and nailed to the side of the bottom end of the head. This enters the ground seven or eight inches and holds the bottom of the fence secure, while the top is held by the braces, which cross each other on the opposite side of the heads, making the connection secure and anchoring the fence firmly. It will be noticed that the spaces in the illustration are very narrow hence the hurdles will turn sheep or pigs. If it is only wanted to turn cattle, the wires might be spaced to dispense with one strand altogether. The hurdles will cost about sixty-five cents each, viz.: lumber thirty-five cents, wire fifteen cents, and labor fifteen cents.

Draining.

Sixty rods of six-inch and forty rods of four-inch drains were laid in field number twenty-one, which is partly swamp land. It will be used for pasture next year, and after that it should be in a condition to grow grain and other crops.

Feeding of Live Stock.

This important subject has not received the consideration it should have had from many of our farmers. To feed stock successfully, requires intelligence and good judgment in adapting the food to the kind of animals and to the different stages of development.

Young cattle should be fed bulky and easily digested food—food suited to the production of bone and muscle, such as clover, either cured or green, roots, bran, crushed oats, etc. Young stock fed on such food regularly and moderately, develop into strong, healthy animals.

A diet for young animals, containing an excess of rich, concentrated food tends too much to the production of fat, renders an animal liable to disease, and is likely to check, or stunt it in its growth. Animals should be fed according to the object desired. For breeding purposes, it is important that both male and female be fed on food that will produce bone, muscle, and flesh, instead of fat.

On the sixth of Nov., 1894, sixteen steers, rising three years old, were purchase in the Guelph market at three and one-half cents per pound, the average weight per animal being eleven hundred and fifty-seven pounds. They were fed largely on rape until Christmas, receiving in addition night and morning, a mixture of cut hay, chaff, pulped roots, and ensilage, about twenty-five pounds per day, the cost of food, including rape, being about seven cents a head per day. During January, February, and March, they received no hay. The food given them was a mixture of chaff, ensilage, and pulped roots, fifty pounds per day, fed in three meals at 5 a.m., 12 noon, and 6 p.m. The cost for each animal was about eight cents per day, including four pounds of grain and bran. With these rations from the sixth November till the end of March, one hundred and forty-four days, they gained an average of two hundred and sixty-five pounds per head, or 1.84 pounds per day. Allowing forty pounds each for shrinkage, the net gain was 1.56 pounds each per day for the one hundred and forty-four days. During April, the same rations was continued, with the exception that cut clover hay was substituted for the chaff, and the average gain was fifty and one-half pounds per day, or say one and one-third per day.

During May, they were fed on four pounds of peameal and two pounds bran, with clover hay, ensilage, and pulped roots, fifty pounds to each animal, at a cost of ten cents per head per day, and they gained twenty-six pounds per animal, or say five-sixth pounds per day.

From the first of June, the food was forty-five pounds per clover hay and ensilage, mixed in the proportion of one to four by weight, together with seven pounds of ground grain (barley, rye, and wheat) and bran. The cost of this ration was twelve cents, and the average gain was one pound per head per day.

The steers were sold to Messrs. J. A. Leaman & Co., of Halifax, Nova Scotia, for five and one-half cents per pound live weight and shipped on July 26th.

Results.

Cost of sixteen steers on Nov. 6,		
Total weight, 18,512 pounds at $3\frac{1}{2}$ cents......	$	647 92
Cost of food from		
Nov. 6 to Dec. 31, 55 days at 7c. per head...		61 60
Jan. 1 " Mar. 31, 89 " at 8c. " .		113 92
Apr. 1 " May 31, 61 " at 10c. " .		97 60
June 1 " July 25, 55 " at 12c. " .		105 60
Total cost....................	$	1,026 64

Results.

Gross weight July 25th,		
24,890 pounds at $5\frac{1}{2}$c......................	$	1368 95
Total cost		1026 64
Net profit....................	$	342 31

In these estimates, clover hay is valued at $7.00 per ton, chaff nothing, ensilage $2.00 per ton, roots $2.50, mixed grain 1 cent per pound, and bran $12.00 per ton.

It will be observed that the greatest gain for the food consumed was during the first five months, while the steers were fed on the coarse, bulky, and easily digested food. The last three months they were fed at a loss, while they were being fed on the stronger and more concentrated food. The decreased gain was, of course, owing in part to the warm weather and the advanced stage of feeding.

Had the steers been sold in May, as is the usual custom, there would have been a much larger profit, as will be seen by the above figures. They were kept until July, that the large number of farmers visiting the College in June and July might see the result of this method of feeding.

The milk cows were fed the same as the steers during the winter, except that they had an addition of twenty pounds of mangels per day when giving milk. In summer, we give them a feed of ensilage twice a day, when they are tied in for milking. During the season of the hornfly, the cattle are all rubbed over once a week with seal oil (fish oil) and carbolic acid, three tablespoonfuls of the latter to one gallon of the former, thoroughly mixed. It may be applied with a sponge or cloth, or even with a syringe, and is a sure preventative of the hornfly. One gallon will be enough for thirty or forty cattle.

Sheep. During the winter season, the breeding sheep (60 in all, ewes and rams) are fed morning and evening a mixture of ensilage, chaff, and pulped roots, four hundred and fifty pounds per day, with thirty pounds of bran. At noon they are fed peastraw. The cost of this ration is as follows: Ensilage mixture forty-five cents, bran eighteen cents, peastraw twenty cents. Total eighty-three cents, or less than one and one half cents per day for each animal; and the sheep are all in good healthy condition.

Swine. The principles of feeding pigs are similar to those applied to other live stock, viz., animals kept for breeding purposes should be fed on food that will form bone, muscle, and flesh, instead of fat. The brood sows at the farm are fed twice a day on boiled roots, mixed with bran and middlings. The young pigs are fed three times a day.

As we have no milk for our pigs, we mix flaxseed in their food as a substitute, for three or four weeks after weaning, about one-half pound per day for each litter of eight or ten pigs.

The cost of the food at the age of four or five months is two and one half cents per day, and the increase in weight is over one pound per day for each animal. After five months, until sold, we substitute peameal for middlings.

The following will show the results from four lots of cross-bred pigs that were sold to Messrs. J. A. Leaman & Co., and shipped with the steers on July 26th.

Lot 1.

Seven animals from Tamsworth sire and Berkshire dam, average weight on

Feb.	13th, at	4	months,	117	pounds.
Mar.	"	5	"	154	"
Apr.	"	6	"	204	"
May	"	7	"	255	"
June	"	8	"	301	"

Lot 2.

Five animals from Tamworth sire and Chester White dam, average weight on

Feb.	25th, at	4	months,	96	pounds.
Mar.	"	5	"	131	"
Apr.	"	6	"	167	"
May	"	7	"	226	"
June	"	8	"	267	"

Lot 3.

Eight animals from Yorkshire sire and Poland China dam, average weight on

Feb.	28th, at	4	months,	102	pounds.
Mar.	"	5	"	137	"
Apr.	"	6	"	186	"
May	"	7	"	226	"
June	"	8	"	256	"

Lot 4.

Four animals from Berkshire sire and Yorkshire dam, average weight on

Apr.	27th, at	4	months,	99	pounds.
May	"	5	"	138	"
June	"	6	"	177	"

There was little difference in the quantity of food consumed by the different crosses, and the food was limited to what they ate within half an hour after feeding.

The Chester White dam suffered from fever for about a week after farrowing, so that her pigs were badly stunted at the start, from which they did not recover until between four and five months old.

The pigs were inspected by two of the most prominent pork packers in this Province, and the Tamworth crosses were pronounced the most suitable for their purpose.

In order to have roots to boil for the pigs during the entire year, we grow about two acres of sugar beets. They keep till August, when the new crop of mangels is ready to feed. For a time, we boil both tops and roots.

By this system of feeding the best quality of pork can be produced for two cents per pound live weight.

Horses. During the winter season, when the farm horses are comparatively idle, they are fed as follows: Morning and evening, they are fed the same mixture as the cattle, viz: ensilage, chaff, and pulped roots, say ensilage twenty pounds, chaff five pounds, and roots ten pounds, a total of thirty-five pounds per day for each horse. At noon, they are fed about three pounds of cut clover hay and straw. Their grain ration consists of two and one-half pounds per day of bran and chopped grain mixed. The cost of this ration is estimated at seven cents der day.

When the horses commence work in spring, and during the summer, they receive nine pounds of chopped grain (principally oats) mixed with six pounds of bran per day, and all the cut hay they will eat within one hour after being fed. The total cost is under twenty cents per head per day.

Live Stock for Educational Purposes

The following live stock is kept for educational purposes:

Eight	breeds of cattle,	one male and	two females	of each breed.	
Nine	"	sheep, one "	six	"	"
Five	"	swine, one "	two	"	"

Practical Instruction.

The first and second year students are required to work on the farm and in other departments each alternative afternoon, for which they are paid in proportion to the work performed, the amount being credited on their board accounts. Lists are prepared, with the names alphabetically arranged, and each student is expected to take his turn at all kinds of work on the farm, among the live stock, at dairying, poultry, horticulture, carpentering, and in the experimental department.

During November, an opportunity is given those students who have had more or less experience in plowing to test their skill in plowing sod. Thirty-one students entered into the competition last fall, each plowing in turn according to the number drawn and each using the same plow and horses, plowing five rounds, forty rods long. The time allowed was one hour and the standard size of furrows was set at six inches deep by nine wide. Sixteen awards were made by two competent judges, the work performed being very creditable. Mr. Colin Carmichael, head teamster, attended to numbering the lots and giving instruction.

During the above competition Mr. Wm. Young gave instruction in plowing in a stubble field to those students who required it.

Before the examinations last June, the second year students plowed a ridge each for the purpose of testing their skill; and marks were given according to the work performed. Messrs. F. Benson and W. Squirrell judged the work by the following standard: For beginning, fifteen; even holding, fifteen; shaped ridge, fifteen; straightness, fifteen;

and finish, fifteen; making a total of seventy-five marks. The mininum number to pass being set at thirty-five.

It is gratifying to know that all passed, Mr. J. D. McPhail, of Dundas County, making the maximum number of 75 marks.

Annual Sale.

The annual sale of surplus live stock was held at the farm on Oct. 30th.

On account of conducting some experiments in the early part of the season, in crossing and feeding pigs, and also in feeding early lambs for Easter market, the animals offered were fewer in number and younger than they otherwise would have been. The amount realized for nine young cattle was $211.00, sheep $133.50, pigs $354.75, making a total of $699 25.

I submit herewith a statement of the farm accounts for 1895:

Receipts.	$ c.
Sales of cattle	2,150 05
" pigs	1,067 31
" sheep	438 80
" wheat	314 95
" oats	388 70
" barley	288 24
" milk	151 96
" wool	68 61
" potatoes	9 50
" old fence	55 28
" hides and skins	4 90
Rent of pasture	12 00
Service of animals	134 00
Wood supplied dairy, 20 cords @ $1.50.	30 00
Hay " 4 tons @ $10.00	40 00
Mangels " 1,000 bu. @ 7 cts.	70 00
Ensilage " 250 tons @ $1.30.	325 00
Pasture " 35 acres @ $4.00.	140 00
Potatoes supplied college, 1,000 bu @ 20 cts	200 00
Milk supplied college, 5,241¼ gals. @ 8 cts	419 30
Feed and bedding 2 horses for college.	100 00
" 2 " garden	80 00
" 4 " experimental	160 00
Six months feed for 2 horses for travelling dairy	25 00
Hay for engineer's horse	25 00
Filling ice houses, college and dairy	50 00
Total revenue	6,748 60

Disbursements	$ c.	$ c.
Running expenses.	$ c.	
Wages	2,771 83	
Live stock	1,154 93	
Feed purchased (mostly bran and middlings)	524 06	
Seeds	282 08	
Binding twine	15 47	
Repairs, alterations and furnishings	657 52	
Advertising, printing, postage, etc	186 89	
Fuel, light, etc.	57 91	
Contingencies	64 20	
		5,714 89
Other Disbursements.		
Superintendent's salary		1,200 00
Permanent improvements (draining, fencing, etc		456 62
Tools and implements		307 79
Total expenditure		7,679 30

It will be seen from the above figures that, had the farm been run as a private enterprise, it would have yielded a handsome profit, which would have been larger but for the fact that it is necessary to keep so many different breeds of live stock for educational purposes, from which we receive no revenue.

Submitting the above in the hope that it will meet with your approval, I have the honor to be

Your obedient servant,

WM. RENNIE,

Farm Superintendent.

PART XII.

REPORT OF THE

MANAGER OF THE POULTRY DEPARTMENT

To the President of the Ontario Agricultural Society:

SIR,—One year having passed since my appointment to the position of manager of the poultry department, you will expect of me only a short report of the work done.

On entering upon my duties over a year ago, I fully realized the responsibilities resting upon me, in a new departure of so great an importance; and I may say that without an assistant, the work at times has been rather laborious; but it has been lightened by the encouragement I have received from you and members of the staff. I feel assured with a continuance of your confidence and of such co-operation this department will be a benefit to the College and to the country at large.

Not having all my stock purchased until quite late in the season, I did not get the breeding pens made up so early as I desired; yet we have had a fairly successful year.

The fowls being confined in their winter quarters, without any outdoor exercise, did not produce so large a proportion of fertile eggs as we could have wished. Through the months of March, April and May fifty per cent. was the average of fertile eggs, including all breeds; and having received letters frequently from Canada and the United States, asking what the trouble was, I concluded, as it was so general, that the severity and length of the winter had something to do with it. In my case, I did not expect to get a large percentage of fertile eggs, as the stock purchased was nearly all last year's birds. This may not have affected the results; but it has been my experience and that of others, that you do not get so high a percentage of fertile eggs, nor so strong and vigorous chicks from pullets as from older stock. Yet, in our position, we thought it advisable to purchase young birds. Under the above circumstances, we did not have so many early chicks as we should have had if circumstances had been more favorable.

ARTIFICIAL INCUBATION.

Under your instruction, I purchased a hot-air incubator, of one hundred egg capacity, and one of two hundred egg capacity, heated by hot water. I used them according to instructions; the results were not satisfactory. I do not, however, intend to say anything for or against those machines at the present time, for two reasons: first, because I was living two miles away from my department; and, having to walk that distance, I could not watch them so closely, late and early, as seems necessary, in order to obtain the best results; secondly, because hatching under hens did not prove much more satisfactory this year, owing, I think, to the weakness and infertility of the eggs. Now, however, I am in a position to look carefully after the working of these incubators; and, other conditions being more favorable, I hope, at the end of next year, to give you and the public an honest and impartial report of every hatch during the year, let the results be what they may. I may add that I used a brooder throughout last spring, manufactured by Mr. Meyers, at Kossuth, Ont, and found it to give entire satisfaction.

Buildings and Furnishings.

I found the buildings erected by Mr. Crawford, the College carpenter, under the direction of the president, all that is required for practical purposes. In addition to those, we need a small brooder house, which can be built at small cost; and two small houses, to protect our surplus chickens in the fall, till they are disposed of.

We found the furnishings, such as boiler for cooking vegetables and heating water, mill for cutting bone, drinking fountains, perches, feeding troughs, nests, etc., all that could be desired, and we do not know wherein they could be improved.

I must also express my satisfaction and gratification at the character of the dwelling house erected for the use of the manager of the poultry department. It is a first-class house; and, in consequence of its nearness to the poultry houses, the manager of the department will be in a position to look closely after his charge at all times, as is necessary in the case of any one who has charge of poultry.

It was not intended, nor could it be expected, that any experimental work would be done this year. A great deal of work had to be done to complete buildings and yards, before the breeding pens were ready for use; so that there was not the time necessary to put things into shape for any well-considered line of research, until the breeding season was past. In future, we hope to give due attention to work under this head.

Losses from Disease.

The year has not passed without our having some losses to report, as I suppose was to be expected, where a number of fowls of different breeds were kept in close quarters. When fowls have their liberty, they are not nearly so subject to disease as when they are confined. Fowls never perspire; and many troubles that are easily thrown off by perspiration, with them have to be exhaled by respiration; so we find that nearly all the fatal diseases among fowl are in the throat and lungs.

I have not had a case of roup during the year; but I had quite a number of late chicks, too small to be disposed of at our annual sale, which had to be crowded into close quarters at the time when they required the best of care, while shedding their chicken feathers; and they did not thrive so well as they should have done. Late hatched chicks are not profitable; they are a continual source of annoyance, and are very apt to bring disease to the rest of the flock.

During the year I have received inquiries from several farmers and poultry fanciers in reference to diseases of various kinds among their fowl; and in some cases, from the symptoms given, I have found it very difficult to determine the nature of the disease. Hence, for the information of farmers especially, I give below the symptoms of two or three of the diseases most prevalent among fowls, and the treatment in each case.

Distemper.

Cases of distemper, which by the way is often taken for roup, can be diagnosed by the following symptoms: A disposition to remain on the roost in the day time; unusual redness of face and comb; a fulness of the face, as if swollen under the eye; and white froth discernible in the corner of the eyes. In aggravated cases, the face is very much swollen and the eyes become watery from the closing of the tear tubes. When healthy and diseased fowls are allowed to drink out of the same vessel, the disease is communicated from one to another, until the whole flock is affected. It is better to isolate the affected ones, or use the hatchet (unless the birds are valuable) than to run chances of spreading the disease, which may, if neglected, turn to roup. There is no offensive smell from the breath, as in case of roup.

Treatment. If noticed in time, the disease may be checked without much trouble. Wash the head in warm water, to which add a few drops of carbolic acid, not more than one part acid to twenty parts water; clean the nasal passage and swab the throat with the same solution; and give each bird half a teaspoonful of electric oil. One treatment may be sufficient, in nearly all cases. Roup may be treated in the same way, unless canker has formed in the throat and mouth; in which case it is advisable to gargle the throat with kerosene oil. Treat two or three times, and the canker will generally disappear. At the same time give a teaspoonful of castor oil and provide nourishing food, with a little sulphur added thereto.

Diarrhœa.

In March last, several of the fowls in house No. 1 (where we keep the larger and least active breeds) were taken with this disease. They were troubled with leg weakness; their sight was affected, as is often the case with this disease; and the excrement was of a greenish color. After losing several birds, I had some of them dissected, and I found that the chief trouble was in the liver, which was disordered and considerably enlarged. Mr. F. C. Harrison, our bacteriologist, examined the excrement and the liver, and found the bacillus of chicken cholera in both. This was, no doubt, the immediate cause of the trouble; but I am of the opinion that it was over-feeding and close confinement which furnished the conditions that enabled the germ to do its work. See the report of the Bacteriologist in Part VIII. of this volume.

Treatment. After using several prescriptions, without effect, I concluded to try epsom salts, giving as a dose half a teaspoonful dissolved in water; and I am pleased to say that it had the desired effect. In some cases, I had to give two or three doses; but, in every instance, the fowls improved rapidly, and in a short time the flock was restored to good health.

If we expect to be successful in the raising of poultry, we must watch our flock while well so as to prevent sickness. We must keep a watchful eye upon them while on the roost, and observe their droppings closely from day to day. If the excrement shows a costive tendency, feed less grain and more vegetables, such as cabbage or boiled potatoes, mashed with bran and middlings, or turnips or beets, thrown into the pen. On the other hand, if the droppings show a relaxed tendency, feed less vegetables; mix your soft food as dry as possible, using milk, instead of water, for mixing; and give them milk to drink, sweet or sour.

If we provide our fowls with dust baths, to which some sulphur is added to dust themselves in from time to time during the winter; if we avoid as far as possible the use of permanent or box-made nests that cannot be easily cleaned; if we use kerosene oil freely on roosts and in nest boxes; if we dust our fowls occasionally with Persian insect powder; if we keep everything about our fowls scrupulously clean, and feed them judiciously, we shall take a few important steps towards success in the management of poultry.

Lectures.

The lectures given to the students in the class-room, have been illustrated, as far as practicable by specimens taken from the breeding pens, and the instruction at work in the houses has been made as practical as possible.

The following is a brief outline of the work covered in the lectures:

Technical terms pertaining to the different parts of poultry; how to select breeding stock, proper mating, etc., characteristics of the Asiatic, American, Mediterranean, and French breeds of fowls; where and how originated; the good points and the defects of each; their standard weights; the disqualifications, and the different points to be obtained in the various classes.

How to apply the standard by the scoring system; the feeding and management of poultry; diseases of fowls; causes and treatment of the same.

Visitors.

Thousands of people have visited this department during the year, some of them the largest and most successful breeders of thoroughbred poultry in America. They were loud in their praises of the quality of the stock and the completeness of the buildings, yards, surroundings, etc.

Under your direction the drives, yards and lawns have been put into shape, and we have endeavored to keep them as clean and tidy as possible, with the help that was at our command.

Disposal of Eggs.

A great many orders were received for eggs, especially of the following breeds: Barred and White Plymouth Rocks, Silver and White Wyandottes, Brown and White Leghorns, Minorcas and Andalusians.

Having only a few hens of each breed, and requiring a great many for the use of the department, we could not begin to fill the orders of the above mentioned breeds. I filled the orders as far as I could in the order of application; and those who waited so patiently, if they so desire, will have the preference next season. The amount, which will be one dollar and fifty cents per setting, should accompany the order and be sent direct to the Bursar. If the order cannot be filled in a reasonable time, the money will be refunded at once. Eggs from each pen will be tested from time to time, and no eggs will be sent out, unless a large percentage of them prove to be fertile and in every way satisfactory for setting.

I find it necessary to make a few changes in our breeding stock. This will be the case every year, as, in some instances, the mating may not give good results. We will therefore have to purchase a few birds to complete pens, and to fill the places of a few varieties which we saw fit to discard that we might try others which would be more suitable for practical purposes.

Respectfully yours,

L. G. JARVIS,
Manager Poultry Department.

Ontario Agricultural College,
Guelph, Dec. 31st, 1895.

PART XIII.

REPORT OF APICULTURIST.

To the President of the Ontario Agricultural College:

SIR,—In submitting to you my first annual report, I would respectfully beg to state that, owing to the extraordinary frosts in May, the unusual variation in temperature, and a large deficiency of rain and snowfall in 1895, few in Ontario have obtained any surplus honey from clover, thistle or basswood; and there is only a small surplus from buckwheat. There has been scarcely any swarming, and, unless apiarists have fed heavily, many colonies will die of starvation. Such an unusual season has made it difficult to carry on experimental work. Such work as has had for its object a comparison of some methods of producing the best comb honey, never reached completion; and therefore such an experiment gave no results of any value. It is our intention to repeat this work during the season of 1896. Again, the poor season left the bees which are kept for purposes of instruction at the College, pratically at a standstill during the months that they are required for this purpose; and, for this reason, the students did not secure the benefits which would have been derived, had the strength and condition of the colony changed from week to week, as might generally be expected at that time.

THE EXPERIMENTAL APIARY.

Anyone taking in hand experimental work in the apiary, will find but little to guide him. The very few who have labored along these lines in the past, after exercising more than average forethought and care, have found, as they progressed in this work, that at times it has been practically valueless, owing to the lack of consideration of some essential point, the importance of which was not thought of until the work was taken in hand. On account of the newness of the work, we are still laboring under this difficulty. In the experiment in wintering, I have to report that, although the general result from the experiment will doubtless be unaffected, yet, in the light of ideas which have suggested themselves to me during the past two months, I think it would be well to conduct a test along the following lines: To take two sets of colonies; one with bees fully matured and having had several flights before winter, and the other with young bees not sufficiently matured to go into winter quarters, the bees otherwise as far as possible under similar conditions. In future, when conducting experiments, to be careful to select colonies which are alike in this respect, and not, as heretofore, select them without regard to this condition. So far as I know, this has never been taken into account by any apicultural experiment station.

WINTERING PROBLEM.

Any light that can be thrown upon the wintering problem will be very acceptable to bee-keepers generally. To define my position clearly, I may say that for the last six years I have wintered my bees, from sixty-two to ninety-three colonies, with an average loss of between three and four per cent. Cellar wintering has been the system adopted. During the fall of 1894 my opinion was asked concerning a book, "The Wintering Problem in Bee-keeping," professing to be an exposition of the conditions essential to success in the winter and spring management of the apiary; and I may here refer very briefly to the contents of that work. The theory submitted was in brief as follows: That bees that wintered in trees and in gums, wintered better than they generally do in the movable frame hives; that bees situated in trees and log gums sometimes perished from excessive swarming, by being short of stores, or by loss of their queen; that bees so domiciled in gums were sometimes afflicted with what is now called bee-diarrhœa, but that this did not often happen, as the conditions which bring it about were not so liable to occur.

The aim of winter protection for bees should be:

(1) To reduce the heat *conduction* of the hive to the lowest possible point.

(2) To conserve the heat given off by the bees, so that it will remain in the hive until gradually lost by diffusion with the cool air in the lower part.

When absorbent material, such as forest leaves, chaff or planer shavings, is used above the cluster, it is gradually saturated and thus changed into a rapid heat conductor, thus defeating the first object aimed at. The second object is also defeated, because more or less warm air escapes at the top, and all the heat contained in the absorbed moisture is carried outside of the hive chamber. When a tight cover is used, very little warm air escapes at the top; and the moisture, when deposited on the side walls, gives up its heat gradually, until it reaches the bottom board. This released heat again returns to the upper regions of the chamber and thus assists in keeping the atmosphere within the hive at the proper temperature, the water meanwhile escaping at the entrance. These are the conditions that are found in the gum or hollow tree, which, from natural formation, has abundant warmth at the top and is rendered impervious to moisture by the sealing of the bees. Further, in a tree, the lower portion of the compartment is comparatively cool; and, if any moisture is condensed, it is in the lower part of the hive. As hives are generally prepared now, with little or no packing above, the under side of the quilt is cooler than the atmosphere, when it rises more or less saturated. The same is the case when absorbents are used and become conductors, cooling the quilt above. When this condition obtains the warm atmosphere, as it rises saturated with moisture from the cluster of bees beneath, strikes the cool surface above, is chilled, and deposits its moisture, as we see it in every-day life on the cool window pane. This moisture, when it collects in sufficient quantities, drops and falls on the cluster, to the great injury of the health of the bees, causing disease and bee-diarrhœa. By packing them in the way about to be described, the condition found in the log or hollow tree is secured. Such was the reasoning of Mr. Pierce. The entire theory is exceedingly plausible; and, I know from correspondence, that it has had its followers.

In my experiment, ten colonies in eight-frame, single-walled, "Langstroth" hives, were prepared, weighing, without lid, but including bottom boards, body of hive, frames, bees, quilt, and stores, as follows, Oct. 29th, 1894:

Clamp 1. No. 1, 58 lbs.; No. 2, 57; No. 3, 59; No. 4, 56; No. 5, 58; No. 6, 58; No. 7, 55; No. 8, 54; No. 9, 57; No. 10, 61.

The bees were placed in what bee-keepers generally call a clamp, specially constructed for the purpose. It was of pine, and, for convenience, had the bottom in one piece, the sides and ends each of one piece, and the cover in two pieces, all hooked together, so as to be removed, piece by piece, when desired. The roof has one-third pitch, sloping to the back, to prevent the fall of rain, etc., at the entrance. The hives rest on 2x4 inch scantling, turned on the narrow side, thus making the packing space four inches, and one fourth inch added in back when the bottom boards of the hives rest on the four inch scantling, making the back a little higher than the front, to prevent moisture from running in at the entrance.

There was a little over three inches of space for packing between the hives, six inches back and front of the hives, and eight inches on the sides, with room for ten inches of packing above. The space in the bottom of the clamp was filled with planer shavings. The wooden covers were removed from the hives and the sealed quilts were left on. Purposely, the quilts had not been removed since the bees sealed them; and said quilts rested flat on the top bars, having no passage from comb to comb over the frames. Manilla tissue paper was now taken, of a sufficient size to cover the top of the hive, and put on to the depth of one inch, making 672 thicknesses of this paper. Ten thicknesses of newspaper were then put over this, all large enough to allow the edge to extend over the sides and ends to within an inch of the bottom board The flaps of the corners were folded and all held tight to the sides of the hive by a cord. A bridge made of wood, the length and width of the alighting board, and one-half inch strips were placed at the entrance, to give the bees free passage out and in, after the packing was placed about the hive. The hives were now thoroughly packed at the sides and ends, and finally on the top, to a depth of eight inches, as nearly as such packing could be measured. It will be seen that in this arrangement the bees were thoroughly protected by packing, with the exception of the entrance, the width of which was controlled by entrance blocks. It will also be noticed that the bees were packed, to avoid the condensation of moisture in the upper part of the hive, and to prevent the absorption of moisture above, with the object of securing its condensation in the lower part of the hive or as it leaves the entrance.

Clamp 2. A similar clamp with ten colonies was also packed, weights as follows:

No. 11, 62 lbs.; No. 12, 57; No. 13, 59; No. 14, 56; No. 15, 58; No. 16, 58; No. 17, 55; No. 18, 54; No. 19, 57; No. 20, 61.

The bees were prepared in every respect the same as before; but the manilla tissue paper was omitted, and according to my usual custom four thicknesses of newspaper were laid on in its place on top of the quilt. The quilt, before packing, was broken loose by raising, thus preventing any slight sealing. Eight inches of planer shavings were then added, this, with the quilt, making the top packing.

In both experiments, the entrance by which the bees went into winter quarters was five inches wide. The only precaution observed during the winter, was to see that the entrance and passage to the entrance, was kept clear of dead bees and snow. When necessary, dead bees were carefully and noiselessly removed by means of a bent wire.

Observations. Many times, during November and December, it was markedly noticeable that the bees in No. 1 clamp were flying, when those in No. 2 were perfectly quiet, and that their flight indicated a restless condition. There was, however, no outward signs of disease during these months. Towards spring, the bees in No. 1 clamp showed decided signs of bee-diarrhœa. When they flew, there was spotting. Some of the entrances showed spotting; hives 2, 3, and 10, markedly so. The bees in No. 2 clamp did not show signs of bee-diarrhœa to anything like the same extent. In fact, there was a marked contrast between the two clamps. It will be remembered that a portion of the winter was unusually severe, the temperature dropping at Brantford to 22° below zero. An examination was made on April 18th; and, as might have been expected from external appearances, with the exception of No. 1, every hive in clamp 1, showed more or less signs of dysentery. Nos. 2 and 3 perished, leaving their combs badly daubed and also leaving small patches of brood in the combs, an indication of exhausted vitality among the bees and an effort to recuperate by breeding young bees. No. 9. in the same clamp, was weak and queenless; but, as a note went to show that this colony had been queenless in the fall and that a queen had been introduced before going into winter quarters, she might have been temporarily accepted and then destroyed. No. 9, should, therefore, be left out of consideration. In the following list of hives in Clamp 1. XXXX denotes a choice colony, covering, fairly well from seven to eight frames, XXX covering five to six, XX covering three to four, X covering one to two:

No 1, XXXX; No. 2, Dead; No. 3, Dead, No. 4, XXX; No. 5, XXX; No. 6, XX; No. 7, XX; No. 8, XXX; No. 9, Queenless; No. 10, X.

The next examination was made April 26th. At this time there was no marked difference in most of the hives, except that No. 7 and No. 10 had perished, having been robbed either just before or after their death. Another examination was made June 1st.

Number of hive.	Number of combs with bees.	Amount of brood, Langstroth frames.
No. 1	8	7
No. 4	6	5
No. 5	3	2½
No. 6	4	3
No. 8	4	2½

It was not the intention to carry this experiment to a test of the amount of honey gathered, as other conditions would influence the result; but it may be of interest to know that the honey season was exceedingly poor, and on July 23rd No. 1 had gathered (allowing 25 pounds per hive for comb and bees,) 33 pounds of honey, stored in the body of the hive, and 17½ pounds stored in the sections. No. 4 had stored 14 pounds in the body of the hive but had no surplus; in fact, on none of the others were surplus receptacles put, as only strong colonies gathered any surplus in the apiary.

The second clamp wintered much better, but did not reach anything like a desirable standard for wintering. On April 18th the facts were as follows:

No. 11, XXXX; No. 12, XXX; No. 13, XX; No. 14, XXX; No. 15, Dead; No. 16, XXX; No. 17, XXXX; No. 18, XX; No. 19, XX; No. 20, XXX.

On April 26th No. 20 was dead, making two dead in the clamp. Another examination was made June 1st, with the following results:

No. 11, XXX; No. 12, XXXX; No. 13, XX; No. 14, XXX; No. 16, XXX; No. 17, XXX; No. 18, XXX; No. 20, XXX.

Number of hive.	Number of combs with bees.	Amount of brood, Langstroth frames.
No. 11	6	5
No. 12	8	7½
No. 13	3	7½
No. 14	6	5
No. 16	5	3½
No. 18	8	7
No. 20	6	5

The remainder of the apiary (73 colonies), with the exception of one colony, was wintered in the cellar, and, owing to the severity of the winter, it was a difficult matter to keep the atmosphere pure and the temperature high enough, hence the loss was a little higher than usual. Only three, however, died, which is a much more satisfactory showing than in either of the clamps wintered outside. Regarding the latter, I may say that I am inclined to the belief that the bees packed with the paper had not sufficient ventilation at the entrance, and the paper packing prevented upward ventilation. In the second clamp some upward ventilation was possible. I do not know of any other way of accounting for the results.

During the winter of 1895 and '96, the experiment will be repeated, with this important difference, that passages will be allowed through the combs, to enable the bees to contract and expand the cluster, according to temperature, yet without having to break the cluster, which is a very important advantage.

Feeding of Bees.

In an experiment in feeding bees sugar syrup for winter stores, the "Boardman" Entrance Feeder was used. It is an *air* feeder in which the bees have ready and continuous access to the syrup and at the same time find it impossible to daub themselves with the liquid. By this arrangement same waste is avoided. In our experiment, the bees had a continuous supply of syrup; and, so far as we are aware, the conditions under which the syrup was stored, were the best. The stores supplied were made of two parts best granulated sugar to one part (by measure) of water. The water was first brought to a boil; then the sugar was poured in and the mixture stirred until the sugar had dissolved and mixture had come to a boil. It was supplied to the bees a little above blood heat. In looking at the table, we notice that there is a considerable difference between the first weight of the hive, plus the syrup, and the actual weight six days after the last syrup was stored. The difference in weights may be attributed to evaporation, the consumption of stores which goes on all the time under natural conditions, and the increased consumption likely to go on whenever the bees are under the excitement or stimulus of storing and for

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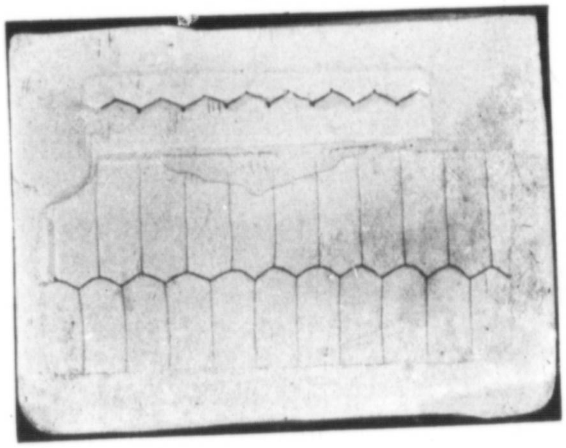

Fig. 1 (*c*).

Giving a side view of comb foundation, 15 sq. ft. to the pound, and above the same after the comb has been completed and capped by the bees. The honey has been extracted and washed away from the comb, which, after a thorough drying, has been filled with plaster of Paris and a section cut down.

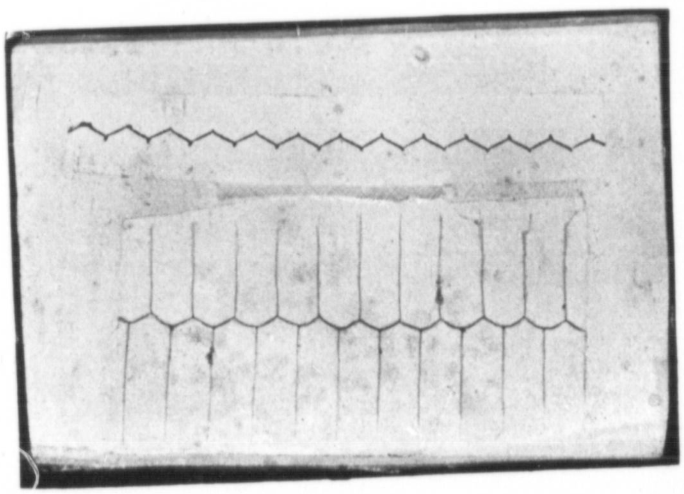

Fig. 2 (*b*).

Giving a side view of comb foundation, 12 sq. ft. to the pound, and above the same after the comb has been completed and capped by the bees. The honey has been extracted and washed away from the comb, which, after a thorough drying, has been filled with plaster of Paris and a section cut down.

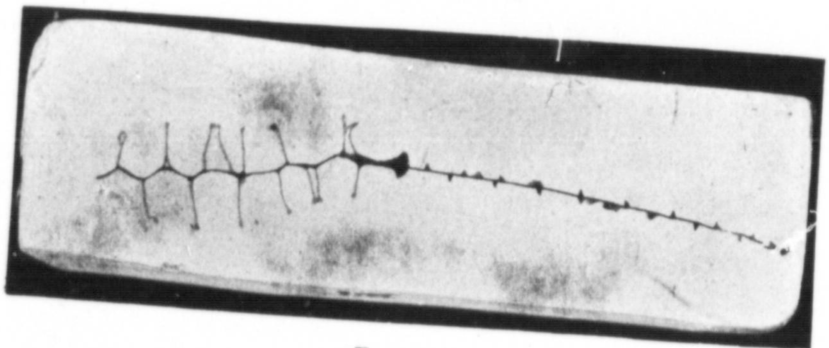

FIG. 3 (*f*).

Giving a side view of comb foundation, flat bottomed, 12 sq. ft. to the pound. This shows a continuous piece of foundation. One half of the foundation was covered over, the other half exposed and worked out by the bees.

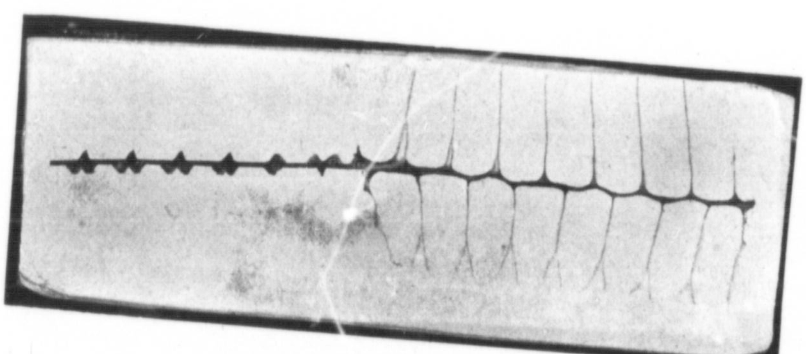

FIG. 4 (*e*).

Giving a side view of comb foundation, flat bottomed, 4 sq. ft. to the pound. This shows a continuous piece of foundation. One half of the foundation was covered over, the other half exposed and worked out by the bees.

The following description refers to the table on page 291 :

	sq. ft. per lb.
(*a*) Is uncolored foundation, "Root" Mill..	10
(*b*) " " "	.. 12
(*c*) " " "	.. 15
(*d*) Vandevort.....	12
(*e*) Vanduzen	4
(*f*) "	12
(*g*) "	6½
(*h*) Is a natural worker comb.	
(*i*) " drone "	

some time thereafter
be noticed that in th

Number of colonies.	Weight pound
1....	36
1....	37
1....	$35\frac{1}{2}$
1....	33

The above experi

(1) That there is
bees in the feeders, an
be explained in any sa

(2) That it will n
supply the bees with s

(3) That when fe
cient comb and stores
colonies with combs of

Many who are in
nothing during the fall
move bees to fall pastu
such an experiment for

When it comes to
own estimate. In my
tant, which had a fair
lake shores, where heav
boneset and aster honey
sixteen colonies with su

Different strengths
or three combs, while ot
in addition. Under th
to report a marked dif
weights were taken after
the gain or loss, allowan
have consumed during th
from. The gains were a

No 1, $112\frac{1}{2}$ lbs.; No
No. 8, $2\frac{1}{2}$; No. 9, 62; N
No. 15, 71; No. 16, 42.

This makes a total g
in a better position to w
and a great many young
quarters fully matured.

It will be noticed fr
$112\frac{1}{2}$ pounds; the least,
other, little or none, altho
the value of the crop secu
its value was 5cts. per pou
that. There is no doubt

some time thereafter. The colony weighing 33 pounds was not strong enough, and it will be noticed that in this case there was the greatest waste.

Number of colonies.	Weight in pounds.	Pounds of syrup supplied.	Weight six days after last syrup was fed.	No. of pounds gained by said feeding.	Difference between first weight, plus syrup supplied and the actual gain in pounds.	Percentage of loss during process.
1	36	27	51½	15½	11½	.61
1	37	10	41½	4½	5½	.55
1	35½	18½	47	11½	7	.37
1	33	14	37	4	10	.71

The above experiment indicates :

(1) That there is a greater difference between the weight of stores supplied to the bees in the feeders, and the increase in weight of the hive. There is a loss which cannot be explained in any satisfactory way.

(2) That it will not pay to extract the honey with a view to making a profit, and supply the bees with sugar syrup for winter.

(3) That when feeding has to be resorted to, the strong colonies should be given sufficient comb and stores to cover their own wants and, in addition, supply the weaker colonies with combs of sealed stores.

Moving Bees for Fall Pasture.

Many who are in localities good for clover, thistle, or linden honey, secure little or nothing during the fall of the year. The question has often been asked: Does it pay to move bees to fall pasture? But, so far as I am aware, no one has attempted to follow up such an experiment for a number of years and give results to the public.

When it comes to the cost of moving bees to fall pasture, everyone must make his own estimate. In my case, I found a district in the vicinity of Scotland, nine miles distant, which had a fair amount of buckwheat, but it does not yield so freely there as on lake shores, where heavy dews prevail ; and the locality affords practically no source for boneset and aster honey. The bees were moved the nine miles, and the cost of moving sixteen colonies with supers, both ways, allowing $3 per day for team and man, was $6.

Different strengths of bees were taken, some of which did not cover more than two or three combs, while others filled, not only the brood-chamber of the hive, but the super in addition. Under these circumstances, it will not be a matter of surprise that I have to report a marked difference in the amount of honey gathered by each colony. The weights were taken after the bees were returned to the home apiary ; and, in estimating the gain or loss, allowance must be made for the amount of stores which the bees would have consumed during the 47 days, if left at home with nothing but their stores to draw from. The gains were as follows :

No 1, 112½ lbs.; No. 2, 57½ ; No. 3, 86½ ; No. 4, 2 ; No. 5, 49½ ; No. 6, 10 ; No. 7, 49 ; No. 8, 2½ ; No. 9, 62 ; No. 10, 16 ; No. 11, 7½ ; No. 12, 41 ; No. 13, 44; No. 14, 53 ; No. 15, 71 ; No. 16, 42.

This makes a total gain in weight of 706 pounds ; and the bees were undoubtedly put in a better position to winter. The buckwheat flow stopped by the 7th of September ; and a great many young bees bred under the stimulus of the flow, went into winter quarters fully matured.

It will be noticed from the foregoing that the highest result from one colony was 112½ pounds ; the least, two pounds. From one, a good profit was derived ; from the other, little or none, although the colony was doubtless in better shape for winter. As to the value of the crop secured, every one must judge from his own market. In my case, its value was 5cts. per pound, and stored in the combs for winter, it was worth more than that. There is no doubt that many last fall, within easy driving distance of as good a locality, secured no fall crop, and as a result had to feed their bees during the winter at a considerable outlay of labor and money.

Comb Foundation.

The use of comb foundation has become general; in fact, few if any, keeping bees in the moveable frame hive, attempt to do without it. At present comb honey, owing to the quality of the comb foundation, is not generally of a kind satisfactory to the consumer. Although it is desirable to get a foundation which, when utilized and added to by the bees, gives a comb as thin as the natural one, many claim that comb a trifle heavier, is not noticed by consumers When, however, the base and bottoms of side walls are materially thickened, and the comb has an artifical appearance, and the wax does not crumble when the comb is broken, the result is that the consumer objects and the objection is intensified by the comparatively harmless nature of the change. Again, comb foundation and wax is wasted in the extra thickness; and this is no small item, as it is generally worth fifty to sixty cents per pound.

In our experiments, observations were taken along various lines—*first*, as to what extent, if any, the bees thin the base and side wall of the various thicknesses and kinds of comb foundation. Measurements were made, whenever possible, of the weight of foundation compared with the number of square feet and the thickness of the base of foundation. Measurements were taken of the comb at the base, the side wall close to the hive, and half an inch up the side wall. The comb was put on ice, to harden it for the purpose of more accurate measurement; and three measurements were taken in this case.

Again, to see just how the bees utilized the comb foundations, three tanks of melted wax were prepared; one was colored with a preparation of Alkanet, another with a preparation of carbon, and the third was pure beeswax, uncolored. The various stages in the manufacture of comb foundation were carried out, giving comb foundation from each tank ten, twelve and fifteen feet square to the pound.

These were placed side by side and drawn out in the upper stories by the bees. It was manifested in various ways that the bees objected to the Alkanet, so this kind was discarded. To the foundation, colored black with the preparation of carbon, the bees did not object. The object in placing foundation made of ordinary wax alongside of the colored, was to make measurements of each kind when drawn out by the bees. The measurements of the colored and uncolored being identical, gave us a basis for the statement that the bees did not object to this preparation; and the method of drawing this out was identical with that of ordinary foundation. The base and lower part of the comb were not as we might expect, of a black color, and the fresh and added wax, white. Instead there is a regular gradation from black at the base to white at the top of the cell. The heavier the foundation, the darker the base and adjoining side wall.

From the above it would appear reasonable to expect that the bees keep adding scales of newly secreted wax and then pulling the side wall, thus decreasing gradually the percentage of colored wax. We also conclude that the quality of wax used in the foundation has an influence, not only on the base, but to a certain extent in almost the entire wall of the cell. The heavier the foundation, the greater the influence on the side wall. Again, notes were taken daily when the bees were beginning to draw out the foundation; and although the heavier foundation was scattered about in the various parts of the upper stories, they gave the preference to the heavier foundation, working on it first. Great caution must, of course, be observed in coming to conclusions. The bees, if the heavier foundation had been taken away, might have been almost as willing to go to work at once upon the lighter grade. At present, no way appears open for conducting a satisfactory experiment to prove anything in this direction. The measurements taken at the base of the wall, and half an inch from the base, all tend to show that the wall is thicker at the base and tapers, becoming thinner at the mouth. So far as I am aware, no one has ever made such measurements.

The "Vandusen" is a flat-bottom (unnatural) foundation. The various specimens of this kind which were put into the sections were partially covered to prevent the bees from touching the covered portion. The remainder was left to the bees. In every case the bees changed the base from flat-bottom to natural. I have adopted a new method.

In the tables given below, the measurements are one ten-thousandth part of an inch.

Kind.	Base.	Wall at base	Wall ½" up.	Base of foundation before putting in.
(a)	72 70 70	32 30 30	28 28 28	107 105 104
(b)	68 70 71	33 35 33	28 28 28	100 95 98
(c)	60 60 62	30 29 30	28 28 27	78 60 60
(d)	51 55 54	32 30 33	28 29 28	Could not get a piece large enough to measure.
(e)*	... ...	32 30 31	28 29 28	230 ... ...
(f)*	... ...	30 32 33	28 28 28	90 ... ...
(g)*	... ...	32 33 32	30 28 30	170 ... ...
(h)*	57 50 62½	... ...	... ...	... ...
(i)	52 55 55	40 42 40	38 34 37	... ...

Owing to the smallness of the piece which could be secured free from the base at either side it was impossible in this case to get a reliable measurement. It will be seen that as far, as the base is concerned, the measurements of (*d*) are practically as natural drone comb; the side wall is even a little thinner. No measurements of the side wall of natural worker comb have been made, and for this reason, the comparison has to be taken with caution, being between a worker side wall, built on Vaudevort foundation 12 ft. square to the pound, and a natural drone comb. The combs (*c*), (*b*), and (*a*) gradually increase in weight. The Vaudevort foundation had a light base but a heavy side wall. In the above specimens of foundation, there is a vast difference in the amount of 4¼x4¼ section which can be filled by a pound of foundation.

With the four square feet per pound, 36 sections can be filled,
" " 6½ " " " " 58½ " " " "
" " 10 " " " " 90 " " " "
" " 12 " " " " 108 " " " "
" " 15 " " " " 135 " " " "

Upon the market in Canada that which will fill 36 sections costs about fifty cents per pound; and that which will fill 135 sections costs about sixty cents per pound. With the latter nearly four times the number of sections can be filled; yet the cost per pound is increased only thirty per cent. If only the question of cost of foundation per section had to be considered it would pay best to take the lightest.

*Impossible to measure.

Experiment With Five-Banded Italian Bees.

Five-banded Italian bees have attracted a good deal of attention during the past three years, but the reports as to their merits have been very conflicting. Five queens were purchased, four from a well known Southern breeder and one from a Canadian. The queens were introduced during July and August, 1894; and as there was a sufficient honey flow during the autumn, the bees went into winter quarters in good condition as to numbers. The bees were wintered in the cellar. Cushions and several thicknesses of paper were placed on top of the frames and quilts; otherwise no protection was given. In this respect, the bees were treated the same as ordinary colonies in apiary. One colony, No. 3, perished. On April 4th, 1895, they were taken from the cellar and placed on their summer stands. On Thursday, April 18th, they were working freely on soft maple. About three weeks later they were about at their lowest in numerical strength, and young bees began to emerge freely. The conditions in an eight frame "Langstroth" hive were then as follows:

No. 1. Very weak, having barely two Langstroth combs of bees.

No. 2. Good average strength, having six Langstroth combs of bees.

No. 3. Perished during winter.

No. 4. Very weak, having barely two Langstroth combs of bees.

No. 5. Wintered well, a very strong colony, marking XXXX when placed on summer stand.

The two numbers, one and four, never pulled up, and were not full colonies on July 15th, after the close of the surplus honey flow, which was light. Number five, which, when examined in spring, was one of the strongest colonies in the apiary, for some reason remained without an upper story—a good full colony. It gathered sufficient for its own immediate requirements, and on Oct. 17th, weighed thirty-seven pounds, which, after allowing for weight of hive, comb, and bees, gives it about twelve pounds of honey, which is not sufficient for winter. The colony never offered to swarm. The queen appeared prolific, but the bees were short-lived. Further, I noticed that the five-banded bees were amongst the most active in the apiary; they never missed a chance to rob, and I formed the opinion that they were of such nervous development that their vitality was quickly exhausted, and the bees were short-lived, the strength of the colony being exhausted by their movements. Touching the winter question, one has to be exceedingly careful not to come to hasty conclusions; but last winter's reports would tend to show that these bees are not good winterers. It is true that the season was not a good one; but the fact that they secured no surplus, while others in the apiary secured as high as eighteen and twenty-two pounds of comb honey, does not say very much for the five-banded Italians.

The bees were gentle while the colony was in a normal condition; but the two weakest colonies, which, according to my usual practice, I re-queened, were exceedingly cross when queenless. The fact that the two weakest colonies gained strength very slowly, should not be recorded against the five-banded bees. With colonies poorly wintered, it is likely that the queen suffers as well as the bees; and, if this is correct, it would explain the condition. The following are the deductions:

1st. They are below the average as to wintering qualities.

2nd. They are short-lived, probably because of a high-strung temperament.

3rd. They are prolific.

4th. They are gentle, unless when queenless.

5th. They are inclined to rob.

In conclusion, I may say that the Ontario Agricultural and Experimental Union also conducted co-operative experiments with these bees. Nine successful experiments were made, and, with the exception of one experiment, the above results are endorsed. Two report, in addition to the above, that the bees have a difficulty in locating themselves and are inclined to get into hives of other bees. I did not observe this during the past year; but in 1896 I will place the five-banded colonies between darker bees and will take observations in this direction.

Respectfully submitted,

R. F. HOLTERMANN,
Lecturer on Apiculture

Brantford, Dec. 31st., 1895.

PART XIV.

REPORT OF THE PHYSICIAN.

To the President of the Ontario Agricultural College :

SIR,—Permit me to present to you my second annual report.

The general health of the College for the past year has been good. We have had no cases of very severe illness. During the winter and spring a number of the students and servants suffered from influenza, from which all recovered without any complications or sequels. A few slight accidents occurred.

With the Dairy School, I regret to say that our experience was not so fortunate. The course opened on January 14th, with a very large class in attendance. Among these, one young man came complaining of the initial symptoms of an illness which, shortly after his arrival, proved to be smallpox. He was sent to the smallpox hospital in the city. All the students and others connected with the Dairy School and College were immediately vaccinated. Those attending the Dairy School were quarantined in the dairy buildings, and the College students in the gymnasium. The College building was thoroughly disinfected. Before being discharged from quarantine, the students took disinfectant baths, put on fresh clothing, and left behind the clothes and bed clothing used by them during quarantine, for disinfection in a steam sterilizer provided for the purpose. The buildings were thoroughly disinfected. The course in the College and Dairy School was resumed, and continued without interruption by the occurrence of other cases among the students.

At the opening of the present College term, the students were carefully examined. The requirements of the by-laws have been carefully observed during the year. The sanitary condition of the College is good.

Respectfully submitted,

GUELPH, ONT., December 31, 1895. WM. O. STEWART.

GRAD

BACHELORS

1893—Beckett, H. L.
1893—Bell, L. G.
1890—Brodie, G. A.
1894—Brown, W. J.
1891—Buchanan, D.

1892—Carlyle, W. L.
1895—Christian, A. H.
1891—Cowan, J. H.
1888—Craig, J. A.
1893—Crealy, J. E.
1888—Creelman, G. C.

1893—Day, G. E.
1890—Dean, H. H.
1895—Doherty, M. W.
1893—Dyer, W. D.

1893—Eaton, L. W.

1888—Fee, J. J.
1894—Ferguson, J. J.
1891—Field, H.

1892—Gibson, D. Z.

The total number

1888—Austin, A. M.
1880—Anderson, J.
1880—Ash, W. E.
1893—*Atkinson, Jas.
1892—Aylesworth, D.

1881—Ballantyne, W. W.
1879—Bannard, E. L.
1888—Bayne, S. R. S.
1892—†Beckett, H. L.
1892—Bell, L. G.
1888—Birdsall, W. G.
1888—Bishop, W. R.
1889—*Brodie, G. A.

* Gold Medallist.

APPENDIX I

GRADUATES, ASSOCIATES AND COLLEGE ROLL.

1. Graduates.

Bachelors of the Science of Agriculture, Degree of B.S.A.

University of Toronto.

1893—Beckett, H. L.
1893—Bell, L. G.
1890—Brodie, G. A.
1894—Brown, W. J.
1891—Buchanan, D.

1892—Carlyle, W. L.
1895—Christian, A. H.
1891—Cowan, J. H.
1888—Craig, J. A.
1893—Crealy, J. E.
1888—Creelman, G. C.

1893—Day, G. E.
1890—Dean, H. H.
1895—Doherty, M. W.
1893—Dyer, W. D.

1893—Eaton, L. W.

1888—Fee, J. J.
1894—Ferguson, J. J.
1891—Field, H.

1892—Gibson, D. Z.

1894—Graham, W. R.

1893—Harcourt, Robt.
1889—Harcourt, G.
1892—Harrison, F. C.
1891—Hewgill, E. A. (*ob.*)
1891—Hutt, H. L.
1889—Hutton, J. R.
1892—Hutchinson, J. W.

1894—Kennedy, P. B.
1895—Kennedy, W. A.
1895—King, A. A.

1889—Lehmann, A.
1891—Linfield, F. B.

1892—Marsh, G. F.
1890—McCallum, W.
1894—McCallum, Wm.
1890—Monteith, S. N.
1889—Morgan, J. H. A.
1892—Morgan, R. N.

1892—Newcomen, W. F.

1891—Palmer, W. J.
1888—Paterson, B. E.

1889—Raynor, T.
1895—Robertson, G. A.
1895—Rowe, G. F.

1890—Shantz, A.
1891—Sharman, H. B.
1893—Shaw, R. S.
1891—Sleightholm, J. A. B.
1894—Sleightholm, F. J.
1894—Spencer, J. B.
1893—Story, H.
1889—Soule, R. M. (*ob.*)
1893—Soule, A. M.

1895—White, E. F.
1891—Whitley, C. F.
1895—Wiancko, A. T.
1895—Widdifield, J. W.

1888—Zavitz, C. A.

2. Associates.

The total number of Associates up to the present time is 309, as follows:

1888—Austin, A. M.
1880—Anderson, J.
1880—Ash, W. E.
1893—*Atkinson, Jas.
1892—Aylesworth, D.

1881—Ballantyne, W. W.
1879—Bannard, E. L.
1888—Bayne, S. R. S.
1892—†Beckett, H. L.
1892—Bell, L. G.
1888—Birdsall, W. G.
1888—Bishop, W. R.
1889—*Brodie, G. A.
1890—Brown, H. H.
1892—Brown, B. C.
1890—Buchanan, D.
1894—Buchanan, Jno.
1888—Budd, W.
1885—‡Butler, G. C.
1884—Black, P. C.
1882—Blanchard, E. L.
1886—Broome, A. H.
1886—‡Brown, C. R.
1888—Brown, S. P.
1893—Brown, W. J.
1892—Burns, J. A. S.
1893—Burns, J. H.

1886—Calvert, S.
1890—Campbell, C. S.
1877—Campbell, J. A.
1880—Campbell, D. P. L.
1895—Campbell, W. G.
1892—Carlaw, W.
1891—Carlyle, W. L.
1884—*Carpenter, P. A. (*ob.*)
1888—Carpenter, W. S.
1892—Carpenter, F. C. S.
1894—Carrick, C. S.
1895—Cass, L. H.
1895—Chadsey, G. E.
1886—Cobb, C.

* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.

ASSOCIATES.—*Continued.*

1880—Chapman, R. K.
1882—Charlton, G. H.
1882—Chase, O.
1894—Christian, A. H.
1879—Clark, J.
1895—*Clark, J. F.
1879—Clinton, N. J.
1880—Clutton, A. H.
1894—Cook, J. H.
1893—Cooper, W. W.
1893—Conn, Joseph.
1890—Cowan, J. H.
1890—‡Cowan, R. E.
1887—Craig, J. A.
1892—Crealy, J. E.
1887—Creelman, G. C.
1878—Crompton, E.

1878—Davis, C. J.
1880—Dawes, M. A.
1882—Dawson, J. J.
1892—*Day, G. E.
1888—†Dean, H. H.
1893—Dean, Fred.
1882—Dennis, J.
1889—Derbyshire, J. A.
1881—Dickenson, C. S.
1894—Doherty, M. W.
1890—Dolsen, W. J.
1887—Donald, G. C.
1887—Donaldson, F. N.
1877—Douglas, J. D.
1894—Duffett, G. P.
1877—Dunlop, S.
1895—Dunn, E.
1892—Dyer, W. D.

1892—Eaton, L. W.
1895—Edelsten, E. J. M.
1890—Elliott, R.
1894—Elliott, Wm.
1893—Elmes, W. A.
1888—Elton, C. W.
1888—Elton, R. F.
1882—Elworthy, R. H.
1887—Ewing, W.

1890—Fairbairn, O. G.
1878—Farlinger, W. K.
1886—Fee, J. J.
1893—Ferguson, J. J.
1890—Field, H.
1881—File, J.
1882—Fotheringham, J.
1883—‡Fotheringham, W.
1879—Fyfe, A.

1883—Garland, C. S.
1889—Gelling, J. A.
1892—Gies, N.
1891—*Gibson, D. Z.
1887—Gilbert, W. J. (*ob.*)
1879—Gillespie, G. H.
1892—Graham, W. R.
1878—Graham, D.
1879—Greig, G. H.
1881—Grindlay, A. W.

1890—Hadwen, G. H.
1891—Haight, W. L.
1882—Hallesy, F.
1893—Hamilton, C. A. W.

1892—Harcourt, R.
1888—*Harcourt, G.
1890—†Harcourt, J.
1887—Harkness, A. D.
1891—Harrison, F. C.
1888—Harrison, R. E.
1887—Hart, J. A.
1887—Hart, J. W.
1892—Harvey, W. H.
1888—Heacock, F. W.
1894—Henderson, R. H.
1890—Hewgill, E. A. (*ob.*)
1894—High, A. M.
1890—Holliday, W. B.
1886—Holtby, R. M.
1880—Holtermann, R. F.
1892—Honsberger, J. D.
1882—Horne, W. H.
1888—Horrocks, T. J.
1887—Howes, J. S.
1882—Howitt, W.
1892—Hurley, T. J.
1893—Husband, E. M.
1890—*Hutt, H. L.
1888—Hutton, J. R.

1886—Idington, P. S.

1886—Jeffrey, J. S.
1883—Jeffs, H. B.
1879—Jopling, W.

1894—Kennedy, W. A.
1893—Kennedy, P. B.
1894—Kidd, D. F.
1894—King, A. A.
1895—Kipp, A.
1895—Knight, J. W.
1888—Knowlton, S. M.

1894—Lailey, F. T.
1894—Laird, J. G.
1882—Landsborough, J.
1895—†Lang, L. W.
1887—Leavens, D. H.
1893—Lehmann, R. A.
1884—‡Lehmann, A.
1887—‡Lick, E.
1877—Lindsay, A. J.
1889—‡Linfield, F. B.
1887—Livesey, E. M.
1880—Lomas, J. W.
1878—Logan, T.

1880—Macaulay, H.
1890—Macfarland, T. W. R.
1885—Macpherson, A.
1886—*Madge, R. W.
1882—Mahoney, E. C.
1884—Major, C. H.
1889—Marsack, F.
1889—Marsack, H. A.
1891—Marsh, G. F.
1877—Mason, T. H.
1890—McKergow, J. G.
1877—Myer, G. W.
1887—Morgan, J. H. A.
1881—Motherwell, W. R.
1885—†Muir, J. B.
1895—McCallan, E. A.
1887—McCallum, E. G.
1893—‡McCallum, W.

1889—McCallum, W.
1895—Maconachie, G. R. B.
1893—McCrimmon, W. D.
1895—McCullough, H. A.
1889—McEvoy, T. A.
1895—McGillivray, J. W.
1885—McIntyre, D. N.
1885—McKay, J. B.
1886—McKay, J. G.
1893—McKenzie, W. G.
1891—McKenzie, A. G.
1889—McLaren, P. S.
1893—McMordie, R.
1893—McNaughton, K.
1895—McPhail, J. D.
1883—McPherson, D.
1890—Monk, W. D.
1889—Monteith, S. N.
1891—*Morgan, R. N.
1890—Mulholland, F.

1878—Nasmith, D. M.
1891—Newcomen, W. F.
1879—Nichol, A. (*ob.*)
1882—Nicol, G.
1882—Notman, C. R.

1877—O'Beirne, A. C.
1887—Orsman, C. P.
1886—Owen, W. H.

1888—Palmer, W. J.
1887—Paterson, B. E.
1895—‡Paterson, T. F.
1895—Payne, G. Y.
1883—Perry, D. E.
1891—Perry, E. C.
1893—Phin, A. E.
1881—§Phin, R. J.
1881—Phin, W. E.
1881—Pope, H.
1886—Power, R. M.
1884—Powys, P. C.

1882—‡Ramsay, R. A.
1879—Randall, J. R.
1885—*Raynor, T.
1885—Reid, P.
1894—Reinke, C. E.
1889—Randall, W.
1889—Rennie, E. A.
1883—*Robertson, W.
1879—Robertson, J.
1894—Robertson, G. A.
1881—Robins, W. P.
1879—Robinson, C. B.
1893—Roper-Curzon, A.C.H.
1892—Roper-Curzon, S.
1881—Ross, J. G.
1894—Rowe, G. F.
1892—Ruthven, W. A.

1884—Saxton, E. A.
1888—Serson, W. E.
1892—*Shaw, R. S.
1888—Sinclair, J. J.
1882—Silverthorne, N.
1894—Simpson, A. E.
1892—Soule, A. M.
1888—Soule, R. M. (*ob.*)
1877—Sykes, W. J.
1883—Schwartz, J. A.

* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.
§ Winner of the Governor-General's Medal—the only medal given that year.

ASSOCIATES.—*Concluded.*

1887—†Scrugham, J. G.
1888—Shantz, A.
1887—Sharman, H. B.
1887—Shaw, G. H.
1882—†Shuttleworth, A. E.
1892—Silverton, C.
1884—†Slater, H. (*ob.*)
1887—*Sleightholm, F. J.
1890—Sleightholm, J. A. B.
1885—Smith, E. P.
1895—Smith, G. A.
1895—Smith, P. B.
1894—Smyth, F. L.
1892—‡Soule, A. M.
1891—Sparrow, J. C. H.
1893—Spencer, J. B.
1891—Spencer, W. A.
1884—Steers, O.
1888—Stevenson, C. R.
1893—Stewart, J.
1878—Stewart, W.
1892—Story, H.
1882—Stover, W. J.
1886—†Sturge, E.
1888—Sweet, H. R.

1895—Taylor, W. H.
1891—Thompson, R. A.
1895—Thompson, W. J.
1889—‡Tinney, T. H.
1892—Tolton, J. E.
1879—Toole, L.
1883—Torrance, W. J.
1884—Tucker, H. V.
1895—Tye, C. W.
1885—Thompson, W. D.

1888—Valance, R. (*ob.*)

1894—Vipond, J. M.

1879—Warnica, A. W.
1884—Wark, A. E.
1878—Warren, J. B.
1890—Webster, F. E.
1880—§Webster, J. L.
1879—Wells, C.
1890—Wells, E.
1882—Wettlaufer, F.
1894—*Wheatley, Jno.

1895—Whetter, J. R.
1891—White, E. F.
1892—Wiancko, A. T.
1894—Widdifield, J. W.
1891—†Wilkin, F. A.
1879—Wilkinson, J. P.
1888—Willans, T. B.
1888—Willans, N.
1879—Willis, J.
1883—Willis, W. B. (*ob.*)
1888—Wilmott, A. B.
1895—Wilson, A. C.
1890—Wilson, F. G.
1894—Wilson, E. E.
1895—Wilson, N. F.
1882—White, C. D.
1879—White, G. P.
1890—Whitley, C. F.
1890—Wood, W. D.
1884—Wroughton, T. A.

1892—Yuill, A. R.

1886—Zavitz, C. A.

* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.
§ Winner of the Governor-General's Medal—the only medal given that year.

3. College Roll for 1895.

Third Year Students.

Name.	P. O. Address.	County, etc.
Atkinson, Jas	Egmondville	Huron, Ont.
Bishop, W. R	Beachville	Oxford, Ont.
Christian, A. H	Guelph	Wellington, Ont.
Clark, J. F	Bay View	Prince Edward Island.
Doherty, M. W	Eglinton	York, Ont.
Kennedy, W. A	Apple Hill	Glengarry, Ont.
Kidd, D. F	Cookstown	Simcoe, Ont.
King, A. A	Johnson's Crossing	Colchester Co., N.S.
Knight, J. W	Elginburg	Frontenac, Ont.
Lailey, F. T	Toronto	York, Ont.
Maconachie, G. R. B	Gurdaspur	Punjab, India.
Paterson, T. F	Lucknow	Bruce, Ont.
Robertson, G. A	Kingston	Frontenac, Ont.
Rowe, G. F	London	England.
Smith, G. A	Morrisburg	Dundas, Ont.
Smith, P. B	Hamilton	Bermuda.
Thompson, W. J	Barrie	Simcoe, Ont.
White, E. F	Clarksburg	Grey, Ont.
Wiancko, A. T	Sparrow Lake	Muskoka, Ont.
Widdifield, J. W	Siloam	Ontario, Ont.
Wilson, A. C	Greenway	Huron, Ont.
Wilson, N. F	Rockland	Russell, Ont.

College Roll for 1895.

Second Year Students.

Name.	P. O. Address.	County, etc.
Bell, T. C	Cataract	Peel, Ont.
Brickwell, J. R	Paris	France.
Butler, W. E	Dereham Centre	Oxford, Ont.
Campbell, A	Dalmeny	Russell, Ont.
Cass, L. H	L'Orignal	Prescott, Ont.
Campbell, W. G	Brantford	Brant, Ont.
Chadsey, G. E	Sumas	British Columbia.
Charlton, E. S	St. George	Brant, Ont.
Cousins, R. J	Enterprise	Addington, Ont.
Cunningham, J	Ardtrea	Simcoe, Ont.
Devitt, I. I	Floradale	Waterloo, Ont.
Dunn, E	Plover Mills	Middlesex, Ont.
Edelsten, E. J. M	London	England.
Farrer, J. W	Parry Sound	Parry Sound District, Ont.
Gadd, T. T	Varney	Grey, Ont.
Gamble, Wm	Cumberland	Russell, Ont.
Guy, J. T	Columbus	Ontario. Ont.
Higginson, G. O	Hawkesbury	Prescott, Ont.
Hodgetts, P. W	St. Catharines	Lincoln, Ont.
Hutton, H	Toledo	Leeds, Ont.
Kennedy, A	Limehouse	Halton, Ont.
Kewley, H. D	Sarnia	Lambton, Ont.
Kipp, A	Chilliwack	British Columbia.
Lang, L. W	St Marys	Perth, Ont.
Leavitt, A. S	Vankleek Hill	Prescott, Ont.
Loghrin, S. M	Stratford	Perth, Ont.
Morgan, G. W	Kerwood	Middlesex, Ont.
McCallan, E. A	St. David's	Bermuda.
McCullough, H. A	Nantye	Simcoe, Ont.
McDougall, D. H	Martintown	Glengarry, Ont.
McDonald, J. C	Lucknow	Huron, Ont.
McGillivray, J. W	Sumas	British Columbia.
Maclennan, J. F	Owen Sound	Grey, Ont.
McPhail, J. D	Vernon	Carleton, Ont.
Macpherson, D. J	Lancaster	Glengarry, Ont.
Nasmith, Jno	Toronto	York, Ont.
Oastler, J. R	Featherston	Parry Sound District, Ont.
Parker, F. A	Bowmanville	Durham, Ont.
Payne, G. Y	Peterborough	Peterborough, Ont.
Ponting, E. A	Moweaqua	Illinois, U. S. A.
Robertson, T. H	Kingston	Frontenac, Ont.
Rogers, C. H	Grafton	Northumberland, Ont.
Sissons, F. J. S	Barrie	Simcoe, Ont.
Stoddart, R. L	Bedford	England.
Taylor, W. H	Peterborough	Peterborough, Ont.
Thom, W. E	Morrisburg	Dundas, Ont.
Tye, C. W	Haysville	Waterloo, Ont.
Whetter, J. R	Lorneville	Victoria, Ont.
Wilson, A. F	McGarry	Lanark, Ont.

College Roll for 1895.

First Year Students.

Name.	P. O. Address.	County, etc.
Allison, D. H	Adolphustown	Lennox, Ont.
Arms, W. L	Randolph	Wisconsin, U.S.A.
Balfour, T. B	Amherstburg	Essex, Ont.
Bard, A. L	Bardsville	Muskoka, Ont.
Beam, E	Black Creek	Welland, Ont.
Benning, Jas	Williamstown	Glengarry, Ont.
Black, G. W	Winchester	Dundas, Ont.
Bourassa, H	St. Hubert	Chambly Co., Que.
Burk, H. W	Amherstburg	Essex, Ont.
Christy, E. V	Bloomfield	Prince Edward, Ont.
Craig, R. D	Guelph	Wellington, Ont.
Davis, A. N	Cayuga	Haldimand, Ont.
Elliott, W. J	Seaforth	Huron, Ont.
Fairweather, T. H	Alma	Wellington, Ont.
Fierheller, E. E	Mount Elgin	Oxford, Ont.
Findlay, J	Toronto	York, Ont.
Geddes, M. D	Midlothian	Parry Sound District, Ont.
Gibson, T. F. E	Toronto	York, Ont.
Gilbert, S	Dublin	Ireland.
Gooch, G. E	Toronto	York, Ont.
Harkness, R. E. L	Irena	Dundas, Ont.
Heartz, W. B. G	Truro	Nova Scotia.
Harris, M. E	Brantford	Brant, Ont.
Irving, J. C	Vernon River Bridge	Prince Edward Island.
Johnston, A. C	Winchester	Dundas, Ont.
Kennedy, J. A	Nassagaweya	Halton, Ont.
King, C	Guelph	Wellington, Ont.
Leggatt, Jas	Mitchell	Perth, Ont.
Leishman, J. E. B	New Lowell	Simcoe, Ont.
Lewes, Geo	Ballymote	Middlesex, Ont.
Lloyd, Jones T	Burford	Brant, Ont.
Lucas, W. T	Bailieboro'	Northumberland, Ont.
Mather, J. W	New Lowell	Simcoe, Ont.
Mills, E. E	Yarmouth Centre	Elgin, Ont.
Milson, W. G	Goring	Grey, Ont.
Moffatt, T	Morewood	Dundas, Ont.
Mooney, John	Inverness	Megantic Co., Que.
McCalla, ——	St. Catharines	Lincoln, Ont.
McCready, J	Harriston	Wellington, Ont.
Macdonald, A. W	Oakville	Halton, Ont.
McDonald, J. D	Lancaster	Glengarry, Ont.
McKenzie, M. A	Thornton	Simcoe, Ont.
McLaughlin, F. G	Stroud	Hants, England.
McMaster, E. B	Toronto	York, Ont.
McMillan, M. J	Newmarket	York, Ont.
McPhail, D. J	Vernon	Dundas, Ont.
Nicholson, Geo	Montreal	Quebec.
Pearson, T. E	Weston	York, Ont.
Pugh, S. H	Milverton	Perth, Ont.
Ratcliffe, A. G	Anderson	Perth, Ont.
Ratcliffe, J. N	Anderson	Perth, Ont.

College Roll for 1895.

First Year Students.—Continued

Name.	P. O. Address.	County, etc.
Reade, J. M	Toronto	York, Ont.
Reinke, B. F	Ancaster	Wentworth, Ont.
Richardson, E. L	Winnipeg	Manitoba
Robertson, Geo	Ottawa	Carleton, Ont.
Roblin, D	Adolphustown	Lennox, Ont.
Ross, M. N	Stirling	Scotland.
Ross, N. M	Stirling	Scotland.
Ross, H. R	Gilead	Hastings, Ont.
Rathwell, W	Ferguson's Falls	Lanark, Ont.
Selwyn, A. L. H	Boscombe	Hampshire, Eng.
Shields, W. M	Glasgow	Scotland.
Squirrell, W. J	Guelph	Wellington, Ont.
Stainton, J. W	Taunton	Durham, Ont.
Stewart, D	Snake River	Renfrew, Ont.
Stovel, H. R	Toronto	York, Ont.
Strong, A	Tilbury Centre	Essex, Ont.
Thomas, Jas	Woodville	Victoria, Ont.
Waddy, P. H	Rosseau	Parry Sound District, Ont.
Welden, R. G	Halifax	Nova Scotia.
Whigham, R. D	London	England.
West, A. W	Shelley Bay	Bermuda.
Wiancko, T. A	Sparrow Lake	Muskoka, Ont.
Wilkes, W. A	Toronto	York, Ont.
Winchester, G. H	Toronto	York, Ont.
Woodcock, R. H	Southport	Lancashire, Eng.
Yuill, J. J	Carleton Place	Lanark, Ont.
	Specialists.	
Gardiner, H	Morpeth	Kent, Ont.
Moore, W. B	Kingston	Frontenac, Ont.

Total number in general course 150

4. Dairy Students.

Name.	P. O. Address.	County, etc.
Abbott, R. C	Lakefield	Peterborough.
Aiken, R. J	Princeton	Oxford, Ont.
Arkell, H. C	Teeswater	Bruce, Ont.
Armstrong, W. M	Guelph	Wellington, Ont.
Baird, A. K	Motherwell	Perth, Ont.
Beavis, A. H	Dunsford	Victoria, Ont.
Biggin, E. O	Vernon	Trulbull Co., Ohio.
Blayney, J. E	Lynnville	Norfolk, Ont.
Boyd, D	Manotick	Carleton, Ont.
Boyes, F	Nilestown	Middlesex, Ont.
Bradley, R. W	Manotick	Carleton, Ont.
Campbell, A	Thedford	Lambton, Ont.
Campbell, Miss E. M	Dalkeith	Glengarry, Ont.
Carlaw, Geo	Warkworth	Northumberland, Ont.
Carson, W. J	Metcalfe	Carleton, Ont.
Carter, J. G	Guelph	Wellington, Ont.
Carter, W. E. C	Toronto	York, Ont
Chalmers, A	Monkton	Perth, Ont.
Christie —	Winchester	Dundas, Ont.
Clute, J. A	Sillsville	Lennox, Ont.
Code, B	Burritt's Rapids	Leeds, Ont.
Comba, W	Gordonville	Wellington, Ont.
Coomber, H	Port Elgin	Bruce, Ont.
Copeland, J. W	Eastwood	Oxford, Ont.
Conroy, W. J	Cornwall	Stormont, Ont.
Cowieson, W. R	Queensville	York, Ont.
Curtis, W	Newmarket	York, Ont.
Dean, F	Harley	Brant, Ont.
Dennis, R. B	Newmarket	York, Ont.
Dixon, T. S	Lunenburg	Stormont, Ont.
Duncan, R. C	Buttonville	York, Ont.
Elliott, A. T	Bluevale	Huron, Ont.
Elliott, Wm	Galt	Waterloo, Ont.
Evertts, M. W	Easton's Corners	Grenville, Ont.
Gardiner, R. M	Valetta	Kent, Ont.
Gibbs, A	Cheapside	Haldimand, Ont.
Goodale, Miss E	Milverton	Perth, Ont.
Graesser, F. A	Llangollen	North Wales.
Graham, G. A	Westwood	Peterborough, Ont.
Hamilton, C. A. W	Guelph	Wellington, Ont.
Heeks, H	Palermo	Halton, Ont.
Henrick, K. A	Headford	York, Ont.
Hill, G. W	Summerhill	Huron, Ont.
Hill, Jas. A	Conway	Lennox, Ont.
Humphrey, Geo	Norval	Halton, Ont.
Irvine, D. A	Dalkeith	Glengarry, Ont.
James, D. A	Nilestown	Middlesex, Ont.
Jackson, Miss L	Petrolia	Lambton, Ont.
Jeffs, C. B	Bond Head	Simcoe, Ont.
King, R. B	Johnson's Crossing	Nova Scotia.
Laird, J. G	Sarnia	Lambton, Ont.
Marquette, G. W	Van Camp	Dundas, Ont.
Marsh, G. F	Thornbury	Grey, Ont.
Marshall, T. B	Princeton	Oxford, Ont.
Matthews, A. F	Denfield	Middlesex, Ont.

DAIRY STUDENTS.—*Continued.*

Name.	P. O. Address.	County, etc.
Malcolm, Robt	Kinlough	Bruce, Ont.
Medd, W. G	Constance	Huron, Ont.
Metcalfe, G	Norwood	Peterborough, Ont.
Millar, J. F	Brantford	Brant, Ont.
Mitchell, H	Keswick Ridge	York Co., N.B.
Mitchell, W. H	Lennoxville	Quebec.
McCallum, L. C	Guelph	Wellington, Ont.
McDonald, T. W	Caledon, East	Peel, Ont.
McDonald, W. J	Ormond	Dundas, Ont.
McDonagh, O. E	Kettleby	York, Ont.
McGarry, W. R	McGarry	Lanark, Ont.
McPherson, A. D	Tayside	Stormont, Ont.
McQuillan, J. J	Guelph	Wellington, Ont.
Papineau, P. C	Constance	Huron, Ont.
Parker, A. A	Rockford	Norfolk, Ont.
Parker, Mrs. E	Puslinch	Wellington, Ont.
Purdy, W. O	Rockdale	Peterborough, Ont.
Ragsdale, W. J	Almonte	Carleton, Ont.
Reist, E. B	Heidelberg	Waterloo, Ont.
Rendall, Wm	Camperdown	Grey, Ont.
Richardson, D	Vandecar	Oxford, Ont.
Robeson, J	Athens	Leeds, Ont.
Ross, E. B	Iroquois	Dundas, Ont
Ross, W. A	Brucefield	Huron, Ont.
Sharpe, A. W	Mount Forest	Wellington, Ont.
Shorey, S. C	Sandhurst	Lennox, Ont.
Scott, J. H	Cromarty	Perth, Ont.
Singleton, W. M	Newboro'	Leeds, Ont.
Smith, E. P	Chilliwack	British Columbia.
Smith, H	Clarence	Russell, Ont.
Smythe, F. L	Tormore	York, Ont.
Stillman, R	Campbellford	Northumberland, Ont.
Stonehouse, J	Port Perry	Ontario, Ont.
Storey, H. E	Cobourg	Northumberland, Ont.
Stevenson, A	Clayton	Lanark, Ont.
Swartz, W. J	Aylmer	Elgin, Ont.
Taber, F. W	Little York	York, Ont.
Tucker, G. E	Clarence	Russell, Ont.
Travis, C	Acacia	Norfolk, Ont.
Travis, F	Staffordville	Elgin, Ont.
Traviss, C. H	Holt	York, Ont.
Waddell, Wm	Kinloss	Bruce, Ont.
Weir, Wm	Lang	Peterborough, Ont.
Westphall, A. A	Nelson	Halton, Ont.
Young, Robt	Stouffville	Ontario, Ont.

Total number in Dairy Course .... 100.

APPENDIX II.

SYLLABUS OF LECTURES.

Lectures began as usual on the 1st October, 1893, and continued, with the omission of the Christmas vacation, until the 30th June, 1894, which latter date was the end of the scholastic year 1893-94.

The following syllabus of lectures will convey some idea of the class-room work done by the several professors in the nine months just mentioned.

FIRST YEAR.

Fall Term—1st October to 22nd December.

Agriculture

Introductory. Ancient and modern agriculture; agricultural literature; different systems of farming; history of agriculture.

Soils. Their formation and composition, physical and chemical properties, etc.; examination and classification of soils; cultivation of soils, including various tillage operations—plowing, harrowing, cultivating, rolling, etc.

Land Drainage. Method of laying out drains; various kinds of drains and their construction; different modes of draining.

Rotation of Crops. Importance and necessity of rotation; principles underlying it; rotations suitable to different kinds of soil; examination and criticism of different systems of rotation.

Cattle. Pointing out and naming the different parts of the animal; characteristic points and peculiarities of the principal beef and dairy breeds of cattle; practical handling of beef and dairy animals.

Natural Science.

Chemical Physics. Matter; accessory and essential properties of matter; attraction; various kinds of attraction—cohesion, adhesion, capillary, electrical and chemical; specific gravity; weights and measures; heat, measurement of heat, thermometers, specific and latent heat; sources, natures and laws of light.

Inorganic Chemistry. Scope of subject; elementary and compound substances; chemical affinity; symbols; nomenclature; combining proportions by weight and by volume; atomic theory; atomicity and basicity; oxygen and hydrogen; water—its nature, functions, decomposition and impurities; nitrogen; the atmosphere—its composition, uses and impurities; ammonia—its sources and uses; nitric acid and its connection with plants.

Human Physiology and Hygiene. Description of the different tissues of the body; alimentary system; circulatory system; nervous system; importance of ventilation and the influence of food on the body; remarks on the proper care of the body and attention to its surroundings in order to keep it in a continual state of health.

Zoology. Distinction between animate and inanimate objects; distinction between plants and animals; basis of classification of animals; leading character of each subkingdom, with special reference to classes of animals connected with agriculture.

Veterinary Science.

Anatomy and Physiology of the horse, ox, sheep and pig; osseous system, muscular system, syndesmology, plantar system, and odontology.

ENGLISH.

Composition. Review of grammar, with exercises on capital letters and punctuation.

Literature. Selections from Palgrave's Golden Treasury and Addison.

MATHEMATICS.

Arithmetic. Review of subject, with special reference to methods, decimals, interest, discount, general problems.

Bookkeeping. Subject commenced.

Winter Term.—22nd January to 16th April.

AGRICULTURE.

Manures. Composition, management, and application of farmyard manure; artificial fertilizers—their composition, uses, and modes of application; mechanical and chemical effects of manures on various kinds of soil and crops; the amounts to apply, etc.; green manures.

Crops for Soiling. The advantages of soiling; the principal soiling crops; feeding of green crops to live stock.

The Weeds of the Farm. The most troublesome weeds described, and different modes of eradicating them.

Sheep. Characteristic points of medium and lon wool breeds, and practical handling of same.

NATURAL SCIENCE.

Inorganic Chemistry (Continued). Carbon; combustion; carbonic acid and its relation to the animal and vegetable kingdom; sulphur and its compounds; manufacture and uses of sulphuric acid; phosphorous; phosphoric acid and its importance in agriculture; chlorine—its bleaching properties; bromide; iodine; silicon; potassium; calcium; magnesium; iron, etc.

Organic Chemistry. Constitutions of organic compounds; alcohols; aldehydes, acids and their derivatives; formic, acetic, oxalic, tartaric, citric, lactic, malic, uric, and tannic acids. Constitution of oils and fats—saponification; sugars, starch, cellulose; albuminoids, or flesh formers, and their allies; essential oils; alkaloids—morphine and quinine; classification of organic compounds.

Zoology (Continued). Sub-kingdoms further described; detailed account of some injurious parasites, such as "liver-fluke," "tape-worm," "trichina," etc.; insects—their influence on plant life; corals and mollusks as agents in the formation of soil; vertebrates, with special reference to those of importance in the economy of the farm.

Lectures illustrated by specimens and diagrams.

VETERINARY SCIENCE.

Veterinary Anatomy. Anatomy and physiology of the horse, ox, sheep and pig; digestive system, circulatory system, respiratory system, urinary system, nervous system, sensitive system, generative system, tegumental system.

ENGLISH.

Composition. Exercises continued; letter writing, etc.

English Classics. Critical study of selections from Palgrave continued, with selections from Irving's Sketch Book.

MATHEMATICS AND BOOKKEEPING.

Arithmetic. Equation of payments; percentage; profit and loss; mensuration.

Bookkeeping. Business forms and correspondence; general farm accounts; dairy, field and garden accounts.

Spring Term.—17th April to 30th June.

Agriculture.

Preparation of soil. Modes of preparation for different crops, and various kinds of soil.

Seeds and Sowing. Testing the quality of seed; changing seed; quantity per acre; and methods of sowing.

The Crops of the Farm. Their growth and management—hay, rye, wheat, barley, oats, peas, buckwheat, potatoes, turnips, mangels, sugar beets, rape, etc.

Pastures. Growth and management of pastures; temporary and permanent pastures.

Feeding of Live Stock. General outline of the principles of feeding different kinds of stock.

Natural Science.

Geology. Connection between geology and agriculture; classification of rocks—their origin and mode of formation, changes which they have undergone after decomposition; fossils—their origin and importance; geological periods and characteristics of each.

Geology of Canada, with special reference to the nature and economic value of the rock deposits; glacial period and its influence on the formation of soil.

Lectures illustrated by numerous specimens and designs.

Botany. Full description of seed, roots, stem, leaves, and flower. Plants brought into the lecture room and analyzed before the class, so as to render students familiar with the different organs and their use in the planet economy.

Lectures illustrated by excellent diagrams.

Veterinary Science.

Materia Medica. The preparation, doses, action, and use of about one hundred of the principal medicines used in veterinary practice.

English.

English Grammar and Composition. Authorized Grammar.

English Classics. Critical study of selections from Palgrave and Irving.

Mathematics.

Mensuration. Mensuration and surfaces—the square, rectangle, triangle, trapezoid, regular polygon, circle. Special application to the measurement of lumber. Mensuration of solids; special application to the measurement of timber, earth, etc.

SECOND YEAR.

Fall Term.—1st October to 22nd December.

Agriculture.

Cattle. Origin and history of the leading breeds of cattle in America; beef breeds—their leading characteristics and principal points: dairy breeds—their leading characteristics and principal points; practical handling and judging of cattle.

Natural Science.

Agricultural Chemistry. Connection between chemistry and agriculture; the various compounds which enter into the compositions of the bodies of animals; the chemical changes which food undergoes during digestion; chemical changes which occur during the decomposition of the bodies of animals at death; the functions of animals and plants contrasted; food of plants, and whence derived; origin and nature of soils; classification of soils; causes of unproductiveness in soil and how detected; preservation, improvement and renovation of soils; manures classified; the chemical action of manures on different soils; commercial valuation of fertilizers.

HORTICULTURE.

Fruit Growing.

Introduction. Brief history of horticulture; extent and importance of the industry; Ontario as a fruit-growing country; the outlook for the fruit industry; requisites for the business.

Leading Principles in the Growth of Trees. Description and function of roots, stems, branches, buds, leaves, flowers, fruit and seeds. Illustrated by specimens in the class room.

Production of New Varieties. Species and varieties; natural and artifical pollination; crossing and hybridizing practised by students in the greenhouses and orchards.

Propagation of Varieties. By cuttings, layers, grafting and budding. Illustrated by specimens and practised by students in the greenhouses.

Setting Out Orchards and Fruit Plantations. Suitable soils and situations; distances for planting; marking out the ground; obtaining nursery stock; transplanting; watering; mulching.

General Management of Orchards and Fruit Plantations. Cultivation; manuring; spraying; thinning fruit: implements suitable for the different operations.

Different Kinds of Fruit. Apples, pears, quinces, plums, apricots, cherries, grapes, raspberries, blackberries, currants, gooseberries, strawberries, etc., treated of in detail according to the following syllabus: (1) History and botanical matter; (2) extent of cultivation; (3) methods of propagation; (4) soils suitable; (5) culture required; (6) methods of pruning and training; (7) time and manner of harvesting; (8) packing and marketing; (9) method of keeping and storing; (10) varieties grown.

VETERINARY SCIENCE.

Pathology. Osseous System. Nature, causes, symptoms and treatment of diseases of bone, as splint, spavin, ringbone, etc.

Muscular System. Nature, causes and treatment of flesh wounds, etc.

Syndesmology. Nature, causes, symptoms and treatment of curb, bog spavin and other diseases of the joints.

Plantar System. Nature, causes, symptoms and treatment of corns, sand-crack, founder and other diseases of the feet.

Odontology. Diseases of the teeth, and treatment of the same.

ENGLISH.

English Classics. Critical study of Shakespeare's "Julius Cæsar."

PHYSICS.

Dynamics. Force (different kind of); motion; laws of falling bodies; work; the simple machines.

Statics. Composition and resolution of forces; parallelogram of forces; conservation of energy.

Winter Term.—22nd January to 16th April.

AGRICULTURE.

Sheep. Origin and history of the leading breeds of sheep in Britain and America; coarse, medium, and fine-wooled sheep—their leading characteristics and principal points; practical handling and judging of sheep.

Swine. Origin and history of the leading breeds of swine in Britain and America; large and small breeds of swine—their leading characteristics and principal points; practical handling and judging of swine.

Natural Science.

Agricultural Chemistry.—Continuation of the subject from preceding term, as follows: Composition of plants in relation to the soils upon which they grow; rotation of crops; the classification of fodders according to their chemical composition and a general treatment of the science of cattle feeding; relation of feeding to manure; chemistry of the dairy.

Economic Entomology.—Anatomy, classification, and metamorphosis of insects; principal insects injurious to vegetation; their habits, and the best methods of checking and preventing their ravages; insecticides, and the best methods of applying them; beneficial insects referred to. Course illustrated by a good collection of beneficial and injurious and of insectivorous birds.

Meteorology. Relation of meteorology to agriculture; composition and movements of the atmosphere; description of the barometer; different kinds of thermometers; pluviameter and anemometer, and how to read them; temperature, its influence on agriculture; the elements which are to be considered in the discussion of climate; the principles considered in forecasting the weather.

Lectures illustrated by instruments referred to.

Horticulture.

1. *Vegetable Gardening.*

Gardening as an Occupation. Extent and importance of the industry; market gardening near large towns and cities.

The Farmer's Garden. Location, size, and soil suitable.

Fertilizers for the Garden. Barnyard manure; composts; artificial fertilizers; time and manner of applying them.

General Management of Garden. Preparation for and cultivation of crops; rotation of crops; plan of garden.

Garden Seeds. Method of obtaining; vitality; time and manner of sowing; conditions favorable to germination.

Raising Plants. Construction and management of hotbeds and cold-frames; transplanting.

Forcing Garden Crops. Illustrated by growth in the greenhouses of radishes, lettuce, onions, potatoes, tomatoes, cauliflowers, cucumbers, melons, rhubarb, mushrooms, etc.

Garden Crops. Beets, carrots, parsnips, salsify, radishes, turnips, potatoes, onions, asparagus, spinach, lettuce, cabbage, celery, rhubarb, cauliflower, peas, beans, corn, melons, squashes, cucumbers, tomatoes, herbs, etc., treated of in detail according to the following syllabus: (1) History and botanical matter; (2) Importance and extent of cultivation; (3) Soils and fertilizers suitable; (4) Propagation; (5) Culture and general management; (6) Harvesting; (7) Packing and marketing; (8) Storing; (9) Varieties grown.

2. *Landscape Gardening.*

Location of buildings; making and care of lawns; kinds, arrangement, and care of trees, shrubs, vines, hedges, and flower-beds; course and construction of walks and drives; general surroundings.

3. *Arboriculture.*

Importance of forests; their effect on climate; different kinds of trees—their occurrence, habits, and uses; where trees should be planted; raising trees from seed; planting operations; transplanting large trees; care and management of trees, with a view to ornament, shelter and economy.

4. Floriculture.

Soil for house plants; methods of potting; propogation of plants; effect of atmosphere, temperature and light on plants; watering; trimming and training; treatment of frozen plants; resting plants; kinds of plants suitable for window or conservatory, hanging baskets, rockeries, flower beds, etc.; arrangement of plants for effect.

VETERINARY SCIENCE.

Digestive System. Nature, causes, symptoms and treatment of spasmodic and flatulent colic, inflammation of the bowels, acute indigestion, tympanitis in cattle, impaction of the rumen, and many other common diseases.

Circulating System. Description of the diseases of the heart and blood.

Respiratory System. Nature, causes, symptoms, and treatment of catarrh, nasal-gleet, roaring, bronchitis, pleurisy, and inflammation of the lungs, etc.

Urinary System. Nature, causes, symptoms, and treatment of inflammation of the kidneys, etc.

Nervous System. Nature, causes, symptoms, and treatment of lock-jaw, string-halt, etc.

Sensitive System. Nature, causes, symptoms, and treatment of the diseases of the eye and ear.

Generative System. Nature, causes, symptoms, and treatment of abortion, milk-fever, etc.

Tegumental System. Nature, causes, symptoms, and treatment of scratches, sallenders, mallenders, parasites, and other diseases of the skin.

ENGLISH LITERATURE AND POLITICAL ECONOMY.

English Classics. The critical study of Shakespeare's "Richard II."

Political Economy. Utility; production of wealth—land, labor, capital; division of labor; distribution of wealth; wages; trades unions; co-operation; money; credit; credit cycles; functions of government; taxation, etc.

PHYSICS.

Hydrostatics. Transmission of pressure; the hydraulic press; specific gravity; density; pumps, siphons, etc.

Spring Term.—17th April to 30th June.

AGRICULTURE.

Breeding. Outline of the general principles of breeding.

Feeding. Feeding standards; feeding for growth, meat, milk, quality of milk, etc.

Care and management of cattle, sheep, and swine; care at different periods of growth, at different seasons, and under varying conditions.

NATURAL SCIENCE.

Determination of soils and fertilizers by physical properties.

Analytical Chemistry. Chemical manipulation, preparation of common gases and reagents; operations and analysis—solution, filtration, precipitation, evaporation, distillation, sublimation, ignition, and the use of the blow-pipe; testing of substances by reagents; impurities in water; a teration in foods and artificial manures; injurious substances in soils.

Systematic and Economic Botany. Classification of plants and characters of the most important orders.

This course is illustrated by a large collection of plants in the college herbarium, and also by analysis of several plants collected in the fields and woods of the farm.

Greenhouse Plants. Special study of all plants grown in our greenhouses, and the shrubs, etc., on the lawn.

Veterinary Science.

Materia Medica. The preparation, actions, uses, and doses of medicines—continued from the spring term of the first year. Lectures on special subjects, such as pleuro-pneumonia, the rinderpest, tuberculosis, etc.

Veterinary Obstetrics. Description of fœtal coverings. Pneumonia in connection with puberty, œsirom gestation, sterility, abortion, normal and abnormal parturition. Diseases incidental to pregnant and parturient animals.

English.

English Classics. The critical study of Tennyson's "Locksley Hall," and Scott's "Talisman."

Physics.

Capillarity, latent and specific heat, as affecting draining and soil cultivation.

Road-making.

Determination of proper slopes; shape of road-bed; drainage of roads; various road coverings, etc.

OUTLINE OF THIRD YEAR WORK.

Agriculture.

(1) Principles and practice of general agriculture; (2) "Agriculture in some of its relations with chemistry" (Storer), Vols. I. and II.; (3) Composition, use, and practical application of the more common artificial fertilizers (Canadian and United States Experiment Station bulletins to date); (4) History, characteristics, and distinguishing points of all the pedigreed breeds of cattle, sheep, and swine now bred in America; (5) The principles which govern successful stock-breeding (Miles); (6) Construction and arrangement of farm buildings, with a view to cheapness, economy of space and convenience.

Dairying.

(1) "Analysis of Foods" (Blyth), Part IV., pp. 201-238; (2) "Dairyman's Manual" (Stewart); (3) "Milch Cows and Dairy Farming" (Flint); (4) "Scientific Dairy Practice" (Lynch); (5) "The Dairy" (Long and Morton); (6) "The Practical Butter Book" (Willard); (7) Reports of Dairy Associations of Ontario for 1891 and 1892, and subsequent reports to date; (8) Eighteenth Annual Report of the Ontario Agricultural College, Part VIII, and Report for 1893, Part IX; (9) Dairy bulletins and reports from Canadian and United States Experiment Stations, to date; (10) "Cheddar Cheese" (Decker); (11) Course of Lectures on dairying.

Chemistry.

The work in this department comes under four heads, each of which forms the basis of a separate examination.

(1) *General Chemistry, Organic and Inorganic.* "Advanced Course" and "Chemistry of the Carbon Compounds" (Remsen), with a course of lectures. Most stress laid on those elements and compounds which have a bearing on agriculture; laws and theories of chemistry discussed.

(2) *Agricultural Chemistry.* "Chemistry of the Farm" (Warington), and "Agriculture in some of its Relations with Chemistry" (Storer), with lectures, Vol. I., Chapters 1, 2, 3, 4, 7, 8, 10, 11 and 12; Vol. II., Chapters 5, 6, 7, 8, 9, 10, 15, 17, 18 and 19.

(3) *Animal Chemistry and Cattle Feeding.* "Manual of Cattle Feeding" (Armsby), with lectures.

(4) *Analytical Chemistry.* Qualitative and Quantitative Analysis, analysis of soils, fertilizers, agricultural products, etc.

Geology.

A general review of the subject, referring to ages, systems, and formations in Canada; special attention to the geology of Ontario, New Brunswick, Nova Scotia, Manitoba, and the Northwest, with reference to their most valuable economic products; the disintegration and decomposition of rocks in the formation of soil.

Natural History. (Three Examinations.)

Systematic and Economic Botany. Classification of plants and characters of the most important orders; special reference to the injurious fungi and weeds.

Structural and Physiological Botany. Cells and tissues in plants; organs of vegetation and reproduction; plants in relation to soil; processes of assimilation, absorption and metabolism.

Economic Entomology. Classification of insects; the consideration of seventy-five species injurious to plants and domestic animals, and the best means of killing them; beneficial insects and insectivorous birds.

Microscopy. Manipulation of the microscope; methods of mounting specimens; drawing objects under the microscope; microscopic study of plant structures.

Books of Reference in Botany, etc. Injurious Insects (Saunders); Structural Botany (Gray); Physiological Botany (Vines); Systematic Botany (Gray's Manual and Spotton, Part II.); Injurious Fungi (Smith); Practical Botany (Hillhouse); Vegetable Histology (Strasburger).

English.

(1) Grammar (High School Grammar); (2) Composition and Rhetoric (Bain); (3) Outline of English Literature (Lectures with Spalding and Craik); (4) Themes; (5) Critical reading of the following selections:

Shakespeare—"Macbeth."

Bacon—Essays: Of Studies, Great Place, Boldness, Goodness and Goodness of Nature, Youth and Age, Discourse, Friendship.

Milton—"Lycidas" and "Paradise Lost," Book 1.

Pope—Essay on Criticism.

Addison—Spectator, Nos. 23, 26, 47, 93, 115, 162, 225, 381, 387, 483, 583, 598.

Wordsworth—The Solitary Reaper; Intimations of Immortality; Resolution and Independence.

Macaulag—Essay on Lord Bacon.

DeQuincey—William Wordsworth.

Tennyson—"Locksley Hall"; "In Memoriam," I-xxvii.

Note—In order to pass in this department, it is necessary, above everything else, that the candidate know how to spell correctly and be able to write good English.

Drawing.

Freehand and mechanical drawing, especially the drawing and construction of farm houses, barns, stables, etc.—ground plans, elevations, sections, and construction.

APPENDIX III.

EXAMINATION PAPERS.

I. Papers Set at Easter Examinations, 1895.

FIRST YEAR.

Agriculture.

I. What is humus?
Discuss its influence and importance.

II. What is the difference between trench ploughing and subsoiling? Under what conditions might these operations respectively be advisable?

III. Mention the principal things to be observed in tile draining.

IV. Name an important variety of each of the following:
Fall wheat, spring wheat, white oats, black oats, two-rowed barley, six-rowed barley, peas, dent corn, flint corn and potatoes.

V. Point out the main points of difference between the requirements of the following crops:
(*a*) Alfalfa and Alsike clover.
(*b*) Turnips and mangels.
(*c*) Legumes and cereals.

VI. Give reasons for the following practices:
(*a*) Sowing fall wheat on pea stubble.
(*b*) Sowing grass seeds with barley after a root crop.

VII. Explain:
(*a*) Why a public highway may be extremely dry, and the soil of a cultivated field beside it may, at the same time, be quite moist.
(*b*) Why plants on a drained field may suffer less from drought than they would had the field not been drained.

VIII. Mention four things which you think to be of importance in selecting a dairy cow, and state fully what you would require with regard to the things mentioned.

Chemistry.

I. In test-tube (*a*) oxide of mercury, and in test-tube (*b*) iron, are heated. What effect has the heat on each? If any difference, state and account for it.

II. An exact weight of lead, exposed to the air, is heated for several hours in a porcelain dish. Does the lead increase or decrease in weight? What is the relation between the change in the weight of the lead and the composition of the atmosphere?

III. Into one jar of oxygen gas, a piece of charcoal at the ordinary temperature, and into another a piece of glowing charcoal, are put.
1. Note the phenomena occuring in each jar.
2. What properties of oxygen are illustrated by these experiments?

IV. How much mercury oxide would be necessary to furnish ten grams of oxygen?
$Hg = 200$; $O = 16$.

V. Describe any experiment by which it may be shown that nitrogen forms about four-fifths by volume of the atmosphere.

VI. Complete the following equations:

1. $KOH + NH_4Cl =$
2. $Ca(OH)_2 + NH_4Cl =$
3. $NaCl + H_2SO_4 =$
4. $NaBr + MnO_2 - H_2SO_4 =$
5. $P_2O_5 + H_2O =$
6. $CO + CuO =$
7. $CO_2 + Ca\,(OH)_2 =$
8. $Cl + KOH$ warm and concentrated) =

VII. Two oxides of nitrogen in separate cylinders are tested. The one supports combustion; the other does not, but turns brown upon exposure to air. Name each oxide.

VIII. Sketch an apparatus that may be employed in preparing sulphuretted hydrogen (H_2S). What substances are required in preparing this gas?

IX. What phenomena did you observe when molybdic solution was added to a hot nitric acid solution of a piece of bone?

X. Into one of two test-tubes, each containing a water solution of KI, are put a few drops of chlorine-water, then the contents of each tube are treated with starch-paste. What change, if any, did the starch-paste produce in each case, and why this change?

Geology.

I. State what ingredients are added to the soil by the decomposition of the boulders of the field, and name the chief agents that affect it.

II. Name the rock systems absent in Ontario, and the places where such are represented. How do you account for their absence?

III. Give the economic products of the Laurentian rocks, and also those of the Silurian.

IV. Distinguish the fishes of Devonian rocks from those of the Eocene.

V. Draw diagrams representing the following: Valleys of denudation and dislocation, conformability, dip, and a section of a coal bed.

VI. Name the characteristic fossils of the coal period, and outline briefly how coal has been formed.

VII. Give the proofs for believing that the interior of the earth is in a heated condition.

VIII. Upon what rock systems are Whitby, Guelph, Brockville and St. Mary's located?

IX. Into what classes or groups are rocks divided? Define each.

X. Give notes on the life represented in Jurassic rocks.

Zoology.

I. Name the different systems considered in classifying animals, and illustrate.

II. Compare the breathing apparatus in the following: Salmon, butterfly, whale and frog.

III. Give examples of mimicry, hybernation and parasitism.

IV. Describe the changes undergone by an insect in its development. What term has been applied to such changes?

V. Give the characters of teleostean fishes and their distribution in time.

VI. Show in what respect worms become important factors in the formation of soil.

VII. Distinguish between the rodentia and the carnivora.

VIII. Give a list of Canadian wild ducks and examples of birds belonging to the orders scansores, cursores, raptores.

IX. Describe the life history of Tænia solium.

X. What is a coral reef, and where are they found? Mention the different kinds.

Veterinary Anatomy.

I. Describe the Linea alba.

II. Trace the food through the whole length of the alimentary canal, and state the changes, and the causes of the changes, it undergoes in its passage.

III. Describe the peritoneum.

IV. Name the urinary organs of the male, and describe a malpighian body.

V. Describe the stomach of the ox.

VI. State the difference between the liver and its duct of the horse and those of the ox.

VII. Describe the epididymis.

VIII. Describe the heart.

IX. Give a general description of the course of the blood from the time it leaves the left ventricle of the heart until it reaches the right auricle.

X. Describe the membrana nictitans.

Literature.

I. The glories of our blood and state are shadows, not substantial things; there is no armour against fate; Death lays his icy hands on Kings; sceptre and crown must tremble down and in the dust be equal made with the poor crooked scythe and spade.

(a) Write in verse form.

(b) State the kind of metre and rhyme.

(c) Point out and explain the figures of speech.

(d) Explain the terms, "blood," "state," "icy hand."

(e) Write the meaning of the selection in one brief sentence.

II. Quote from the Ode to Duty the stanza commencing:

I, loving freedom . . . . .

(a) Write briefly the meaning of the stanza.

(b) Explain clearly the meaning of each line separately.

(c) Give another title to the poem expressing more fully the central thought.

(d) What can you learn from this poem of Wordworth's character?

III. Which of the three poems do you prefer, The Bard, Ode to Duty, or Battle of the Baltic? Give reasons for your choice.

IV. Quote any one of the twenty-line stanzas from The Bard.

V. Give the name of the author and the name of the poem, to which the following lines. respectively belong:

(a) We carved not a line, and we raised not a stone.

(b) But the tender bloom of heart is gone, ere youth itself be past.

(c) My eyes are dim with childish tears.

(d) Where ignorance is bliss,
'Tis folly to be wise.

(e) He gave to misery all he had, a tear.

(f) The best laid schemes of mice and men,
Gang aft awry.

IV. Write, after Addison, an essay on "Westminster Abbey", or "Improving the Time."

Grammar and Composition.

I. What is case?

How many case forms have nouns and pronouns respectively?

Illustrate your answer.

II. Give the future predictive, and the future interrogative of the verb *strike*.

III. Improve the following sentences, giving reasons for changes made:

(1) My old friend, after having seated himself, and trimmed the boat with his coachman, who, being a very sober man, always serves for ballast on such occasions, we made the best of our way to Fox-hall.

(2) Alarmed by so unusual occurrence, it was resolved to postpone their departure.

(3) Rising from these table-lands, the traveller will see lofty ranges of granite mountains.

(4) Near the town is a deep ravine, containing a wonderful variety of trees, shrubs, and herbs, and which extends eastward nearly four miles.

IV. Explain the difference in the meaning of the terms, "simple sentence" "sentence" and "paragraph".

V. In the Old Colony days, in Plymouth, the land of the Pilgrims,
To and fro in a room of his simple and primitive dwelling,
Clad in doublet and hose, and boots of Cordovan leather,
Strode with a martial air Miles Standish, the Puritan Captain.
Buried in thought he seemed, with his hands behind him, and pausing
Ever and anon to behold his glittering weapons of warfare,
Hanging in shining array along the walls of the chamber,
Cutlass and corselet of steel, and his trusty sword of Damascus,
Curved at the point and inscribed with its mystical Arabic sentence,
While underneath, in a corner, were fowling piece, musket, and matchlock.
Short of stature he was, but strongly built and athletic,
Broad in the shoulders, deep-chested, with muscles and sinews of iron;
Brown as a nut was his face, but his russet beard was already
Flaked with patches of snow, as hedges sometimes in November.

In the above passage:

(1) State the kind of the first sentence.

(2) Make a list of the preposition phrases in the first sentence, stating their kind and telling the words which they modify.

(3) Paraphrase the whole passage.

VI. Write a composition of at least two paragraphs, on *one* of the following subjects:

(1) How to spend a holiday.

(2) The value, to the farmer, of a good education.

Arithmetic.

I. A room is 24 ft. by 20 ft.; in the centre part is a carpet which measures 21 ft. by 17 ft. Find the cost of painting the rest of the floor at 12c. per square yard.

II. Define Linear Foot, Square Foot, Cubic Foot, Broad Foot,. Express in inches the perimeter of a field 4 rods by 40 rods. Find the area in acres.

III. How many board feet in a pile of lumber consisting of :

30 boards each 15 ft. long, 10 in. wide, 1 in. thick.
25 planks " 12 ft. long, 8 in. wide, 2 in. thick.
20 scantlings " 16 ft. long, 3 in. wide, 3 in. thick.

IV. Explain clearly what is meant by Similar Triangles.

If the slope of a hill is 1 in 30, find the height of a hill which is half a mile long.

V. If a tax of $2.30 is paid on a salary of $1,200, $700 being exempt from taxation, find the rate.

VI. A town requires $19,600 to meet expenses for the year ; it pays 2 per cent. for collection. What must be the rate, if the taxable property is assessed at $1,200,000?

VII. How many bushels of turnips are there in a wedge-shaped pit 27 ft. long, 5 ft. wide, 4 ft. high?

VIII. State the rules that should guide you in operations in concrete arithmetic. Give an example of each. Explain clearly how you would find the height of a box, having given the length, breadth, and volume. Use definite quantities in your explanation.

IX. Find the area of a regular twelve-sided figure, inscribed in a circle of 7 ft. radius.

Book-keeping.

I. Define, and write an example of each of the following :

Promissory Note, Receipt, Order, Check, Draft.

II. Explain clearly what is the purpose of each book used in keeping a set of accounts.

III. Journalize the following so as to give a fair statement of actual proceeds,

August 15.

(*a*) Have harvested and threshed from field No. 4, 160 bushels Oats, assumed to be worth 50c. a bushel.

September 15.

(*b*) Have Havested from field No. 5, 150 bushels potatoes, assumed to be worth 40c.

December 15.

(*c*) Sold 40 bushels oats for cash at 40c.

December 30.

(*d*) Sold 20 bushels potatoes for cash at 50c.

IV Write the following in Day Book form :

(*a*) Field No. 6. Dr............	$ 7.00	
To Cash		$ 7.00
(*b*) Farm Produce. Dr...........	200.00	
To field No. 6		200.00
(*c*) Cash. Dr..................	288.00	
Farm Produce. Dr...........	24.00	
To field No. 3		312.00
(*d*) Loss and Gain. Dr..........	89.00	
To Plant		89.00

SECOND YEAR.

Agriculture.

I. Discuss the utility of Dorset Horn Sheep.

II. Explain how Shropshire sheep differ from Oxfords, and note the principal points in the history of each.

III. What points of resemblance and what points of difference are there between Tamworth and Improved Yorkshire hogs.

IV. Account for the popularity of Short Horn cattle.

V. Describe the type of bull which you think could be mated most successfully with the Roan Short Horn Cow, "Laundress," belonging to the College.

VI. To what would you attach importance in selecting:
  (*a*) A Hereford bull;
  (*b*) An Aberdeen-Angus cow?

VII. Briefly mention any facts that have given prominence to the following names:
  Bakewell, Bates, Ellman, Watson, Cruickshank, Tompkins, Duthie, and Moberley.

VIII. Why do so many breeds of live stock continue to exist. Illustrate your answer by reference to the breeds of cattle.

IX. Discuss the present condition of the cattle, sheep, and hog market, accounting for its condition, and deducing any lessons that are to be learned from it.

Judging Cattle.

I. State which of the two cows (Devon and Sussex) you would prefer, as a dam from which to breed beef animals, and state the *principal* reasons for your preference.

II. Criticize the skin, udder, milk, veins, and milk-wells of the grade cow.

III. Criticize the Shorthorn heifer as a representative of the breed.

Horticulture.

I. Give briefly the methods of propagating the following: Grapes, gooseberries, raspberries, strawberries, asparagus and rhubarb.

II. Describe with drawings the renewal system of pruning and trellising grapes.

III. Discuss the subject of cultivation among orchard and garden crops.

IV. Write notes on the farmer's garden, under the following headings: Location, soil, size, shape, cultivation and rotation.

V. In what respect do garden seeds differ? How should these differences affect the time and manner of ordering and sowing such seeds?

VI. Outline the management of a potato crop from the time of planting till harvesting.

VII. Write brief notes on the structure and development of the edible parts of the following: Apple, raspberry, strawberry, carrot, potato, onion, cabbage and cauliflower.

Chemistry.

I. The proportions of the several constituents composing the whole bodies of animals are influenced by growth, fattening and maturity. How do these respectively influence the several constituents composing the animal body?

II. Animal bone, muscle and blood are distinct sources of incombustible constituents. What ash constituents predominate in each? and in about what proportions do they occur?

III. Calculate the loss of phosphoric acid, potash and nitrogen to the farm by the sale (1) of six hundred gallons of milk, (2) of only the cheese of six hundred gallons of milk, and (3) of only the butter of six hundred gallons of milk.

IV. Ptyalin, pepsin and trypsin are unorganized ferments.

(1) In which digestive agents do these respectively occur?

(2) By which digestive agent, or agents, and how, is each nutrient of the food digested?

V. An animal receives abundant food, excessively rich in albuminoids, and equilibrium between protein fed and protein consumption becomes established. What will be the effects, economic and otherwise, of the following changes:

(1) Adding more albuminoids to the ration?

(2) Reducing the absolute amount of albuminoids in the ration?

(3) Rapidly reducing the absolute amount of albuminoids while proportionately increasing the carbo-hydrates?

(4) Changing rapidly to a cheaper ration of an albuminoid ratio of 1 : 8.5.

VI. Give reasons for or against allowing animals free access to water and salt.

VII. It is required to produce upon a given acreage the largest quantity of red clover hay of the highest nutritive value. Mention every necessary precaution, with reasons, to be taken in producing this quantity and quality of hay.

Veterinary Pathology.

I. Give the causes, symptoms and treatment for speedy cut.

II. Name the different kinds of broken knees and give treatment for each kind.

III. Name the diseases of the feet and give treatment for corns.

IV. Give symptoms and treatment for nasal gleet.

V. Give symptoms and treatment for choking in the ox.

VI. Give causes, symptoms and treatment for foul in the feet of cattle.

VII. Give treatment for fistulous withers.

VIII. What is umbilical hernia? Give treatment.

IX. Give treatment for lice on cattle.

X. State the difference between the symptoms of spasmodic colic and those of inflammation af the bowels, and give treatment for the latter.

Literature.

I.

Com'st thou because the *anointed* King is *hence?*
Why, foolish boy, *the King is left behind,*
And *in my loyal bosom lies his power.*
Were I but now *the lord of such hot youth*
As when brave Gaunt, thy father, and myself
Rescued the Black Prince, *that young Mars of men,*
From forth the ranks of many thousand French,
O, then, how quickly should this arm of mine,
Now *prisoner to the palsy*, chastise thee,
And *minister correction to thy fault!*

(*a*) Who is the speaker? To whom, and on what occasion is he speaking?

(*b*) State briefly (not more than ten or twelve lines) the condition of affairs in England at this time.

(*c*) How many persons are mentioned in line 5?

(*d*) Give in simple prose the meaning of the above passage, taking special care to make clear the meaning of the italicized words and phrases.

II. Give a brief account of any *one* of the following scenes, and show how it contributes to the author's purpose in the play:

(*a*) The scene in Wales between the Earl of Salisbury and the Welsh Captain.

(*b*) The scene in the Duke of York's garden, in which the Queen, her ladies and the gardeners appear.

(*c*) The scene in the Duke of York's palace, in which the Duke, the Duchess and Aumerle are represented.

III. In the following passages, give the speaker and the connection; and explain clearly the meaning of the italicized portions:

(*a*) And formally, according to our law,
Depose him in the justice of his cause.

(*b*) The *fly-slow* hours shall not *determinate*
The *dateless limit* of the *dear* exile.

(*c*) From my own windows torn my *household coat.*

(*d*) My father hath a *power;* inquire of him,
And learn *to make a body of a limb.*

(*e*) My *wretchedness unto a row of pins,*
They'll talk of *state;* for every one doth so
Against a change.

(*f*) And put on *sullen* black *incontinent.*

IV. Quote any five consecutive lines of Gaunt's panegyric on England.

V. To illustrate or explain what is each of the following similes used:

(*a*) As seven vials of his sacred blood.

(*b*) . . . . . Like two men
That vow a long and weary pilgrimage.

(*c*) As gentle and as jocund as to jest.

(*d*) . . . . . as sugar
Making the hard way sweet and delectable.

VI. In what different characters does Saladin appear in "The Talisman"? Describe briefly the meeting of the knight of the Leopard with him in each of the characters.

Political Economy.

I. What is the province of Political Economy? Discuss at length.

II. Is a general rise in prices a good or a bad thing for a community?

III. What are the qualities requisite in a substance to render it a good basis for a currency? Apply your conclusions to show whether monometalism or bimetalism would be more serviceable to Canada.

IV. State the leading rules which should be observed in levying taxes. Show where any of these rules are contravened in our system of Municipal, Provincial or Dominion taxation.

V. Discuss the question, whether the great excess of imports over exports is a desirable economic condition.

VI. Should trades unions insist that none of their members take less than a defined minimum wage in each district?

Physics.

NOTE.—Use diagrams as much as possible. Nos. 3, 6, 9, 10, 11, 12, and any three of the remaining six, will constitute a full paper.

I. Describe and explain the action of Bunsen's Filterer.

When running without any attachments, what is the appearance of the water in the lower part of the tube? Explain.

II. Explain the construction and use of the water-hammer.

III. Define specific gravity.

State the law by which you determine the specific gravity of heavy bodies by immersing in water.

Describe Nicholson's Hydrometer, and relate the experiment by which you determine the specific gravity of lead or mercury, giving quantities if possible.

IV. Describe an experiment that you have conducted which illustrates the property of a gas.

V. Explain the action of the ordinary lift pump.

VI. Define Pressure, Friction, Gravitation, Passive Force.

A glass cylinder three and one-half inches in diameter, sixteen inches high, is filled with water. Find the total pressure on the sides and bottom of the cylinder, reckoning air-pressure at fifteen pounds per square inch.

VII. Explain fully the action of the siphon. Upon what does the velocity of flow depend? Will the siphon work in a vacum?

VIII. Show how to find the total pressure at the mouth of an inverted funnel when filled with water.

IX. Define Capularity, Saturation.

Describe fully the action of water and murcury, respectively, when tubes of different bores are inserted into the liquids; and deduce, from the action of water in the tubes, the condition of soil favorable to capillary action.

X. Describe and explain fully the movements of water in the soil from the time when it enters dry soil to the point of saturation, and thence through a drying period. Under what conditions are drains necessary?

XI. Define Mass, Weight, Moment of a Force.

If the slope of a hill is one in fifteen, and the co-efficient of friction is one-twentieth, what is the least force that would be required to move up the hill a load of 3,000?

XII. Write a brief essay on the subject of "Wells," under the heads: kinds, sources, causes of failure.

Drawing.

I. (*a*) Construct a triangle, its sides being three-quarters, one, and one and one-half inches respectively.

(*b*) On each side construct a square.

II. Given a building 34′ x 58′ outside measurement, with walls 1′ thick:

Arrange the building for a stable to contain twenty cows, making two rows of double stalls running lengthwise of the building and facing a central feed passage. Also show feed-room and silo at one end and on the inside of the building, and all necessary doors and windows.

Scale, one-eighth inch to one foot.

Indicate all measurements.

II. Papers Set at Midsummer Examinations, 1895.

FIRST YEAR.

Agriculture.

I. Describe the type of hog which you think is the most profitable to raise.

II. What injurious effects have weeds?
How are weeds distributed?

III. Describe the habits of growth of the following weeds, and name the crops in which they flourish:
Wild flax, mustard, ox-eye daisy, ragweed, and burdock.

IV. How would you treat a field infested with:
(*a*) Couch grass.
(*b*) Canada thistles.

V. Explain the advantages to be derived from following a systematic rotation, and state the principal things to be observed in planning a rotation.

VI. Under the following heads, write notes on the cultivation of millet and corn:
(1) Place in rotation.
(2) Cultivation of soil.
(3) Time and method of sowing.
(4) Quantity of seed per acre.
(5) Proper time to harvest.
(6) Utility.

VII. How would you proceed to improve a clay soil that had been greatly over-cropped, and upon which clover generally winter-killed through being heaved by frost?

Dairying.

I. Give a minimum yearly standard for dairy cows. How would too low a standard of production affect profit and loss in the dairy?

II. Outline the best method of securing a profitable dairy herd for the average farmer.

III. What are the chief points in a good dairy stable? Give the best methods of watering, tying, and keeping cows clean and healthy during the winter.

IV. Outline the present methods of judging cows at exhibitions, and suggest some improvements.

V. Give what you consider would be a profitable ration for milking-cows during the winter. What points should be considered in deciding on a ration?

VI. What combination of grains will give best results in soiling cows? Name a suitable series of soiling crops for Ontario.

VII. Explain the secretion of milk in the udder.

VIII. To what extent would a successful milking machine affect dairying? Describe any that you have seen or heard about, and the results.

IX. Discuss the relative feeding value of skim-milk, butter-milk, and whey: (1) for feeding pigs, (2) for feeding calves.

X. Name the different kinds of cream separators in the new dairy building, and tell which are belt machines and which are turbines.

Poultry.

I. Name the varieties of fowl in the Asiatic class, and state whether they are sitters or non-sitters; also give the color of eggs and the standard weights.

II. State the main points of difference between the Langshans and the Cochins.

III. Give a list of the varieties in the American class, and state whether they are sitters or non-sitters; also give briefly the leading characteristics of this class.

IV. Describe the comb and the plumage of the Golden and the Silver-laced Wyandottes.

(*a*) Give the chief disqualification in the Wyandotte varieties.

V. What are meant by the "hackle," the "primaries," and the "secondaries," "barring," "pencilling," and the "shaft"?

VI. State what you regard as essential to the health and comfort of fowls.

VII. Describe what you consider a suitable roost for hens, giving size, height, and method of construction.

VIII. What should be done to keep hens and hen-house free from vermin?

(*a*) How would you proceed to get rid of lice in poultry buildings?

IX. What would you use for soft food? How would you mix and feed it?

X. Name the two best varieties of hens for the Ontario farmer. Compare them, and state as fully as you can the reasons for your choice.

Bee-Keeping.

I. How many kinds of bees form a colony?

(*a*) Give the sex of each.

(*b*) Give the average lifetime of each.

II. In the keeping of bees and the production of a honey crop,

(*a*) What advantage does the horticulturist in the vicinity derive?

(*b*) How does bee-keeping affect the fertility of the farm? Give reasons for answers in both cases.

III. Give the use of Comb Foundation, Section, and Brood.

IV. In the specimens of Comb Foundation before you, Nos. 1, 2, and 3, give order of preference for Comb Honey, and state reasons for your choice.

V. State briefly rules to observe when handling bees so as to guard against being stung.

VI. Explain the use of the self-hiver, giving its advantages and disadvantages, if any.

VII. As regards the depositing of eggs, how can you tell the difference between the work of a normal queen and fertile workers?

VIII. Give briefly the method of preparing old comb for the wax extractor.

Botany.

I. State all the ways endogenous plants can be distinguished from exogenous.

II. Describe fully the pistil, and distinguish between a vegetable and a fruit. Give five examples of vegetables.

III. Name the different kinds of irregular flowers and the orders in which they are found.

VI. Explain the terms plumule, follicle, pepo, nucellus, parianth and micropyle.

V. Give a list of weeds found in the Cruciferæ, Labiatæ, and Compositæ.

VI. What are the characters of the Rosaceæ and Leguminosæ?

VII. Classify the orders you have studied into groups of economic value, for fruits, flowers, vegetables, and grain.

VIII. How are plants nourished before and after they appear above ground?

IX. Identify the plants before you.

Materia Medica.

I. Define and give an example of (*a*) a caustic, (*b*) a rubefacient, (*c*) an aphrodisiac, (*d*) a tonic, (*e*) a stimulant.

II. Mention the different ways in which medicines can gain access to the circulation in order to establish their actions.

III. Define the following terms: (*a*) infusions, (*b*) decoctions, (*c*) tinctures, (*d*) fomentations, (*e*) drenches.

IV. Give the properties, actions, uses, and doses of Areca nut.

V. Give the actions and uses of Antimony Tartrate (Tartar Emetic) and state why it should not be given in full doses for a long time.

VI. Give the actions and uses of eserine; state how it should be administered, and give the doses.

VII. Give the properties, actions, and uses of cantharides.

VIII. What is quinine? Give its actions.

IX. Give the actions, uses, and doses of Sweet Spirits of Nitre.

X. Give the actions, uses, and doses of the Hyposulphite of Soda.

English Literature.

I. State briefly the *matter*, and explain clearly the *method of treatment*, of "The Art of Book-making."

II. "Formerly there were some *restraints* on this *excessive multiplication*."

Discuss the above in a paragraph, explaining clearly the italicised words.

III. "That *chivalrous courage* which *induces* us to *despise* the *suggestions of prudence* and to *rush in the face* of certain danger, is the *offspring of society*, and produced by *education*."

(*a*) From which essay is the above taken?

(*b*) What particular topic is being discussed?

(*c*) Re-write the above, substituting equivalent expressions for those in italics.

IV. "On a fine autumnal afternoon, Ichabod, in pensive mood, sat enthroned on the lofty stool from which he usually watched all the concerns of his little literary realm. In his hand he swayed a ferule, that sceptre of despotic power; the birch of justice reposed on three nails, behind the throne, a constant terror to evil doers; while on the desk before him might be seen sundry contraband articles, and prohibited weapons, detected upon the persons of idle urchins."

(*a*) Shew, in detail, in what the *humor* of this passage consists.

(*b*) Re-write the passage, substituting for the humorous expressions their literal equivalents.

V. What is meant by the *style* and the *purpose* of an author? Give a general discussion of these (style and purpose) in the case of Irving.

VI.

One summer day I chanced to see
This old man doing all he could
To unearth the root of an old tree
A stump of rotten wood.

(a) Criticize the poetry of this selection.

(b) Relate briefly the story of the poem from which this selection is taken.

(c) Quote the last two lines of the poem and explain their meaning.

VII. (a)

The whispering waves were half asleep,
The clouds were gone to play,
And on the bosom of the deep,
The smile of Heaven lay;
It seemed as if the hour were one
Sent from beyond the skies.
Which scattered from above the sun
A light of Paradise.

(b)

It is a beauteous evening, calm and free;
The holy time is quiet as a nun
Breathless with adoration; the broad sun
Is sinking down in its tranquility;
The gentleness of Heaven is on the sea.

Make a full critical comparison of these two selections.

Grammar.

I. What are auxiliary verbs? Name the principal English auxiliaries.

II. Give the past perfect indicative, and the present and past subjunctive of the verb *be*.

III. Discuss the uses of *shall* and *will*, and *may* and *can*, and apply what you have said in criticizing the following sentences:

(1) If I had saved my money years ago, I would not have been in this condition.

(2) When will you be able to pay me back?

(3) If you work well to-day, you will have a holiday to-morrow.

(4) Can I speak to him when he comes?

IV. Explain how a progressive verb phrase differs from a passive verb phrase, and give an example of each.

V. Explain the different methods of completing incomplete predicates, giving an example of each method.

VI. Punctuate the following sentences, and insert capitals where necessary, giving reasons:

(1) And nathan said unto david thou art the man.

(2) Prosperity makes friends adversity tries them.

(3) The storm being over he departed.

(4) Dear gentle patient noble nell was dead.

VII. Analyze fully the following sentences:

(1) Such as I have give I unto thee.

(2) He said that the storm had destroyed the trees which he had planted.

VIII. Correct, giving reasons, any errors in the following:

(1) It is me that will have to suffer.

(2) His diet was scanty, his prayers long and fervent.

(3) A fondness for show is, of all other follies, the most vain.

(4) The fact of me being a stranger to him, does not justify his conduct.

(5) I have never seen Major Cartwright, much less enjoy the honor of his acquaintance.

Composition.

I. Write an essay on any *one* of the following subjects :

(*a*) A sound mind in a healthy body.

(*b*) Advantages of education.

(*c*) Pleasures of travel.

(*d*) The blessing of friends.

(*e*) The beauties of nature.

(*f*) Ambition.

Marks will be given for, writing, use of capitals, spelling, punctuation, vocabulary, sentence structure, paragraph structure, plan of essay, value and originality of substance.

Arithmetic.

I. A mixture of oats and barley, forty-two bushels, weighs 1,806 pounds. How many bushels of each in the mixture ?
Give two methods of solution.

II. Determine $(1.05)^{25}$, correct to four decimal places.

III. What sum, deposited each year for twenty years, will amount, at the end of that time, to $2,000, money being worth five per cent ? And hence if a premium of eighty dollars a year is paid for a policy of $2,000, twenty-year endowment, how much per year is paid simply for insurance ?

IV. How many bushels of corn and peas must be mixed with seven bushels of barley, so that the mixture may average fifty-three pounds per bushel ?
Integral solution required.

V. Prove the following, using the number 478 as an example :
The remainder obtained on dividing any number by nine is the same as that obtained on dividing the sum of the digits composing that number by nine.
Multiply 98,764.35 by 7,060,805 and test your results by casting out nines.

VI. A rope ninety-eight feet long has its whole length wound round a building twenty-one feet square. How far will a person walk in unwinding the rope until it is straight, keeping it tight all the time ?

VII. The sides of a right-angled triangle are fifteen, twenty, twenty-five feet, respectively ; a perpendicular is drawn from the right angle upon the hypotenuse ; find (1) the length of this perpendicular, and (2) the length of the segments into which the perpendicular divides the hypotenuse.

SECOND YEAR.

Agriculture.

I. Write brief notes on the characteristics and utility of Holstein-Friesian cattle.

II. Explain wherein the treatment of a heifer, intended for dairying purposes, differs from that of one intended for beef purposes.

III. Note briefly the principal points in the care of a young sow from the time she is weaned until she has had her first litter of pigs.

IV. Enumerate as briefly as possible the principal things to be observed in the care of a flock of ewes from the time they are bred until after the lambs have been weaned.

V. Which of the cross-bred hogs in the farm piggery do you prefer ? State fully the reasons for your preference, and compare the hogs in question with the other cross-breds which are in the same building.

VI. (*a*) Comment on the value of a pedigree.

(*b*) Why use pedigreed sires?

VII. Explain the importance of heredity and variation in stock breeding.

VIII. Write notes on the growing and selection of seed grain.

Dairying.

I. Indicate how a handy table may be constructed for reckoning fat values at a cheese factory or creamery.

II. At the Guelph Station dairy in the month of September, 1894, 1,800 pounds of milk, averaging four per cent. fat, produced $179\frac{3}{4}$ pounds cheese; the same quantity (1,800 pounds) of milk, averaging three per cent. fat, produced $152\frac{3}{4}$ pounds cheese. If this milk had been supplied by two patrons of a factory and the cheese netted ten cents per pound, what amounts of money would each receive if the milk was "pooled"?

(1) According to weight of milk.
(2) " " per cent. of fat in milk.
(3) " " per cent. of fat + two to fat readings.
(4) " " weight of cheese.

III. Indicate the chief features of the McLennan Bill. State its origin and probable effects if it becomes law.

IV. What is meant by the term "half-pound, up-beam weight"? What gave rise to this rule? What objection have factory men to complying?

V. When is a curd ready to cut? Describe the process.

VI. What is the most important quality in a cheddar cheese? How may it be injured?

VII. Give the temperature for "setting," "cooking," "salting," "putting to press," and for the curing room in cheddar cheese-making.

VIII. State the advantages and disadvantages of the separator creamery.

IX. Give a list of cream separators on the market, with prices and names of the manufacturers. Which is the best separator? What are the causes for the bowl of the separator vibrating?

Poultry.

I. Name the varieties of fowl in the Mediterranean class, giving briefly their leading characteristics; and state whether they are sitters or non-sitters.

II. Describe the comb and color of plumage of Light Brahmas.

III. What is meant by the following technical terms:

"Fluff," "cushion," "duck-foot," "wattles," "crest," "breed," "carriage," "crop," "hock"?

IV. Describe a "rose," "single" and "pea" comb.

V. Give some of the disqualifications for the following breeds: Rocks, Langshans, Silver Laced Wyandottes, and White Javas.

VI. Give the standard weight of the Wyandottes.

VII. Before building a poultry house, what is the first thing to be considered; also what size would you build to accommodate fifty hens?

VIII. Name three varieties of fowl that you would select for winter layers; also three varieties for summer layers.

IX. State what you would use for soft food. How would you mix, and when would you feed it?

X. Give periods of incubation of hens, ducks and geese.

XI. On what day during incubation should you test eggs? How will a fertile egg appear on that day; also an unfertile one?

Bee-keeping.

I. Give the length of time it takes, under normal conditions, for the drone, workers and queen to develop from the depositing of the egg to the winged insect, mentioning the time of each in the egg stage.

II. State the various conditions under which the bees will build queen cells.

III. In the specimens before you, Nos. 1, 2 and 3,

(*a*) Which contain worker comb?

(*b*) Which contain drone comb?

IV. State briefly how excessive swarming can be prevented.

V. In the production of first-class extracted honey,

(*a*) What condition should the honey be in before extracted?

(*b*) How can you tell when this condition exists?

VI. In the production of comb honey, state briefly the leading points to be observed in producing a good article with the least labor.

VII. How can you distinguish "chilled brood" from "foul brood"?

Practical Chemistry.

I. Give one characteristic test for each of the following: Iron, aluminium, phosphoric acid, nitric acid and ammonia.

II. Name the group reagents, the bases precipitated by each reagent, and the conditions under which each group reagent precipitates its respective group of bases.

III. A certain salt, soluble in water, gives a white precipitate with a solution of lead nitrate, which precipitate dissolves in an excess of sodium hydroxide; the same salt gives no precipitate with the group reagents; but by treating an alkaline solution with a few drops of sodium phosphate solution, a white granular precipitate occurs. Name the salt.

IV. Does sample A contain phosphoric acid?

(*a*) Would you expect ammonia to escape from manure marked B?

(*b*) Is any ammonia escaping?

VI. Are nitrates washing from soil marked C?

Agricultural Chemistry.

I. (*a*) Name the physical conditions necessary to seed germination.

(*b*) Indicate, concisely, the slope of land, the class of soil, and the preparation of seed bed (in clay loam) most favorable for the germination of spring wheat.

II. "Carbonate of lime is beneficial to the soil in many ways." Discuss this. Would field No. 14, or any part of it, have been benefitted by liming before sowing with wheat and seeding down this spring? Support your answer with reasons.

III. (*a*) Give, approximately, the average percentage in farmyard manure of the following: Nitrogen, potash and phosphoric acid.

(*b*) In what proportion does each occur in the liquid excrement?

(*c*) Briefly state how to care for and apply farmyard manure to turnip land so as to obtain from its use the maximum amount of good.

IV. (*a*) Give the chemistry of the preparation of superphosphate from mineral of phosphate.

(*b*) Is it a fertilizer that can be advantageously used upon the farm, and, if so, upon what crops?

V. Name the leading characteristics of farm crops, determining their order in a rotation.

VI. (*a*) Briefly outline the fertilizer experiments with oats being conducted in the experimental department.

(*b*) Note the observations you have made this season regarding the effect of the fertilizers in this experiment.

Botany.

I. Describe fully the process of fertilization, and state how nature prevents self-fertilization.

II. Give the characters of the orders *Polygonaceæ* and *Scrophulariaceæ*, and give examples of weeds in each.

III. Draw diagrams illustrating open and closed fibro-vascular bundles, and mention how they are arranged in roots and stems.

IV. Name orders containing poisonous plants, and give examples in each order.

V. What causes the circulation of fluids in plants?

VI. Distinguish a grass from a sedge, and give the characters of the *Gramineæ*.

VII. To what orders do the following plants belong: Bind-weed, bloodroot, ginseng, tobacco, sorrel, pigweed, redroot and false flax?

VIII. Explain what is meant by the plan and formula of a flower, and give such of a Fuchsia and Trillium.

Horticulture.

I. How and when would you prune the following: Apple, pear, currant raspberry?

II. (1) Name the kinds of fruit growing here, and mention the prospect for this year's crop in each.

(2) How may the injury from frosts be first detected in the blossoms and newly formed fruits?

III. (1) Describe what you consider a complete outfit for spraying.

(2) How would you prepare a "stock solution" of the Bordeaux mixture?

IV. Give a list of the implements of most practical use in a vegetable garden.

V. (1) Write notes on the potting of house plants.

(1) Give a list of the plants you would select in making up a collection of two dozen.

VI. (1) Mention the authors and books you would recommend on the following subjects: (*a*) Fruit growing generally, (*b*) small fruits, (*c*) strawberry culture, (*d*) vegetable gardening, (*e*) potato culture, (*f*) floriculture.

(2) Name two of the leading horticultural periodicals.

VII. Identify the specimens before you, giving as far as possible the botanical and common names.

Veterinary Obstetrics.

I. Name, and define the four great functions of the generative system.

II. Name and describe the arrangement of the fœtal membranes.

III. What is abortion. Give the preventive treatment where abortion is indicated or suspected.

IV. In case of difficult parturition in which the whole four feet of the fœtus are presented, how would you proceed to deliver?

V. Give the symptons and treatment for parturient laminitis.

English Literature.

I. Mated with a squalid savage—what to me were *sun or clime?*
I the *heir of all the ages*, in the *foremost files of time*—
I that rather held it better man should perish one by one,
Than that earth *should stand at gaze* like *Joshua's moon in Ajalon?*
Not in vain the *distance beacons*, Forward, forward let us range.
Let the great world spin forever down the ringing grooves of change.
Thro' the *shadow of the globe* we sweep into the *younger day:*
Better *fifty years of Europe* than a *cycle of Cathay.*

(*a*) Give in simple prose the subject of this extract, taking special care to make clear the meaning of the italicised passages.

(*b*) State fully the connection in which the extract occurs.

II. Give briefly the force of the following:—*Squalid, files, at gaze, beacons, range, spin, ringing, sweep.*

III. Ploughmen, shepherds, have I found, and more than once, and still could find,
Sons of God, and kings of men, in utter holiness of mind.

Truthful, trusting, looking upward to the practised hustings-liar,
So the Higher wields the Lower, while Lower is the Higher.

Here and there a cotter's babe is royal-born by right divine;
Here and there my lord is lower than his oxen or his swine.

Give the substance of this in your own words, and state its connection in the poem.

IV. Explain the meaning of the following passages, and state the connection in which each occurs:

(*a*) Puppet to a father's threat, and servile to a shrewish tongue.

(*b*) Summer isles of Eden lying in dark purple spheres of sea.

(*c*) Celtic Demos rose a Demon, shrieked and slaked the light in blood.

(*d*) Let the trampled serpent show you that you have not lived in vain.

(*e*) Sweet St. Francis of Assisi would that he were here again.

V. What are the following similes and metaphors used to illustrate or explain:

(*a*) . . . . . like a swarm of fireflies tangled in a silver braid.

(*b*) . . . . . as a lion creeping nigher
Glares at one that nods and winks behind a slowly dying fire.

(*c*) Baby fingers, waxen touches, press me from the mother's breast.

(*d*) Fires that shook me once, but now to silent ashes fallen away.

(*e*) Strowing balm, or shedding poisons in the fountains of the will.

VI. (*a*) State, with reasons for your answer, to what class of poems "Locksley Hall" belongs.

(*b*) What is meant by a *Dramatic Monologue*? Discuss briefly the appropriateness of the term as applied to "Locksley Hall."

VII. Explain clearly the different points of view in the two poems, and show the appropriateness of each both to the speaker and to the time.

Grammar.

I. Give the principal parts of *cut, sat, lain, hang, set, bear, swim,* and *went.*

II. Write the predictive, the permissive, and the interrogative future of *go.*

III. State concisely the auxiliary uses of *have* and *be*.

IV. Give the participles and the infinitive forms of *strike*, and state the uses of each.

V. Divide the following passage into simple sentences, stating the kind and connection of each, and parse the words italicised: "A pronoun, which almost never takes an attributive adjective before it, has an appositive adjective or noun *added* to it *just* as frequently as a noun has."

VI. Punctuate the following sentences and give the rule for each point used:

(*a*) Dashes marks of exclamation interrogation and quotation lend liveliness to composition they may be used to excess.

(*b*) Judged by his appearance he is fully forty years old.

(*c*) The subject is treated of under three heads as follows first the history of the tariff second the present condition of the tariff system third the features of the present system that are capable of improvement.

(*d*) *Can* indicates possibility as I can read.

VII. Correct or improve the following sentences where necessary, giving the reason for every change which you make:

(1) By this time the whole superstructure of the old family mansion was wrapped in the devouring element.

(2) I was surprised at him blushing.

(3) He is an old friend of us.

(4) Hoping to hear from you soon, believe me very truly yours.

(5) Thus much is certain.

(6) Consider everyone's circumstances, healths, and abilities.

(7) Try and do it as soon as possible.

(8) I will go and lay down.

(9) Him absent, we are unable to proceed.

(10) It's us that will have to pay the penalty.

VIII. Distinguish—

1 { An able and intelligent friend.
An able and an intelligent friend.

2 { He was happier than any person in the house.
He was happier than any other person in the house.

3 { Few men have been more honored.
A few men have been more honored.

Physics.

I. Describe the construction and explain the use of the theodolite.

II. Define Latent Heat of Evaporation, and describe an experiment by which you determine it; the apparatus being such as would give an accurate result.

Explain how the study of Latent Heat emphasizes the importance of draining

III. Describe the action of water at 4° Centigrade and discuss fully the economic importance of the phenomenon.

IV. Define Specific Heat.

A cavity is made in a block of ice; into this is introduced a lump of lead, weighing 500 grams, which has been heated to 100° in steam; the cavity is then capped with ice and the lead allowed to remain until cooled to zero. The cavity is then wiped dry with a sponge. The weight of the water is found to be 20 grams.

(1) State how this weight is found.

(2) State the object of the experiment.

(3) Determine the result of the experiment.

V. Describe the process of constructing a delicate Centigrade thermometer. Reduce 40° C. to F.

VI. State the thermal phenomenon in connection with each of the following, and give an example of each: (*a*) A gas is allowed to expand without the addition of heat. (*b*) A gas is suddenly compressed. (*c*) A solid is liquified without applying heat. (*d*) A liquid is evaporated without applying heat.

VII. Describe and explain the experiment known as "regelation."

VIII. Explain, in a general way, with reference to principles, the arc light and the incandescent light.

Road Making.

I. Explain the different systems of drainage of roadbed, location, capacity, depth, grade or fall to outlet, and best material to use for underdrains.

II. How should a roadbed be prepared (*a*) for earth roads, (*b*) for gravel or stone?

III. In constructing a gravel or stone road, give width and depth of material necessary, and explain process of applying the material.

VI. Explain best methods of maintaining (*a*) earth roads (*b*) gravel and stone roads.

Practical Mechanics.

I. Explain the essential points of a well-trimmed ripping saw.

II. Give the points of difference between a cross-cutting and ripping saw; explain the manner of filing the same and state the reasons for the difference.

III. How should panel saws for general work be filed?

IV. Give the number and names of the bench planes.

V. What plane is used first on rough surfaces? State the condition of the edge.

VI. Give the grinding angle of the basil of all planes.

VII. What is the use of the double iron or cover in planes, and how should it be set for smooth planing?

VIII. Name the tables or rules on the framing square.

IX. What numbers on blade and tongue of the square should we apply to find the down and level cuts for a common rafter?

X. Lay a square on the paper, the figure six on the blade at the edge, and figure seven on the tongue; and the blade will then be at an angle of fifty degrees. With this line as the given angle, construct the diagram that will give the three angles required in making a hopper.

Steam Engine.

I. How would you find the water level when your boiler is foaming?

II. Where would you put a steam gauge?

III. Why is a pet-cock put under the steam gauge?

IV. What is a steam gauge for?

V. If the steam gauge were out of order, what would you be governed by?

VI. Why is it necessary to have governors on an engine? Explain their working fully.

VII. What is the main throttle used for?

CLASS LIS

Agriculture.

CLASS I.

1 { Devitt, I. I.
Gadd, T. T.
3 { Higginson, O. G.
Kewley, H. D.
5 Bell, T. C.

CLASS II.

1 { Christy, E. V.
Ratcliffe, A. G.
3 { Hodgetts, P. C.
Reinke, B. F.
5 Roblin, D.
6 { Kennedy, A.
Wilson, A. F.
8 { Bard, A. L.
Gamble, Wm.
McKenzie, M. A.
11 Oastler, J. R.
12 Morgan, G. W.
13 Yuill, J. J.
14 Nasmith, Jno.
15 { Allison, D. H.
Benning, Jas.
Cunningham, J.

CLASS III.

1 { Cousins, R. J.
Guy, J. T.
3 { Harkness, R. E. L.
Leavitt, A. S.
Ross, M.
Shields, W. M.
Sissons, F. J. S.
8 { Campbell, A.
Charlton, E. S.
Ross, N.
11 { Findlay, J.
Stoddart, R. L.
13 Macdonald, A. W.
14 { Hutton, H.
Irving, J. C.
16 Fierheller, E.
17 { Evans, A. R.
Leggatt, Jas.
Leishman, J. E. B.
Robertson, G.
21 { Brickwell, J. R.
Parker, F. A.
23 { Harris, M. E.
McLaughlin, P.
25 Black, G. W.
26 Robertson, T. H.
27 Moffatt, T.
28 McDonald, J. D.
29 Bourassa, H.
30 Gilbert, S.
31 Gibson, T. E. F.

Arms, W. L.
Mather, J. W.
Waddy, P. H.
Strong, A.
Burk, H. W.
Gooch, G. E.

APPENDIX IV.

CLASS LISTS—EASTER EXAMINATIONS, 1895—FIRST YEAR.

Agriculture.

Class I.

1 Devitt, I. I.
Gadd, T. T.
3 Higginson, O. G.
Kewley, H. D.
5 Bell, T. C.

Class II.

1 Christy, E. V.
Ratcliffe, A. G.
3 Hodgetts, P. C.
Reinke, B. F.
5 Roblin, D.
6 Kennedy, A.
Wilson, A. F.
8 Bard, A. L.
Gamble, Wm.
McKenzie, M. A.
11 Oastler, J. R.
12 Morgan, G. W.
13 Yuill, J. J.
14 Nasmith, Jno.
15 Allison, D. H.
Benning, Jas.
Cunningham, J.

Class III.

1 Cousins, R. J.
Guy, J. T.
3 Harkness, R. E. L.
Leavitt, A. S.
Ross, M.
Shields, W. M.
Sissons, F. J. S.
8 Campbell, A.
Charlton, E. S.
Ross, N.
11 Findlay, J.
Stoddart, R. L.
13 Macdonald, A. W.
14 Hutton, H.
Irving, J. C.
16 Fierheller, E.
17 Evans, A. R.
Leggatt, Jas.
Leishman, J. E. B.
Robertson, G.
21 Brickwell, J. R.
Parker, F. A.
23 Harris, M. E.
McLaughlin, P.
25 Black, G. W.
26 Robertson, T. H.
27 Moffatt, T.
28 McDonald, J. D.
29 Bourassa, H.
30 Gilbert, S.
31 Gibson, T. E. F.

Arms, W. L.
Mather, J. W.
Waddy, P. H.
Strong, A.
Burk, H. W.
Gooch, G. E.

Chemistry.

Class I.

1 Higginson.
2 Gamble.

Class II.

1 Kewley.
2 Shields.
3 Hodgetts.
4 Leavitt.
5 Stoddart.
6 Devitt.
7 Parker.
8 McKenzie.
9 Cunningham.
Leggatt.
Yuill.

Class III.

1 Bard.
Roblin.
Ross, N.
4 Reinke.
5 Evans.
Ratcliffe.
7 Kennedy.
Nasmith.
Oastler.
10 Christy.
11 Gadd.
12 Cousins.
Guy.
Ross, M.
15 Bell.
Robertson, T.H.
17 Harris.
18 Brickwell.
Charlton.
20 Fierheller.
Morgan.
22 Hulton.
23 Sissons.
24 Wilson.
25 Benning.
26 Findlay.

Campbell.
Allison.
Harkness.
Robertson, G.
Macdonald, A.
Black.
Irving.
Mather.
McDonald, J.D.
McLaughlin.
Leishman.
Arms.
Bourassa.
Burk.
Gibson.
Gilbert.
Moffatt.
Strong.
Waddy.

Geology.

Class I.

1 Hodgetts.
2 Higginson.

Class II.

1 Kewley.
2 Gamble.
3 Shields.
4 Nasmith.
5 Guy.
6 Bard.
Charlton.
Oastler.
Reinke.
10 Christy.
Wilson.
12 Parker.
13 Devitt.
Ratcliffe.
15 Stoddart.
16 Leggatt.
McKenzie.

Class III.

1 Benning.
2 Gadd.
Roblin.
4 Cunningham.
Ross, M.
6 Bell.
7 Evans.
8 Leavitt.
Morgan.
Ross, N.
11 Yuill.
12 Sissons.
13 Findlay.
14 Kennedy.
15 Brickwell.
16 Irving.
Robertson, T.H.
18 Black.
Macdonald, A.
McLaughlin.
21 Cousins.
Fierheller.
Robertson, G.
24 Allison.
Harkness.
26 Campbell.
Hutton.
Mather.
29 Leishman.

Bourassa.
Harris.
Arms.
McDonald, J.D.
Gibson.
Burk.
Waddy.
Strong.
Gilbert.
Gooch.
Moffat.

Zoology.

Class I.

1 Hodgetts.

Class II.

1 Devitt.
2 Oastler.
3 Higginson.
4 Nasmith.
5 Parker.
Ratcliffe.
7 Gamble.
Shields.
Kewley.
10 Guy.
Ross, N.
12 Charlton.
13 Ross, M.

Class III.

1 Reinke.
Yuill.
3 Bard.
Roblin.
5 Gadd.
6 Robertson, T.H.
Benning.
8 Christy.
Leggatt.
Morgan.
11 Bell.
Wilson, A. F.
13 Cunningham.
McKenzie.
15 Leavitt.
16 Brickwell.
Robertson, G.
18 Evans.
Findlay.
Kennedy.
Stoddart.
22 Cousins.
23 Fierheller.
24 Allison.
Campbell.
Harkness.
Leishman.
27 Harris.
28 Sissons.
29 Bourassa.
Hutton.
McDonald, J. D.
Macdonald, A.
33 McLaughlin.
34 Mather.

Black.
Irving.
Gibson.
Waddy.
Arms.
Moffat.
Gilbert.
Burk.
Pugh.
Strong.

Veterinary Anatomy.

Class I.

1 Reinke.

Class II.

1 Gamble.
2 Guy.
3 Higginson.
4 Christy.
5 Devitt.
Ross, M.
7 Wilson.

Class III.

1 Hodgetts.
2 Oastler.
3 Kewley.
4 Shields.
5 Gadd.
6 Bard.
7 Nasmith.
Roblin.
9 Cousins.
Kennedy.
McKenzie.
12 Evans.
13 Ratcliffe.
Ross, M.
15 Charlton.
Yuill.
17 Sissons.
18 Benning.
Stoddart.
20 Leggatt.
21 Leavitt.
Morgan.
23 Macdonald, A.
24 Bell.
25 Black.
Parker.
27 Allison.
Campbell.
Cunningham.
30 Hutton.
Findlay.

Bourassa.
Harkness.
Moffatt.
Robertson, G.
McDonald, J.D.
Fierheller.
Irving.
Gilbert.
Brickwell.
Mather.
Leishman.
Waddy.
Arms.
Gibson.
Robertson, T.H.
Burk.
McLaughlin.
Harris.
Gooch.
Strong.

CLASS LISTS—EASTER EXAMINATIONS, 1895 (*Continued*)—FIRST YEAR.

Literature.

CLASS I.

1 Devitt.
2 Hodgetts.

CLASS II.

1 Craig.
2 Guy.
Parker.
4 Oastler.
Shields.
6 Nasmith.
7 Higginson.
Kennedy.
9 McKenzie.

CLASS III.

1 Reinke.
2 Wilson.
3 Ratcliffe.
4 Bard.
5 Gamble.
Kewley.
7 Gadd.
8 Roblin.
9 Bell.
10 Mather.
Sissons.
12 Charlton.
Cousins.
Morgan.
Macdonald, A.
16 Yuill
17 Leggatt
Leishman.
19 Brickwell.
20 Cunningham.
Leavitt.
McLaughlin.
Robertson, T. H.
24 Ross, M.
25 Allison.
26 Benning.
Irving.
27 Robertson, G.
28 Christy.
Findlay.
Ross, N.
31 Campbell.
32 Hutton.
33 Evans.

Stoddart.
McDonald, J. D.
Black.
Harkness.
Harris.
Gibson.
Fierheller.
Moffatt.
Bourassa.
Arms.
Waddy.
Gilbert.
Burk.
Strong.

Grammar and Composition.

CLASS I.

1 Hodgetts.
2 Devitt.

CLASS II.

1 Guy.
2 Morgan.
Parker.
4 Kewley.
5 Craig, R. D.
McKenzie.
7 Higginson.
8 Nasmith.

CLASS III.

1 Gibson.
2 Cousins.
Sissons.
4 Robertson, G.
Roblin.
6 Bell.
7 Reinke.
8 Oastler.
Shields.
Wilson, A. F.
11 Christy.
Ross, M.
13 Harris.
14 Ratcliffe.
Kennedy.
Leggatt.
17 Moffatt.
McDonald, J. D.
19 Benning.
Bard.
Brickwell.
Robertson, T. H.
23 Charlton.
24 Allison.
Leavitt.
Leishman.
27 Mather.
28 Findlay.
29 Gamble.
30 Gadd.
31 Cunningham.
Evans.
Yuill.
34 Hutton.
Ross, N.

Harkness.
Stoddart.
Black.
Fierheller.
Irving.
Macdonald.
McLaughlin.
Bourassa.
Gilbert.
Arms.
Burk.
Cambell.
Gooch.
Waddy.
Strong.

Arithmetic.

CLASS I.

1 McKenzie.
2 Devitt.
3 Hodgetts.

CLASS II.

1 Wilson.
2 Higginson.
Nasmith.
4 Craig.
Kennedy.
Ratcliffe.
7 Bell.
Guy.
9 Gadd.

CLASS III.

1 Yuill.
2 Shields.
3 Parker.
Kewley.
5 Evans.
6 Bard.
Charlton.
8 Christy.
9 Leavitt.
10 Cousins.
Reinke.
12 Gamble.
13 Harris.
14 Cunningham.
Roblin.
16 Morgan.
Oastler.
18 Allison.
Hutton.
Mather.
21 Robertson, T. H.
22 Ross, M.
23 Arms.
Ross, N.
25 Irving.
26 Harkness.
27 Benning.
Findlay.
29 Sissons.
30 Robertson, G.
31 Leggatt.
McDonald, J. D.

Bourassa.
McLaughlin.
Brickwell.
Black.
Fierheller.
Macdonald, A.
Burk.
Moffatt.
Gibson.
Stoddart.
Gamble.
Gooch.
Strong.
Gilbert.
Waddy.

Bookkeeping.

CLASS I.

1 Devitt.
2 Hodgetts.
3 Shields.
4 Guy.
5 Ratcliffe.

CLASS II.

1 Nasmith.
Hutton.
3 Bell.
Craig.
5 Bourassa.
Kewley.
7 Christy.
Higginson.
McKenzie.
10 Parker.
11 Reinke.
Sissons.
13 Charlton.
Robertson, T. H.
15 Yuill.

CLASS III.

1 Roblin.
2 Cunningham.
Gadd.
McDonald, J. D.
5 Cousins.
Oastler.
7 Brickwell.
Wilson.
9 Leishman.
10 Bard.
Gamble.
Ross, M.
Ross, N.
14 Benning.
Leavitt.
Morgan.
17 Allison.
18 Robertson, G.
19 Findlay.
20 Harkness.
21 Harris.
22 Kennedy.
23 Black.
Evans.
25 Leggatt.
26 Macdonald, A.
Stoddart.
28 Campbell.
Irving.
Moffatt.
31 Arms.
Fierheller.
Mather.

McLaughlin.
Gibson.
Gilbert.
Burk.
Strong.
Waddy.

Proficiency.

1 Hodgetts.
2 Devitt.
3 Higginson.
4 Guy.
5 Kewley.
6 Shields.
7 McKenzie.
8 Nasmith.
9 Reinke.
10 Gamble.
11 Ratcliffe.
12 Parker.
13 Oastler.
14 Wilson.
15 Christy.
16 Bard.
17 Roblin.
18 Gadd.
19 Bell.
20 Charlton.
Yuill.
22 Kennedy.
23 Ross, M.
24 Morgan.
25 Cousins.
26 Leavitt.
27 Ross, N.
28 Cunningham.
29 Sissons.
30 Leggatt.
31 Benning.
32 Evans.
33 Hutton.
34 Findlay.

CLASS LISTS—EASTER EXAMINATIONS, 1895 (*Continued*)—SECOND YEAR.

Agriculture.

CLASS I.

1 Clark, J. F.
2 Lang, L. W.
3 Paterson, T. F.
4 Butler, W. E.

CLASS II.

1 Knight, J. W.
2 McCallan, E. A.
3 Ponting, E. A.
4 { McPhail, J. D.
McGillivray, J. W.
6 Whetter, J. R.
7 Chadsey, G. E.
8 Dunn, E.
9 Campbell, W. G.

CLASS III.

1 Thomson, J. W.
2 { Tye, C. W.
Kipp, A.
4 { Cass, L. H.
Taylor, W. H.
6 Smith, G. A.
7 Smith, P. B.
8 McCullough, H. A.
9 Wilson, N. F.
10 Wilson, A. C.
11 Maclennan, J. F.
12 Payne, G. Y.
13 Maconachie, G. R. B.
14 McDougall, D. H.
15 Farrer, J. W.
16 Edelsten, E. J. M.

—

Macpherson, D. J.
Smith, C. F.

Judging Cattle.

CLASS I.

1 Ponting.
2 Lang.
3 Paterson.
4 { Clark.
McPhail.
6 Whetter.
7 Knight.
8 { Taylor.
Tye.
10 Dunn.
11 Wilson, A. C.
12 { Chadsey.
McCallan.

CLASS II.

1 Butler.
2 McCullough.
3 Payne.
4 Smith, P. B.
5 Cass.
6 Campbell.

CLASS III.

1 Kipp.
2 { Macpherson.
Thompson.
4 { Maclennan.
McDougall.
6 Maconachie.
7 Smith, G. A.
8 Edelsten.
9 McGillivray.
10 Wilson, N. F.
11 Farrer.

—

Smith, C. F.

Judging Sheep.

CLASS I.

1 Ponting.
2 McPhail.
3 Dunn.
4 Paterson.
5 Lang.
6 Clark.
7 { Campbell.
Kipp.
9 Knight.

CLASS II.

1 Whetter.
2 Cass.
3 Thompson.
4 { Butler.
Taylor.
6 Tye.
7 McCullough.
8 Wilson, A. C.
9 McCallan.
10 Chadsey.

CLASS III.

1 McGillivray.
2 Macpherson.
3 Smith, P. B.
4 Wilson, N. F.
5 Payne.
6 Edelsten.
7 Farrer.
8 { McDougall.
Smith, G. A.
10 Maclennan.
11 Maconachie.

—

Smith, C. F.

Horticulture.

CLASS I.

1 Clark.
2 Paterson.
3 Lang.
4 McCallan.
5 Dunn.

CLASS II.

1 Butler.
2 Cass.
3 { Chadsey.
Tye.
5 Knight.
6 Smith, G. A.
7 { Campbell.
McCullough.

CLASS III.

1 Smith, P. B.
2 Kipp.
3 Maconachie.
4 Edelsten.
5 McPhail.
6 McGillivray.
7 Maclennan.
8 { Thompson.
Wilson, N. F.
10 McDougall.
11 Ponting.
12 { Taylor.
Wilson, A. C.
14 Whetter.
15 Payne.
16 Farrer.

—

Macpherson.
Smith, C. F.

Agricultural Chemistry.

CLASS I.

1 Clark.

CLASS II.

1 Paterson.
2 Butler.
3 Lang.

CLASS III.

1 Tye.
2 Knight.
3 McCallan.
4 Kipp.
5 { Cass.
Thompson.
7 Wilson, N. F.
8 { Campbell.
Chadsey.
10 McPhail.
11 McGillivray.
12 McCullough.
13 Dunn.
14 McDougall.
15 Maconachie.
16 Edelsten.
17 Taylor.
18 Smith, G. A.
19 Wilson, A. C.
20 { Smith.
Payne.
Whetter.

—

Maclennan.
Ponting.
Macpherson.
Farrer.

Veterinary Pathology.

CLASS I.

1 Clark.
2 Lang.
3 Paterson.

CLASS II.

1 Knight.
2 Chadsey.
3 Campbell.
4 Dunn.
5 Wilson, N. F.
6 { McCallan.
Smith, P. B.

CLASS III.

1 McCullough.
2 Smith, G. A.
3 Taylor.
4 Butler.
5 McPhail.
6 Whetter.
7 Tye.
8 { McGillivray.
Kipp.
10 Maconachie.
11 McDougall.
12 Cass.
13 { Ponting.
Wilson, A. C.
15 Maclennan.
16 Thompson.
17 Payne.
18 Edelsten.

—

Smith, C. F.
Macpherson.
Farrer.

CLASS LISTS—EASTER EXAMINATIONS, 1895 (*Continued*)—SECOND YEAR.

Practical Horse.

CLASS I.

1 Clark.

CLASS II.

1 Whetter.
2 Knight.
3 Smith, P. B.
4 { Kipp.
   Paterson.

CLASS III.

1 { Thompson.
   McPhail.
3 Cass.
4 Lang.
5 { Campbell.
   Chadsey.
   McCallan.
   Ponting.
9 Taylor.
10 Smith, G. A.
11 Edelsten.
12 Dunn.
13 Wilson, N. F.
14 { Butler.
   Wilson, A. C.
16 { Maconachie.
   McGillivray.
   McCullough.
   Tye.
   Payne.
   McDougall.
22 { Maclennan.
   Macpherson.

Farrer.

Literature.

CLASS I.

1 Clark.
2 Lang.
3 Maconachie.

CLASS II.

1 Smith.
2 Edelsten.
3 Paterson.
4 Knight.
5 Smith, G. A.
6 Thompson.
7 { Campbell.
   McCallan.
9 { McCullough.
   Tye.
11 Butler.
12 Cass.
13 Wilson, A. C.

CLASS III.

1 Kipp.
2 McGillivray.
3 Wilson, N. F.
4 Dunn.
5 { Chadsey.
   Payne.
7 Farrer.
8 Taylor.
9 McDougall.
10 Maclennan.
11 Ponting.
12 { McPhail.
   Whetter.

Macpherson.
Smith, C. F.

Political Economy.

CLASS I.

1 { Clark.
   Lang.
3 Paterson.
4 McCallan.

CLASS II.

1 Tye.
2 McCullough.
3 { Butler.
   Cass.

CLASS III.

1 McGillivray.
2 Kipp.
3 Edelsten.
4 Maconachie.
5 Chadsey.
6 Campbell.
7 Dunn.
8 Thompson.
9 Whetter.
10 Wilson.
11 Smith, P. B.
12 { Knight.
   Smith, G. A.
   Wilson, A. C.
15 { Maclennan.
   McPhail.
17 Taylor.
18 Macpherson.
19 McDougall.
20 Payne.
21 Farrer.

Ponting.

Physics.

CLASS I.

1 Clark.
2 Lang.
3 Paterson.

CLASS II.

1 McCallan.
2 Chadsey.

CLASS III.

1 Dunn.
2 McGillivray.
3 { Kipp.
   McCullough.
5 { Campbell.
   Cass.
7 Knight.
8 Tye.
9 Wilson, A. C.
10 Butler.
11 Smith, G. A.
12 Smith, P. B.
13 Wilson, N. F.
14 Taylor.
15 Maclennan.
16 Maconachie.
17 Payne.
18 Thompson.
19 { Edelsten.
   Whetter.
21 Macpherson.
22 McPhail.
23 McDougall.

Ponting.
Farrer.

Drawing.

CLASS I.

1 Payne.
2 Clark.
3 Paterson.
4 McCallan.
5 Campbell.
6 Wilson, N. F.
7 McCullough.
8 Knight.

CLASS II.

1 Kipp.
2 Maclennan.
3 Tye.
4 McGillivray.
5 { Lang.
   Taylor.
7 Edelsten.
8 { McDougall.
   Smith, P. B.
10 Wilson, A. C.
11 Maconachie.
12 Whetter.
13 Cass.
14 McPhail.
15 { Chadsey.
   Macpherson.

CLASS III.

1 Thompson.
2 Smith, G. A.
3 Ponting.
4 Butler.
5 Dunn.
6 Farrer.

Smith, C. F.

Proficiency.

1 Clark.
2 Lang.
3 Paterson.
4 McCallan.
5 Knight.
6 Butler.
7 Tye.
8 Campbell.
9 Chadsey.
10 Cass.
11 Kipp.
12 Dunn.
13 McCullough.
14 Smith, P. B.
15 McPhail.
16 McGillivray.
17 Thompson.
18 { Smith, G. A.
   Whetter.
20 Wilson, N. F.
21 Taylor.
22 Maconachie.
23 Wilson, A. C.
24 Edelsten.
25 Payne.
26 McDougall.

CLASS LISTS.—MIDSUMMER EXAMINATIONS—FIRST YEAR.

Agriculture.

Class I.

1 Devitt.
2 Kewley.
3 Higginson.
4 { Kennedy.
Gamble.
6 { Gadd.
Reinke.
8 { Christy.
Guy.
Hodgetts.
11 Ratcliffe.
12 Fierheller.

Class II.

1 Oastler.
2 { Charlton.
Yuill.
4 Wilson.
5 Stoddart.
6 Morgan.
7 Bell.
8 { Benning.
Shields.
Sissons.
11 Leavitt.
12 Nasmith.
13 Cousins.
14 Ross, M.

Class III.

1 Macdonald, A. W.
2 { Campbell.
Findlay.
4 Roblin.
5 Irving.
6 { Cunningham.
Ross, N.
8 { Allison.
Hutton.
10 { Harkness.
McDonald, J. D.
12 Bard.
13 { Black.
Brickwell.
15 Harris.
16 Parker.
17 Robertson, G.
18 Gibson.
19 Whigham.
20 Arms.
21 { McLaughlin.
Robertson, T. A.
23 Mather.

Leishman.
{ Bourassa.
Waddy.
Moffatt.
Gilbert.
Wilkes.

Dairying.

Class I.

1 Higginson.
2 Guy.
3 Ratcliffe.
4 Wilson.
5 { Parker.
Devitt.
7 Oastler.
8 Roblin.
9 Harkness.
10 { Nasmith.
Gamble.
12 { Hodgetts.
Bell.
14 { Kewley.
Shields.
16 { Reinke.
Fierhelier.
18 { Allison.
Macdonald, A.
20 { Gadd.
Irving.
Leavitt.

Class II.

1 Christy.
2 Sissons.
3 { Yuill.
Leishman.
5 { Cunningham.
Charlton.
7 Benning.
8 Harris.
9 Cousins.
10 Stoddart.
11 { Hutton.
Kennedy.
13 Bard.

Class III.

1 Black.
2 Campbell.
3 Robertson, T.H
4 Morgan.
5 McDonald, J.D
6 Findlay.
7 Brickwell.
8 Robertson, G.W
9 Gibson.
10 Ross, M.
11 Mather.
12 Ross, N.
13 Arms.
14 Bourassa.

McLaughlin.
Moffatt.
Waddy.
Whigham.
Wilkes.

Poultry.

Class I.

1 Robertson, G.
2 Parker.
3 Shields.
4 { Nasmith.
Stoddart.
6 Robertson, T.H
7 Reinke.
8 { Higginson.
Leavitt.
10 Gamble.

Class II.

1 { Kewley.
Irving.
Bell.
4 { Campbell.
Bard.
Gadd.
Hodgetts.
Ross, N.
9 { Yuill.
Christy.
11 { Morgan.
Oastler.
13 Cunningham.
14 Wilson.
15 Devitt.
16 Ross, M.
17 { Hutton.
Benning.
19 Fierhel er.
20 Roblin.

Class III.

1 Guy.
2 { Ratcliffe.
Harris.
4 Allison.
5 Findlay.
6 Leishman.
7 { McDonald, J.D
Cousins.
Kennedy.
10 Macdonald, A.
11 { Black.
Fourassa.
Harkness.
14 Sissons.
15 Moffatt.
16 Brickwell.
17 Gibson.
18 Mather.
19 Arms.

McLaughlin.
Waddy.
Gilbert.
Whigham.
Wilkes.

Bee-keeping.

Class I.

1 Gadd.
2 Higginson.
3 Yuill.
4 { Charlton.
Cunningham.
6 Shields.
7 Gamble.
8 Bard.
9 Allison.
10 Fierheller.
11 Ratcliffe.

Class II.

1 Guy.
2 Findlay.
3 Devitt.
4 { Kewley.
Ross, M.
6 Hodgetts.
7 { Roblin.
Hutton.
Wilson.
10 Oastler.
11 Irving.
12 Leavitt.
13 { Sissons.
Black.
McDonald, J.D
16 { Reinke.
Campbell.
18 { Arms.
Nasmith.
20 { Benning.
Kennedy.
Stoddart.
23 Bell.
24 Harkness.

Class III.

1 Robertson, T.H
2 Ross, N.
3 { Macdonald, A.
Cousins.
5 Leishman.
6 Mather.
7 Brickwell.
8 Christy.
9 Whigham.
10 Robertson, G.
11 McLaughlin.
12 Morgan.
13 { Harris.
Moffatt.
15 Gibson.
16 Parker.
17 Bourassa.

Waddy.
Wilkes, W. A.
Gilbert.

Botany.

Class I.

1 Hodgetts.
2 Devitt.
3 { Gamble.
Stoddart.
5 { Guy.
Parker.

Class II.

1 Ratcliffe.
2 Higginson.
3 { Oastler.
Shield
5 Kewley.
6 Bard.
7 Harris.
8 Charlton.
9 { Reinke.
Ross, N.

Class III.

1 { Nasmith.
Ross, M.
3 { Leavitt.
Roblin.
5 Gadd.
6 { Morgan.
Wilson.
8 { Allison.
Benning.
Kennedy.
11 Robertson, T.H
12 Cunningham.
13 Bell.
14 Sissons.
15 Yuill.
16 { Black.
Christy.
18 { Brickwell.
Cousins.
Irving.
Fierheller.
Macdonald, A.
23 { Bourassa.
Robertson, G
25 { Campbell.
Findlay.
27 Harkness.
28 { Arms.
Hutton.

{ McDonald, J.D.
McLaughlin.
Leishman.
Mather.
Gibson.
Wi kes.
Gilbert.
Waddy.

CLASS LISTS.—MIDSUMMER EXAMINATIONS, 1895.—(*Continued*)
FIRST YEAR.

Materia Medica.

CLASS I.

1 Reinke.
2 Guy.

CLASS II.

1 Gamble.
2 Shields.
3 Higginson.

CLASS III.

1 Stoddart.
2 Oastler.
3 Kewley.
4 Ross, M.
5 Devitt.
6 Macdonald, A. W.
7 Leavitt.
Ratcliffe.
9 Bard.
10 Benning.
Campbell.
Gadd.
Hodgetts.
Wilson.
15 Harris.
Roblin.
Ross, N.
18 Fierheller.
19 Cousins.
20 Charlton.
Cunningham.
Irving.
23 Black.
Christy.
25 Bell.
Nasmith.
27 Kennedy.
28 Parker.
Sissons.
30 Allison.
31 Robertson, G.
32 Hutton.
Leishman.
Morgan.
35 Robertson, T. H.
36 Findlay.
Yuill.

———

Brickwell.
McDonald, J. D.
Harkness.
Gibson.
Mather.
McLaughlin.
Bourassa.
Whigham.
Arms.
Wilkes.
Gilbert.
Moffatt.
Waddy.

Literature.

CLASS I.

1 Hodgetts.
2 Oastler.

CLASS II.

1 McLaughlin.
2 Guy.
3 Parker.
4 Kewley.
5 Craig.
Devitt.
7 Higginson.
8 Gamble.
9 Kennedy.
10 Wilson.
11 Nasmith.
Shields.

CLASS III.

1 Brickwell.
Ross, M.
3 Charlton.
Ratcliffe.
5 Gadd.
Ross, N.
Stoddart.
8 Sissons.
9 Macdonald, A.
10 Bell.
11 Christy.
Irvin.
Mather.
14 Findlay.
Cunningham.
Roblin.
17 Gibson.
Leavitt.
19 Allison.
Bard.
Reinke.
22 Harris.
Whigham.
Robertson, G.
25 Cousins.
Leishman.
27 Benning.
28 Campbell.
Robertson, T.H
30 Hutton.
Yuill.

———

Morgan.
Black.
Moffatt.
McDonald, J.D
Gilbert.
Fierheller.
Harkness.
Waddy.
Bourassa.
Arms.
Wilkes.

Grammar.

CLASS I.

1 Hodgetts.
2 Devitt.

CLASS II.

1 Kewley.
2 Guy.
Higginson.
4 Craig.

CLASS III.

1 Nasmith.
2 Gibson.
3 Gamble.
Wilson.
5 Oastler.
Parker.
7 Reinke.
Roblin.
9 Cousins.
Leavitt.
11 Christy.
12 Bell.
Harkness.
14 Kennedy.
Morgan.
Sissons.
17 Irving.
Stoddart.
19 Allison.
Bard.
21 Charlton.
22 Cunningham.
Shields.
24 Benning.
Brickwell.
Ross, N.
27 Robertson, T.H
Yuill.
29 Macdonald, A.
McDonald, J.D
Ratcliffe.
32 Robertson, G.
33 Findlay.
Gadd.

———

Bourassa.
Ross, M.
Black.
Harris.
Mather.
Moffatt.
Hutton.
McLaughlin.
Leishman.
Whigham.
Fierheller.
Arms.
Campbell.
Gilbert.
Waddy.
Wilkes.

Composition.

CLASS I.

1 Devitt.
2 Shields.
3 Kewley.

CLASS II.

1 Hodgetts.
2 Oastler.
3 Brickwell.

CLASS III.

1 Morgan.
2 Parker.
Wilson.
4 Irving.
5 Leishman.
6 Reinke.
7 Ross, N.
Kennedy.
9 Cunningham.
10 McLaughlin.
Gadd.
Gamble.
13 Findlay.
14 Ratcliffe.
15 Benning.
Craig.
Guy.
18 Higginson.
19 Ross, M.
Mather.
21 Bard.
Bell.
23 Macdonald, A.
24 Robertson, G.
Allison.
26 Stoddart.
27 Harkness.
Nasmith.
29 Christy.
Yuill.
31 Whigham.
McDonald, J.D
33 Hutton.
Harris.
35 Black.
Charlton.
Cousins.
Campbell.
Leavitt.
Roblin.
Sissons.

———

Robertson, T.H
Fierheller.
Moffatt.
Wilkes.
Waddy.
Arms.
Gibson.
Bourassa.

Arithmetic.

CLASS I.

1 Devitt.
2 Hodgetts.

CLASS II.

1 Higginson.
2 Nasmith.
3 Kennedy.

CLASS III.

1 Cunningham.
2 Bard.
3 Hutton.
4 Ratcliffe.
5 Gadd.
6 Guy.
7 Kewley.
Sissons.
9 McDonald, J.D
Yuill.
11 Craig.
Parker.
13 Irving.
14 Allison.
Shields.
16 Oastler.
17 Christy.
18 Leavitt.
Reinke.
Roblin.
Stoddart.
22 Charlton.
Findlay.
McLaughlin.
25 Bell.
Benning.
Cousins.
Gamble.
Ross, N.
Wilson.

———

Robertson, T.H
Campbell.
Arms.
Morgan.
Ross, M.
Mather.
Fierheller.
Brickwell.
Bourassa.
Gibson.
Harkness
Macdonald, A.
Harris.
Whigham.
Gilbert.
Robertson, G.
Leishman.
Black.
Moffatt.
Waddy.
Wilkes.

See page 339 for General Proficiency.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1895 (Continued)—SECOND YEAR.

Agriculture.

CLASS I.

1 Clark.
2 Paterson.
3 Lang.
4 Tye.
5 Knight.

CLASS II.

1 McCallan.
2 Campbell.
3 Whetter.
4 Dunn.
5 Chadsey.
  Taylor.
7 Kipp.
8 Thompson.
9 Cass.
  Wilson, A. C.

CLASS III.

1 McCullough.
2 Smith, P. B.
3 Payne.
4 McGillivray.
5 McPhail.
6 Maconachie.
7 Smith, G. A.
8 Edelsten.
9 Wilson, N. F.
10 Maclennan.
11 Evans.

Dairying.

CLASS I.

1 Black.
2 Knight.
3 Campbell.
4 Paterson.
5 McCullough.
6 Lang.
  Tye.

CLASS II.

1 Thompson.
2 Edelsten.
3 Whetter.
4 Cass.
5 Maconachie.
6 McCallan.
7 McPhail.

CLASS III.

1 Dunn.
2 Taylor.
3 Smith, P. B.
4 Evans.
5 McGillivray.
  Kipp.
7 Chadsey.
  Wilson, N. F.
9 Smith, G. A.
10 Wilson, A. C.
11 Maclennan.
12 Payne.

Poultry.

CLASS I.

1 Clark.
  Knight.
3 Lang.
4 Chadsey.
5 Evans.
  Whetter.
7 Payne.
8 Tye.
9 Paterson.
  McCallan.
  Kipp.
12 Cass.
  Maconachie.
13 Dunn.
  McGillivray.
  McCullough.
17 Thompson.
18 McPhail.
  Taylor.
  Smith, G. A.
21 Campbell.

CLASS II.

1 Maclennan.
2 Wilson, N. F.
  Wilson, A. C.

CLASS III.

1 Edelsten.
  Smith, P. B.

Apiculture.

CLASS I.

1 Paterson.
2 Clark.
3 Campbell.
4 Tye.

CLASS II.

1 Whetter.
2 Wilson, A. C.
  Knight.
4 Wilson, N. F.
5 McGillivray.
6 Thompson.
7 Lang.
8 Taylor.
9 Edelsten.
10 Smith, P. B.
11 Chadsey.
  McCullough.

CLASS III.

1 Kipp.
2 Smith, G. A.
3 Maconachie.
4 McCallan.
5 Payne.
6 Dunn.
7 McPhail.
8 Evans.
9 Cass.
  Maclennan.

Practical Chemistry.

CLASS I.

1 Clark.
2 Lang.
3 Cass.
4 Paterson.
5 Tye.
6 Kipp.
7 Maconachie.
8 Thompson.
9 McCullough.
10 McCallan.

CLASS II.

1 Whetter.
2 Dunn.
  Knight.
4 Campbell.
5 Edelsten.
  Taylor.
  McGillivray.
8 Wilson, N. F.
9 Chadsey.

CLASS III.

1 Smith, P. B.
2 McPhail.
3 Wilson, A. C.
4 Smith, G. A.
5 Maclennan.
6 Evans.
7 Payne.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1895 (*Continued*)—SECOND YEAR.

Agricultural Chemistry.

CLASS I.

1 Clark.
2 Lang.

CLASS II.

1 Paterson.
2 { Knight.
McCallan.
4 Thompson.

CLASS III.

1 Whetter.
2 { Campbell.
Taylor.
4 Tye.
5 McCullough.
6 Payne.
7 Dunn.
8 Edelsten.
9 { Cass.
McGillivray.
11 Chadsey.
12 McPhail.
13 { Wilson, A. C.
Maconachie.
15 Smith, P. B.
16 Wilson, N. F.
17 Smith, G. A.
18 Kipp.

Evans.
Maclennan.
McDougall.
Macpherson.
{ Ponting.
Smith, C. F.

Botany.

CLASS I.

1 Clark.
2 Lang.

CLASS II.

1 Paterson.
2 Chadsey.
3 McCallan.
4 Thompson.
5 Knight.

CLASS III.

1 Kipp.
2 Smith, P. B.
3 Maconachie.
4 Cass.
5 Tye.
6 McCullough.
7 Payne.
8 Dunn.
9 Whetter.
10 Edelsten.
11 McGillivray.
12 Campbell.
13 Wilson, N. F.
14 Wilson, A. C.
15 Smith, G. A.
16 Taylor
17 McPhail.

Maclennan.
Evans.

Horticulture.

CLASS I.

1 Clark.
2 Paterson.
3 Knight.

CLASS II.

1 Lang.
2 Chadsey.
3 Campbell.
4 Tye.
5 { McCallan.
Thompson.
7 { Maconachie.
Smith, G. A.
9 { Cass.
Smith, P. B.

CLASS III.

1 McCullough.
2 { McPhail.
Taylor.
4 { Dunn.
Payne.
6 { Whetter.
Wilson, N. F.
8 Edelsten.
9 { McGillivray.
Maclennan.
11 Wilson, A. C.
12 Kipp.
13 Evans.

McDougall.
{ Ponting.
Macpherson.

Veterinary Obstetrics.

CLASS I.

1 Clark.
2 Lang.
3 Paterson.

CLASS II.

1 Smith, P. B.
2 { Campbell.
Whetter.
4 Wilson, N. F.
5 { Chadsey.
Kipp.
7 Knight.
8 Wilson, A. C.

CLASS III.

1 Maconachie.
2 { Dunn.
Thompson.
4 McCalla.
5 { Evans.
Taylor.
Tye.
8 { Cass.
McPhail.
Payne.
11 { Edelsten.
McGillivray.
13 McCullough.
14 Smith, G. A.
15 Maclennan.

McDougall.
Ponting.

Literature.

CLASS I.

1 McCallan.
2 Clark.
3 Paterson.
4 Lang.

CLASS II.

1 Edelsten.
2 Maconachie.
3 Cass.
4 Smith, P. B.
5 { Knight.
McCullough.
7 Tye.

CLASS III.

1 Smith.
2 Thompson.
2 McGillivray.
4 Campbell.
5 { Chadsey.
Taylor.
7 Payne.
8 Kipp
9 { Dunn.
Whetter.
11 Wilson, N. F.
12 McPhail.
14 { Maclennan.
Wilson, A. C.

Evans.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1895 (*Continued*).—SECOND YEAR.

Grammar.	Physics.	Road-making.	Second year proficiency.	First year proficiency.
CLASS I.	CLASS I.	CLASS III.	1 Clark.	1 Devitt.
1 Clark.	1 Clark.	1 Paterson.	2 Lang.	2 Hodgetts.
2 Lang.	2 Lang.	Clark.	3 Paterson.	3 Higginson.
CLASS II.	CLASS II.	3 Wilson, A. C.	4 Knight.	4 Kewley.
1 Paterson.	1 Paterson.	4 Wilson, N. F.	5 McCallan.	5 Guy.
2 Maconachie.	2 McCullough.	Whetter.	6 Tye.	6 Shields.
3 McCullough.	CLASS III.	Tye.	7 Campbell.	7 Gamble.
CLASS III.	1 Tye.	7 Payne.	8 Thompson.	8 Oastler.
1 McCallan.	2 Campbell.	8 Knight.	9 McCullough.	9 Reinke.
2 Smith, G. A.	3 Knight.	Taylor.	10 Maconachie.	10 Nasmith.
3 Thompson.	4 Cass.	Dunn.	11 Cass.	11 Charlton.
4 Campbell.	5 Dunn.	McCallan.	12 Whetter.	12 Ratcliffe.
Chadsey.	McCallan.	Maconachie.	13 Chadsey.	13 Wilson.
6 Wilson, A. C.	Smith, G. A.	13 McCullough.	14 Kipp.	14 Gadd.
7 Cass.	Whetter.	Lang.	15 Dunn.	15 Parker.
Edelsten.	9 Maconachie.	Edelsten.	16 Taylor.	16 Stoddart.
Knight.	10 Taylor.	16 McPhail.	17 Edelsten.	17 Kennedy.
Tye.	11 Chadsey.	Chadsey.	18 Smith, P. B.	18 Bard.
11 Payne.	12 Kipp.	Thompson.	19 McGillivray.	19 Cunningham.
Whetter.	13 Payne.	Evans.	20 Wilson, A. C.	20 Leavitt.
Taylor.	Wilson, A. C.	Kipp.	21 Smith, G. A.	21 Bell.
14 Smith, P. B.	15 Thompson.	Campbell.	22 Payne.	22 Irving.
Wilson, N. F.	16 Edelsten.	McGillivray.	23 Wilson, N. F.	23 Roblin.
16 Dunn.	McPhail.	23 MacLennan.	24 McPhail.	24 Yuill.
17 McGillivray.	18 McGillivray.	24 Smith, G. A.		25 Christy.
Evans.	19 Smith, P B.	25 Cass.		26 Benning.
19 Kipp.	20 Evans.	26 Smith, P. B.		27 Allison.
—	21 Wilson, N. F.			28 Ross, N.
Maclennan.	—			29 Sissons.
McDougall.	Maclennan.			30 Cousins.
Macpherson.				31 Findlay.
Ponting.				

DAIRY SCHOOL STUDENTS CLASS LISTS.—GENERAL PROFICIENCY, 1895.

Class I.	Class II.	Class III.
1 Smith, H.	1 Hill, J. A.	1 { Dennis, R. B.
2 Boyes, F.	2 Millar, J. T.	{ Richardson, D.
3 Scott, J. H.	3 Travis, C.	3 McGarry, W. R.
4 Waddell, Wm.	4 McDonald, T. W..	4 { Code, B.
5 Jeffs, C. B.	5 Mitchell, H.	{ Medd, W. G.
6 James, D. A.	6 Travis, F. E.	6 Marquette, G. W.
7 Stonehouse, J.	7 Carlaw, G.	7 Cowieson, W. R.
8 Chalmers, A.	8 Malcolm, R.	8 Robeson, J.
9 Mitchell, W. H.	9 Weir, Wm.	9 Aiken, R. J.
	10 McCallum, L. C.	10 Campbell, Miss E. M.
	11 Baird, A. K.	11 { Metcalfe, G.
	12 Biggin, E. O.	{ Parker, A. A.
	13 Singleton, Wm.	13 Westphall, A. A.
	14 Henricks, K.	14 { Smith, E. P.
	15 Rendall, Wm.	{ Traviss, C. H.
	16 Laird, J. G.	16 Heeks, H.
	17 Stillman, Robt.	17 Humphrey, Geo.
	18 Christie, Jas.	
	19 Smyth, F. L.	
	20 Coomber, H.	
	21 { Carson, W. J.	
	{ Tucker, G. E.	
	23 Shorey, S. C.	
	24 Reist, F. B.	
	25 McDonald, W. J.	
	26 Campbell, A.	
	27 Hill, G. W.	
	28 { Elliott, Wm.	
	{ Marshall, T. B.	
	30 King, R. B.	
	31 Jackson, Miss L.	

APPENDIX V.

FINANCIAL STATEMENT FOR 1895.

I. College Expenditure.

(a) *College Maintenance.*

1. *Salaries and Wages*		$17,685 35
2. *Food*—		
Meat, fish, and fowl		3,727 04
Bread, biscuits, etc.		690 26
Groceries, butter, and fruit		4,487 53
3. *Household Expenses*—		
Laundry, soap and cleaning		179 82
Women servants' wages—cooks, laundresses, housemaids, etc.		1,901 85
4. *Business Department*—		
Advertising, printing, postage and stationery		1,223 88
5. *Miscellaneous*—		
Chemicals, apparatus, etc., used in laboratories		622 67
Library and reading-room—books, papers, and periodicals		364 44
Medals		92 16
Unenumerated		602 10
		$31,577 10

(b) *Maintenance and Repairs of Government Buildings.*

Furniture and furnishings	$1,635 36	
Repairs and alterations	1,478 73	
Fuel	2,036 00	
Light	695 53	
Water	650 00	
Disposal of sewage	199 23	
		6,694 85
		$38,271 95

College Revenue.

Fees	$1,597 00	
Balances for board, after deducting allowances for work in outside departments	5,080 86	
Supplemental examinations	54 00	
Gas and chemicals	67 00	
Contingencies—fines, breakage, etc.	206 44	
Analysis of soil	5 00	
Sale of bones, drippings, etc.	22 74	
Stationery	3 38	
		7,036 42
Net expenditure of College and Government Buildings		$31,235 53

The net sum voted by the Legislature for the College and the maintenance and repairs of Government Buildings (See Estimates for 1895, pp. 36 and 42) was $31,311.00. Hence the unexpended balance under this head in 1895 was $75.47.

II. Farm Expenditure.

(a) *Farm Proper.*

1. *Permanent Improvements*—	
Fencing, underdraining, etc.	456 62

2. *Farm Maintenance—*

Salary of Superintendent	$1,200 00	
Wages—herdsmen, teamsters, engineer, etc.	2,771 83	
Live stock	1,154 93	
Maintenance of stock	907 06	
Seed	282 08	
Binding twine	15 47	
Repairs and alterations, including blacksmithing	438 26	
Furniture, furnishings, etc.	219 26	
Tools and implements	307 49	
Advertising, printing, postage, and stationery	186 89	
Fuel and light	57 91	
Contingencies	64 20	
		7,605 38
		$8,062 00

Cash Revenue of Farm Proper.

Sales of cattle	$2,150 05	
" sheep	438 80	
" pigs	1,067 31	
" wool	68 61	
" hides	3 10	
" milk	151 96	
" wheat	309 15	
" oats	388 70	
" barley	288 24	
" old fence	55 28	
Service of animals	134 00	
Rent of pasture	12 00	
Screenings	5 80	
Sheep skins	1 80	
Potatoes	9 50	
		5,084 30
Net expenditure of farm proper		$2,977 70

Unexpended balance for the year, $2,197.30. (See Estimates, p. 37.)

(b) Experimental Plots and Feeding.

1. *Permanent Improvements—*

Experimental piggery, stable and sheep shed; bath and alterations therefor in Experimentalist's house; and certain furnishings in new Experimental Building		912 90

2. *Maintenance—*

Salaries and wages—		
Experimentalist	$1,500 00	
Experimental foreman	400 01	
Labor	2,313 34	
Seed	361 51	
Manure and special fertilizers	85 75	
Furniture, furnishings, and repairs	147 36	
Printing, postage, and stationery	97 99	
Implements	124 89	
Contingencies	168 21	
		5,201 06
		$6,111 96

Unexpended balance for the year, $1,295.04. (See Estimates, p. 37.)

III. Dairy Department.

(a) Experimental Dairy.

Salary of foreman	$650 00
Experimental cheese-maker (9½ months)	425 00
Man to assist in experimental work, attend boilers, etc.	255 00
Assistant chemists, employed in analyzing milk, whey, cheese, etc.	462 50
Cattleman, milkers, etc.	649 12
Temporary assistance	99 98
	2,541 60

Purchase of milk for experimental cheese-making	$1,575 37	
" cows and pigs	268 50	
Feed and fodder	1,037 78	
Furniture, furnishings, and repairs	550 96	
Laboratory expenses—gas, chemicals, etc.	139 72	
Advertising, printing, postage, and stationery	99 54	
Fuel	399 14	
Contingencies	140 23	
		$6,752 84

Revenue of Experimental Dairy.

Sales of butter	$1,211 31	
" cheese	768 78	
" milk	115 74	
" cream, skim-milk, whey, and butter-milk	43 11	
" cattle	87 50	
" pigs	476 94	
" hides	1 80	
" old milk-tester	2 00	
		2,707 18
		$4,045 66

Unexpended balance for the year, $784.34. (See Estimates, p. 38.)

(b) Dairy School.

Wages of instructors, engineer, and general help	$1,351 93	
Purchase of milk for use in School	5,018 80	
Dairy utensils, supplies, and repairs	458 23	
		6,828 96

Revenue of Dairy School.

Fees	$ 468 00	
Sales of butter	2,241 72	
" cheese	823 83	
" skim-milk	194 20	
		3,727 75
		$3,101 21

Unexpended balance for the year, $848.79. (See Estimates, p. 38.)

(c) Travelling Dairy.

Expenses of Travelling Dairy	$2,371 30

Unexpended balance for the year, $428.70. (See Estimates, p. 38.)

IV. Poultry Department.

Salary of manager		$ 700 00	
Purchase of stock		176 65	
Furnishings		123 71	
Feed, etc		166 72	
Fuel and light		48 20	
Temporary assistance		26 70	
		$1,241 98	
Revenue.			
Fees	$ 5 00		
Sales of fowl	122 89		
" eggs	59 75		
		$187 64	
Unexpended balance for the year, $115.66 (See Estimates, p. 38).			$1,054 34

V. Horticultural Department—Garden, Greenhouses, Lawn, Arboretum, Forest-Tree Clumps, &c.

1. *Permanent Improvements*—Underdraining, fencing, etc		$288 19
2. *Maintenance*—		
Salary of foreman and head gardener	$ 650 00	
Assistant gardener and florist	527 98	
Assistant in greenhouses	380 00	
Teamster and laborers	1,689 40	
	$3,247 38	

Manure	$ 44 60	
Seeds, bulbs, plants, shrubs, trees, etc	180 95	
Furniture, furnishing, repairs, tools, implements, flo er pots, etc	317 64	
Fuel and light	469 83	
Contingencies	60 78	
		$4,321 18
		$4,609 37

Unexpended balance for the year, $458.63 (See Estimates, p. 38)

VI.—MECHANICAL DEPARTMENT.

Salary of foreman	$700 00	
Salary of extra carpenter for erection of buildings, etc	650 00	
Tools, etc	49 70	
Fuel	6 95	
		$1,406 65

Unexpended balance, $18.35 (See Estimates, p. 39).

SUMMARY.

Total net expenditure of all departments in 1895—	
I. College and Government Buildings	$31,235 53
II. Farm—	
1. Farm proper	2,977 70
2. Experimental plots and feediug	6,111 96
3. Dairy department—experimental dairy, dairy school, and travelling dairy	9,518 17
4. Poultry department—wages, stock, etc	1,054 34
III. Horticultural department—garden, greenhouses, orchards, lawn, aboretum, etc	4,609 37
IV. Mechanical department—construction of buildings, repairs, etc.	1,406 65
	$56,913 72

Unexpected balances on the year's operations in all departments, $6,222.28

The amount paid by the College to students for work in the outside departments in 1895, was $3,321.89. This was done by crediting on board bills the sums allowed to students from week to week by the foremen under whom they worked.

Notes on Statement

Without going into a formal statement of accounts between different departments, I may say that *the Farm Proper is entitled to credit* from several of the other departments—

(1) From the College for feed and bedding of College horses; the filling of the College ice house; a large quantity of milk (varying from thirty to seventy quarts a day), and potatoes, turnips, etc., for College use.

(2) From the Dairy Department for ensilage and mangels, and the years's supply of pasture, hay, and straw for thirty cows, ten to twelve calves and a number of swine.

(3) From the Poultry Department for straw, chaff, mangels, etc.

(4) From the Experimental Department for the feed and bedding of four horses throughout the year.

(5) From the Horticultural Department for feed and bedding of two horses throughout the year.

It is also right to add in this connection, that the farm proper keeps a number of male animals—bulls, rams, and boars—solely for educational purposes. Twenty-three or more of these animals are fed and cared for from year to year at large expense, when three would serve all the requirements of the farm superintendent for breeding. This is a large item of expense which the farm superintendent has to incur every year for the benefit of the College, that the students may have the means of getting a thoroughly practical knowledge of live stock—that they may have both male and female of all the principal breeds of farm animals for daily inspection and class-room work. See Superintendent's statement, part XI. of this report.

The Horticultural Department is also entitled to credit for a regular supply of fruit vegetables, and flowers to the College throughout the year, and a large amount of work of man and team in grading and hauling sod and gravel for Dairy, Poultry, and Experimental Departments.

JAMES MILLS,
President.

APPENDIX VI.

SEVENTEENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

The Seventeenth Annual Meeting of the Ontario Agricultural and Experimental Union was held at the Agricultural College, Guelph, on the 12th and 13th of December, commencing at 10 a.m. on the 12th.

Mr. C. A. Keil, President, occupied the chair, and opened the meeting in good time. The attendance at the opening session was the largest it has been for several years.

REPORT OF COMMITTEES.

Mr. E. Lick, Oshawa: In regard to securing an increased grant to the Union, I might say that I was one of the committee appointed at the last annual meeting to interview the Minister of Agriculture, and endeavor to have the grant to the Union increased $300 for 1895. Mr. N. Monteith and I saw the Hon. Mr. Dryden at the time of the Central Farmers' Institute, in Toronto, and I am pleased to state that the grant to the Union has been increased by $250 during the past year.

Secretaryship.

Mr. R. F. Holtermann, Brantford: There is a matter which I wish to bring before the meeting, and that is in regard to the secretaryship of the Union. I have now held the office for several years, but find it is almost impossible to perform the duties connected therewith, and therefore desire to ask the Union to release me from the office. I wish to thank the Union for electing me as Secretary for so many years.

Revision of Constitution.

Mr. R. F. Holtermann: The Ontario Agricultural and Experimental Union now comes under the Agriculture and Arts Act, as revised in 1895. After the present year it will be necessary to make our membership fee one dollar per year. I suggest that arrangements be made for all members to receive the *O. A. C. Review* free of charge, if the membership fee to the Union is placed at one dollar. A similar practice to this is done by several of the other associations.

Moved by Mr. R. F. Holtermann and seconded by Mr. T. G. Raynor, That the constitution of the Ontario Agricultural and Experimental Union be revised to meet the requirements of the Agriculture and Arts Act, and that E. Lick, C. A. Zavitz and A. Shantz be a committee to make the necessary revision and report to this meeting. After the name of Mr. Holtermann was added to the list the resolution was carried.

PRESIDENT'S ADDRESS.

The President, Mr. C. A. KEIL, Chatham, then delivered the following address:

Another year has almost passed and gone with its many changes, since we last assembled in the capacity of our Experimental Union. We cordially welcome you to this the seventeenth annual meeting of the Ontario Agricultural and Experimental Union, and I trust we will all do our best to make this the most useful and interesting meeting yet held. The past season has been a most trying one to the agriculturists of this Province. We had a very severe frost in May, doing great damage, and this was followed by one of the driest seasons that this country has ever experienced. The past season has fully demonstrated the value of growing soiling crops, and especially corn.

Our work has been increasing each succeeding year since the Union launched out in experimental work. In 1885 there were but twelve experimenters, in 1894 there were over one thousand three hundred and forty, and during the past season about two thousand experimenters were engaged in the good work. How much farther we shall extend operations I shall not forecast, but our work is only limited by our means. This year we had a grant of $950; which, I believe, has been well spent, and will result in a vast amount of benefit to our Province. I have never yet heard our work adversely criticized, and it is surprising what an interest farmers take in our experiments. I speak from personal observation. The enquiry for Dawson's Golden Chaff wheat for seed last fall was something wonderful. Let us be more thorough and more exact, if possible, in conducting our experiments, so that we will have a larger percentage of complete returns sent in, and so that there can be no doubt that the results are absolutely correct. Subsoiling has been much recommended as a means of combatting weeds, and perhaps the Union could experiment along this line. Every ex-student who engages in agriculture, of whatever branch, should be a member of this Union, and should carry on some line of experimental work. There are many things that can be learned by observation, experience, and experiment, which cannot be learned at college, and our education should continue throughout our lives; and not stop when we leave these College walls. The future of our alma mater lies in the conduct of her ex-students, and I believe the ex-students, as a rule, are doing credit to this College. I think the chief reason that more farmers' sons do not attend the Agricultural College is because they can *get along* without taking a course at this place. In almost all other professions and trades one *has to* go through a prescribed course of study, and come up to a certain standard before he can follow his calling; but this is not so with ordinary farming. The idea still largely prevails that anybody is good enough to farm, but I believe this state of things is rapidly passing away. Too many farmers are still more intent on getting a farm for the boy than of improving his mind. If the farmers of this country wish to take the position that many are now clamoring for, they must become better educated before they can do so. The farmer who would succeed in these times of glutted markets, and low prices, must combine science with practice; he must work with his head as well as with his hands; he must study how to produce the largest quantity and best quality of any articles at the least possible cost; he must produce more per acre than he has done in the past, whether it be fruit, grain, live stock, or their products. The time has come when we must specialize more. The average human being has not brains enough to thoroughly master all the different branches of agriculture and make a success of them. While it is well to follow mixed farming to a certain extent, we should make a specialty of some particular line that is to our liking. If we have too many irons in the fire some are apt to get burned.

A great many farmers have too much land. They spread a limited amount of work over a large area, and get very poor results. One thing well done is worth half a dozen half done, and will be a source of pride and satisfaction to the doer. Let us, the members of this Union, uphold the dignity of our calling.

I conclusion I thank you, gentlemen, for electing me to this honorable office, and hope that in the future we may attain unto even greater usefulness in our experimental work.

PROFITS IN POULTRY ON THE FARM.

BY H. J. PAGE, ST. MARYS, ONT.

The question is often asked: "Does it pay to raise and keep poultry on the farm?" This depends entirely on circumstances. If poultry are left entirely to shift for themselves, I would answer this question with an emphatic "No;" but if properly managed and given a good coop in which to roost comfortably at night, I would answer the question just as emphatically, "Yes."

It must be understood that it is the farmer and not the fancier I am talking to, and that I have based my calculations on the average prices of cost and production. For easy calculation I have assumed that the average flock of hens on a farm is one hundred. Some flocks I know are larger, and some, I am sorry to say, are very much smaller. I am also assuming that we are calculating on egg production, and that the best breeds for this purpose are kept, most of which will average from 125 to 175 eggs per year. I have placed the production per hen just half-way between those figures, viz, 150. This number can be obtained without anything approaching to extra trouble and I feel convinced that with a little extra care each hen would lay from five to ten eggs more than I have given them credit for.

Now as we are simply calculating on the production of eggs I think the following breeds are the best to keep: Minorcas, Wyandottes, Houdans and Javas, the three last mentioned breeds being exceptionally good winter layers, producing eggs at the time when the highest price can be obtained for them. Then, as uniformity of eggs for sale is always desirable, only one breed should be kept and that as thoroughbred as possible. With regard to the Javas, I would say that they make superior birds for the table, are very hardy, and are easily raised and for those reasons are much to be preferred. As Guelph is what may be termed the Canadian home of the Java, stock of this breed should not be difficult to obtain. Some of the very finest specimens of this breed can be seen in this institution.

When starting a flock, procure your stock from some reliable person, who is breeding birds for egg production alone, as very often the best show birds are not the best layers, and I wish it to be distinctly understood that the best stock for this purpose can be obtained in Canada. We do not require to import.

Now I am assuming that one or the other of the breeds I have mentioned is kept, and an account of receipts and disbursements is also kept. I think a fair estimate of results obtainable will be shown in the figures I am about to give you. I have carried the account on for a period of five years, as I am assuming that the poultry department of the farm is started by borrowing from the rest of the farm, and has to be kept going for that period in order to clear off the mortgage.

FIRST YEAR.

18.....	Dr.	Amount. $	c.	18.....	Cr.	Amount. $	c.
1st Jan..	To stock, 100 hens at 50c	50	00	31st Dec	By 14,250 eggs at 1c..........	142	50
	To cost to build coop	50	00		By 3 bbls manure, 140 lbs to bbl	3	00
	To feed for one year @ 7oc. each	70	00		By value of coop............	50	00
	To sand and lime	2	00		By value of stock.............	50	00
	To rent of one acre of land....	5	00				
	To 7 per cent. interest on $100..	7	00				
	To profit on investment	61	50				
		$245	50			$245	00

SECOND YEAR.

18.....	Dr.	Amount $ c.	18....	Cr.	Amount. $ c.
1st Jan..	To value of stock at end of last year	50 00	1st Jan..	By balance from last year	56 50
	To value of coop	50 00	31st Dec	By 14,000 eggs @ 1c	140 00
	To feed for year	70 00		By 3 barrels (140 lbs) manure @ $1 00	3 00
	To rent of land	5 00		By 50 pullets raised and placed in stock	25 00
	To sand, lime, sulphur, etc	2 00		By young male birds for sale or use	12 50
	To interest on $100	7 00		By 50 of old stock sold off or used	12 50
	To cost to raise young stock	25 00		By 50 of old stock kept	25 00
	To repaid loan of $100	100 00		By value of coop	50 00
	Balance credit	19 50			
		$324 50			$324 50

THIRD YEAR.

	Dr.	Amount		Cr.	Amount
	To stock at end of last year	50 00	1st Jan..	By credit last year	19 50
	To feed for year	70 00	31st Dec	By 14,000 eggs @ 1c	140 00
	To sand, lime etc. etc	2 00		By 3 barrels (140 lbs) manure	3 00
	To rent of land	5 00		By 50 pullets raised and placed in stock	25 00
	To cost of raising young stock	25 00		By 50 young male birds sold off or used	12 50
	Balance credit	85 50		By 50 of old stock sold	12 50
				By 50 stock carried over, first pullets raised	25 00
		$237 50			$237 50

FOURTH YEAR.

	Dr.	Amount		Cr.	Amount
1st Jan..	To value of stock	50 00	1st Jan..	By credit last year	85 50
	To feed	70 00	31st Dec	By 14,000 eggs	140 00
	To lime, sand, &c	2 00		By 3 barrels manure	3 00
	To rent	5 00		By 50 young pullets raised and put in stock	25 00
	To 2 thoroughbred roosters for changing stock	4 00		By 50 of old stock carried over	25 00
	To cost of raising young stock	25 00		By 50 of old stock sold off	12 50
	Balance credit	147 50		By 50 young male birds sold off	12 50
		$303 50			$303 50

FIFTH YEAR.

	Dr.	Amount		Cr.	Amount
1st Jan..	To value of stock	$50 00	1st Jan..	By credit last year	$147 50
	To feed	70 00	31st Dec	By 14,000 eggs	140 00
	To lime, sand, etc	2 00		By 3 barrels manure	3 00
	To rent	5 00		By 50 pullets added to stock	25 00
	To cost of raising young stock	25 00		By 50 old stock kept	25 00
	Balance credit	213 50		By 50 old stock sold	12 50
				By 50 young males sold	12 50
		$365 50			$365 50

I suppose better prices might be obtained from the sale of hens culled from the flocks, if near cities or large towns, and also for the young male birds. We will now take stock, and we find that we have—

Cash on hand	$213 50
Coop valued at	45 00
100 fowls value	50 00
Total	$308 50

This shows a clear yearly profit of $61.70 on this one acre of land devoted to poultry, and I think I have demonstrated that it does pay to keep poultry on the farm if properly managed. Flocks of thoroughbred hens may be improved in the direction desired by selecting those birds having the greatest percentage of the desired qualifications, and breeding from them only. Flocks of any common stock may be improved by introducing a few thoroughbred male birds and selecting the best hens to breed from. It is just as necessary to make careful selections in the poultry yard as it is for the diaryman to save only the calves from his best cows in order to improve his herd.

Coop and Equipment.

The coop should be of sufficient size to prevent crowding. It should also be weather-tight and free from drafts, but at the same time be well ventilated and have plenty of light. There is an old proverb which says "Where the sun does not enter the doctor does." This applies as much to the hen coop as it does to human dwellings, therefore, let in as much sunlight as possible, and in order to do this, place your windows so as to face as near as you can to the south-east. Right here I might say that one of the chief reasons for live stock not thriving as well in winter as in summer is the want of fresh air and sunlight. The perches should be made of 4 x 4 scantling rounded off at the corners and at the upper side and should not be higher than three feet from the ground, as high perches are injurious. A dust bath must be provided and should be placed so that the sun will shine directly on it for a good part of the day. This will induce the fowls to dust themselves, which is one of the best ways to prevent vermin. The best thing to fill this bath with is road dust in which a little flowers of sulphur has been mixed. Part of the floor should be so arranged as to allow of sand or gravel or even straw or chaff to be spread a few inches deep in order to induce fowls to scratch. Nest-boxes must also be supplied in sufficient numbers. The best nest-boxes and water fountains I have seen are those in use at this institution, as they can be easily removed for cleaning.

When going into a business of any kind it is always advisable to observe the methods and profit by the experience of those who have made the greatest success of that business, and the poultry business is no exception to this rule, and as the French have made the greatest success of the poultry business, I think if we follow as closely as possible in their footsteps we shall be more likely to succeed than by any other method. Climatic conditions are of course different, so that we cannot follow them to the letter, but we can keep very close to them.

An abundance of fresh hard water should be supplied, as hard water contains lime and magnesia in just the proportions required for the formation of bone and egg shells. This of course should be supplemented by ground bone or some other substance such as the scale taken from steam boilers, or better still, the substance taken out of the heaters used in large steam plants, and which may be had for taking away.

The morning meal should consist of vegetables of any kind boiled and mixed with shorts or chop, and fed warm in such quantity as they will eat up clean. The noon meal should be a light one, and consist of barley and oats scattered through the litter on the floor of the coop. Exercise is very necessary, and here they will get it. The evening meal should consist of whole grain, such as wheat or corn with a little buckwheat mixed with it, as buckwheat is one of the best egg foods known. Skimmed milk or butter-milk mixed in the morning meal, and any available meat scraps will supply animal food which is very necessary.

Always keep a box of fine gravel in the coop, so that the fowls can obtain the necessary grit. This grit enters the gizzard and acts as a mill to grind the food, taking, in fact, the place of the hen's teeth, which we often hear about, but never see.

Before closing this paper, I would like to call your attention to the fact that poultry keeping is a source of national wealth, as, apart from the vast quantities used in the country, large quantities are exported every year. From the little town of St. Mary's alone, there have been shipped to Great Britain, since August the 26th last up to the present time, 38 car-loads of eggs, each car containing 12,000 dozen, thus making in all 456,000 dozen, or 5,472,000 eggs, valued at $55,000.

An American paper lately stated that the hen added yearly to the wealth of the United States in eggs alone not less than $135,000,000, equalling the value of the combined output of iron and wool.

Q. How do you feed the scale you mentioned ?

Mr. Page : I pulverize it and mix it with the morning meal.

Q. Do you think it a drawback not to wash the drinking fountains inside ?

Mr. Page : I would prefer having them washed out.

Q. Which is the best bone mill in Canada ?

Mr. Page : There are several mills made in Canada. I would not like to say which is the best.

Q. Is there any danger in putting too much of the mixture you mentioned in the morning feed ?

Mr. Page : No.

Q. Do you believe in tar paper ?

Mr. Page : Tar paper will take up moisture.

Mr. Pettit : I wish to say that I am very much pleased with the paper Mr. Page has given us. There are no overdrawn statements. Now, with regard to warmth of henhouses, tar papering is a mistake. Two years ago I built a henhouse and tar-papered it up and down, covered that over and tar-papered it up and down again. I do not think it is beneficial. I think it it is a mistake. I do not think there is anything gained.

Mr. Graham : I may say that this subject of poultry raising is of great importance to the farmers of Ontario. If farmers could get chickens out early they would get a very high price for them in the American markets—as high as forty cents per pound. Use lots of meat to get eggs in winter. Give your hens plenty of exercise. Keep them right down to work. Give them plenty to eat. I may say, in regard to getting eggs in wintertime, that you must have warm houses. I have not much trouble in getting eggs at that season.

The question has been raised, "Is tar-paper good for henhouses ?" My houses are built of four thicknesses of rough lumber and two of tarred felt. They are three feet six inches high in front, and five feet in the rear, with a thirteen foot rafter sloping southward, and a five foot rafter northward. This gives the heat of the sun a chance to warm up the houses during the day. About one-third of the front is glass. The roof is sheated with two thicknesses of tarred felt in opposite directions, then covered with rough lumber running lengthwise. This has not leaked as yet and is very cheap. There is a walk three feet wide in the rear running the full length of the building, Trap doors open from the pens so that the eggs can be removed without disturbing the hens.

Q. I would like to ask Mr. Graham what variety of poultry he counts best for profit ?

Mr. Graham : When I was in the State of Michigan, on one of the largest poultry farms that they had, pullets that were hatched on the 16th of April, commenced laying on the 20th of September. Fifty-five of these pullets averaged about twenty-five eggs a day from that time through the winter and spring, and they would sometimes get three dozen and sometimes four dozen eggs from these fifty-five pullets daily. They were Plymouth Rocks. I am breeding Plymouth Rocks, Wyandottes and Indian Game. These are good winter layers. They grow very rapidly and are extra hardy.

Q. What kind of Plymouth Rocks?

Mr. GRAHAM: Barred.

Q. Have you any experience with Javas?

Mr. GRAHAM: I have had some experience with Javas. I liked them very well but for their color, it being the black variety which I bred. This color always shows dressed goods to disadvantage if picked when pin feathers are plentiful, while the light breeds do not.

Q. Do you consider it a great disadvantage not being able to wash the drinking fountain on the inside?

Mr. PAGE: While I do not consider it a serious drawback, I would prefer being able to wash them out.

Q. In regard to building poultry houses, do you think it advisable to tar the boards inside the coop.

Mr. PAGE: Yes I think tarring beneficial, as it tends to keep the coop dry.

QUESTION DRAWER.

Q. What do you consider the best feed for ewes in lamb in winter?

Mr. RENNIE, Agricultural College: We fed our breeding ewes during winter months as follows: A mixture of corn silage, pulped roots and chaff and a little bran morning and evening, and at noon peastraw, and for two or three weeks before lambing in the spring more bran was mixed with the feed. They were all in good healthy and thrifty condition.

Q. Does it pay to house milch cows during the day in summer time?

Mr. SLEIGHTHOLM: There is nothing to-day in connection with our live stock interests that has more to do with dollars and cents than this one thing. I talked with a man who handles about forty milch cows, improved grades principally, to get information that would enable me to get rid of the ravages of the hornfly. He tried nearly everything; but as for housing, he said a farmer with ten cows could not afford to do it. One year I tried housing our cows during the daytime. I started keeping the cows in about the first week in August to get rid of the hornfly, and fed them with green fodder at noon and night during the summer months, and in one night our supply of milk increased one-third. It is best to house milch cows, despite what people say on this question. Not many years ago I tried greasing; then I got a spray pump, small one, and sprinkled the cows all over. I also used horn application. That did not work; so I gave up in disgust the trying to get rid of the hornfly by using applications.

Mr. RENNIE: I would recommend housing milch cows twice a day, for milking, and feeding them ensilage in addition to the pasture they are getting. During the summer, when the hornfly is troublesome, rub them all over once a week with a mixture of seal oil and carbolic acid; a small tablespoonful of the latter to a quart of the former.

A MEMBER: In our ordinary farm practice we bring our cows in the stables about five o'clock in the morning. They are kept in during the daytime and turned out at night, and from our own experience, and from what I hear others say, I find it is a most excellent preventive of the ravages of the hornfly.

Q, What is the value of a ton of meadow muck as compared with a ton of farmyard manure of average quality?

Prof. SHUTTLEWORTH: Farmyard manure is a general manure, that is, it contains all the plant food constituents; but muck is valuable chiefly for its nitrogen, as it contains very little potash and phosphoric acid. The value of the muck would depend upon its nitrogen, and it would need to be used where nitrogen is required. Practically speaking, one ton of muck would be worth from one-eight to three-eights that of a ton of farmyard manure.

Q. What do you consider the best method of dressing poultry for market?

Mr. PAGE: For an answer to this question I would refer you to Mr. Graham, who is more conversant with that part of the business than I am.

Mr. GRAHAM: When poultry is dressed for shipment to distant points, and where it comes in competition with local goods, it must present as nearly as possible similiar appearance. Fast the birds intended for slaughter about eight hours. Kill by cutting a deep gash in the roof of the mouth, immediately under the eyes. Commence picking at once, (all kinds must be dry-picked), being careful not to tear the flesh. When picking is done, wash the head and all bloody parts in clean water; then put the bird in cold water, but not ice cold, and allow to remain there about fifteen minutes; then remove to a barrel containing floating ice, there let it remain for twelve hours, when it will be ready to pack. Should there be any contents in the crops remove and sew up carefully, so as not to mar the appearance. None should be drawn, as our American friend wants undrawn. In packing, take an ordinary sugar barrel washed clean, put a thin layer of ice in the bottom, then put in your chickens, head downwards and feet toward the center, leaving a small space around the edge of the barrel which should be filled with ice. In between each layer of fowls put a little ice, and on top cover with fine ice, and cap with a large piece, then cover all with a piece of linen. Poultry packed thus will usually stand shipment for eighteen hours. Be careful and keep all filth away from all parts. Never dress poor birds as they will not sell to advantage.

Q. What about ground bone?

Mr. GRAHAM: Ground bone is almost a necessity where good strong fertile eggs are expected in winter. It is of great value in increasing the number of eggs. When a bone cutter cannot be afforded, the liver, lights and refuse matter from the butcher shop may be cooked in feed, and in this way partially supply the food in the bone. Bone acts as grit as well as food, avoids soft-shell eggs, and many diseases. I am using a bone cutter; it does its work well, and is very satisfactory. I have tried no others so cannot say anything further.

Q. Which is the best incubator?

Mr. PAGE: I do not know which is the best incubator in use, but men who have been in the poultry business most of their lives cannot always depend on making a successful hatch with the incubator, I could not advise a farmer to invest. I do not think the incubafor has arrived at that state of perfection when it can be left for any length of time to care for itself.

Mr. GRAHAM: This is a very difficult question to answer, and one which is probably beyond my ability. However there are a few things to be considered in purchasing an incubator. (*a*) It should be self-regulating; (*b*) it should be double-cased in order that the outer atmosphere, if changeable will have little or no effect on the egg-drawer; (*c*) it should be simple in its management.

TESTS WITH FIVE-BANDED ITALIAN BEES.

R. F. HOLTERMANN, Brantford, Ont., Director of co-operative experiments in agriculture, said: In considering the results from five-banded Italian bees, it must be remembered that the season of 1895 was almost a total failure as regards the honey flow. There can, therefore, be but little comparison between the honey-gathering qualities of the various strains of bees. Other marked traits appear to have been reasonably well established, some having been suspected before. Two very close observers report that the bees appear to have difficulty in locating themselves. As far as we know, no one has ever reported to that effect before, and it may be well to ask experimenters during the season of 1896 to pay special attention and report in regard to the above.

The tendency to supersede queens was reported at the last meeting. The reports this season do not mention any difficulty in this direction during the season of 1895. The difficulty in 1894 may have been due to the long journeys the queens underwent before introduction.

It is quite impossible to tabulate the various reports, and as they are not lengthy it would be as well to publish them in full. They are as follows:

Individual Reports of Five-Banded Bees.

S. T. Pettit, Belmont: My report of the five-banded bees is that the queen is prolific and the bees seem industrious, but they do not get numerically strong from some cause, no matter how much cared for and fed. Another unfavorable peculiarity is that they do not seem to have the power to locate themselves very well. Many bees returning miss their own hive and get into adjacent hives and are killed. The bees are even and very pretty. As you know, the poor season prevented testing their usefulness.

R. F. Holtermann, Brantford: In conducting this experiment I had one Union queen, and purchased four others, giving me five queens in all. These were introduced to full colonies at various times during July and August, 1894. These were, therefore, entirely, or almost entirely, five-banded bees that went into winter quarters. Four of the queens were Southern, and one was purchased from a Canadian breeder. The report of wintering is as follows: One (No. 3) perished, two (Nos. 1 and 4) came out very weak, having barely two Langstroth combs of bees. When the first brood began to emerge from the comb, one colony (No. 2) was of good average strength covering, which would be equal to six Langstroth frames. The Canadian bred queen (No. 5) wintered well, it was very strong, and when examined was marked XXXX. The two weakest colonies never pulled up, and were not full colonies July 15th, after the surplus honey, which was light, was exhausted.

One of the strongest colonies in the apiary was No. 5, but for some reason it remained without an upper story. This colony gathered sufficiently for its own immediate requirements, and on October 17th weighed thirty-seven pounds, which would probably give at that time about twelve pounds of honey, not sufficient for winter. It never offered to swarm. The queen appeared prolific, but the bees short-lived.

I noticed the five banded bees were among the most active in the apiary. They never missed a chance to rob, and I formed the opinion that they were of such nervous development, that their vitality was quickly exhausted, and the bees were short lived, the energy of the colony being exhausted in keeping up its own strength. When touching the wintering question, one has to be exceedingly careful not to come to quick conclusions, but last winter's reports would tend to show that they are not good winterers.

The season was not a good one, but the fact that they secured no surplus, while others in the apiary secured from eighteen to twenty-two pounds of comb honey, does not speak well for five-banded Italians. The bees were very gentle while the colony was in normal condition, but the two weakest colonies, which, according to my usual practice I requeened were exceedingly cross when queenless. The fact that the two weakest colonies gained strength very slowly, should not be recorded against the five-banded bees, it is likely that the queens suffer as well as the bees in colonies poorly wintered. This if correct would explain such a condition.

Deductions: The five-banded bees appear to be—

1. Below the average as to wintering qualities.
2. Of a high strung temperment, making them short-lived, and therefore poor honey gatherers.

3. Prolific.
4. Gentle, unless queenless, when very cross.
5. Inclined to rob.

W. J. Brown, Chard: The queen I received in September, 1894, was introduced successfully to a moderately strong colony, and was artificially strengthened for fall and winter. The queen layed only a short time before the close of the season. In the spring of 1895 this hive came out weak, and in a short time, in spite of all possible care, dwindled away and died. Her majesty arrived too late to get a fair trial.

John Fixter, Dominion Experimental Farm, Ottawa: In reply to your enquiry about the five-banded queen I would say, I am much pleased with her. The colony to which she belonged gave us seventy-eight sections of honey and two swarms. As to gentleness, I can only say they are good. They appear to be good fighters, and crosser than the black bees. The color is very fine—in fact, the bees are exceedingly handsome. The only fault I have is that we have not enough like this queen.

Wm. Couse, Streetsville: In regard to the five-banded bees and queen, I can say they wintered fairly well, but did not swarm or gather any honey, and had to be fed considerably. I found the bees in several hives in close proximity to their own. They seemed to go into other hives more than any bees I ever handled. They are gentle. The season here was bad, and the bees had to be fed for winter.

F. A. Gemmell, Stratford: The past season has been very unfavorable. I got no swarms, not a pound of honey, and had to feed over $50 worth of granulated sugar syrup for winter. No particular disposition was manifested by the five-banded bees. The first queen was superseded. The queens proved only average layers, and not nearly as good as queens of the Adel or golden Carniolian strain. The bees are fairly gentle. The propensity to rob is not by any means latent, in fact, it is a trifle above normal. They always take a prominent part when an opportunity presents itself. The three banded or leather colored queen and her progeny produced bees of a good average strain, but on account of the very unfavorable season I did not get an opportunity of judging of the honey-gathering qualities of either.

C. W. Post, Trenton: As the qeeen did not arrive until late in the season, I had no chance to test their wintering qualities, and as the season caused almost a total failure in the production of honey, there was not a good chance to test their honey-gathering qualities. The workers, however, showed one good quality, they were the quietest bees that I ever handled, requiring no smoke in any kind of weather. Although the queen was a good layer, and plenty of young bees hatched, they never got up to the numerical strength of the leather colored Italians. I am inclined to think that they are a very short-lived bee. They gave twelve pounds of extracted honey with plenty of winter stores.

A. Pickett, Nassagaweya: As to five-banded bees, my report is not very satisfactory. I could not see any difference in wintering. It was quite easy to handle the bees. We did not get much surplus honey from any one hive, but on the contrary had to feed an average of not less than twenty pounds of sugar to each hive. I could see no difference in the amount gathered. They increase faster than the Italian.

R. H. Smith, St. Thomas: I am sorry I cannot say much about five-banded bees. I received the queen in good order, in May, 1894, and introduced her successfully to a colony that had swarmed, and that lost their young queen. She started to lay at once, and in October there was a larger percentage of her bees to be seen than of any others. They were very gentle and stayed well on the comb, building up to a medium-sized colony for winter. There was no fall flow, so I fed thirty pounds of granulated sugar syrup for winter stores, and packed them in leaves under the same conditions as the rest of the yard. In April when other bees were flying, I found them very weak, and by May they were all dead, leaving plenty of sealed stores. There was no sign of diarrhœa of the bees, or dampness in the hive. They did not seem to have vitality enough for such a cold winter. All the other colonies in the same clamp wintered well, with only a loss of five per cent.

UNDERDRAINING.

A. W. CAMPBELL, C. E., ST. THOMAS, ONT.

Horace Greeley, who some years ago passed the remark "Go west, young man," also said that any land worth plowing was worth draining. This with certain limitations I believe to be true. The cost of drainage may exceed the value of the land after it is drained, in which case, or in cases approaching this result, the advisability of drainage is doubtful; or the land may be so perfectly drained by nature that, though the land may be benefited, the additional returns would not justify the expenditure; and it is well to emphasize the fact, that some land which is plowed is not worth plowing and consequently not worth draining. There is no well-defined line of demarcation between soils which can with profit be underdrained and those which cannot; underdraining is not a panacea for all ills, not even the effects of bad farming. But in order to know when it can be profitably applied to farm land it is necessary to look a little into the working of nature.

Soil is porous and, like a sponge, retains in its texture, by attraction, a certain amount of water. When any in excess of this is added, it sinks to the first impenetrable strata or stratas, through which it passes but slowly and from thence rises higher and higher as more is added until it finds a lateral outlet, just as water poured into a pail will rise higher and higher until it finds an outlet in the side of the pail or until it flows over the top. Thus, descending into the ground we come to a certain point where the water is in excess and is stagnant. The most common sources of moisture are rain and snow, but there are other causes of an excess of water in soils which would otherwise have a sufficient outlet, *e.g*, when water is poured out on the surface by springs, or from the high lands. For the germination of plants, there are three requisites—warmth, air and moisture. An excess of moisture in the soil, besides being in itself hurtful to the plant, excludes the other two and prevents proper cultivation of the soil. If the water rises very close to the surface or is swampy, the seed rots in the ground and only aquatic and other wild plants and grasses will grow.

Underdraining supplies the necessary outlet for this excess of moisture at proper depth from the surface. This means, in effect, that the soil is deepened, for the roots will then strike downward and the plant obtains a wider feeding ground, stands more firmly in the earth, and has a greater depth of earth to protect it from the summer drouth. The season is lengthened for growth and cultivation. A strata of ice below the earth's surface melts very slowly in the spring; but when the earth is rendered porous by underdraining, even though the frost may have sunk deeper through the removal of the stagnant water, the melting snow and the warm spring rains quickly pass through the porous earth and it is more quickly warmed and dried for growth or cultivation. That the soil may retain a healthful and proper degree of moisture it must be pulverized as much as possible, and in order to be pulverized it must be moderately dry when plowed, otherwise it is left in hard lumps. Pulverization of soil, besides rendering it more capable of retaining moisture, enables it to absorb the dew and the moisture from the air during the season of drouth. It is the crystallization of stagnant water a short distance below the surface which throws out the roots and results in winter killing. Drained land is lighter to work, is less injured by cattle in feeding, loads may be hauled on it with less injury, and surface washing is prevented. It permits the rain to pass freely through it with its wealth of ammonia, carbonic acid and other fertilizing vapors absorbed from the air. It permits air to reach the roots from which they may obtain their needed supply of oxygen since an excess of water excludes the air. Drainage also warms the soil, as it prevents evaporation and permits the air and warm rain to enter its pores; as heat will not pass downward in water it removes the excess of water which would retard the conduction of the heat downward from the surface of the ground. Underdraining protects the plant from drouth as well as from too much moisture.

When and to what extent underdraining is needed can only be learned by close study of each particular soil and the underlying strata, together with the general geological formation of the district. The depth in a climate where we are subject to severe frosts should not be less than four feet or three at the least, very retentive soils requiring a less depth than those which are porous. Omitting the consideration of frost, the deeper drains are in any case more efficient, for, as will be inferred from my previous remarks on the theory of draining, the greater portion of the water enters the tile from the bottom, not from the top as usually supposed. It is good practice in very porous soils to put a roof of clay directly over the tile to prevent it directly receiving the water. Water entering from the top is very apt to carry sand with it, while it has not been sufficiently filtered of its fertilizing substances. The deeper the drain the fewer drains will be needed. The distance of drains apart must vary with individual circumstances. As has just been said, depth compensates for distance. Some lands need drains ten feet apart, in others sixty feet is not too great a distance. In this the landowner must be guided by his knowledge of the porosity of the soil, the amount of water to be carried off, and the fall which can be given to the drain.

Whatever draining is done should be carried out in a systematic manner. A plan should be drawn showing the location of every drain, together with the general topography of the land. Stones should be placed at the corner of the fields and measurements referred to them. Drains should be, as a rule, laid down in the direction of the greatest fall. The greater one's experience in such matters the more thoroughly they know the impossibility of correctly judging it by the eye, unless the fall is very great. Nor can tile be evenly laid by the method usually adopted, viz., judging the fall by the water level. If a drain is worth putting down it is worth constructing properly. The capacity of a tile drain is limited by the capacity of the bore at its smallest part. If tiles are laid unevenly, hollows act as miniature catch basins for sand and other material which clog the pipe, and to that extent diminishes the whole capacity of the drain above. A drain will work satisfactorily with a fall of 3.20 feet to the mile. Six feet per mile is considered a good fall. The less the fall the greater the danger from obstruction, but with a great fall there is more necessity for careful laying, as at the times of a rush of water the water may force its way through the joints and washouts are apt to occur. In laying tile, care should be taken to make the joints as close as possible. The closest joint that can be made freely admits the water and large openings allow sand to enter the pipe. By revolving the tile or perhaps turning end for end, equal contact all around can be obtained.

In joining one drain with another, some difficulty is experienced. The smaller drain should not meet the main drain at right angles, but should be curved so as to permit the water in it to enter the main drain in the direction of the current. A junction should be made by the use of a branch tile in the shape of a Y, as cutting and fitting tile to one another can rarely be done successfully, the tendency being to cause an obstruction.

Outlets should be as few as possible, and to this end the smaller drains should, if practicable, be carried to one large main drain and thence to a common outlet. The outlet is usually a very much neglected portion of the drain. It should, if possible, be composed of an iron pipe supported by stone masonry. Tile when exposed cannot be safe from frost or the treading of cattle and consequent filling up. It should be protected by an iron grating or screen to prevent frogs, mice and other vermin entering and choking the drain. It is common to see the tile outlet completely submerged in mud, and you need scarcely be told that this is bad practice. The outlet should, if possible, be six inches or a foot above the bottom of the open drain or stream into which it flows.

An important adjunct to tile drains are openings at the junctions or other convenient points where the farmer can frequently ascertain how the drain is working. They should be in the form of catch-basins where sediment coming down the drain may settle and be removed as often as necessary. If these are objectionable in the centre of the field they may be placed at the line of the fences. They should be composed of iron, wood or other material not easily injured by the frost and should be securely covered. If located in the middle of the field they can be placed at a convenient distance below the surface and covered with earth so as not to interfere with cultivation.

Tile must be hard burned, otherwise they will not stand the frost; they should also be truly circular and straight. In manufacturing they are frequently warped and twisted to such an extent that a close joint cannot be secured. All such should be culled, together with broken tile. The size should not be less than three inches, and this only for very short distances, as tile with so small a bore can scarcely be laid in such a manner as to secure a clear outlet unless the fall is very great.

In deciding upon the size necessary, regard must be had to the amount of water to be carried away, the fall (velocity of the current), and to some extent the distance. A common defect is the presence of lime in the clay, which, when burned and afterwards exposed to moisture, will burst the tile.

In laying tile through quicksand, the best method is to completely surround the tile with sawdust. This at once acts as a sieve, through which sand cannot penetrate, while it allows the water full liberty. In time the sawdust decays, and forms a porous and bark-like covering around the tile. Straw and elm bark are too coarse to act with the same degree of success, and generally prove entirely useless. Slabs laid in the bottom of the trench cause an unequal distribution of pressure, and frequently cause obstructions by broken pipe. In draining swamp land, allowance must be made for shrinkage of the soil, which is composed frequently of vegetable matter in an almost floating condition, so that when the soil has completely subsided, the outlet and drain may be deep enough.

The drainage of stiff clays is a matter which has long been in dispute. Because puddled clay is used so effectually in stopping water in dams, ponds, reservoirs, etc., it is commonly supposed that to drain clay is an impossibility. Clay will absorb more than half its weight and bulk of water, and "puddling" is merely the working, treading or stirring of wet clay until it is thoroughly saturated, and its particles so firmly divided that water has an exceedingly slow passage between them. We see the effect of this on roads in the ruts; and in the fields where cattle have been treading water remains in the footprints long after the surface of the ground elsewhere is dry. After the water has been removed from the puddled surface of the clay by evaporation, it will be observed to crack under the hot rays of the sun. Clay shrinks nearly one-fifth of its bulk by drying, and as the sides cannot approach each other, it is torn apart in different directions. Everyone who has observed the bottom of a ditch or drain in clay land, must have seen this phenomenon on a larger scale, the whole soil being divided into a network of fissures. If any of you have tile drains through clay lands, you will observe in the season of drouth deep cracks in the surface of the ground over the drain and extending down a considerable distance. If you could see into the ground, you would observe these fissures extending in every direction from the tile; from the main fissures smaller ones extend, until the whole subsoil is a network of fissures, which are in effect miniature underdrains. Just as the sun drew the water from the surface of the puddled soil, causing it to contract, so has the tile drain taken the water from the soil in immediate contact with it, until it is contracted and cracked, and the fissures thus formed became new drains to lead the moisture to the tile, and so the process of shrinking and cracking goes on until the stiffest clay soil is thoroughly drained. In time, vegetable and other fertilizing matter is washed into these cracks, and after a few years of thorough cultivation no more productive soil can be obtained.

The life of a tile drain varies with circumstances, but should be at least half a century if carefully laid. To take up tile, clean and relay them is generally a more expensive operation than constructing a new drain, and no pains should be spared in avoiding this contingency.

By the use of tile drains, the necessity of open drains is avoided. Beside the loss of a large amount of land occupied by the open drain, and a space on each side which there is not enough room to cultivate, the presence of open drains results in much inconvenience to the farmer in his farming operations. Time is wasted in seed time, and in harvest in turning the plow and harrow, the reaper and the horse-rake, and hand labor must be employed to work on the banks. True economy requires a liberal expenditure of labor and money in securing tile drains wherever drainage is necessary.

T. G. RAYNOR, Rose Hall: If by saying ditto to what Mr. Campbell has given us in his valuable paper, I would sufficiently emphasize it, I should feel that I had said enough. I quite agree with Mr. Campbell on the principles he has laid down for draining. There should be a thorough developed plan of drains laid out on paper, with a good outlet. Provision should be made for silt basins where required, and for the use of round tile, which should be carefully laid. The depth should be three feet when possible, and the distance apart should suit the kind of soil drained. As a rule, the more tenacious the clay the closer should be the drains, etc. I agree with him also in the very many benefits arising from a thorough system of underdraining. It causes the land to be worked earlier in the spring, and also after heavy rains; it increases the productiveness of the soil; it allows better distribution of the manure, and it increases the advantages from the atmosphere while passing through the soil, etc. Just here allow me to remind you of the contrast between the processes of filtration as compared with absorption, or underdraining as compared to surface flow and evaporation. We know that absorption is a cooling process, requiring heat. Much more heat is required to evaporate water than to raise it to the boiling point. In swampy lands which have been underdrained, a difference of several degrees of temperature has been noticed. Perhaps I could not better summarize the benefits from underdraining than by saying that all the benefits arising from a thorough tillage are greatly augmented by the soil being underdrained. Plants are enabled to obtain food at a much greater depth. There are but few farmers in this rolling Province who have not fields which "hang out their signals of distress," and which would be greatly benefited by underdraining. I think that lack of drainage is one of the greatest leaks upon our farms. Perhaps only second in this respect is our general method of handling farmyard manure. I believe that where a farmer has a limited amount of capital, at least a partial system of underdraining is the proper thing. By the placing of the drains where they are most needed, as in the lowest portions of the fields, with an eye to future completeness, the system can be extended at any time, as a person's capital accumulates. By using a plow, a foot or so of the ground may be loosened in such a way that it may be easily turned out with a shovel, and in this way the cost of digging may be materially reduced as compared with doing all the work by hand. In my opinion water is the best leveller, and if we dig at a time when there is a proper amount of water in the soil, there is little or no trouble in securing the proper grade. If the soil is heavy, sods may be carefully placed over the tile. These, with a few inches of earth thoroughly tramped down, will make a very good covering. In conclusion, I would say that I believe it pays to underdrain.

Q. What length of time will a tile drain stand?

Mr. CAMPBELL: Probably fifty years. It will depend on the drain, where and how laid.

Q. Will tile rot?

Mr. CAMPBELL: No, not if made of the proper material. If the material used in making the tile is all right before made into tile, and then properly laid so as to prevent it from crystallizing.

Q. Would you recommend using a glass?

Mr. CAMPBELL: I do not know that using a glass is of any particular use.

Q. Would you recommend using straw?

Mr. CAMPBELL: No.

Q. Is it possible that a certain kind of soil will not underdrain, where it is difficult to get sufficient fall in the drain? I understand that such has been the case in draining in some sections.

Mr. CAMPBELL: What kind of clay?

A. Blue clay.

Mr. CAMPBELL: I find nowhere in Ontario where underdraining has been a greater benefit than to the western part of this Province. They lay the tile properly, and no difficulty has been experienced in layeng tile in stiff clay soil.

Q. If the fall is sufficient?

Mr. CAMPBELL: Yes.

Q. Do any of you use coarse stone or gravel. I heard of some filling their drains with straw on top of the tile. They had to take that all up and put in coarse stone and gravel, which I think will keep the tile to its place better than straw or any of those things. If any of you have tried gravel let me hear of it.

Q. Would you recommend putting in gravel?

MEMBER: I put in coarse stone.

Mr. KEIL: I would like to ask this gentleman if he did not have any gravel, what would he do.

A. I would not put any in.

Mr. CAMPBELL: In our section of the country we have drains that are very level, and it is quite usual for men to do their own levelling. It is not necessary for a man to get an engineer. Level with your own instrument. Simply take a spirit level, which is certainly level, and place it on a board. You can go through your field and do practically good work with this instrument, in ordinary farm work.

Q. I would like Mr. Campbell to give us any information he can, in regard to sandy bottom land.

Mr. CAMPBELL: This would require some little time to answer properly. Relieve the land of the surface water; allow the ground to settle; keep your tile as much as possible on hard bottom; and make the grades all long, and uniform as possible. Keep all these things in view. Make your drains as long as possible, then uniform from point to point.

ADDRESS.

BY DR. MYERS, DIRECTOR AGRICULTURAL EXPERIMENT STATION, MORGANTOWN, WEST VIRGINIA.

It is with a great deal of pleasure that I am able to be here to-day and see you assembled in your council hall to discuss the importance of advancing the great agricultural interests of Ontario.

I do not know when it has been my pleasure to visit an institution that offers greater advantages for the education of young men for the great activities of life than are offered in this College. I cannot well see how a young man could go through this institution, taking its course of instruction, and coming in contact with the distinguished men who preside over it and control airs, without going away to be useful and progressive citizens in this great country.

It is comparatively a few years since it was thought necessary to educate the farmer. I can remember, and I presume the older gentlemen here on the floor remember very distinctly, when it was quite fashionable to practice medicine without any training;

preachers could preach without preparation, lawyers could carry on practice of law without any preparation; but, it has dawned upon our progressive citizens that it is not only necessary to teach the lawyers and doctors, but also the farmers, the theologians, and the farmers' boys.

I am pleased to state that this institution has extended its reputation all over the northern part of our country. We know more about you gentlemen, perhaps, than you think we do. We are quite a piece away, but we know something of you, as may be shown by our sending here every now and then and taking away some of you. (Applause). Over in the country that I came from, we are on the lookout for bright young men who have fitted themselves for doing something in life. We do not want those all-round fellows, but young men who are prepared to do something well. We would just as leave come to the Agricultural College at Guelph, or anywhere else to get them. We do it. (Applause).

Now we want every young man here to feel that he is enjoying many opportunities, and that the world expects a great deal of him; that there is an ample field in which to exercise his ability. Now, you can go a long distance, and you will not find better opportunities than President Mills and his faculty have for you here. I have seen some stakes out around here, that look like some stakes down in our country. I believe there is most excellent work being done with those stakes. At your institution these stakes are under the superintendence of Mr. Zavitz, and let me tell you they mean something. You want to keep a lookout for them. There is something there. There is liable to be more, so keep a sharp lookout on those stakes. We have stakes of that kind in our country. They mean something there also. There are stakes of that kind being driven all over this country of yours. You have skilled men, I understand, to the number of probably fifteen hundred or two thousand driving stakes all over this Province. They mean something there. What do they mean? They mean that the influence of this College is being felt, that agriculture is being elevated, and that in the future the agriculture of Ontario, and the agriculture of the States will be placed upon scientific principles.

REPORT OF COMMITTEE ON THE CONSTITUTION.

The committee on the revision of the constitution beg leave to report as follows:

Constitution.

Articles 1 and 2—To remain the same.

" 3—Change membership fee from 50 to $1.00 and strike out "Commissioner or."

" 4—Change to read "The officers of this Association shall consist of a President, Vice-President, Secretary, and Treasurer, five directors and two auditors, who shall hold office for one year or until their successors are elected."

Articles, 6, 7 and 8—Strike out.

By-Laws.

Articles, 1, 8, 9, 11 and 13—Strike out.

" 2, 3, 4, 7, 10 and 12—To remain.

Article, 5—Leave out from "Executive" to "Council" and add instead "Board of Directors."

Article, 6—After the word "Editor" add "to be appointed by the Board of Directors."

Also leave duties of experimental committees the same as at the present time.

The report was passed by the meeting.

THE FOOD VALUE OF MILK AND ITS DERIVATIVES; COOKING OF MILK, CHEESE AND EGGS.

Miss Bessie Livingston, Supt. Ottawa School of Cookery.

In arranging this address for the meetings of the Farmers' Institutes, I did not expect be called upon to speak before such representative audiences as have attended the meetings in Guelph, and it is with a feeling of timidity that I venture to speak of the food value of milk, butter and cheese to an audience, many of whom have investigated and treated the subject much more exhaustively and scientifically than I have.

However, I may present the subject in a somewhat different manner than that to which you have been accustomed to think of it, and also suggest new ideas in the combination and preparation of some of the most common foods which we get in almost perfect condition from the farm, and from which a great number of nutritious and appetizing dishes can be made.

The food value of any article of diet depends largely upon the amount of nutritive and digestible matter it contains, and upon how far it may meet the different requirements in the various offices which food performs in the body. We require food to build and repair the tissues and fluids of the body, and also to furnish heat and energy. Our bodies being varied in structure, we require foods of varied character to nourish the different parts. We are accustomed to speak of milk as a typical or perfect food because it contains in correct proportion all the elements necessary for the nutrition and development of child life.

Composition of Milk. The composition and quality of milk are influenced by race, feeding, etc., etc., but a fair average analysis of milk shows that it contains about eighty-seven per cent. water and thirteen per cent. solids, the solids consisting of mineral matter, casein or curd of milk, fat and milk-sugar. These different constituents serve different purposes in nutrition. The mineral matter furnishes material for the teeth, hair and bony structure; the casein or curd is the flesh or muscle-forming and stimulating food; the fat rounds out the muscles and serves as a fuel and heat-producing agent; the sugar of milk furnishes muscularenergy and heat. The large proportion of water acts as a solvent agent upon other foods and floats them through the body. Perhaps these latter statements have been somewhat positive, as it is supposed that one constituent may perform to a certain extent the offices of another, yet the best authorities agree in considering that the best results are obtained from a correct combination of them all. During early life, milk should form an important part of a child's diet, and when nature has provided a food so simple, complete, and easily digested, we should infer from this that simple feeding should be continued up to the age of at least six or seven years. Much of the irritibility, debility and lack of power to resist disease in children is due to improper feeding. Stronger foods are given than the immature organism can assimilate, and when we consider the ill effect of undigested food upon the adult, how much more disastrous it must prove to the delicate organism of childhood. In later life the effects are seen in the defective dentition and many other prevalent physical defects.

Milk served with bread, potatoes, rice and other grains is well suited to the nourishment of adults. A diet of milk alone is frequently prescribed in fevers and other diseases where the digestive organs are weakened, and it has been suggested that it might prove a valuable food in old age, to remedy the defective tissue formation of that period.

We cook our foods in order to improve their taste, develop new flavours, and also to make them easier of digestion. We are not accustomed to think it necessary to cook food which is furnished us from nature's laboratory in such assimilable form as milk, but in some cases it is necessary. A glass of hot milk furnishes a pleasant stimulant to many who find that cold milk disagrees with them. The flavour also is improved by cooking for instance, the flavour of cooked milk in coffee is more agreeable than uncooked.

Milk forms a particularly suitable medium for the growth of the little living organisms (bacteria) which are so frequently the source of infection and disease. No dangerous organism is said to be present in the milk drawn from a healthy cow, the contamination coming from some surrounding source, either during or after the process of milking, hence the necessity of absolute cleanliness in its care. In large cities where the source of milk supply is unknown, the precaution is frequently taken to scald the milk, or can it, as we do fruit; it would be wise to adopt this plan where any doubt exists as to the purity of the milk. Sterilized milk is now commonly prescribed in the diet of young children. The milk is put in clean bottles or fruit jars, which are corked with baked cotton, and placed in a pan or pail of warm water. The water is raised to a temperature of about 190° and allowed to stand at that temperature for an hour. The bottles are then removed and cooled as quickly as possible. Enough for one feeding only is sterilized in each bottle. By this method the milk does not reach the boiling point, and the physical condition of the milk remains unchanged. By some authorities boiled milk is considered to be indigestible.

In this pan I have one pint of milk. It is heating over boiling water. Were I to place the pan of milk directly over the fire to heat, we would probably find that it would have been burned at the side of the kettle, and a disagreeable flavour would have resulted. Were it left a little longer it would boil over. This is probably due to the fat and sugar in the milk, for we know the tendency of fats and syrups to boil over. When heated over hot water, milk will not boil. It will reach a temperature of about 196°. The boiling point of milk is a few degrees over 212°. From this pint of milk I shall make a soup, the proportion of materials used being one pint of milk, one cup of mashed potatoes, and one scant tablespoonful each of flour and butter. Melt the butter, then add the flour and cook it thoroughly. In this we have a lesson in cooking starch. Starch is a most important food in its relation to the production of heat and force, and its value as food depends upon its being properly cooked. Starch is a glistening white powder made up of little sacs or grains which require much heat to break them up. The butter reaches a degree of heat about one hundred times greater than milk or water, and the starch is thoroughly cooked in three or four minutes. If I were cooking this starch in milk or water, it would be necessary to cook it fifteen or twenty minutes. To this flour and butter I shall add the hot milk, stir until smooth, then add the potato. I could have used the same quantity of any strained vegetable, peas, tomato, carrot or celery. Milk being deficient in starch, the addition of the potato gives a better balanced dish. To this soup I shall add for flavor and garnish, a tablespoonful of grated cheese and a little minced parsley. In this soup we have a nourishing, appetizing food and one which might be served as a hot supper or luncheon dish very acceptably in cold weather.

Fat. Fat is one of the most important food products, and we get it in a very agreeable and digestible form, in the cream or butter of milk. Animal fats undergo certain chemical changes in the process of cooking, which makes them unwholesome. Vegetable fats, such as olive oil, etc., are more wholesome for cooking purposes.

Cheese. When we come to consider the food value of cheese we have to deal with milk in its most concentrated form, as in the process of cheese-making the water is removed, the casein coagulated by the rennet, and then subjected to pressure which makes it a close and compact food. Cheese, if eaten raw, is generally regarded as being difficult of digestion. I am going to cook a savory and nutritious cheese-dish from one cup of grated cheese, one-quarter cup of milk, one teaspoonful of butter, one egg, pepper and salt to taste, and four slices of bread. I shall put the milk and cheese in a pan, place over hot water and cook until the cheese is melted. Then add the butter and the beaten egg, the pepper and the salt, and cook two or three minutes, or until it thickens.

This we might call a cheese custard. The bread has been soaking in one cup of milk to which was added a beaten egg. I shall fry it in butter, a delicate brown, and pour the cheese custard over it.

The addition of milk to the cheese brings it back nearer to its original condition. The addition of the bread makes a well balanced food, and cooking renders it more digest-able. Very often when we eat cheese we do not consider its very highly nitrogenous character, as one pound of cheese is equal in nutritive value to nearly two and a half pounds of beef, and as a matter of economy and variety, we should substitute a cheese-dish for meat occasionally, instead of serving it with meat or other nitrogenous foods.

Cooking of Eggs. Eggs, like milk, form another complete food and like the milk and cheese, being a food that can be eaten raw, required little cooking. They form a very nutritious and concentrated article of diet, and it is well to combine them with milk or other liquid and starchy foods such as bread, potatoes, rice, etc.

The most important point to be observed in cooking eggs, is that the temperature does not exceed 160° or 170°, which is considerably below the boiling point (212°). When cooked at a temperature of 160° or 170° the egg is tender and delicate, when raised to 212° it becomes tough, hard and indigestible. There are two ways by which an egg is properly cooked in the shell. Put enough boiling water in a saucepan to more than cover the eggs to be cooked, let them stand on the hearth or any place where the water will not cool too quickly and in ten minutes the egg will be cooked soft, or put the eggs into cold water and bring them slowly to a boil. In order to cook the eggs hard to the centre, they need only to be exposed to a continued heat in hot water for half an hour. In order to properly cook eggs, milk, meat and other albuminous food, the knowledge of the proper temperature is necessary, and we should apply this principle in the cooking of any custard or puddings, where eggs are used. In preparing an egg and milk dish where starch is used, the starch should be thoroughly cooked first.

I shall make an omelet to illustrate the cooking of eggs. I shall beat two eggs just enough to mix the yolk and white together, then add two tablespoonsful of water. Milk might have been used instead of water but its cheesy property has a tendency to toughen the omelet. Pour it into this small frypan in which one-half a teaspoonful of butter has been melted. Cook it slowly. As the under part of the omelet begins to cook, prick it with a fork to let the uncooked part pass under. When cooked to a soft creamy consistency sprinkle with salt and pepper. I shall also sprinkle one tablespoonful of grated cheese over it, roll and turn as usual.

A variety of omelets may be made, the difference depending upon the ingredient, which is added last. Instead of cheese I might have used grated ham, parsley, oysters, tomatoes, etc., etc.

REPORT OF COMMITTEE ON ECONOMIC BOTANY AND ENTOMOLOGY.

PROF. J. H. PANTON, AGRICULTURAL COLLEGE, GUELPH.

The committee appointed to collect information concerning the presence of injurious insects, fungi and weeds throughout the Province of Ontario issued 250 circulars of enquiry to the secretaries and some others of the Union.

The replies received come from the following thirty-eight counties: Renfrew, Lanark, Addington, Lennox, Hastings, Russell, Prince Edward, Waterloo, Perth, Lambton, Peel, Grey, Wellington, Huron, Brant, Middlesex, Oxford, Dufferin, Bruce, Victoria, Ontario, Dundas, Welland, Haldimand, Glengarry, Norfolk, Lincoln, Simcoe, York, Essex, Carleton, Wentworth, Northumberland, Kent, Muskoka and Manitoulin.

In 1894 we were able to obtain replies from only twenty-four counties, while this year we have obtained them from thirty-eight, consequently our information is derived from a much more extensive area. The accompanying blank form shows the kind of information sought, and, if it is properly filled, supplies very valuable notes upon weeds and insects.

ECONOMIC BOTANY AND ENTOMOLOGY.

DEAR SIR,—You will confer a great favor by filling out the following and sending it at as *early a dat as possible*. I shall take pleasure in identifying plants or insects forwarded at any time to the College Information in reference to columns four and five is particularly requested. If you have applied an remedies for injuries from insects, mildews, etc., GIVE YOUR RESULTS

J. HOYES PANTON.

1. Names of six most common weeds in your district.	2. The six worst mildews, blights, smuts, rusts, etc.	3. The six worst insects.	4. Any new weeds or blights likely to be injurious.	5. Any new insects likely to be injurious.	6. Any plants considered poisonous.

REMARKS.—

....

....

The following is a summary of the replies received :

1. *The worst weeds reported.*

Canadian Thistle (Cnicus arvensis).
Mustard (Brassica Sinapistrum).
Ox-eye Daisy (Leucanthemum vulgare).
Wild Oat (Avena fatua).
Ragweed (Ambrosia artemisiæfolia).
Couch grass (Agropyrum repens).
Burdock (Arctium Lappa).

Forty species of weeds are referred to, but the above seven are those which have been mentioned by fourteen or more observers.

2. *New weeds and blights reported as likely to be injurious.*

Perennial Sow Thistle (Sonchus arvensis).
Bindweed (Convolvulus arvensis).
Prickly Solanum (Solanum rostratum .
Prickly Lettuce (Lactuca scariola).
Plum Rot (Monilia fructigena).
Anthracnose of Raspberry (Glœosporium venetum).
Rib Grass (Plantago lanceolata).
Penny Cress (Thlaspi arvense).

3. *Worst fungi reported.*

Rust (Puccinia graminis).
Smut (loose), (Ustilago Carbo).
Apple "Spot" (Fusicladium dendriticum).
Black Knot (Plowrightia morbosa).
Corn Smut (Ustilago maydis).
Wheat Smut (Tilletia fœtens)
Peach Curl (Taphrina deformans).
Anthracnose of the Raspberry (Glœosporium venetum).
Potato Blight (Macrosporium Solani).
Gooseberry Mildew (Sphærotheca mors-uvœ).
Grape Mildew (Peronospora vitisola).

4. *The worst insects reported.*

Potato Bug (Doryphora decem-lineata).
Horn-fly (Hæmotobia serrata).
Grasshopper (Melanoplus femur-rubrum).
Curculio (Conotrachelus nenuphar).
Codling Moth (Carpocapsa pomonella).
Turnip-fly (Phyllotreta vittata).
Pea Weevil (Bruchus pisi).
Cabbage Worm (Pieris rapæ).

Besides the above, thirty additional species were reported, but only by a few observers.

5. *New insects reported likely to be injurious.*

Aphis on turnips, oats and peach leaves.
Plum Scale (Lecanium).
Peach Borer (Sannina exitiosa).
Blister Beetle (Epicanta Pennsylvanica).
Buffalo Carpet-beetle (Anthrenus scrophulariæ).
Grape-vine Flea-beetle (Graptodera chalybea).
Pea Bug (Bruchus pisi).

Poisonous plants.

Nightshade (Solanum nigrum).
Poison ivy (Rhus toxicodendron).
Poison sumac (Rhus venenata).
Wild parsnip (Pastinaca sativa).

Spraying. Comparatively few reports stated that spraying was done to any extent; but when tried it proved successful. The references to blanks for the names of new weeds and blights, for any plants considered as poisonous, and for any new insects likely to prove injurious, were not so well filled as we would like to have seen them. It is very important to note the arrival of new pests, for if looked after early in their appearance, it is often possible to prevent them ever getting a foothold. The worst insects, mildews and weeds were well reported upon.

In the column for new weeds and blights likely to prove injurious, though many species were mentioned, very few were referred to by more than one observer. The committee are particularly desirous that experimenters give this group particular attention next year, so that better information may be secured regarding the distribution of some new forms. They also express a desire to have special attention given to the column for new insects, so as to obtain more data regarding such species as the Turnip Aphis, Buffalo Carpet-beetle and Blister-beetles.

The committee thank the observers for the information which they have given, and hope they will continue to take an interest in this work. The Professor of Biology at the College will always take pleasure in determining the species of plants or insects referred to him. We would recommend observers in their returns to mention any remedies which they have found successful against insect and plant pests referred to.

Committee, F. C. HARRISON
L. W. LANG.
J. HOYES PANTON, Director.

CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

C. A. Zavitz, B.S.A., Agricultural College, Guelph, Director of Co-Operative Experiments in Agriculture.

As director of the committee of co-operative experiments on agriculture, I am again asked to present the report of the work carried on throughout Ontario. Some of you in this room may perhaps remember that ten years ago it was decided at a meeting of this kind that some co-operative experimental work should be conducted in connection with our Experimental Union, and a small committee was appointed at that time to establish work of this nature throughout Ontario. I believe that the speaker is the only member of that committee who is still working in connection with this co-operative work. Prof. James, who is now Deputy Minister of Agriculture for Ontario, and Mr. F. J. Sleightholm, who has had charge of the travelling dairy during the past season, were both members of the first committee on co-operative experimental work on agriculture in connection with our Union. During the first five years, the committees appointed were able to make but little headway in connection with this work; but during the past five years the work has made a very steady and substantial increase, and at present occupies a very prominent place in the agriculture of this Province. In 1886 there were but 12 experimenters, and during the past year upwards of 1,700 were engaged in this work, which is an increase of over one hundred-fold in the ten years.

The year 1895 has been rather a severe one in connection with our experimental work, owing to the severe frosts which we had during the month of May, and the exceeding dry weather which occurred during the growing season. There have been a good many failures reported. I am pleased to state, however, that we are enabled to present to you a larger number of successfully conducted experiments than during any of the previous years. A number of the experimenters speak of failures caused, not only by the effects of frosts and drouth, but also through the ravages of grasshoppers and poultry and also through accident.

I wish to draw your attention for a short time to the increase of the co-operative experiments during the past ten years by referring you to the chart which you here see upon the wall. In the first column is mentioned the years during which our experimental work has been conducted; the second column gives the number of distinct experiments during each of the ten years; the third column gives the number of experimenters over Ontario, who were successful with their experiment and who sent us carefully prepared reports of their year's work; and the last column gives the number of plots used for the successfully conducted experiments during each of the years mentioned.

Co-Operative Experiments in Agriculture.

Successful experiments for ten years.

Years.	Experiments.	Successful experimenters.	No. of plots.
1886	1	8	33
1887	1	27	135
1888	1	40	240
1889	4	21	76
1890	6	21	64
1891	12	126	662
1892	12	295	1,585
1893	13	416	2,105
1894	14	504	2,520
1895	15	513	2,356

It will be observed from the foregoing table that co-operative experimental work in agriculture has had a very substantial growth in different respects. It will be remembered that this table does not represent the full number of those who undertook experimental work, but simply those who were successful and whose reports are used in the summary to be given here at this time. There were in all upwards of nine thousand packages of grains and fertilizers sent over Ontario in connection with this work during the past season. Tests were undertaken upon upwards of seven hundred different farms distributed throughout this Province. You will see by this that the number is sufficient to reach nearly all the neighborhoods. We have sent a fair amount of experimental material to the northern sections of Ontario, especially in Parry Sound, Muskoka and Algoma; in fact the distribution has been fairly uniform throughout the Province as far north as Algoma. The material for experimental work is first sent to the members of the Union, and then to others throughout Ontario who desire to carry on co-operative experimental work. I wish to have it clearly understood, however, that we do not send out the experimental seeds, grain or fertilizers to any person who has not sent in an application for them. The demand is increasing year by year, and during the past three or four seasons we have been unable to supply the full number of applicants with the desired material owing to the demand being so great.

The system of our co-operative work is now established in such a way that we are very careful not to change it in any way unless we can see a direct advantage therefrom. By so doing we are enabled in many instances, not only to present the report of the year's work, but also in addition to give the average results of the same experiment for two, three, four, or even five years in succession. Great care is exercised in using none but carefully prepared reports of successfully conducted experiments for our reports. For instance, if any experimenter receives six varieties of oats for his tests, and should, through any cause whatever, neglect to report upon any one of the varieties, his report would be put aside and not used by us in any instance. The force of this can be seen when you consider that the yield of the five varieties would quite likely be greater or less than the average of all the reports, and consequently would make the average higher or lower for the five varieties included in this particular experiment, while the average of the variety not reported upon would remain constant. Several questions are asked each experimenter, and if the experiment is unreliable in any way as made manifest by the answers given or the report received, the results are not included among those used for the summary.

The cost of our co-operative experiments in agriculture during the past year has been $537, which amount has been used for the material and manufacture of about ten thousand bags in which to send out the experimental seeds, printing, postage and expressage. It will be plainly seen that these are items that cannot be cut down to any marked degree. If the work is increased to any perceptible degree, more money will be required to be expended in 1896 than was used in 1895.

Importance of the Co-Operative Experiments in Agriculture Throughout Ontario.

During the first few years' work of the Union, the experiments were confined entirely to the testing of fertilizers, but during the past season fertilizer experiments numbered but two among a total of fifteen. The experimental work now covers nearly all kinds of farm crops in Ontario. The following table gives the number of acres devoted to the various farm crops throughout Ontario during the present year. We have one or more experiments conducted with each of the farm crops which are mentioned. There is no reason why our co-operative experimental work should not have an influence upon each and all of these crops.

Field Crops in Ontario, 1895.

	Acres.
Hay and Clover	2,537,674
Oats	2,373,309
Peas	799,963
Fall wheat	743,199
Barley	478,046
Corn	452,828
Spring wheat	223,957
Potatoes	184,647
Turnips	151,806
Mangels	34,383
Carrots	13,002

It might be interesting if you would make a calculation for yourselves as to the influence of this co-operative work, providing the Experimental Union, though its co-operative experiments, would increase the average yield of each kind of grain over Ontario one bushel per acre. For instance, if the yield of oats were increased one bushel per acre for one year, it would increase the amount of oats in Ontario over two and a quarter million bushels. This slight increase, valued at twenty-five cents per bushel, would be worth over $500,000. I will allow you to make the calculations respecting the other crops for yourselves.

Tho following circular was sent out in February to members of the Union, to previous experimenters, and to those who applied to the College for seed:

Dear Sir,—The members of the Ontario Agricultural and Experimental Union, along with other interested farmers over Ontario, are carrying out a system of co-operative experiments in agriculture. This work was started upon its present plan in the spring of 1886 with twelve experimenters, who received the grains and fertilizers, carried out the necessary instructions, and reported the results at the end of the season. For the first two or three years the experiments were confined almost entirely to the ex-students of the Agricultural College, but as many other farmers expressed a desire to join in the work the invitation was extended to them also, and material was sent to those who applied on the condition that they would be careful to follow the necessary instructions and report the results of their tests after harvest. The work has steadily increased since its commencement, and during the past three years the Union has been unable to supply the material to the full number of applicants, owing to the demand being so great. In 1891 there were 2,642 plots, in 1892, 5,688 plots, in 1893, 7,181 plots, and in 1894 upwards of 7,700 plots were used for these co-operative tests over Ontario. Reports of successful and valuable experiments were received during the past year from every county in Ontario.

The members of the committee on agricultural experiments are pleased to state that for 1895 they are again prepared to distribute into every township of Ontario material for experiments with fertilizers, folder crops, roots and grains. Upwards of 800 varieties of farm crops have been tested at the Experiment Station, Guelph, during the past six years. These consist of nearly all the Canadian sorts, and about four hundred new varieties imported during the past eight years from different parts of Europe, Asia, Africa, Australia and the United States. Some of the kinds have done exceedingly well and are now being distributed over Ontario in small quantities. Great care is exercised in sending out real choice varieties.

Prosperous farmers do not find very great difficulty in conducting these experiments successfully, but care certainly needs to be exercised in every instance, and when this is done the experimenters are far more than repaid for all the time and labor expended. Each experimenter gleans information from his own work and also has the benefit of the report of similar experiments from other parts of Ontario. The results of carefully conducted experiments are presented in a summary form to the annual meeting of the Union, held in December, at the Agricultural College, Guelph, and are afterwards printed more fully, along with the proceedings of the meeting, as an appendix to the report of the College. Each experimenter is invited to this annual gathering of the Union and also has forwarded to his address a copy of the report.

Each person who wishes to join in the work may choose any one of the experiments for 1895, fill out the accompanying form of application and return the same to the Director of the Co-operative Experiments in Agriculture at as early a date as possible. The material will be furnished in the order in which the applications are received until the limited supply becomes exhausted. A sheet containing the instructions for conducting the various tests, and the blank forms on which to report the results of the work, will be sent to each experimenter at the time the fertilizers or seeds are forwarded. All material will be furnished entirely free of charge to each applicant, and the produce of the plots will, of course, become the property of those who conduct the experiment. In return, *the Committee desires to ask that each experimenter will sow all the plots belonging to the particular experiment which he has chosen for 1895, and that he will be very careful and accurate in his work, and forward to the Director by October 25th, 1895, a complete report of the results obtained from the tests.*

Yours truly,

C. A. Zavitz,

Directo of Co-operative Experiments in Agriculture.

A blank form upon which each person, desirous of conducting an experiment, could make his application, was sent with each of the above circulars. A list of experiments to be conducted during the year was also enclosed from which each person could choose as he desired, mentioning his choice upon the form sent.

As soon as each application was received it was entered upon our books, and the experimental material was sent out in the order that the applications were received. The demand was very large, but in nearly all instances we were enabled to supply the full number of applicants. Besides the experiments mentioned in the above list, it was arranged later in the season that an experiment would also be carried on, in testing six leading varieties of potatoes, and in the autumn an experiment was arranged for testing leading varieties of winter wheat. The applications for both of these were very numerous and in the case of the last-mentioned experiment, we were not able to supply more than seventy-five per cent. of the applicants with the desired material; we, however, sent out upwards of 3,000 packages of winter wheat.

The following is a list of the experiments and of the blank form sent out:

No. of Experiments.	Name of Experiments.	No. of plots Required for each.	Size and shape of each plot.
1.	Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure with oats	5	2 rods x 1 rod
2.	Comparing the advantage of nitrate of soda over no fertilizer with rape	2	2 rods x 1 rod
3.	Ascertaining the relative value of four varieties of millet	4	2 rods x 1 rod
4.	Growing lucerne as a crop for green fodder	1	4 rods x 4 rods
5.	Growing crimson clover as a crop for hay	1	4 rods x 4 rods
6.	Testing six leading varieties of fodder corn	6	1 rod x 1 rod
7.	Testing five leading varieties of turnips	5	1 rod x 1 rod
8.	Testing five leading varieties of mangels	5	1 rod x 1 rod
9.	Testing five leading varieties of carrots	5	1 rod x 1 rod
10.	Testing five leading varieties of spring wheat	5	1 rod x 1 rod
11.	Testing six leading varieties of barley	6	1 rod x 1 rod
12.	Testing five leading varieties of oats	5	1 rod x 1 rod
13.	Testing four leading varieties of peas	4	1 rod x 1 rod

Material for No. 1 experiment will be sent by express, and for each of the others it will be forwarded by mail. All fertilizers and seeds will be sent in good time for spring seeding, providing the applications are received at an early date. The supply of material being limited, those who apply first will be surest of obtaining the desired outfit. It might be well for each applicant to make a second choice for fear the first could not be granted. The experiments selected should be indicated by using the numbers shown in the left hand column of the table given above.

Particular varieties need not be mentioned as all the kinds to be distributed are those which have done exceptionally well upon the trial plots at the Experiment Station.

THIS FORM OF APPLICATION.

Experiment chosen ...... { 1st choice...
(*Indicate by number.*) { 2nd choice ....

Name.. Line of railway ....

Post Office ....Township ....

Express Office...County ....

The following letter was sent with each set of experimental material:

DEAR SIR,—Your application for material for experimental work has been received, and we have entered your name upon our books as one of the experimenters for 1895. If you have asked for No. 1 experiment, the material is now being forwarded to your express office; but if your application calls for any of the other experiments, the material is herewith forwarded to you by mail.

For each experiment, soil of a uniform character throughout should be selected, and the plots should be so located that there would be no danger of trespassing by poultry, etc. The preparation of the land should be similar to that for the same kind of crops in larger fields. Be sure and sow every package of seeds or fertilizers which you receive, or the value of the experiment will be greatly impaired. If you are not familiar with any of the varieties in the experiment, it would be a good plan to sow an extra plot with some variety which you have grown for several years and with which you could compare the new kinds.

We are sending out some of the best varieties of farm crops, selected from all the kinds obtained in Ontario or imported from foreign countries and tested in the experimental department of the Agricultural College, Guelph, for several years in succession. Each test is worthy the careful attention of the experimenter. We hope that you may have much success with your experimental work during 1895, and that we will get a good report from you before the 25th of next October.

Yours very truly,

C. A. ZAVITZ,
Director of Co-operative Experiments in Agriculture.

The greatest advantage of this comparative work is perhaps derived by the experimenters themselves, who tested these different varieties, or different fertilizers upon their own farms, but the summary results also possess much useful information. This co-operative experimental work corroborates the experimental work carried on at the Agricultural College, and this, when combined with these experiments at the College, makes the results much more reliable. It is very pleasing to notice that there is a great uniformity in the results of the Union work during the last four years when one year is compared with another. There is also a great similarity in the results of the different varieties tested over Ontario in comparison with the same varieties tested in the experimental department of the College. The following gives the instructions, individual results, summary results, and the conclusions of each of the experiments in agriculture carried on during 1895 :

I. FOUR FERTILIZERS AND NO FERTILIZERS WITH OATS.

(1) Upon uniform land, which has received no manure for at least four years, mark off five plots of one-eightieth of an acre each, leaving a clean path, three feet wide, between the plots. Two rods long by one rod wide is the size recommended for each plot.

(2) Treat all plots alike as regards cultivation of ground, etc., and sow the packages of Siberian Oats upon the five plots, as indicated by the labels on the bags. Aim at seeding one inch deep, and cover the seed by going crosswise over the plots with a light harrow, or by using a hand rake.

(3) Apply the fertilizers upon their respective plots, as indicated by the labels on the bags.

(4) When the plants are three or four inches high, cut off all those outside of the plot limits.

(5) Your safest method of harvesting would probably be to cut the crops with a cradle after the oats have become sufficiently ripened, and then, when properly dried thresh with a flail.

(6) During the harvesting of the plots, watch carefully the requirements of the blank form on this page.

Individual results of 14 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1894.	When and how last manured.	Weight of grain on plot.				
					Mixture.	Nitrate of soda.	Superphosphate.	Muriate of potash.	No fertilizer.
					lbs.	lbs.	lbs.	lbs.	lbs.
R. Cinnamon	Dundas	clay loam	oats..........	never	18.5	18.0	17.0	17.0	15.0
T. Armstrong	Muskoka ..	heavy loam	potatoes	1888..........	30.0	35.0	30.0	25.0	24.0
J. Knight.... ...	Frontenac ..	clay loam	corn	1881, b.y.m...	48.0	44.0	46.0	44.0	38.0
J. H. Ferguson...	Peel	"	sod	never	25.0	34.0	22.0	20.0	19.0
J. H. Herd	Grey	sandy loam	hay	....	20.0	22.0	17.0	23.0	15.0
W. Buskin	Grey	light loam...	peas	1891, b.y.m...	18.0	16.0	16.0	15.0	12.0
Geo. Johnson	Victoria....	clay loam	timothy	1888..........	16.0	15.0	16.0	21.0	19.0
Jas. Abell........	Lambton ..	sand and clay	hay	1890, b.y.m...	14.0	17.0	13.0	12.0	8.0
H. McPhee	Huron	sand loam	hay	....	12.0	12.0	16.5	15.0	9.0
C. D. Lawrence ..	Parry Sound	sandy clay loam ..	potatoes	never	25.5	20.0	28.0	21.0	24.0
T. E. Bowman....	Waterloo ..	sandy loam	oats	1892, b.y.m...	17.3	12.5	15.0	14.0	14.5
J. H. Cook	Wellington..	clay..............	spring wheat .	never	21.0	19.8	20.5	18.8	21.0
O. A. College	Wellington..	... .	....	....	19.8	19.6	18.6	19.0	18.7
E. Minogue	Russell	clay loam	... .	1889..........	14.0	18.0	15.0	12.0	11.0

It will be observed by study of the above table that in some instances the fertilizers had but very little effect upon the crops, while in other instances, the advantage from the fertilizers was very marked. In one instance it will be noticed that the nitrate of soda gave more than double the yield of grain per acre, as compared with the unfertilized plot. These experiments should give a good index to the fertility of the land upon which they were sown.

The mixed fertilizer was made up of nitrate of soda, muriate of potash, and superphosphate, in the proportion of one, one, and two, by weight. The nitrate of soda was applied at the rate of 160 pounds per acre, when the plants were about two inches in height the muriate of potash was applied at the rate of 160 pounds per acre at the time of sowing the grain; and the superphosphate was applied at the rate of 320 pounds per acre, also at the time when the grain was sown. One-third of each of these fertilizers was used for the mixture. Each of the three fertilizers used cost about $400 per acre, for the amount applied. The following table gives the average results:

Fertilizers.	Average yields, 1895		Average yields, 4 years 59 tests.	
	Straw.	Grain.	Straw.	Grain.
	tons.	bush.	tons.	bush.
Mixture	1.1	50.3	1.3	48.4
Nitrate of soda	1.0	49.2	1.3	45.9
Superphosphate	1.0	48.9	1.2	42.9
Muriate of potash	1.0	46.5	1.2	42.8
No fertilizer	.8	41.7	1.1	38.2

Conclusions.

1. The average results obtained by fourteen experiments over Ontario in 1895 show that the fertilizers increased the oat crop as follows:

Mixture. Grain, 8.6 bushels; straw, .3 tons.

Nitrate of Soda. Grain, 7.2 bushels; straw, .2 tons.

Superphosphate. Grain, 7.2 bushels; straw, .2 tons.

Muriate of Potash. Grain, 4.8 bushels; straw, .2 tons.

2. The mixed or "complete" fertilizer gave an average increased yield of 2,06 per cent.; nitrate of soda, 18 per cent.; superphosphate, 17.3 per cent., and muriate of potash, 11.5 per cent. of oats over no fertilizer.

3. The grain crop was more than doubled upon some soils by the use of fertilizers, while upon others it was influenced to a very limited extent.

4. In 50 per cent. of the individual experiments, the mixed fertilizer was unsurpassed by any of the other fertilizers used in this experiment.

5. For four years in succession the mixed fertilizer has given the best average yield of grain per acre; nitrate of soda has given the second largest yield of grain; and no fertilizer has given the smallest average yield of grain per acre.

6, The different fertilizers and in this experiment gave the same comparative yield of grain pea acre in 1895, as in the average of four years.

7. In the average of four years' experiments it is found that land fertilized with the mixture has produced 10.2 bushels per acre more oats than land which was unfertilized.

II. NITRATE OF SODA AND NO FERTILIZER WITH RAPE.

(1) From a section of ordinary land, to which no manure has been applied for at least four years, measure out two uniform plots, each one rod wide by two rods long, and leave a path three feet wide between the plots.

(2) Prepare the soil for rape in much the same manner as you would that for a root crop.

(3) In each plot make eight drills, two rods long, leaving twenty-five inches between the rows.

(4) During the last week in June, sow the two packages of rape seed upon their respective plots.

(5) When the young plants are about two inches high, sow the sodium nitrate upon plot No. 1, after which stir the soil.

(6) Cultivate the land in the same manner as you would that having a root crop.

(7) About the 20th of October cut the rape and immediately weigh the crop from each plot.

In 1895, there was only one successful experiment in determining the value of nitrate of soda in the growth of rape. The soil upon which this experiment was conducted was an average clay loam, and the land grew a crop of peas in 1894.

Nitrate of soda was applied at the rate of about 80 pounds per acre upon plot No. 1, and plot No. 2 was left unfertilized. The cost of the fertilizer would amount to about $2 per acre. Dwarf Essex variety of rape was used.

Nitrate of soda with no fertilizer, with rape for four years in succession :

Fertilizer.	Yield of crop per acre, (tons.)				
	1892. 1 test.	1893. 1 test.	1894. 2 tests.	1895. 1 test.	Average. 4 years.
Nitrate of soda	20.0	9.2	15.2	18.3	15.7
No fertilizer	18.0	4.0	14.8	16.8	13.4

Conclusions.

1. For four years in succession the application of nitrate of soda increased the growth of rape in the co-operative experiments, the average increase being 2.3 tons per acre.

2. Rape can be grown successfully over Ontario to produce an average of about 14 tons of green crop per acre.

3. The demand for rape seed for experimental purposes is still very limited.

III. TESTING FOUR VARIETIES OF MILLET.

(1) Measure off four uniform plots, each two rods long by one rod wide, leaving a path of two feet between each two consecutive plots.
(2) Prepare the land similar to that for a corn crop.
(3) Sow broadcast the four packages of millet seed upon their respective plots during the first week in June. Aim at seeding one inch deep.
(4) Cut the crop as soon as all the heads are in appearance.
(5) Weigh the produce from each plot immediately on cutting.

Individual results of 5 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1894.	How and when last manured.	Weight of green millet on plot.			
					Salzer's Dakota.	Golden Wonder	Common.	Hungarian Grass.
					lbs.	lbs.	lbs.	lbs.
W. R. Weese	Prince Edward.	black clay	oats	1893	300	250	200	200
E. Butterworth	Victoria	clay loam	roots	1894	200	150	120	100
J. F. Beam	Welland	black loam	oats	never	203	115	174	87
C. Campbell	Huron		potatoes	1894, b. y. m.	250	190	140	90
O. A. College	Wellington	clay loam	peas	1894 b. y. m.	207	237	180	172

The millet was sown at the rate of forty pounds per acre in each instance.

Average results of experiments with millets for four years in succession :

Varieties.	Yield of green crop per acre, (tons).				
	1892. 4 tests.	1893. 2 tests.	1894. 5 tests.	1895. 5 tests.	Average of 4 years, 16 tests.
Salzer's Dakota	8.1	9.3	6.1	9.3	8.2
Golden Wonder	5.8	7.1	5.7	8 3	6.7
Common	5.2	5.8	4 0	6.5	5.4
Hungarian	....	....	3.3	5.2	... .

CONCLUSIONS.

1. The varieties of millets tested over Ontario during the past four years hold the same relative position in yield of crop per acre in each of the four years.

2. Salzer's Dakota millet gave an average increase of green fodder at 55.8 per cent. in 1892; 53.6 per cent. in 1893; 53.2 per cent. in 1894, and 43.1 per cent. in 1895 over that of any of the other millets in the co-operative experiments.

3. Among the four varieties of millet tested in 1895, the Salzer's Dakota gave the best yield of green crop per acre in 60 per cent. of the individual experiments which we conducted.

IV. THE GROWING OF LUCERNE.

(1) For either experiment select a plot one-tenth of an acre in size. Four rods square is a good shape.
(2) As the lucerne is a perennial, the plot should be conveniently situated to the stables in such a position that it may remain unbroken for a number of years. The lucerne may either be sown alone or with a lighter seeding of grain.
(3) Cultivate the ground thoroughly, making a fine seedbed.
(4) Sow the $1\frac{1}{2}$ lbs. of lucerne in the same way you would sow red clover.
(5) The lucerne should not be cut the first year unless the crop is heavy, and then not closely.

The lucerne was sown broadcast upon plots one-tenth of an acre in size, and the seed was sown at the rate of eighteen pounds per acre, and in most instances no grain crop was sown with the lucerne.

The results of thirty-six experiments with lucerne, seeded in the spring of 1895, showed that the average height of crop in the autumn was 10.6 inches as compared with an average of 11.8 inches for the four years (94 tests).

CONCLUSIONS.

1. The lucerne under experiment over Ontario during the past year varied in height from six to twenty-six inches.

2. A crop of lucerne cannot be expected during the same season in which the seed is sown; although the catch in 1895 seemed to be fairly good.

3. As lucerne is a perennial plant the most important results of the experiments will be obtained after the tests have been continued for a number of years.

V. THE GROWING OF CRIMSON CLOVER.

(1) For either experiment select a plot one-tenth of an acre in size. Four rods square is a good shape.
(2) As crimson clover is an annual, the land can be plowed in 1896. The crimson clover should be sown alone in every instance.
(3) Cultivate the ground thoroughly, making a fine seedbed.
(4) Sow the one and one-fifth pounds of crimson clover in the same way you would sow red clover.
(5) The crimson clover should be cut as soon as it comes out into bloom, and then weighed immediately on being cut.

The crimson clover seed was sown broadcast at the rate of twelve pounds of seed per acre. In a few instances, seed was sown in April; but in the majority of experiments it was sown during May.

Individual Results of 36 experiments of Lucerne:

Experimenters.	County.	Nature of soil.	Nature of subsoil.	Character of drainage.	Height of plants.	Remarks.
					inches.	
R. H. Harding	Middlesex	loamy	heavy	tile	10	Lucerne promises well.
N. A. Crozier	Haldimand	gravelly loam		underdrained	8	I am well satisfied, and think it will make good hay.
John Holbrook	Haldimand	black clay	black clay	slanting surface.	12	Crop uniform. Had it been cut it would have weighed half a ton per acre.
G. Hicks.	Haldimand	gravelly	gravel	soakage	6	I am satisfied now that I have a green food that will be successful, as it does not heave by the frost.
A. Kennedy	Dundas	clay and gravel.	hard pan	good natural	8	Do not think it will be profitable in this section of Dundas.
B. Mannen	Brant	clay loam	clay	fair	10	
K. McNaughton	Bruce	sandy loam	limestone & sand	good natural	6	I think it will catch better than red clover. We have a good stand of lucerne, while clover is all killed out.
Jno. Kenner	Haldimand	gravelly loam	limestone	sidehill slope	8	I am well pleased with lucerne and am sure of success.
Jas. Partridge	Simcoe	clay loam	heavy clay	natural	6	I sowed it with grain and it did not do well until the grain was cut, but is doing well since.
J. F. Mannen	Wentworth	sandy loam	clay	surface	4	Crop is fairly uniform.
S. Brodie	Grey	clay loam	gravel	natural	12	Lucerne is looking well. If it stands the winter well it will be a profitable crop.
A. T. Horne.	Ontario	clay and gravel.	gravelly	very dry	5	Started well, but land and season were too dry.
Jno. Hunter	Lambton	clay loam	limestone, clay	tile	8	Lucerne thin but healthy.
Jno. Priddle	Norfolk	sandy loam	sand	medium high	12	About half a crop. Kept back by the drouths.
J. H. Gray	Oxford	clay loam	gravelly clay	none	16	In my opinion lucerne is going to take first place among the clovers if it winters well.
T. H. Sissons	Carleton	mucky clay	clay	dry	26	Not very heavy on account of dry season.
A. Betz	York	clay loam	sand	natural	9	Started well but frost cut it back; however, it is doing well again.
F. Fach	Norfolk	sand	quicksand		7	The lucerne stood the drouth better than any other grass seed I sowed this season.
T. Bettles	Huron	loam	gravel	natural	12	Crop uniform.
E. Butterworth	Victoria	sandy loam	gravel	none	6	
Wm. Dawson	Norfolk	sand	gravelly quick-sand		8	Lucerne stood the drouth all right while red clover is all gone.
H. P. Westgate	Lambton	clay loam	clay	furrow at end of plot	13	Almost a failure on account of drouth.
S. M. Billings	Durham	clay loam	clay	natural	8	A fine catch.
J. Bedford	Elgin				8	Almost a failure on account of drouth and frost.
B. E. White	Lanark	sandy	clay	good natural	14	Lucerne was sown with oats and the whole cut about 12th July; afterwards it sprang up and gave good grass. I think it should be more extensively grown as it stands drouth well.
Jno. A. Julien	Kent	sandy	quicksand		13	An even catch.
C. S. Smith	Haldimand	red clay	black clay	slanting surface.	9	I am well pleased with lucerne.

S. G. Holbrook	Haldimand	black clay	loam	rolling surface	12	Seed germinated quickly as the soil was moist. Crop very even.
J. D. Stewart	Perth	clay loam	limestone	tile	10	Crop uniform.
Geo. Baker	Simcoe	sandy loam	sand	natural	8	
Wm. H. Clubine	York				18	Lucerne started well and was cut with the oats, and afterwards grew to a height of 18 inches, when it was pastured off and again grew to a height of 8 inches before winter.
G. A. Brodie	York	clay loam	sandy	well und'r drain'd	18	Am well pleased with lucerne. Drouth apparently did not affect it.
G. S. Hull	Middlesex	clay loam	red clay	tile	13	Lucerne was quite thick. I think it is a good kind of clover and will grow more of it next season.
Jno. Hilbert	Northumb'rl'nd	stiff clay	clay	hillside	12	Very even.
J. Lapp	Victoria	clay loam	heavy clay	not drained	14	It was sown with wheat. After wheat was cut it was pastured off and afterwards grew up thickly to a height of 14 inches.
Jno. Hamilton	Russell	clay	clay	good	15	A very light crop on account of cold, wet spring.

Individual results of 36 experiments with Crimson Clover:

W. H. Mallett	Wellington	sandy loam			10	Weight of the crop 700 lbs. Owing to dry weather and frost after the clover came up the crop was short. We cut on 1st August.
D. H. Cohoe	Welland	clay	clay	surface drainage	6	Season too dry until late in the fall, when it took quite a growth, matted the ground, and came in blossom when nothing else was in bloom. Stood the frost well. Think it will be a great fertilizer.
Geo. Aspden	Simcoe	clay loam	mixture clay and gravel	natural	6	I think crimson clover would be a good thing in a favorable season.
U. S. Waltin	York				20	Made little growth owing to dry weather until end of August; when rain came it looked beautiful. The blossoms attracted the bees and worked every day until frost came. Cut in October.
R. M. Quickfall	Waterloo	heavy loam	clay mixture	good, natural	11	Did not come into blossom early. Was very bushy.
J. L. Groyean	Northumberland	clay loam	clay		10	Season too dry. It all headed out. Cattle and horses ate it down before second growth of red clover, and kept it eat down when the clover was high.
Wm. Mobray	Lambton	good soil			6	Slow in coming up owing to dry weather. Most of it has gone to seed. Too short to cut.
H. D. Buckley	Wentworth				4	Failure caused by frost.
Robert Thompson	Lincoln				12	Owing to dry weather it made slow growth, but after 1st September it shot up and bloomed and made a good heavy growth of about one foot high on clay soil. Have sown 4 acres to winter over.
Robert Findlay	Algoma	clay loam	heavy clay	natural	6	Not cut.
C. M. Johnson	Lincoln	clay loam	clay	surface	6	Not cut. Germinated quickly. Dry weather set it back and made crop short.
Windle Johnson	Lincoln	{ clay loam black ground }	clay	surface	7	Uncut. Grew well considering dry weather.
W. M. Leigh	Perth	peaty clay	red clay	tile	2 ft. 4	Seeds sown April 24th.
John A. Turnbull	Perth	sandy loam	inclined to gravel	natural	8½	Weight, 430 lbs. Frost in May hurt the clover. Cut it August 15th.

Individual results of 36 experiments with Crimson Clover—*Concluded.*

Experimenters.	County.	Nature of soil.	Nature of subsoil.	Character of drainage.	Height of plants.	Remarks.
					inches.	
D. H. Clemens	Oxford	rich sandy loam	yellow soil	natural	12	Seeded down a piece last spring. Was 14 inches high when frost came. Pastured it off; cut it twice, and now there is clover about a foot high.
J. F. Manner	Wentworth	sandy loam	clay	surface	5	Did not make much growth, weather being dry.
Francis Taylor	Grey	clay loam	inclined to harden after 8 or 12 inches	natural	1 ft. 6	Crop weighed 400 lbs. soon after being cut, area 4 rods square.
John Hunter	Lambton	muck and clay	clay	tile	15	Crop not very good, owing to drouth. Sheep and cows like it, increases the flow of milk.
R. H. Harding	Middlesex	loamy	heavy	tile	12	I would not advise it in large quantities. I sowed an acre besides the test and it never grew fit for cutting.
J. L. Edmonston	Grey	sandy loam	gravel	stone	7	Heads full of seed; too short to cut.
Thos. Paterson	Middlesex	gravelly loam	clear gravel	natural	15	As it was so thin it was not cut.
Edmond Prout	Durham	sandy loam	clay	good	5	Season too dry.
W. D. Foss	Oxford	sandy loam	porous	natural	8	Frost on May 13th killed more than half the plants. I doubt if the crimson clover will make a crop of hay to cut the same season.
Thos. S. Bettles	Huron	clay loam	clay	natural	12	Uniform crop.
Alfred Smith	Brant	sandy loam	clay	natural, good	7	It was growing nicely when frost came and killed it back. A large amount of it never seemed to start again Ground was in good condition, but the season was too dry.
Wm. Dryden	Bruce	light loam	sandy	good, natural	11	Weight of crop 590 lbs.
Otto Moser	Wellington	sandy loam		natural	21	Weight 1,600 lbs. of crop. The hay shows finer stems with more leaves than red clover. Cut August 30th.
Moses Pierce	Middlesex	clay	clay	well drained	12	Owing to dryness of season, germination was slow. Would likely produce a good crop in an average season.
R. C. McGowan	Huron	dark loam	reddish clay	underdrained	24	The clover got badly frozen in spring, but late rains made it grow well. In a good season this clover should produce good yield. Had 1,632 lbs. of crop.
Michael Chipsham	Muskoka	clay loam	hard clay	undrained	18	Weight of crop 687 lbs. Season too dry. Think it will be a grand thing for the sandy soil of this country.
Ed. Butterworth	Victoria	sandy loam	rock 2 ft. deep		12	Even throughout.
Chas. Bard	Muskoka	sandy loam	hard pan	slope, natural	15	Seeds sown May 18th.
Jno. Burns	Perth	clay loam	limestone clay	good, natural	11	Came up very slowly and at the time of germination we had severe frosts which retarded the growth very materially. Came into bloom very unevenly. Think under good cultivation it will yield almost as much as common red clover.
S. M. Billings	Durham	clay loam	clay	natural	8	
Alex. Mitchell	Wentworth		clay	natural	6	Weight of crop 90 lbs.
T. G. Raynor	Prince Edward	sandy loam	clay loam	natural	5	Crimson clover quite uniform throughout.

The results of thirty-six experiments with crimson clover showed that the average height was 11.1 inches, and the average green crop in eleven tests was 4.35 tons.

Conclusions.

1. The crimson clover plants reached a little greater average length than those of the lucerne during the same season.

2. The summer of 1895 appeared to be a severe one for the growth of crimson clover, owing to the exceedingly dry weather.

3. In the average of four years' experiments with crimson clover at the College the yield has been about 1.1 tons of hay per acre, and in the co-operative experiments over Ontario in 1895, the average amount of green crop per acre was 4.35 tons.

VI. Testing Six Varieties of Corn.

(1) Measure off six plots, each one rod square.
(2) Mark out each plot into five rows both ways, allowing in every case three feet four inches between two consecutive rows.
(3) Plant each variety of corn upon its respective plot. Drop six kernels at each of the places where the lines touch, and thus make twenty-five hills of each variety.
(4) When the corn is about four inches high, thin out to four plants per hill.
(5) Cultivate all the plots alike, and take necessary notes during the summer for the report.
(6) Cut each variety before frost, and at the time when its stage of growth corresponds to the roasting condition of field corn, or when the grain is partly glazed.

Individual results of 28 experiments:

Experimenter.	County.	Date of planting.		Nature of soil.	Cropping of 1894.	Weight of whole crop per plot.					
						Cloud's Early Yellow.	Rural Thoroughbred White.	Mammoth Cuban.	Improved Leaming.	Salzer's North Dakota.	Compton's Early.
						lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
S. M. Billings	Durham	May	26	clay loam	barley	66	88	52	55	39	33
David Brown	Ontario	do	28	heavy clay	peas	209	215	197	183	149	159
Duncan McVannel	Perth	do	23	clay loam	barley	252	246	175	220	185	195
E. G. McCallum	Glengarry	do	23	clay	hay	191	221	238	181	137	101
P. R. Longworth	Kent	do	10	black clay	peas & oats	349	355	345	300	260	200
John McKee	Oxford	do	28	sandy loam	potatoes	291	249	245	232	190	155
Howard W. Russell	Russell	do	25	clay loam	hay	312	283	246	226	171	155
A. Munro	Parry Sound	do	28	clay loam	carrots	182	178	180	186	160	154
Jas. Grant	Renfrew	do	28	clay loam	corn	224	172	192	204	120	112
J. F. Dix	Victoria	do	25	clay loam	alsike	86	90	70	70	65	52
Jas. D. Rose	Wentwort	do	25	clay loam	hay	15	106	88	85	85	72
John Lancaster	Peterboro'	do	25	clay loam	potatoes	211	250	167	145	155	146
D. H. McDougal	Glengarry	do	18	gravel loam	potatoes	385	330	295	250	260	150
W. J. Wilson	Dundas	do	29	sandy loam	meadow	189	207	168	171	192	129
D. D. Kellington	York	do	25	clay	....	206	175	180	195	187	150
E. P. Wilson	Norfolk	do	31	sandy loam	....	170	190	155	160	132	135
Wm. Kirstine	Bruce	do	25	sandy loam	mangels	248	433	320	267	218	212
Edgar M. Husband	Middlesex	do	31	heavy cl'y loam	mangels	182	144	192	198	114	120
Chas. Shisler	Welland	do	27	clay loam	....	94	68	106	86	87	72
D. Hartley	Halton	do	25	light loam	turnips	147	157	153	195	154	114
David James	York	June	1	clay loam	barley	235	143	139	130	152	134
Peter McNaughton	Middlesex	do	5	rich loam	peas	286	256	268	264	200	196
Wm. Magee & Son.	Durham	May	27	clay loam	timothy & clover.	191.50	184	164.50	173.50	144.50	143
R. A. Butler	Lambton	do	24	sandy loam	oats	176	203	142	118	90	87
G. W. Sutherland.	Lambton	do	28	clay	sod	440	330	358	326	285	240
Dan Campbell	Dundas	do	30	clay loam	potatoes	235	165	200	240	180	175
J. F. Wilson	Oxford	do	25	clay	peas	180	160	190	700	100	139
Wesley W. Fisher.	Huron	do	29	clay loam	oats	149.5	148	184	204	85	104

Average results of 28 experiments:

Varieties.	Average condition about 15th Sept. at O. A. C. for five years.	Height of crop.	Number of ears per plot.		Yield per acre.	
			Good.	Poor.	Ears.	Whole crop.
					tons.	tons.
Cloud's Early Yellow	Late milk	103	33	40	4.0	17.1
Rural Thoroughbred White Flint	Milk	92	32	38	3.2	16.4
Mammoth Cuban	Firm dough	99	52	36	4.2	15.6
Improved Leaming	Firm dough	96	52	35	3.7	14.9
Salzer's North Dakota	Ripe	82	68	29	3.6	12.4
Compton's Early	Ripe	77	56	35	3.3	11.2

Conclusions.

1. It is considered that the best variety of fodder corn for any section in Ontario is the variety which will produce the largest amount of fodder by weight, combined with the largest yield of grain, and that will mature before frost comes in the section where grown.

2. The four varieties of corn which were sent out in both 1895 and in 1894 give the same comparative average yield of whole crop per acre for the two years.

3. The largest number of well developed ears was produced by the Salzer's North Dakota, and the smallest number of well developed ears was produced by Rural Thoroughbred White Flint.

4. The individual experiments show that no one variety of corn is equally well suited to all parts of Ontario.

5. Among fifty-five varieties of corn tested for five years in succession at the Agricultural College, the Cloud's Early Yellow and the Rural Thoroughbred White Flint seemed about the best adapted for Southern Ontario; Mammoth Cuban and the Improved Leaming for Central Ontario; and the Salzer's North Dakota and Compton's Early for Northern Ontario.

6. In the co-operative experiments over Ontario in 1895 the Cloud's Early Yellow appears to have given better all-round satisfaction than the Rural Thoroughbred White Flint; the Mammoth Cuban better than Improved Leaming; and the Salzer's North Dakota better than Compton's Early.

VII. Testing Five Varieties of Turnips.

(1) Five plots, each containing 272 square feet are required for the experiment with Turnips, or Mangels or Carrots.

(2) The drills for the roots should be twenty-five inches apart.

(3) Make all plots alike and arrange each plot according to one of the following plans: (a) Eight drills, sixteen feet four inches long; or (b) four drills, thirty-two feet eight inches long; or (c) two drills, sixty-five feet four inches long.

(4) Sow the different varieties upon their respective plots.

(5) Thin young plants in the rows to the following distances apart: Mangels and Turnips, ten inches; Carrots, four inches.

(6) Be careful of the plants when cultivating and hoeing the ground.

As the number of roots of the different varieties of turnips in each experiment were not exactly uniform, the average weight per root was determined and will be seen in the following summary table, as well as the yield of roots per acre. This was a very unfavorable season for the experiments with turnips, and a large number of failures were reported.

Individual results of 13 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of turnips per plot. Greystone.	Jersey Navet.	Carter's Elephant.	Hartley's Bronze Top.	Marshall's Purple Top.
					lbs.	lbs.	lbs.	lbs.	lbs.
W. H. Crew	Northumberland...	sandy loam (new land).	peas	b.y.m., 1893	276.5	355.5	268	200 5	271
Isaac Fearon, ...	Algoma west	clay loam ..	....	never	71	90	37	42	44
Donald McLaren .	Lanark	gravelly lo'm	carrots.	....	247	325	120	207	210
Louis Adolph	Perth	clay loam ..	fall wheat ..	b.y.m., 1895	384	412	258	178	221
Henry McCormick	Brant	light loam...	barley	b.y.m., 1895	286	305	153	160	181
R. O. Smith	Middlesex ..	clay loam ..	potatoes	b.y.m., 1895	326	343	376	287	228
Angus Munro	Parry Sound	clay loam ..	carrots	1893	650	600	516	694	512
T. E. Bowman ...	Waterloo ..	sandy loam .	oats	b.y.m., 1895	297	127	163	322	167
John B. Landon .	Leeds	sandy loam .	turnips	b.y.m	458	472	702	630	563
E. A. Skelly	Simcoe	clay muck ..	1st crop	never	760	509	567	478	593
C. L. Johnson	Lincoln	clay loam ..	beets	b.y.m	250	400	370	380	350
T. J. M. Skelly ...	Simcoe	clay loam ..	fall wheat ..	b.y.m., 1894, clover turned under ..	645	400	590	511	460
Robt. Thompson	Lincoln	sandy loam .	barley	b.y.m., 1895	420	390	255	285	310

Average results of 13 experiments :

Varieties.	Class.	Average weight per root.	Yield per acre.
		lbs.	bush.
Greystone	fall turnips	2.8	1,114.4
Jersey navet	fall turnips	2.5	1,039.2
Carter's Elephant	Swede turnips.......	2.3	961.5
Hartley's Bronze Top	Swede turnips...	2.2	961.4
Marshall's Purple Top	Swede turnips......	2.0	903.3

Conclusions.

1. The fall turnips gave a larger yield of roots per acre than the Swede varieties in the co-operative tests of 1894 and 1895.

2. The Jersey Navet did not give as high results over Ontario when compared with the Greystone in the co-operative experiments in 1895, as in five years' trials with these two varieties at the Agricultural College.

3. Carter's Elephant and the Hartley's Bronze Top verieties of Swedes gave practically equal results in the Union experiments during 1895.

VIII. Testing Five Varieties of Mangels.

Instructions.—Same as those given for turnips.

There were four varieties of mangels, and one variety of sugar beet tested in 1895. The varieties of mangels used for the co-operative experiments were two long varieties, one Intermediate and one Globe variety; these had given the largest average yield per acre on their respective classes of all the mangels grown at the Agricultural College for four years. The variety of sugar beet used also stood at the head of the list among the varieties tested at the College.

Individual results of 22 experiments.

Experimenter.	County.	Nature of Soil.	Cropping 1894.	How and when last manured.	Weight of roots on plot. Improved Mammoth Saw-Log.	Improved Mammoth Long Red.	Carter's Warden Orange Globe.	Carter's Champion Yellow. Intermediate.	White Silesian Sugar Beet.
					lbs.	lbs.	lbs.	lbs.	lbs.
A. M. Ross	Middlesex..	clay loam.....	potatoes....	Fall 1895 ..	300	300	280	326	250
Cyrus Davis.......	Lanark	loam...... ..	onions'.....	1895........	560	959	348	540	574
J. B. Muir.	Bruce	loam with clay subsoil...	corn	1894........	340	346	390	234	241
Geo. L. Fair........	Durham....	....	....	....	303	242	183	140	163
Jas. Chisholm	Waterloo...	sandy loam. ..	wheat	1895	248	254	310	204	210
K. B. Sutherland...	Oxford	clay loam.....	corn	1895	925	270	710	620	725
Wm. Watson	Lanark	"	potatoes....	1894........	499	477	349	319	417
Geo. Adams........	Lincoln	rich loam.....	oats........	never	1,241	1,227	902	1,187	897
Wm. Jackson	Huron.	clay loam.....	potatoes....	hen m., 1885	153	192	232	85	240
W. D. Ventress	Victoria....	sandy loam ..	potatoes....	1895........	235	186	192	107	166
David James	York	clay loam.....	pease	b.y.m., 1895	480	681	298	198	290
Richard Connolly...	Oxford	"	potatoes....	b.y.m., 1895	1,075	958	710	600	776
Francis Morley	Huron.	clay loam.....	....	b.y.m	485	389	334	307	385
Henry Jacobs	Muskoka...	sandy loam ..	carrots	1895........	210	183	203	150	142
W. K. Foreman	Muskoka. ..	loam	"	b.y.m	500	435	450	450	325
John Mosser........	Wellington.	sandy loam ..	"	b.y.m., 1894	756	870	745	496	485
R. McDonald.	Glengarry..	"	wheat... ..	never	293	402	278	496	315
Jas. A. Neilson	Leeds	"	turnips	....	366	320	358	322	338
Jas. Bell.	Lanark	clay "	onions.	b.y.m., 1894	418	296	302	230	256
C. L. Johnson......	Lincoln	" "	mangels ...	....	900	884	616	775	480
R. Thomson........	Lincoln	light clay loam	tomatoes. ..	1894.... ...	485	415	265	510	290
Thos. W. Stephens .	York	....	... .	....	592	631	343	341	331

Average results of 22 Experiments.

Varieties.	Average weight per root.	Yield per acre.
	lbs.	bush.
Improved Mammoth Saw Log	4.4	1,284.7
Improved Mammoth Long Red.	4.8	1,258.7
Carter's Warden Orange Globe...........	3.2	980.6
Carter's Champion Yellow Intermediate	3.7	953.7
White Silesian Sugar Beet.........................	3.1	857.9

Conclusions.

1. The Improved Mammoth Long Red and and the Improved Mammoth Saw Log varieties of mangels gave the largest average roots, and the White Silesian Sugar Beet gave the smallest average yield of roots among the varieties tested over Ontario in 1895.

2. The White Silesian Sugar Beet requires much more labour in removing the roots from the land than any of the mangels used on the experiment.

3. There were only about ninety per cent. as many roots of the Intermediate variety as there were of the Globe variety, therefore the average weight per root mentioned in the above table is of great value in comparing the different varieties under experiment.

IX. TESTING FIVE VARIETIES OF CARROTS.

INSTRUCTIONS.—Same as those given for turnips.

Individual results of 27 experiments.

Experimenter.	County.	Nature of soil.	Cropping 1894.	How and when last manured.	Weight of roots on plot. Improved Short White.	Large White Vosges.	Large White Belgian.	Guerande.	Danver's Orange.
					lbs.	lbs.	lbs.	lbs.	lbs.
Thos. Canfield	Ontario	sandy loam	....	b.y.m. 1894	387	325	295	286	255
A. E. Quinn	Muskoka	" "	turnips	....	352	261	156	279	198
A. Chisholm	Waterloo	" "	wheat	b.y.m. 1895	400	220	260	180	125
J. S. Bell	Lanark	heavy clay	....	b.ym	360	340	300	320	300
Nicholas DeHart	Simcoe	light clay	buckwheat	b.y.m. 1894	456	341	406	434	423
W. D. Ventrese	Peterboro'	sandy loam	potatoes	1895	193	228	162	182	138
David James	York	clay loam	peas	b.y.m. 1895	558	487	418	334	303
Roscoe E. Law	Nipissing	clay muck	none	new land	160	173	114	91	178
Jas. Clark	Glengarry	light soil	potatoes	1895	572	330	441	460	550
R. O. Smith	Middlesex	clay loam	corn	b.y.m. 1894	424	456	308	176	184
Robert Russell	Bruce	sandy loam	oats	....	256	167	120	170	176
J. T. Smith	Parry Sound	sandy loam	rape	b.y.m. 1894	460	464	376	328	380
John Henderson	Hastings	clay loam	....	b.y.m. 1894	224	244	213	196	168
Mark M. Clark	Perth	" "	oats	....	278	264	198	140	160
Will. J. Brady	Muskoka	" "	peas	b.y.m. 1895	285	223	74	94	147
W. J. Rent	Parry Sound	sandy loam	corn	b.y.m. 1895	385	147	185	279	133
Geo. A. Miller	Grey	clay loam	peas	1895	518	448	316	290	320
Martin Johnson	Simcoe	" "	"	....	360	230	192	232	300
Thos. Canfield	Ontario	sandy	vegetables	....	387	325	295	286	255
C. L. Johnson	Lincoln	muck	....	new l'd none	500	460	510	490	524
T. J. M. Skelley	Simcoe	clay loam	mangels	b.y.m. 1894	718	637	590	496	410
Chas. Young	Algoma	sandy loam	mangels	b.y.m. 1894	368	322	410	320	305
Thos. E. Cook	Monk	black clay	potatoes	b.y.m. 1894	180	169	194	134	124
Donald McDiarmid	Kent	sandy	....	new ground	331	300	335	270	290
Robert Oliver	Huron	sandy loam	....	b.y.m	390	331	420	310	300
R. R. Sangster	Glengarry	....	....	....	520	336	304	304	240
Leonard T. Leach	Simcoe	heavy loam	mangels	1894	250	200	184	118	160

Average results of 27 experiments.

Varieties.	Average weight per root 1895.	Yield of Roots per acre. 1895, 27 tests.	Average 3 years, 80 tests.
		bush.	bush.
Improved Short White	1.4	1,086.6	1,015.0
Large White Vosges	1.1	901.4	880.5
Large White Belgians	1.0	822.4	850.9
Guerande	1.0	770.3	793.1
Danver's Orange	.9	754.1	792.1

CONCLUSIONS.

1. The Improved Short White took the lead in point of yield in fifty per cent. of the co-operative experiments during 1892; in forty-two per cent. of the co-operative experiments in 1893; in fifty-five co-operative experiments in 1894; and in sixty-three per cent. of the co-operative experiments in 1895.

2. The white-fleshed varieties of carrots in 1895 gave better yield of roots than the yellow-fleshed varieties in 1893, 1894, and in 1895.

3. The Guerande was the easiest to remove from the ground and the Large White Belgian the most difficult to remove from the ground of all the varieties.

4. The five varieties gave the same comparative yield of roots per acre in 1895, as during the average of the three past years.

X. TESTING FIVE VARIETIES OF SPRING WHEAT.

(1) Select a portion of uniform soil and mark off five plots, for either spring wheat or barley, six plots for oats, or four plots for peas. Each plot should be one rod square. Allow paths three feet wide between the plots. Note.—To prevent the peas from hybridizing, the plots should be located at least 100 feet apart.

(2) Drive stakes at the four corners of each plot.

(3) Sow the different varieties upon their respective plots. It is an advantage to run a strong cord around each plot and sow inside the line.

(4) After the grain is up three or four inches, again run the cord around the plots and cut off any plants that happen to be outside the line.

Individual results of 13 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1894.	How and when last manured.	Yield of grain on plot. Herison Bearded.	Red Fern.	Pringle's Champion.	Bart Tremenia.	Haynes' Blue Stem.
					lbs.	lbs.	lbs.	lbs.	lbs.
W. H. Cullis	Victoria....	clay loam	barley......	b.y.m., 1891...	5.50	6.50	5.50	4.00	4.50
B. Tates	Simcoe	"	clover, 1893.	1894	15.00	13.00	8.00	12.00	9.00
Gutlip Lantgz....	Renfrew ...	new land	....	....	7.00	8.00	10.00	5.50	8.75
Robt. Ash........	York	clay..........	buckwheat .	{ b.y.m., 1894 salt, 1895... }	15.00	9.00	11.00	13.00	10.00
J. Kinder	Renfrew ...	medium loam.	timothy hay	b.y.m., 1895 ...	3.50	2.06	2.13	1.22	2.25
A. Timmins	Dundas ...	gravelly	barley......	1894	2.50	4.00	3.50	1.50	3.50
T. Robertson	Victoria...	light loam....	peas	b.y.m., 1888. .	2.38	2.19	2.25	2.13	3.06
R. Beneteau......	Essex	clay	"	new land......	7.75	6.50	6.50	5.50	6.00
F. R. E. DeHart .	Ontario	black loam ...	"	new land	10.75	12 00	10.00	11.00	9.00
E. Cullis	Grey	light clay loam	carrots	b.y.m., 1894 ...	4.25	4.00	3.75	3.00	4.00
Wm. Murray	Algoma	clay	potatoes....	pasture land...	12.00	9.00	7.00	8.50	10.00
J. F. Beam	Welland ...	black loam ...	oats	never	11.00	6.00	8.50	10.00	5.00
Geo. Baker	Norfolk ...	sandy loam...	rye	salt & ashes, '94	3.50	3.00	3.25	2.50	2.00

The Agricultural College imported the Herison Bearded spring wheat from France in 1889, the Pringle's Champion from Germany in 1889, and the Bart Tremenia from Greece in the same year. The Haynes Blue Stem was imported from North Dakota, where it had made a very high record at the North Dakota Agricultural Experiment Station in two years' trials. The Red Fern was obtained in Ontario, where it has been grown for a number of years. The following gives the average results :

Varieties.	Comparative value as determined by experimenters.	Yield per acre. Straw.	Grain.
		tons.	bush.
Herison Bearded	100	1.3	20.5
Red Fern	93	1.6	17.5
Pringle's Champion........................	83	1.4	16.7
Bart Tremenia	53	1.4	16.4
Haynes' Blue Stem........................	67	1.5	15·8

Conclusions.

1. The Herison Bearded heads the list in yield of grain per acre in the average of twenty-nine co-operative experiments conducted in 1893, of nineteen co-operative experiments conducted in 1894, and of thirteen co-operative experiments conducted in 1895.

2. The Herison Bearded was the most popular variety among experimenters among five varieties of winter wheat tested in 1895.

3. The Bart Tremenia variety of spring wheat stood the lowest in the estimation of the experimenters in 1895, it being a coarse quality of wheat.

4. The Herison Bearded spring wheat gave an average of three bushels per acre more than Red Fern variety over Ontario in 1895, and the Red Fern stands the highest among all the Ontario varieties tested at the Agricultural College.

5. Herison Bearded has given the highest weight per measured bushel of all the varieties of winter wheat tested at the Agricultural College during the last seven years, and was selected as one of the best milling wheats among fifty-seven varieties examined by the Dominion Millers' Association.

XI. Testing Five Varieties of Barley.

Instructions.—Same as those given for spring wheat.

Individual results of 22 experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1894.	How and when last manured.	Yield of grain on plot. Mandscheuri.	Oderbrucker.	Two-rowed Italian.	Guy Mayle.	Kinna Kulla.
					lbs.	lbs.	lbs.	lbs.	lbs.
S. Westney	Ontario	str'ngs'd'ylo'm	peas	b.y.m., 1894 ..	12.00	14.00	10.50	8.00	5.00
Wm. Field	Middlesex..	heavy clay....	oats	b.y.m., 1894 ..	5.00	5.00	3.00	2.50	2.00
Geo. Mueller	Haldimand.	new land	corn	never	7.00	6.00	4.50	7.00	4.00
Robt. Murphy....	Simcoe	clay	fallow	b.y.m., 1892 ..	5 00	5.00	3.50	6.00	3.00
F. Somerton......	Lanark.....	heavy clay ...	....	 1894	11.00	12.00	18.00	11.00	15.00
G. S. Docker	Elgin	clay loam	mangels....	b.y.m., 1894 ..	17.75	11.75	12.50	14.00	6.25
F. D. Roberts....	Lincoln	clay	oats........	b.y.m., 1895 ..	8.00	7.50	7.00	6.00	5.00
R. B. Cowie......	Ontario	clay loam	"	new land never	13.00	18.00	13.00	15.00	18.00
J. F. Campbell ..	Dundas	"	potatoes....	b.y.m.	12.00	9.00	10.00	8.00	9.50
J. Martineau	Prescott ...	loamy	beans	b.y.m., 1895 ..	5.75	3.00	6.75	2.50	1.75
Wm. Williams ...	Haliburton.	clay	oats	b.y.m.& lime '95	11.25	8.75	7.75	10.00	7.50
Jno. Speiran	Huron	clay loam	roots	b.y.m., 1894 ..	11.50	10.00	6.00	9.00	5.50
A. Kennedy......	Dundas	cl'y and gravel	potatoes ...	b.y.m., 1893 ..	8.00	6.00	11.00	4.00	6.00
F. R. E. DeHart .	Ontario	black loam . .	peas	new land never	13.00	12.00	9.00	10.50	10.00
E. Casselman	Parry Sound	sandy loam ..	potatoes....	b y.m., 1894 ..	13.50	13.13	7.31	9.00	8.75
Jno. Hall	Grey	heavy cl'y lo'm	corn	b.y.m., 1894 ..	14.75	12.25	13.25	18.00	15.25
Jno. Bell	Grey	clay loam	peas, oats & barley mixed	b.y.m., 1894 ..	17.50	13.50	13.50	12.50	13.00
Wm. Tiplady	Huron	"	oats & barley mixed	b.y.m., 1893 ..	8.75	7.75	9.75	9.25	6.50
Wm. Ramage	Grey	sandy loam .	potatoes....	b.y.m., 1894 ..	5.75	4.75	4.25	3.50	4.25
J. F. Beam	Welland ...	black loam ..	oats	never	13.00	8.00	12.00	6.50	10.25
R. Kelly	Peel	clay..........	peas	b.y.m., 1893 ..	12.25	7.75	7.25	7.50	7.00
Wm. Rynard	Ontario	"	'	b.y.m., 1893 ..	7.00	6.00	6.00	6.00	4.00

The Ontario Agricultural College imported the Mandscheuri variety of barley from Russia; the Oderbrucker from Germany; the Two-rowed Italian from Italy; the Guy Mayle from the United States, and the Kinna Kulla from Sweden. The Mandscheuri and Oderbrucker are six-rowed varieties, the Two-rowed Italian and Kinna Kulla are two-rowed variety, and the Guy Mayle is a hulless barley. In giving the yield of the Guy Mayle, forty-eight pounds to the measured bushel was used as in the case of the other varieties.

Average results of 22 experiments:

Varieties.	Comparative value as determined by experimenters.	Yield per acre.	
		Straw.	Grain.
		tons.	bush.
Mandscheuri	100	1.1	35.3
Oderbrucker	84	.9	29.7
Two-rowed Italian	72	1.2	29.6
Guy Mayle	53	.9	28.1
Kinna Kulla	31	.9	25.4

Conclusions.

1. The Mandscheuri variety of barley gave the highest yield of grain per acre in the co-operative tests for 1892, 1893, 1894 and 1895.

2. The six-rowed varieties of barley have surpassed the two-rowed and hulless varieties in the co-operative experiments over Ontario for four years in succession.

3. Mandscheuri variety was surpassed by no other variety in seventy-five per cent. of the co-operative experiments over Ontario in 1894, and in sixty-four per cent. of the experiments in 1895.

4. The Two-rowed Italian barley gave an average yield of grain in 1895 almost equal to the Oderbrucker, which is a six-rowed variety.

5. The Mandscheuri variety of barley was most popular of the varieties tested among experiments in 1895, and the Kinna Kulla was the least popular.

XII. TESTING SIX VARIETIES OF OATS.

Instructions.—Same as those given for spring wheat.

Individual results of 79 experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1894.	How and when last manured.	Yield of grain per plot.					
					Siberian.	Bavarian.	Joanette.	Oderbrucker.	Besthorne.	Poland White.
					lbs.	lbs.	lbs.	lbs.	lbs	lbs.
Geo. Baird, Sr	Huron	clay loam	fall wheat	b.y.m., 1893	16.50	14.50	18 00	15.00	14.50	14.00
Wm. Fitzgerald	Bruce	....	clov'r past're	b.y.m., 1892	9.00	12.00	7.00	11.00	15.00	10.00
F. Kosmack	Renfrew	yellow loam	wheat	never (n. l'd)	11.88	9.06	11 63	7.50	11.00	8.25
Jos. Ingles	Lambton	clay loam	"	never	10.00	11.00	10.00	10.50	9.00	11.50
Wm. Sadler	Middlesex	"	fall wheat	b.y.m., 1893	13.00	17.00	10.50	15.00	11.00	11.50
R. W. Mowbray	Ontario	"	turnips	new land	17.00	16.00	19.00	12.50	21.00	16.00
C. White	Lambton	sandy loam	mangels	b.y.m., 1894	15.00	14.00	12.00	13.50	10.50	16.50
Jno. Armstrong	Stormont	loam	carrots	b.y.m., 1893	11.50	12.50	10.50	13.00	11.50	11.00
Frank Shuh	Waterloo	sandy loam	fall wheat	1893	9.00	9.50	7.25	8.75	8.00	7 25
R. S. Rennie	York	bl'kcl'yloam	barley	1888	1.00	14.00	11.00	11.50	11.50	10.00
P. D. Campbell	Lanark	clay loam	peas	no manure	10.00	10.00	12.00	9.00	13.00	10.00
W. McGregor	Ontario	clay	wheat	5 years ago.	9.00	8.00	10.00	7.50	5.50	5.50
A. McKellar	Lambton	"	oats	1889	8.13	7.63	7.13	5.63	6.19	7.56
M. M. Cardiff	Huron	clay loam	fall wheat	1894	7.50	11.00	10.00	10.50	9.00	9.00
J. Boyes	Ontario	good clay	pasture	....	0.50	13.00	16.50	14.00	11.00	12.00
Jas. Fraser	Renfrew	loam	barley	1894	9.00	11.00	9.00	13.00	9.00	8.00
Wm. Worden	Perth	loamy	fall wheat	b.y.m., 1893	11.75	7.25	9.50	9 00	11.00	9.25
Wm. Paterson	Lanark	clay loam	peas & oats.	6 or 7 y'rs ago	20.50	13.25	10.00	21.00	13.00	12.00
S. Lee	Wentworth	"	pasture	....	9.56	9.50	12.50	10.69	9.06	8.75
S. Rankin	Perth	sandy loam	"	never	12.00	9.00	15.00	8.00	9.00	14.00
J. B. Rhodes	Kent	clay loam	potatoes	1893	12.50	16.50	11.50	8.00	24.00	13.00

XII. TESTING SIX VARIETIES OF OATS.—*Concluded.*

Experimenter.	County.	Nature of soil.	Cropping of 1894.	How and when last manured.	Yield of grain per plot. Siberian.	Bavarian.	Joanette.	Oderbrucker.	Besthorne.	Poland White.
					lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Chas. Musclow	Hastings	sandy loam	wheat	1894	4.50	6.75	11.50	11.00	7.75	5.75
B. J. Palmer	Oxford	clay loam	turnips	b.y.m., 1894	5.00	4.00	14.00	5.00	6.50	3.50
A. J. Taylor	Middlesex	"	oats	never	12 25	14.00	12.00	12.00	12 50	13.50
C. W. Taylor	Perth	"	"	b.y.m., 1893	17.75	18.50	11.25	18.25	13.25	12 25
Jas. Petigrew	Bruce	clay	clover	no manure	15.00	14 00	18.00	15 00	14.00	18 00
J. J. Brady	Middlesex	clay loam	potatoes	never	14.00	16.00	12.00	17.00	13.00	18.00
H. Miller	York	swamp loam	peas	never	16.50	15 00	20 00	13.00	11 00	16.00
Jas. Auld	Wellington	loam	oats	b.y.m., 1890	6.00	5.25	5.00	5 50	4 75	6.25
D. Taylor	Grey	sandy loam	potatoes	b.y.m., 1894	13.50	8.50	7.00	9.00	5.00	7.00
A. Ecker	Norfolk	"	wheat	b.y.m., 1894	23.00	19.00	17.00	20.00	20.00	18.00
I. Hansen	Haldimand	clay loam	oats	b.y.m. '94-'95	11 50	11.25	10.00	12.50	16 00	10.75
Jas. Andrews	Grey	light loam	"	v'ry little '94	13.00	13.00	13.50	11 00	10.50	12.50
J. Wooddisse	Wellington	sandy loam	peas	never	8.00	10 25	9.00	10.25	9.25	8.00
G. N. Gerow	Ontario	"	alsike	b.y.m., 1892	9.75	9.50	6.00	6 50	6.50	7.00
R. Lawrence	Halton	clay loam	millet	old pasture	9.13	8.80	9 38	9.13	9.00	9.38
J. W. Gillies	Brant	"	wheat	1893	9 50	6.00	12 00	10.50	6.50	10.00
A. Nichol	Middlesex	"	fall wheat	b.y.m., 1894	13.50	14.00	10.50	15.00	12.50	10 50
W. E. Gillies	Brant	clay	turnips	1894	20 00	11 00	15.00	15.00	19 00	22.00
Jas. Armstrong	Grey	sandy	potatoes	b.y.m., 1894	10 00	10.00	7.00	7.00	10.50	6.50
G. W. Beckett	Welland	clay	hay	b.y.m., 1891	10.00	9 00	10.00	8.00	6 00	10 40
Graham Bros.	Middlesex	clay loam	peas	1894	13 00	16.00	16.00	12.00	14.00	12.00
R. Gray	Huron	"	fall wheat	1893	21.00	22.00	18.50	19.50	20.00	17.00
D. Madden	Bruce	"	bare fallow	b.y.m., 1894	18.00	14.50	16.00	15.00	15.50	15.50
Jas. Fell, Jr.	Victoria	"	spring wheat	b.y.m., 1890	6.75	9.00	5.50	8.50	8.00	8 75
Jas. Howe	Elgin	gravelly	wheat	1893	9.00	9.50	9.00	9.00	8.00	10.00
J. T. Bayley	Muskoka	sand	clover	none	8.10	7.20	8.20	8 00	5.50	6.00
H. Dawson	Wellington	fair	oats	b.y.m., 1895	7.25	11.50	13.00	7.75	11.00	11.50
A. Kennedy	Dundas	clay & grav'l	potatoes	b.y.m., 1894	5.00	8.00	3.00	9.00	6.00	6.00
J. L. Wilson	Lanark	sandy loam	peas	b.y.m., 1894	4.00	6.00	3.00	3.00	4.00	5.00
J. R. R. Secord	Lincoln	black loam	clover	none	8.88	7.38	7.00	9.13	9.31	8.31
J. W. Hartman	Grey	light, gr'v'lly loam.	potatoes	not for sev'r'l [years	9.00	9.00	12.00	9.00	10.00	8.50
D. Reid	Halton	loam	barley	1893	8.50	7.0)	6.00	10.00	8.00	9.00
Wm. Murray	Algoma	clay	potatoes	never	15.00	14 00	20.00	14.25	13.25	14.00
Jos. Fearon	Algoma	h'vy cl'y lo'm	new land	never	12.00	10.50	10.00	17.00	15.50	16.00
W. L. Montgomery	Stormont	loam	potatoes	1894	11 00	10.50	9.00	10.00	10.00	7.50
Wm. Goodger	Oxford	....	fall wheat	b.y.m., 1894	12.25	11.50	10.00	12.00	15.00	9.25
H. Coben	Peterboro'	sandy loam	peas	b.y.m., 1894	10.50	9.00	10.50	11.00	10.00	11.00
Thos. Sproule	Frontenac	bl'ck ground	barley	never	11.00	12.00	9.50	9.00	10.50	12.00
J. P. Rutherford	Algoma	clay loam	peas	1892	13.00	13.00	12.00	13.50	14.00	16.00
P. Rutherford	Algoma	"	"	1893	13.00	14.00	10.00	12 00	13 00	17.00
W. H. Helmer	Renfrew	loam	old land	1894	14.00	16.00	17.00	13 00	16.00	15.00
Jas. McMahan	Lambton	black clay	corn	never	26.00	25.75	23.00	23.50	24.00	25.50
J. F. Beam	Welland	black loam	oats	never	22.00	16.00	20.00	18.00	19.00	17.50
T. J. M. Skelly	Simcoe	clay	potatoes	1894	18 00	16.00	21.00	18.00	15.00	23.00
Wm. Lamb	Bruce	gravely loam	pasture	b.y.m., 1892	9.00	9.00	7.00	9.50	9.00	9.50
W. H. Teeple	Elgin	cl'y & gr'v'ly loam	mangels	b.y.m., 1894	4.25	6.00	6.50	4.00	5.00	3.75
F. Sweet	North'mbl'd	st'ng cl'y l'm	fall wheat	....	6.00	8.50	8.75	5.00	7.50	11.00
J. Duncan	Wellington	clay loam	oats	1893	7.50	5.25	5.50	6.25	5.00	5.00
Chas. Hay	Frontenac	"	mangels	1894	21.25	12.50	20.00	11.00	17.50	16.00
T. W. Stephens	York	"	fall wheat	b.y.m., 1893	25.50	24.00	25.50	23 50	23.00	21.00
J. E. Hull	Middlesex	"	wheat	1893	16.00	12 00	13.00	17.00	20 00	15.00
H. Kelly	Waterloo	"	roots	1893	16.50	15 00	16.00	18.00	17.00	12 00
J. H. Best	Haldimand	black loam	corn	1893	12.00	11.00	6.00	14.00	10.00	10.00
Jno. Kelly	Grey	sandy loam	potatoes	1894	20.00	13.00	18.00	13.00	12.00	15.00
Joel Brenton	Hastings	clay loam	corn	none	4.00	4 00	4.25	2.75	3.25	2.50
J. J. Hall	Dufferin	sandy loam	roots	1893	16.00	19.00	17.00	16.00	16.50	11.00
Exp. Dept. O.A.C.	Wellington	clay loam		....	10.14	15.94	11.23	14.00	12.19	19.27
N. Dunbar	Bruce	sandy loam	oats	b.y.m., 1883	13.50	7.50	11.00	11.00	8.00	13.00

The Ontario Agricultural College imported the Siberian Oats from Russia, the Joanette from France, the Oderbrucker from Germany, the Besthorn from Germany, and the Poland White from France. The Bavarian is termed an Ontario oat, as it has been grown in this Province for about twelve years, and it was grown in New York State about six years previous to that. The Bavarian stands highest of all the Ontario oats that have been grown at the Ontario Agricultural College for seven years in succession.

Average results of 79 experiments:

Varieties.	Comparative value given by experimenters.	Yield per acre.	
		Straw.	Grain.
		tons.	bush.
Siberian	100	1.6	57.1
Bavarian	74	1.6	55.0
Joanette	82	1.4	54.9
Oderbucker	82	1.4	54.8
Besthorne	70	1.5	54.1
Poland White	77	1.4	53.9

Conclusions.

1. The Siberian which stands at the head of the list in average yield of grain per acre among seventy-eight experiments in 1895, also occupied first place in the average of 121 experiments in 1894, 105 in 1893, and 125 in 1892.

2. The Joanette which stands third in the list of 1895 occupied first place in the list of 1894, 1893, and also of 1892.

3. The Joanette is the shortest strawed variety of those tested in the co-operative experiments.

4. The Siberian variety of oats was the most popular among the experimenters in 1895, and the Besthorne was the least popular.

5. The Siberian gave an average of over two bushels per acre more than the next highest yielding variety. This amount of increase upon the area devoted to oats in Ontario in 1895, would make a difference of nearly five million bushels of oats in the Province in one year, simply through the increase of two bushels per acre.

XIII. FOUR LEADING VARIETIES OF PEAS.

Instructions.—Same as those given for spring wheat.

Average results of 69 experiments.

Varieties.	Comparative value given by experimenters.	Yield per acre.	
		Straw.	Grain.
		tons.	bus.
Egyptian Mummy	85	1.2	24.3
Prussian Blue	100	1.1	24.2
White Marrowfat	84	1.1	22.5
Canadian Beauty	99	1.1	21.1

The following table gives the individual results of 69 experiments:

Experimenter.	County.	Nature of soil.	Cropping 1894.	How and when last manured.	Yield of grain on plot.			
					Egyptian Mummy.	Prussian Blue.	White Marrowfat.	Canadian Beauty.
					lbs.	lbs.	lbs.	lbs.
T. F. Howell	Brant	....	....	....	9.00	10.00	9.25	10.00
Geo. McKay	Bruce	heavy loam	fall wheat	6 yrs. ago	4.00	3.00	4.50	4.25
Jas. Pegg	Grey	sandy loam	potatoes	1893	2.50	3.13	4.00	3.50
Frank Doud	Brant	clay loam	wheat	clover, 1894	10.75	10.00	9.00	9.75
Guildford Butler	Lambton	clay	barley	1895	10.00	12.00	12.00	11.00
Geo. Jackson	Huron	clay loam	oats	1893	4.00	10.00	4.00	6.00
Robt. Adams	Bruce	clay loam	oats	15 yrs. ago	22.00	24.00	15.00	20.00
P. M. Campbell	Lanark	sandy loam	turnips	b.y.m., 1893	10.00	9.00	8.00	10.50
E. A. Maddock	Simcoe	clay loam	spring wheat	never	10.50	11.00	11.00	10.00
Nicol Dawson	Northumberland	"	oats	1895	5.00	5.00	4.50	10.00
J. R. Maddock	Simcoe	"	spring wheat	never	10.50	11.00	11.00	10.00
Jas. Cruickshank	Kent	sand	corn	1895	6.00	7.00	5.00	8.75
J. B. Lindsay	Huron	clay	corn	b.y.m., 1894	14.00	10.00	7.50	7.00
Fred Swaine	Bruce	sandy loam	turnips	1894	7.50	10.00	7.00	7.00
Chas. Silverthorn	York	gravel	oats	never	3.00	7.50	5.50	3.25
Jos. R. Hamilton	Simcoe	clay loam	wheat	1893	8.00	7.00	12.00	11.50
Jno. F. McCracken	Huron	heavy clay	turnips	b.y.m., 1894	8.00	6.00	4.50	8.00
J. S. Rumney	Victoria	loam	....	never	4.00	4.50	4.00	4.00
R. J. Deachman	Huron	clay loam	summer fallow	b.y.m., 1894	4.00	4.66	4.00	5.00
J. H. Weaver	Welland	clay	potatoes	1894	9.50	8.75	9.50	11.25
J. W. Kernigham	Huron	clay loam	fall wheat	never	7.00	7.00	5.50	4.5.
Gordon Young	Huron	"	corn	1894	1.50	3.00	2.50	2.00
Henry J. Wary	Durham	light clay l'm	clover hay	1889	9.00	10.00	11.00	11.50
Jas. Robertson	Simcoe	clay loam	alsike	b.y.m., 1892	15.00	12.50	8.50	12.00
Thos. J. Lee	Simcoe	"	potatoes	b.y.m., 1894	2.00	3.75	4.00	8.00
David Graham	Hastings	"	peas	....	11.05	13.00	9.50	12.00
Jno. W. Jessop	Renfrew	sandy loam	oats	never	17.00	10.00	13.00	11.00
Nelson Monteith	Perth	clay loam	hay	b.y.m., 1892	13.50	12.00	8.00	13.00
Edmond Cook	Dufferin	sandy loam	roots	1894	13.50	7.50	13.50	15.50
Jas. Alexander	Halton	clay loam	pasture	1891	9.00	9.00	8.50	6.50
Ed. Mans	Brant	sandy loam	strawberries	b.y.m., 1891	5.59	6.50	7.00	6.44
Robt. Waterson	Russell	"	peas	1894	4.38	5.88	3.44	4.63
Geo. Wright	Wellington	sandy loam	ensilage corn	b.y.m., 1894	16.00	15.00	13.00	12.00
J. H. Frarey	Algoma District	clay	peas	never	14.00	11.50	10.50	12.50
David Sinclair	Muskoka	sandy loam	beans	b.y.m., 1895	4.75	6.50	6.25	8.50
Jas. T. Bayley	Muskoka	sandy	fodder corn	b.y.m., 1895	11.50	17.50	15.75	7.00
E. P. Wilson	Norfolk	sandy loam	wheat	b.y.m., 1895	2.00	3.00	2.50	3.50
John Ramage	Russell	clay loam	meadow	b.y.m., 1894	15.00	11.50	10.50	11.00
W. Mc. Leigh	Perth	"	fall wheat	b.y.m., 1894	10.00	13.50	11.50	14.00
Wesley Rose	Simcoe	sandy loam	barley	b.y.m., 1894	12.50	18.00	9.00	15.00
C. W. Neville	Lennox and Ad	"	meadow	b.y.m., 1895	4.50	3.50	3.00	4.00
J. I. Graham	Grey	loam	sod	never	7.00	10.00	8.00	7.50
T. C. Wheatley	Lambton	mucky	corn	none	14.50	8.00	12.00	14.00
Jas. Pate	Brant	sandy loam	oats	1892	4.25	7.00	2.25	3.00
Jas. Allen	Simcoe	clay loam	fall wheat	b.y.m., 1894	8.75	12.00	9.00	10.25
J. L. Wilson	Lanark	sandy loam	peas	b.y.m., 1894	5.00	2.00	4.00	3.00
Robt. Gray	Huron	clay loam	fall wheat	1893	13.00	17.00	15.00	17.50
Thos. Robertson	Victoria	light	....	....	3.19	2.06	4.13	3.38
Jas. Fell	"	clay loam	spring wheat	b.y.m., 1890	2.50	3.00	2.75	3.50
John Currie	Huron	light clay l'm	peas	spring, 1894	9.00	10.50	9.00	10.00
Ralph Tiplady	"	clay loam	oats	b.y.m., 1892	14.25	10.00	15.00	11.00
John D. Scott	Oxford	"	pasture	b.y.m., 1890	12.38	11.19	12.25	11.81
Geo. F. Laxton	Ontario	sandy loam	hay	never	7.75	5.63	4.25	8.50
W. R. West	Nipissing	clay muck	potatoes	virgin soil	12.50	13.25	15.50	14.00
Jas. H. Newlove	Peel	clay loam	clover	b.y.m., 1892	10.00	9.50	12.00	7.50
A. G. McIntosh	Bruce	sandy loam	carrots	b.y.m., 1894	15.00	10.50	10.25	11.00
Jos. McCallum	Perth	clay loam	fall wheat	1893	7.50	7.00	5.50	8.50
J. F. Beam	Welland	black loam	oats	never	11.25	8.50	9.00	12.00
Abram Schooley	East Elgin	sandy loam	fall wheat	1893	6.00	8.00	8.00	6.00
John Richardson	Dufferin	clay loam	oats	b.y.m.	9.13	8.50	6.75	10.38
S. Parkinson	Huron	"	corn, 3 years	b.y.m., fall	5.00	11.00	13.00	16.00
David Thompson	Wellington	"	pasture	b.y.m., 1888	15.00	11.00	12.00	8.00
Richard Moore	Frontenac	clay	hay	b.y.m., 1890	10.50	6.00	8.00	10.00
R. R. Sangster	Glengarry	clay loam	sod	b.y.m., 1888	12.00	10.00	8.00	16.00
Henry Kelly	Waterloo	clay & bl'k m'k	barley	1892	9.00	10.50	10.00	13.00
John Kelly	Dufferin	sandy loam	potatoes	1895	9.00	9.00	7.00	10.00
Adam Esplen	Bruce	"	roots	1894	2.50	3.00	4.50	3.75
C. M. Macfie	Middlesex	"	potatoes	b.y.m., 1895	4.00	7.00	4.00	7.00
Experimental Dep't.	Wellington	clay loam	....	....	12.91	10.75	10.41	11.09

CONCLUSIONS.

1. The Prussian Blue variety of peas gave the largest yield of grain per acre of seventy-three co-operative experiments in 1893; and of sixty-three co-operative experiments in 1894; and, along with the Mummy, of seventy-two experiments in 1895.

2. The Prussian Blue was the most popular variety tested by the experimenters in 1895, and the Canadian Beauty was the next most popular variety.

3. There is a great demand in Ontario for a good variety of peas.

XIV. TESTING SIX VARIETIES OF POTATOES.

(1) Prepare for planting *all* the potatoes received upon *uniform* plots made to an *exact size*.

(2) First count the potatoes and then cut them in such a way that there will be exactly sixty-six pieces of each variety.

(3) One row sixty-six feet (four rods) long is required for each kind. If the rows are placed side by side a distance of thirty inches should be allowed between the rows.

(4) Drop the pieces one foot apart in the row, and aim to have the pototoes placed four inches below the surface of the ground.

(5) Each variety should be marked with a good substantial label made out of wood.

(6) Flat cultivation thoroughly done is recommended.

Previous to the year 1894 the work of the horticultural committee was devoted to the testing of varieties of potatoes. As the committee of agricultural experiments was in a much better position to take charge of this work, and as it was the desire of the director of the horticultural committee to carry on tests with small varieties of fruits, the experiments on potatoes were transferred from the horticultural committee to the committee on agricultural experiments.

Average results of 49 experiments.

Varieties.	Table quality. 100=best.	Percentage crop marketable.	Average yield per acre, bush.
Empire State	94	93	205.1
Freeman	87	91	204.7
American Wonder	79	92	196.0
Pearl of Savoy	87	93	189.4
Summit	86	91	181.3
Burpee's Extra Early	100	88	165.6

CONCLUSIONS.

1. The Empire State gave the largest average yield of potatoes per acre in fifty-two co-operative experiments in 1895, and in thirty-eight co-operative experiments in 1894, as well as among twenty-three varieties of potatoes grown at the Agricultural College for six years in succession.

2. From the reports giving the weight of the thirty largest potatoes of each variety in the individual experiments, it is found that the Empire State and the Pearl of Savoy produced the largest sized potatoes, and the Burpee's Extra Early the smallest.

3. In table quality the majority of the experimenters mentioned the Burpee's Extra Early and the Empire State as being the best, and the American Wonder as being the poorest.

4. The Burpee's Extra Early was the earliest variety to reach maturity of the six kinds under experiment.

5. The Empire State and the Pearl of Savoy possessed the largest per cent. of marketable potatoes, and the Burpee's Extra Early the smallest per cent.

6. There was a difference of about forty bushels per acre between the average yield per acre of the Empire State and the Burpee's Extra Early.

Individual results of 49 experimonts with potatoes.

Experimenter.	County.	Nature of soil.	Cropping of 1894.	How and when last manured.	Yield of potatoes per plot					
					Empire State.	Freeman.	American Wonder.	Pearl of Savoy.	Summit.	Burpee's Extra Early.
					lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
John Dawson	Algoma	sandy loam	turnips	....	1.14	68	114	71	73	106
Ed. Allen	Simcoe	" "	oats	never	69.5	72	78	67	73	50
F. A. Whetter	Victoria	clay loam	oats	1895	84	97	92	85	79	58
A. Duncan	Russell	gravel	potatoes	1894	66	79	63	75	71	70
D. V. Purvis	Leeds	loam with clay bottom	potatoes	artificial manure, 1894	79.8	87.5	68	73.8	48	50.3
Jas. Branch	Durham, W.	sandy loam grvl. bottom	onions	1895	85.5	73.8	77	82.3	69	65
Jas. Brodie	Grey	clay loam	....	never	57	60	42	56	50	56
Joseph Osborne	Lambton	strong clay	peas	....	159	117	130	110.3	95.3	71
Jno. R. Suddaby	Wellington	good s. loam	fall wheat	b. y. m. 1984	71	91	64	100	64	55
A. S. Yarwood	Pr. Edward	rich loam	oats	b. y. m. 1893	72.3	65.5	70.6	74.8	68.2	67
H. H. Kottmeier	Welland	black loam	....	b y. m. 1894	50	45	48	38	50	45
E. C. DeGuerre	York	clay	mangels	1894	44	56	61	55	49	53
T. Black Laws	Lambton	sandy loam	hay	....	40	61	31	39	37	52
Chas. King	Oxford	clay loam	oats	....	76	91	72	84	86	78
Jno. Allen	Grey	sandy loam	corn	....	43	35	51	45	38	38
Walter Hartman	Grey	clay loam	peas	b. y. m. 1895	63	51.3	47	48	47.5	41
J. M. Fair	Frontenac	sandy	potatoes	b. y. m.	56	51	52	55	50	42
J. A. Davidson	Peterboro	clay loam	hay	....	24	18	17.5	20	19	24
A. Zimmerman	Welland	muck	potatoes	never	51	39.5	37.5	21	28	24.8
John Oxendale	York	clay loam	oats	1894	84	73	65	68	47	29
Adam Douglas	Victoria	sandy loam	....	1894	122.5	128.5	126	84	152	103.5
F. C. Garbutt	Peterboro'	" "	potatoes	....	67	62	72	67	67	67.5
Fred B. Hutt	Welland	" "	onions	b. y. m. 1894	82	64	49	62	61.5	71
Jas. S. Miller	Parry Sound	clay loam	corn	b. y. m. 1894	74	90	76	80	70	70
Geo. North	Wellington	" "	oats	1895	32	49.5	26	50	51	34.2
B. A. Johnston	Stormont	sandy loam	corn, 1894	....	132	153	1[illegible]7	163	113	164
Nathaniel White	Grenville	....	pasture	....	46.7	33	43	18	27.5	26.7
John Sinclair	Ontario	sandy loam	oats	fall, 1894	38.5	55	40	44.5	36.5	36
Simpson Rennie	York	black c. loam	oats	1895	124	134.5	94	103	92.5	89.5
Wm. Wills	York	sandy loam	potatoes	1894	62	90	8[illegible]	68.5	58	53.[illegible]
J. Blackburn	Simcoe	clay	peas	....	47.5	53.5	46	48	33.2	36.5
J. F. Davis	Peterboro'	sand loam	mangels	b. y. m. 1895	59.5	77	52	57.5	49	46
Ira F. Pearce	Durham	clay	mangels	b. y. m. 1895	48	65	97	81	65	52
Jas. More	Perth	clay loam	potatoes	b. y. m. 1895	72	6[illegible]	66	73	85	56
W. R. Vrowman	Oxford	" "	corn	b. y. m. 1895	82	74	66	68	62	52
Thos. F. James	Ontario	s'ndy c. loam	oats	....	80	68	75	71	66	68
J. N. Wiley	Peel	sandy loam	oats	1894	54	60	55	57	51	50
Thos. Barber	Hastings	clay loam	turnips	1894	92	121	106	133	139	90
R. A. Thompson	Simcoe	" "	hay	....	73	84	77	80	71	80
H. Storey	Pr. Edward	loam	corn	b. y. m. 1894	57	72	57	37	61	35
Moses Kraft	Waterloo	limest'ne gvl	melons	1894	159	126	120	96	104	121
J. E. Hull	Appin	new gvl loam	corn	....	152	78	116	147	163	57
R. R. Sangster	Glengarry	red loam	peas	b. y. m. 1887	64	50	85	54	37	60
W. C. McGregor	Kent	clay "	potatoes	....	38	34	37	37	32	38
Geo. Short	Wellington	" "	alsike clover	1895	55	73	68	53	52	61
Arch. McColl	Elgin	" "	....	....	160	160	105	140	95	80
W. T. Prangley	Kent	" "	first crop	never	68	63	160	7[illegible]	75	63
A. E. Smith	Wentworth	sandy loam	potatoes	never	58	77	67	54	68	43
J. H. Elliott	Hastings	clay loam	peas	1895	125	122	105	133	126	110

XV. TESTING FIVE LEADING VARIETIES OF WINTER WHEAT.

(1) Select a portion of uniform soil and mark off five plots, each one rod square. Allow a path three feet wide between each two consecutive plots.

(2) Drive stakes at the four corners of each plot.

(3) Sow the different varieties upon their respective plots. It is an advantage to run a strong cord around each plot and sow inside the line.

(4) After the grain is up three or four inches, again run the cord around each plot and cut off any plants that happen to be outside the line.

Individual results of 100 experiments.

Experimenter.	County.	Nature of soil.	Cropping, 1894.	Weight of grain on plot.				
				Dawson's Golden Chaff.	American Bronze.	Jones' Winter Fife.	Surprise.	Early Red Clawson.
				lbs.	lbs.	lbs.	lbs.	lbs.
G. M. Cary	Middlesex	clay loam	bare fallow	11.0	8.0	11.0	10.0	11.0
E. A. Maddock	Simcoe	clay	peas	16.0	13.0	15.0	14.0	15.0
Mrs. J. W. Todd	Simcoe	clay loam	peas	16.0	13.0	15.0	14.0	15.0
R. Robertson	Northumberland	sandy loam	peas	12.0	7.0	6.5	8.0	7.0
W. Fotheringham	Huron	clay loam	bare fallow	9.5	6.7	6.2	5.0	9.2
W. W. Russell	Simcoe	clay loam	potatoes	17.2	10.2	13.2	11.7	17.0
Jas. Lindsay	Grenville	gravelly	oats	15.0	13.0	17.0	14.0	12.0
G. S. Duncan	Haldimand	clay		8.0	7.0	8.7	8.0	7.0
Jno. F. Andrew	Huron	gravelly loam	bare fallow	8.5	6.5	4.0	9.0	6.0
D. A. Moss	Elgin	clay loam	potatoes	11.2	9.2	9.5	9.7	6.2
J. W. Brown	Elgin	free clay	wheat	12.0	9.7	10.7	10.0	10.0
Thos. Thompson	Peterboro'	clay loam	bare fallow	12.8	10.1	9.0	12.0	11.7
D. D. Springstead	Lincoln		oats	7.0	6.0	5.0	6.0	4.0
Wm. Lamb	Bruce	gravelly loam	wheat	11.0	13.0	9.0	7.0	11.0
T. G. Page	Halton	clay loam	bare fallow	4.0	3.0	4.0	4.0	3.5
Thos. Ferguson	Bruce	clay	hay	8.0	5.5	5.0	7.0	4.0
Wm. McMaster	Simcoe	clay loam	oats	20.0	16.5	12.2	9.2	18.7
O. Mosser	Wellington	clay loam	peas	16.0	15.0	15.8	14.5	14.2
J. R. Maddock	Simcoe	clay	peas	15.0	13.0	15.0	14.0	15.0
Jas. B. Muir	Bruce	clay loam	peas	12.0	14.5	14.0	10.0	13.0
Jno. Kehoe	Peel	clay loam	fallow	7.5	4.7	5.2	7.5	5.7
J. W. Hugill	Victoria	clay loam	peas	10.0	6.0	6.0	9.5	9.0
Jno. Dalgarno	Grey	clay loam	corn	11.5	11.0	10.0	9.0	11.0
N. Dawson	Northumberland	clay	clover pasture	7.5	8.0	7.0	6.0	7.0
A. Magee	Lennox	sandy loam	beans	14.0	15.0	8.0	13.0	9.0
E. Armbrust	Welland	sandy loam	hay	3.7	4.0	1.7	3.0	1.5
P. C. Blackburn	Kent	sandy loam	corn	10.0	6.2	9.5	9.5	9.5
T. E. Cragg	Ontario	loam	potatoes	11.0	7.5	9.5	8.5	8.2
Geo. Roberts	Bruce	light		10.5	7.5	9.0	6.0	7.0
F. Somerton	Lanark	heavy clay	clover	20.0	17.5	21.0	19.0	15.0
Jas. Stewart	Oxford			10.4	9.0	10.0	8.3	8.3
H. Mosser	Wellington	clay loam	roots	15.2	14.5	14.5	14.0	13.8
Jno. Mosser	Wellington	clay	none	15.0	14.0	16.5	14.5	14.0
T. Stephenson	Grey	sandy loam	potatoes	12.2	13.7	11.5	11.2	11.7
R. McLaren	Huron		barley	15.0	12.5	13.0	12.0	13.0
P. H. McCall	Lambton	clay	oats	6.7	5.0	6.0	6.5	5.5
R. Cummings	Bruce	clay	peas	19.0	22.0	17.5	20.0	20.0
H. Mackey	Peterboro'	clay loam	bare fallow	14.5	12.5	15.0	15.5	19.5
I. H. Turner	Grey	clay	peas	8.2	4.0	12.2	7.5	7.2
J. White	Kent	clay	oats	14.0	10.0	11.0	11.0	13.0
Thos Henry	Kent	clay loam	potatoes	9.5	6.0	7.5	8.0	6.0
Jno. Priddle	Norfolk	sandy	peas	5.0	7.0	6.0	5.0	7.0
Jas. Tesky	Addington	clay loam	oats	10.0	10.5	9.5	8.0	11.0
D. Oram	Hastings	sandy loam	potatoes	7.0	8.2	5.0	6.5	8.0
J. A. Frame	Bruce	clay	bare fallow	8.7	10.0	8.5	8.0	8.0
A. H. Jacobs	Huron	clay loam	strawberries	16.0	11.0	7.0	9.0	11.0

Individual result of 100 experiments.—*Continued.*

Experimenter.	County.	Nature of soil.	Cropping, 1894.	Weight of grain on plot.				
				Dawson's Golden Chaff.	Pride of Genesee.	Early ripe.	Early Genesee Giant.	Early White Leader.
				lbs.	lbs.	lbs.	lbs.	lbs.
Wm. Hollingreen	Halton	clay loam	potatoes	12.5	13.0	12.5	14.0	11.0
Wm. McNab	Middlesex	clay	bare fallow	14 0	11.5	11.5	12.5	14.0
Wm. C. Wilson	Simcoe	clay loam	bare fallow	10 0	8 9	6.6	7.6	9.7
Jno. Phillips	Huron	sandy	peas	8.0	7.0	6.0	10.0	11.0
Jas. Wiley	Lambton	sandy loam	potatoes	16.0	10.0	13.0	15.0	8.0
W. S. Fraser	York	clay loam	bare fallow	15.0	14.0	14.5	12 6	12.0
N. Wiley	Lambton	gravelly loam	potatoes	15.0	10.0	13.5	14.5	9.0
S. Moore	Peel	heavy clay	timothy	11.0	9.5	7.5	11.5	11.5
T. W. Klinch	York	black clay loam	spring wheat	23.5	22.5	20.5	26.0	20.5
Thos. Wheatley	Grey	clay loam	peas	6.0	1.5	1.0	5.0	2.0
D. McVannel	Perth	clay loam	peas	18.0	18.0	12.0	16.0	14.0
Chas. Krueger	Grey	light loam	potatoes	5.7	6.0	3.0	6.5	6.0
F. Somerton	Lanark	heavy clay	potatoes	20 0	22.0	16.0	21.0	15.0
Jno. Barron	Norfolk	clay	corn	11.2	7.0	6.2	14.0	11.5
C. Ketchaban	Elgin	light sand	fodder corn	9.0	5.5	6 5	7.5	6.5
C. C. Ford	Elgin	black loam	pasture	8.5	7.0	9.0	7.0	6.7
H. G. Nisbet	Peterboro'		peas	7.0	5.5	5.5	8.0	5.0
Jno. A. Hankinson	Elgin	clay loam	peas	19.0	12.0	20.0	14.0	18.0
Jno. Leonard	Elgin	clay loam	corn	22.0	17.0	17.0	15.0	16.0
R. Gray	Huron	sandy loam	hay	8.0	5.5	5.5	6.5	5.0
M. Buchanan	Middlesex	clay loam	bare fallow	18.0	17.0	16.0	15.0	16.0
Hamill Bros	Victoria	clay loam	alsike clover	8.5	7.0	8.5	11 0	6.0
A. Pickett	Halton	loam	fall wheat	10.0	9.0	9.5	10.0	8.0
Jno. L. Hugill	Victoria	heavy clay loam	peas	9.0	10.0	6.5	8.0	7.0
H. Salmon	Wentworth	heavy clay	bare fallow	5.0	6.5	6.0	6.0	5.5
Geo. Brent	Lambton	clay loam	potatoes	21.0	16.5	18.0	24.7	17.0
Jas. McLaren	Middlesex	sandy	peas	8.0	5.5	3.0	5.5	5.0
O. Vansickle	Wentworth	clay loam	pototoes	6.0	9.0	8.5	3.0	4.0
Jas. Woods	Huron	clay	bare fallow	10.0	10.0	9.0	7.0	10.0
Jno. D. Neilson	Lambton	loam	bare fallow	11.0	3.5	4.5	8.0	5.0
R. B. Fitzgerald	Haldimand	clay	bare fallow	7.7	7.6	6.5	8.0	6.5
Jas. Smith	Lambton	sandy loam	oats	15.0	13.0	14.0	12.0	13.0
W. R. Walker	Halton	clay	bare fallow	16.0	12.0	12 0	13.0	11.0
D. H. McCallum	Middlesex	clay	bare fallow	13.0	12.0	13.0	10.0	12.0
W. H. Locke	Northumberland	clay loam	peas	8.7	9.5	9.9	6.2	7.0
Wm. Ireland	Middlesex	clay	bare fallow	7.5	6.0	7.5	7 0	4.0
Jas. Orr	Lambton	clay loam	corn	11.0	15.0	14.0	17.0	15.0
Wm E. Saddler	Middlesex	strong clay	potatoes	17.0	13.5	14.0	18 0	13.5
W. Hartman	Grey	clay loam	peas	7.5	6.5	7.7	4.7	8.5
D. Stewart	Oxford			10.1	9.0	5 0	7.8	7.0
R. Richardson	Lambton	clay loam	wheat	15.0	12.0	14.0	16.0	13.0
W. H. Turnbull	Huron	sandy loam	peas	13.0	14.0	13.0	16.0	14.5
A. Reeve	York	gravelly loam	peas	5.5	4.0	3 0	3.2	3.1
G. W. Beckett	Welland	clay loam	oats	8.5	12.2	6.0	9.0	6.2
W. J. Coleman	Dufferin	clay loam	bare fallow	8.0	7.1	3.1	8.5	7.7
D. E. Charlesworth	Durham	clay loam	beans	8.0	6.0	1.5	3.2	4.4
S. Peter	Perth	sandy loam	peas	12.0	10.0	13.0	11.0	11.0
C. Horsburg	Northumberland	sandy loam	pasture	5.0	4.0	3.0	3.5	3.0
E. D. Plato	Welland	clay loam	peas	7.0	3.0	7.0	4.5	5.0
Jno. Morken	Middlesex	sandy	peas	14.0	15.0	16.0	17.0	20.0
D. Marshall	Grey	clay loam	corn	13.0	12.5	7.0	9.0	9.0
A. C. Park	Lambton	clay loam	peas	8.0	7.0	15.0	8.0	6.0
S. C. Smale	Lambton		potatoes	13.5	12.7	12.0	15.5	12.5
Geo. Sebben	Oxford	clay loam	barley	8.0	10.5	7.5	7.0	8.5

One hundred and twenty-two varieties of winter wheat have been tested at the Ontario Agricultural College within the past six years. Some of the varieties have produced yields of grain which were more than double those of other varieties grown beside them on plots of the same area. Not only has there been a great variation in the comparative yields of grain produced by the different varieties, but there has also been a marked difference in strength of straw, weight of grain per measured bushel, value of grain for milling purposes, etc., of the different varieties tested. The results of these experiments are published annually in bulletin form and in the College report, and are sent free to all members of Farmers' Institutes and others in Ontario by the Department of Agriculture, Toronto.

In the fall of 1894, nine leading varieties of winter wheat were selected from the kinds which had been grown from one to five years at the Agricultural College, and were distributed throughout Ontario for co-operative experimental work. These were divided into two sets, with five varieties in each, the Dawson's Golden Chaff being used in both sets to form a basis by which the results of all the varieties could be compared with one another. Each person wanting to conduct an experiment, stated in his application which set he desired, and the five varieties in the set selected were sent to his address with full instructions for conducting the experiment. The grain was sown at the rate of $1\frac{1}{3}$ bushels per acre upon plots 1-160th of an acre in size.

Two hundred and forty-seven winter wheat experimenters have reported already this season. Of this number, one hundred favored us with good reports of successful experiments, eighty furnished partial reports, and sixty-seven wrote of failure or unreliable results. The names of the successful experimenters and the detailed results of the test will be printed in the annual report of the Experimental Union for 1895, which will be published as an appendix to the Agricultural College report.

The following table gives the comparative yields of straw and grain per acre of the winter wheat varieties tested during the past season on one hundred Ontario farms :

	Straw per acre. (Tons.)	Grain per acre. (Bush. 60 lbs.)
1. Dawson's Golden Chaff	1.39	32.9
2. Early Genesee Giant	1.44	30.8
3. Early Red Clawson	1.23	28.9
4. Jones' Winter Fife	1.33	28.8
5. Pride of Genesee	1.33	28.8
6. American Bronze	1.34	28.6
7. Surprise	1.33	28.1
8. Early Ripe	1.36	27.8
9. Early White Leader	1.29	27.4

As none except the one hundred good reports of successfully conducted experiments have been used in the preceding summary of results, they should be of great value and worthy of the thoughtful attention of wheat growers in Ontario. Much credit is due to the careful experimenters who sent us the full reports, which have been used in this summary.

Concise Results of These Co-operative Winter Wheat Experiments.

1. Reports of successful experiments with winter wheat have been received this season from thirty counties in Ontario, nineteen of which are east and eleven west of the city of Guelph.

2. The counties of Lambton, Middlesex, Huron, Grey, Elgin, Simcoe and Bruce, furnished fifty-one of the one hundred good reports received in 1895.

3. Of the two hundred and fifty-seven experimenters who reported the results of their tests, only eight speak of wishing to discontinue the co-operative experimental work, and much interest is manifested throughout.

4. Dawson's Golden Chaff, Early Genesee Giant, Early Red Clawson, and Jones' Winter Fife gave the highest yields of grain among nine leading varieties of winter wheat tested throughout Ontario for two years in succession.

5. In average field of winter wheat per acre, Dawson's Golden Chaff stood highest among eleven varieties tested over Ontario in 1893, nine varieties in 1894, and nine varieties in 1895, also among fifty-three varieties grown at the Ontario Agricultural College for four years in succession.

6. In the co-operative experiments for 1895, Dawson's Golden Chaff, Jones' Winter Fife, and the Early Genesee Giant gave the best yields on heavy soils; and Dawson's Golden Chaff, the Early Genesee Giant, and the American Bronze on light soils.

7. When the experiments followed peas, grass, or bare-fallow, Dawson's Golden Chaff gave the largest average yield of grain, and when they followed potatoes, Early Genesee Giant came first in this respect.

8. Early Genesee Giant and Dawson's Golden Chaff made the best appearance in the spring of 1895, and Early Ripe looked the poorest.

9. American Bronze, Early Genesee Giant, and Dawson's Golden Chaff possessed the stiffest straw.

10. Pride of Genesee and American Bronze produced the greatest length of straw, and the Surprise the shortest length.

11. Early Ripe and Dawson's Golden Chaff were the least, and Early Genesee Giant and Early White Leader were the most affected by rust.

12. Early Ripe and Early Red Clawson were the first to mature, and the Pride of Genesee and Early White Leader were the last to mature.

13. Early Genesee Giant and Dawson's Golden Chaff produced the plumpest grain, and Early Ripe and American Bronze the most shrunken grain.

14. Dawson's Golden Chaff was decidedly the most popular variety with the experimenters in each of the past three years; and during the present season it was chosen by over sixty per cent. of the farmers who sent in full reports, as being the *best* among the varieties tested.

The results of the co-operative experiments for 1895 were all worked out on large charts of which there were seventeen in number. These were used at the meeting, and they seemed to be much appreciated by those in attendance. It seems as though as valuable a report as this should receive fully a half day for presenting and discussing. During the two and a half hours in which Mr. Zavitz was presenting it at the meeting the questions asked him were very numerous and many valuable points were brought out. The discussion is not herein given, as many of the questions are already answered, owing to the results being given in this report in more detail than could possibly be done at the meeting.

SMALL SIZE FACTORY CHEESE FOR HOME USE.

By J. F. Beam, Black Creek, Ont.

I propose, in this paper, to briefly state some of my own experience in supplying cheese to the local trade, and the possibilities attainable in properly cultivating the home market. I think I can best do so by giving a brief history of how I came to make small size factory cheese for home use. About five years ago I heard a lecture by President Mills, of the O. A. C., at a farmer's institute meeting in Welland. The lecturer showed the advantages of dairy farming for refertilizing the land, especially in the older sections where long-continued grain cropping had so impoverished it that the annual yield of grain had fallen below a paying basis. As a result of that lecture I started a cheese factory on my farm the following spring. In procuring vats and presses I obtained also a few small sized hoops for pressing small cheese. When making a number of full size cheese per day, of sixty to seventy pounds each, the daily remnant or pieces of curd were pressed in one or more of these small hoops. Thus quite a number of these little cheese were made in the course of the season. We also made a number of flats or twins about four to six inches thick. The local demand for cheese was good at the adjacent villages and towns of the Niagara frontier. The price obtained per single seventy pound cheese delivered, was about one cent per pound more than when shipping by wholesale. But from the first I could not supply the demand for the small size cheese ten inches in diameter and weighing from twelve to twenty pounds each and flats made in regular large size fourteen-inch hoop that would weigh about twenty-five to thirty-five pounds. The latter was much preferred by certain grocerymen, because in cutting, there was not only less waste, but a neater and more convenient parcel could be made for customers to carry home, besides being less likely, than a full size cheese, to remain on the counter to lose flavor by drying out. Of course others who cut up a large cheese in one or two days, preferred the full size. My sixty-five factory patrons who supplied milk from one up to eighteen cows,—mostly from a few cows each—nearly all made earnest request for the small size cheese for their own home use and that of their neighbors. We made some by special order of ten pounds and under. The more the small cheese went out from the factory the stronger came the demand for them from patrons of the factory and other farmers, and also from townspeople. The cheese-maker in charge, although most obliging to meet the demand of the patrons of the factory, was not at first favorable to this outside demand for small cheese, and for a good reason, as it took just about as much time and labor to press, bandage and handle in the curing room a seven to ten or fifteen pound cheese as a seventy pound one. The extra cost, although slight, was an item to take into consideration. To those who desired to buy a small cheese I would say "I can cut you a piece just the size you like from one to ten pounds more or less, from a large cheese." The almost invariable reply was to the effect that a piece of cheese, cut in that way (from a large cheese) has so much exposed surface that it will dry out, crack and become leathery, tough, hard and unpalatable before we can use it all, and that there is more or less wasted, but with a small cheese it is not so much the case and we can take it home and cut it when we like. After having the matter brought to my attention in this way, so urgently, for a season or two, I decided to try and supply this demand for small cheese. I procured a number of small hoops for the purpose. Such hoops as I used can be made of galvanized iron, by any good careful tinsmith, and should be six or eight inches in diameter, and eight to twelve inches deep But they must be made very true to work well. In such hoops you can make cheese of three, five, seven or ten pounds each, as desired. Bandage and make them in every way the same as the large cheese. Press four of eight inches in diameter and seven of six inches on an upright press in the same space you would press one full size cheese. The best method of cutting such long, round-shaped cheese, is to cut it in two pieces near one end; then slice enough for the meal, like off a large Bologna sausage or round loaf of bread. Place the two pieces together with the larger or heavier piece on top. Keep the cheese on or near the cool, dry ground floor of the cellar, and you can always have fresh cut, palatable cheese for every meal. The head-cloths and all bandages must be left upon the cheese to help retain the moisture until the cheese is used up. The best curd should always be taken for such small cheese. Gaseous curds and poorly made cheese will soon ruin the reputation and sale of such cheese (or in fact of any cheese.) Many prefer a soft, moist cheese. By salting lightly and using an extra quantity of rennet, and hastening the curd into the press, more moisture will be retained and greater profit realized. But this must be limited so that the quality is not injured. Cheese made in this way will cure rapidly and be ready for use for a certain portion of the trade within two to three weeks. By taking a number of such small cheese to the nearest market, or driving to every farmhouse in the vicinity, I found that good prices and quick returns could be realized. Every small cheese should be properly weighed, always giving good down weight,—and having weight and price plainly marked on every cheese with blue pencil which is best. In 1894, I realized twelve cents per pound for all small cheese and cut cheese at the factory to others than patrons sending milk, selling the bulk of my product in the local market. Say the wholesale price that year averaged nine cents per pound, and twelve cents could be realized for an output of twenty tons in the local market. The Niagara district alone consume several times that amount. This extra three cents on that amount means $1,200 extra income, paying well for extra cost in making and marketing. People who said they seldom bought cut cheese at the store, would buy the small cheese when put up in a form to suit them and brought right to their doors. Some families I furnished have averaged as high as forty pounds per month. I sold the small cheese at the same price as grocerymen sold cut cheese, generally twelve cents in the summer time. We handled all small cheese in the local markets without the expense of boxing But of course, such cheese can also be boxed and shipped to distant markets. We did not undertake to make what is known to the trade as "small fancy cheese" in various odd shapes, names and forms, to be sold only at fancy prices to a few epicures. But my idea is to put up cheese in a form and at a price to suit the million. I believe there is a special demand in our own home market which can be best supplied by putting up the cheese in an inexpensive, convenient form, similar to that which I have described. Many factories throughout the land, may, in this way, increase their incomes, by adding a small cheese department. Farmers, with good sized herds, can make up their own milk product by this plan and dispose of it all in the local market, generally at a price consideraly above the regular export rate.

It is said that we export our best cheese and consume the poorest quality at home. This can be reversed by this plan of supplying the home market. If our country in so many respects outranks the rest of the world, and the farmers, especially of our own Province, are so much in advance, as a class, of those of any other state or country, as has been so fully demonstrated at recent World's Fairs, should they not be suppliep with the best the earth affords?

As we make the best cheese should we not put it up in the best form possible to suit home demands? Will not the consumption of cheese also increase as the fact becomes more generally known that a pound of good cheese contains nutritive value equal to two and a half pounds of meat. There are about one million families in our Dominion, estimating five persons to a family. If they could all be properly supplied with cheese in a form that they would like and appreciate, would not our home consumption of cheese be vastly increased? If it could be increased only two pounds per family per week, it means two million pounds more per week consumed. That for fifty-two weeks in the year is over a hundred million pounds, or about the amount of our whole present annual export, all consumed in our own country! Referring to the important part in a factory, which the cheese-maker controls, I may here state that we took a natural pride in the good reputation our cheese acquired. But while our expert cheese-maker was such an adept in detecting the least mote of defect in the neighboring patron's milk, it transpired, surprising as it may appear, that he had a good sized beam (or Miss Beam) in his own eye all the while, and who is now his life companion. I am pleased to state further that our cheese maker attended and took a course of study in the dairy department at the O. A. C By his natural skill and diligence he received highest honours and came out at the head of a large class of students. He thus appears to have been discovered and promoted by this institution, being now cheese-maker and instructor here at the O. A. C. I must say I consider his appointment to that position a most worthy one, although the people of Willowdale factory at Black Creek, while regretting to loose his efficient services, are pleased at his promotion. I feel it proper to say this much as an encouragement to other young men to go and do likewise.

FEEDING SHEEP.

By John A. Craig, B.S.A., Professor of Animal Husbandry, Agricultural College, Madison, Wisconsin, U. S. A.

The kind words of your worthy President in introducing me to you, and the previous subject which has been discussed have called to my mind a fable which seems to apply in a way to my position before you at this time. A crow was perched on a tree with a piece of cheese in his mouth when a fox happened that way. Desiring to obtain the cheese, the fox began to study how he could outwit the crow and secure his end. Relying on his native wit he began to address the crow in the following words :—"Oh, crow, how beautiful are thine eyes, how brilliant the plumage of thy wings, how shapely are thy talons, but oh, what a misfortune it is, that such a beautiful bird should be lacking only a voice!" The crow, anxious to remove this one deficiency in his qualities, opened his mouth to caw, and down came the cheese. The previous speaker having the subject of cheese and the kind words of your President has made me think of this peculiar instance and if I can leave with you anything of the solid worth of cheese, I shall feel that I have done something.

To present the feeding of sheep to you in the clearest way, it will be best to consider the management of the flock during the different seasons of the year. Beginning in the fall, after the lambs are weaned, we turn our breeding ewes on the poorest field of pasture or grain stubble that we have. The aim at this time is to check the milk flow of the ewes as soon as possible. For two or three days the udders of the ewes are noticed and milked out so that they may not become inflamed. After this is accomplished the ewes are given whatever pasture is available without reference to its quality until breeding season approaches. They are then fed so as to improve. It is the general belief that if the ewes are in good condition during the breeding season they are likely to drop a larger number of lambs. The belief is quite common, and it is also thought that when the ewes are in fair flesh they will breed earlier than those that are thin. We have made observations bearing directly on the latter point in our flock, but have not been able to secure results which would bear out such an opinion. Our aim in getting ewes in good condition is chiefly supported by the fact that they will keep in better thrift throughout the winter if they begin the winter season in vigorous and hard condition. They suffer less from colds and any trouble that they are generally liable to escapes them if they are thrifty and hardy when winter arrives. If the pasturage is not good enough to keep the ewes in the condition we want them, we do not hesitate to feed some grain as soon as the ewes go into winter quarters. They are fed oats if their condition is not thoroughly satisfactory, but on going over them if they are found to be as fat as we wish for they are not fed any grain. I may say, however, that we have never been able, on the pasturage and other food that we have, to get our ewes fat enough to go into winter quarters without feeding them extra grain. We feed oats and usually find that half pound per head daily is sufficient. The oats are fed as long as they seem to be needed to maintain the ewes in such flesh as we want them. With the oats during the winter, clover hay or good corn fodder is mostly used as the coarse portion of the ration. We have experimented with different kinds of fodder, for maintaining breeding ewes, and have found that there is nothing that will compare with clover hay for keeping the sheep in the best condition, and the sheep are also very fond of it. Of the different kinds of clover hay the preference of the sheep seems to be for alsike as it is very fine and has a flavor which they relish. Good corn fodder ranks next to clover hay in point of cheapness and the degree to which the ewes relish it. Oat hay is a very satisfactory fodder, and is perhaps on the whole superior to good corn fodder. Next comes oat straw and finally timothy. There is a fodder which is quite common in Canada, which I would place next to clover hay, and that is pea straw. We aim to feed some succulent food to our ewes, especially after they have lambed. At this time we feed them quite liberally on silage and roots with the hope that it will encourage the flow of milk. With this same object in view, as soon as the ewes have lambed we begin to feed them bran and this is the only grain feed that they get after lambing. While the ewes are in the shed we continue to feed grain, and for a short while after they have been turned out to pasture and then the grain is withheld from them. We have experimented to find out whether it pays to feed ewes corn while they are on pasture or whether it is best to feed such grain as we have had to the lambs. We have found that the lambs on the ewes that were getting grain did not make any more gain than those that were suckling ewes that had no grain. Without giving the details I may say that it was a satisfactory proof to us that it paid us much better to feed the grain directly to the lambs and allow the ewes nothing but good pasturage. We found that the ewes would improve in condition when fed grain but they did not seem to give any more milk than those that were not given grain.

FEEDING LAMBS FOR MARKET.

Periods.	Lot I. Grain since birth.				Lot II. Grain since weaning.				Lot III. Grain since fattening.			
	Weekly gain.	Total gain.	Extra cost.	Average weight and value.	Weekly gain.	Total gain.	Extra cost.	Average weight and value.	Weekly gain.	Total gain.	Extra cost.	Average weight and value.
	lbs.	lbs.	$ c.	lbs. $ c.	lbs.	lbs.	$ c.	lbs. $ c.	lbs.	lbs.	$ c.	lbs. $ c.
First Trial, 1891. First: 10 weeks— April 30 to July 9	4.48	44.8	18	63.5 @ 5 66 =3.59— 18 *Profit,* 3 41	....	....	......	....	3.65	36.5	......	55.8 @ 4 91 *Profit,* 2 73
Second: 19 weeks— July 9 to November 19	2.66	50.7	1 47	103.7 @ 4 81 =4.98— 1 65 *Profit,* 3 33	....	....	......	....	1.86	29.9	......	82.6 @ 3 81 *Profit,* 3 14
Third: 14 weeks— November 14 to February 25.	2.81	39.4	1 62	145.7 @ 6 35 =9.25— 3 27 *Profit,* 5 98	....	....	......	....	2.95	4.14	1 62	125.7 @ 5 60 =7.03— 1 62 *Profit,* 5 41
Second trial, 1892. First: 12 weeks— April 27 to July 20..........	3.1	37.6	34	61.8 @ 5 66 =3.44— 34 *Profit,* 3 15	....	....	......	....	2.7	33.5	......	56.2 @ 4 91 *Profit,* 2 75
Second: 16 weeks— July 20 to November 9	2.1	34.0	1 13	99.8 @ 4 81 =4.80— 1 47 *Profit,* 3 33	....	....	......	....	1.6	26.3	......	84.5 @ 3 81 *Profit,* 3 21
Third: 14 weeks— November 9 to February 15..	2.8	40.5	2 35	140.3 @ 6 35 =8.90— 3 82 *Profit,* 5 08	....	....	......	....	2.9	41.	2 30	125.5 @ 5 60 =7.02— 2 30 *Profit,* 4 72
Third trial, 1893. First: 12 weeks— May 10 to August 2	3.4	40.9	47	78.2 @ 5 66 =4.42— 47 *Profit,* 3 95	2.8	33.6	......	70.6 @ 4 91 *Profit,* 3 46	2.35	28.2	......	6.51 @ 4 91 *Profit,* 3 19
Second: 14 weeks— August 2 to November 8	1.4	19.4	56	97.6 @ 4 81 =4.69— 1 03 *Profit,* 3 66	1.5	21.1	56	91.7 @ 4 00 =3.66— 56 *Profit,* 3 10	.91	12.8	......	77.9 @ 3 81 *Profit,* 2 96
Third: 12 weeks— November 8 to January 31 ..	3.08	37.0	1 79	134.6 @ 4 25 =5.72— 2 82 *Profit,* 2 40	2.7	32.9	1 74	124.6 @ 4 00 =4.98— 2 30 *Profit,* 2 68	3.	36.	1 60	113.9 @ 3 50 =3.98— 1 60 *Profit,* 2 38
Fourth trial, 1894. First: 14 weeks— May 11 to August 17	3.63	50.9	33	77 @ 5 75 =4.42— 33 *Profit,* 4 09	2.67	37.5	.....	63.1 @ 5 00 *Profit,* 3 15	2.67	37.5	......	63.1 @ 5 00 *Profit,* 3 15
Second: 12 weeks— August 17 to November 9....	1.35	16.3	36	93.3 @ 5 00 =4.66— 69 *Profit,* 3 97	1.57	18.9	36	82. @ 4 00 =3.28— 36 *Profit,* 2 92	1.1	13.3	......	77. @ 4 00 *Profit,* 3 08
Third: 14 weeks— November 9 to February 15..	3.17	44.4	2 55	137.7 @ 5 75 =7.91— 3 24 *Profit,* 4 67	2.97	41.7	2 37	123.7 @ 5 50 =6.80— 2 73 *Profit,* 4 57	2.8	39.2	2 07	116.2 @ 5 00 =5.81— 2 07 *Profit,* 3 74

Feeding Lambs for Market.

The first point which I wish to lay before you bears on the question whether it is advisable in feeding lambs for market to give them grain continuously from birth or wait until within the last three months to fatten them for market. The general practice of our farmers may be said to be the withholding grain from their lambs until fall or the beginning of winter, and then they are put in pens or yards and fed on a fattening ration for two or three months before going to market. We have thought that this practice was not the most profitable, and to determine whether it was or not we have experimented over a period of five years with lambs from time of birth until sold ten or twelve months later. The general plan of our experiments has been to take three lots of ewes with their lambs at foot and divide them as uniformly as possible in every particular. To the one lot we would give the lambs grain from the time of birth. The other lot would not get any grain before weaning, but as soon as weaned they would be put on a grain ration. The last or third lot would not have any grain before or after weaning but as soon as it was necessary to put them in the sheds, on the approach of winter, they were given a fattening ration. You will see that there were three different periods in these experiments. The first period covers the time before weaning, and during that time the lambs in lot one had grain, and both of the other lots had no grain. The second period extends over the time of weaning usually in July or August until the time of fattening began, generally in November. The third period, called the fattening period, extended from November until February as a rule, and during this third period it is to be remembered that all the lots of lambs were put on exactly the same ration and given a similar management as closely as it was possible to do so. We have conducted these experiments for four years, and have now almost completed the fifth year. I should say in regard to the management of lambs that no difference whatever was made in their management except in the single particular that some lots had grain and the others had no grain at different periods. The chart which I have prepared here will make clear the exact difference in the profits from these various systems in feeding. Before giving you definite results, I wish to say that the profits that are shown on this chart are only comparative profits, that is they show the difference in the profit which results from the different management which was given the lambs. There is no charge made for pasturage, because all the lambs had exactly the same field to run over, and there is no cost added for labor, because it is a very hard matter to get at this, and the labor involved in the care of all the lots varied but very slightly. In explanation of this chart I wish to say further that we supposed that the lambs were to be sold at the end of each period. To get at exact results we had a butcher inspect the lambs and tell what he would give for them, each lot separately, and the prices that I have used on the chart to show the value of the lambs at the end of the different periods are the prices which were given to me by the butcher who inspected the lambs carefully. You will notice, in the case of the grain-fed lambs, that they have been carefully charged with the amount of grain that they had eaten up to the end of that period, and I desire to state further that this grain has been charged to them at current market prices.

We will suppose that in the first trial the lambs were sold at the end of the first period. It will be seen from the chart that there would have been at this time a profit of $3.41 per head from the lambs in Lot I., and only $2.73 from those in Lot III., which clearly shows that there was an advantage in feeding grain before weaning in this instance. Inferring that the lambs were to be sold in the fall at the end of the second period, it will be noticed in the chart that there would be a profit of $3.33 from the lambs of Lot I., and only $3.14 per head from the lambs in Lot III. This profit from Lot I. is above the cost of their food during the two periods. If the lambs were carried over winter and fed at the end of the third period it will be seen that there was a profit of $5.98 per head from those in Lot I., and $5.41 per head from those in Lot III. By instituting similar comparisons throughout the four periods it will be clearly seen, that no matter when the lambs were sold, there would be the same from those that were fed grain since birth. There is another point which should be referred to and that is the difference in the value per pound of the grain-fed lambs and those that had no grain until fattening. At the end of each period throughout each trial the lambs were examined by a butcher and his opinion was taken as to the difference in the value per pound on the two lots. At weaning time this difference amounted to ½ cent per pound. In the fall it was generally 1 cent and in the spring it usually was ¾ cent per pound. The reason for this difference was stated by the butcher to be due to the inference that the grain-fed lambs would dress higher than those that had not received any grain. At the conclusion of the trial the lambs were killed and their dress weights obtained, and it was invariably found that the facts supported this inference although in some instances the differences were very slight.

We also found that the lambs fed grain since birth throughout were heavier than those that had not received grain until the fattening began. Samples of the fleeces of the sheep in the different lots were washed in hot water, and it was found that the increased weight of the fleece of the grain-fed lambs was almost wholly due to the greater amount of grease or yolk that was in their fleeces. The grain feeding seemed to help the growth of the fibre, although this was not very marked in some of the trials. Considering all things it seems clearly evident that it is best to feed grain to lambs that are being prepared for the market continuously from birth.

GRAIN-FED LAMBS BEFORE WEANING.

Having decided that it is best to feed lambs grain before and after weaning, the next important point to determine is what grain will give the best satisfaction for feeding lambs before weaning. We have made definite experiments with cornmeal, oats and bran for this purpose. There were three lots of lambs with six in each of them, which were fed these grain foods as their ration on pasture. All of the lots received the same management and were treated similarly in every respect. The following table shows the most important results obtained from feeding these foods:

Six lambs fed.	Lot I.	Lot II.	Lot III.
	Cornmeal.	Oats.	Bran.
	lbs.	lbs.	lbs.
Weight at the beginning June 3rd	289.5	288.5	299.
Weight at ending July 29th	452.5	455.5	437.
Total gain in eight weeks	163.	167.	138.
Average weekly gain per head	3.4	3.4	2.8
Total grain eaten	251.	270.5	313.
Cost of grain { Oats 20c per bu; Corn 30c. per bu; Bran $13 per ton }	$1.25	$1.62	$1.87
Cost of 100 lbs. gain	.76	.97	$1.35
Amount of grain per lb. gain	1.5	1.6	2.2
Total loss of ewes	47.5	41.5	46.

It will be seen from this that the cornmeal gave the most profit, and next to this the oats and last the bran. As soon as these same lambs were weaned they were kept upon the same foods. They had the same pasture which consisted mostly of clover aftermath for the time, but during the greater part of the experiment they had inferior blue grass pasture. Each night the lambs were brought to the sheds, divided into the respective lots and received the different rations.

The results from this trial show that cornmeal is superior as a fattening ration to either oats or bran. The position of the two foods in this trial is different from what it was in the experiment that was made with lambs before they were weaned. If a general summary is made of the results from the two periods extending over sixteen weeks' feeding it will be seen that the cornmeal will be superior as a fattening ration to either oats or bran for feeding lambs before and after weaning. The oats rank next to the corn considering the data obtained from the two periods, while the bran proves inferior to either of the other two rations.

	Lot I.	Lot II.	Lot III.
	Six lambs fed cornmeal.	Six lambs fed oats.	Six lambs fed bran.
Weight beginning June 29	452.5	455.5	437.
Weight at ending September 23	539.	499.	488.
Total gain in eight weeks	86.5	43.4	51.
Average weekly gain per head	1.8	.9	1.10
Total grain eaten	3[illegible].	337.	301.
Cost of grain { Oats 20c. per bus; Corn 30c per bus; Bran $13 per ton }	$1.71	$2.02	$1.80
Cost of 100 lbs. gain	$1.97	$4.64	$3.52
Average amount of grain per lb. gain	3.9	7.7	5.9

Ration for Fattening Lambs.

There are so many points to determine in regard to the different ration for fattening lambs that it is somewhat of a task to arrange the experimental data in a clear way so that the comparative value of the rations may be self-evident. I know of no better way than to consider only the money value of the different rations. Even this can only be determined in a general way. It is certain that the feeder of sheep for market follows this industry for the profit that there is in it, and the point that concerns him is, how much are the different grains and fodders worth for fattening sheep. He grows certain grains, selling in the market at a stipulated price, and he wishes to learn if he can dispose of his grain and fodder to more advantage by selling them or feeding them to wether lambs, or shall he sell what he has produced and buy others. Some say that the farmer should be satisfied with the manure which he obtains from feeding stock for his labor, if the cost of producing the food is also offset. Those who have made a study of feeding sheep have secured both fertility for their farms and profits for themselves, and there is no reason why others need be satisfied with less.

To make it possible to show the profits returned by feeding any ration, and also to put all the rations on a uniform basis for comparison, the following scale of prices will be used in estimating the cost of all the rations which follow. These are as near average prices as it is possible to estimate in a general way.

Hay	$ 8 00	per ton, .4 cents per pound.
Corn fodder	4 00	per ton, .2 cents per pound.
Roots	2 00	per ton, .1 cent per pound.
Ensilage	2 00	per ton, .1 cent per pound.
Corn	40	per bushel (56 pounds), .7 cents per pound.
Bran	13 00	per ton, .6 cents per pound.
Oats	30	per bushel (32 pounds), .8 cents per pound.
Oilmeal	25 00	per ton, 1.2 cent per pound.
Wheat		53 cents per bushel (60 pounds), .8 cents per pound.
Peas		60 cents per bushel (60 pounds), .1 cent per pound.
Barley		45 cents per bushel (48 pounds), .9 cents per pound.
Cottonseed meal	28 00	per ton, 1.4 cent per pound.

In estimating a profit from feeding a ration, the wether lambs will be charged with their cost price at three cents per pound, and the food they ate at the foregoing prices, and they will be credited with their value when followed at four cents per pound. The difference between these amounts will be accepted as the amount of profit produced. While this may not be entirely satisfactory, yet it will come the nearest to meeting the enquiries of the practical feeder. It is not wholly satisfactory as a method of comparing rations, as the sheep fed by different experiments must have varied somewhat, and it is not completely reliable in presenting the profits, as there are many other minor matters that are to be considered that vary much with local conditions.

Succulent Food for Fattening Lambs.

The value of roots in a ration was tested at the Michigan Experiment Station (bulletin 113). Corn and hay were fed against corn, roots and hay. Ten, weighing 824 pounds, ate during the period of fifteen weeks 1,579 pounds corn, 1,097 pounds hay, and they gained a total of 328 pounds, or a weekly gain of 2.18 pounds per head. The ten lambs receiving the corn, roots and hay weighed 817 pounds, and they ate 1,612 pounds corn, 984 pounds of hay, 2,720 pounds roots, and they gained 397 pounds, or a weekly gain of 2.64 pounds.

The lambs receiving the dry ration in these herds, according to the method of valuation before outlined, returned a profit of fifty-nine cents per head, and those receiving the succulent ration sixty-two cents per head.

In other tests at the same station, corn and oilmeal were fed with hay against the same kind of grain and hay with roots. The ten lambs receiving the ration weighed 829 pounds, and in the fifteen weeks they ate 347 pounds oilmeal, 1,388 pounds corn and 1,152 pounds hay, and they gained 357 pounds, or a weekly average per head of 2.38 pounds. The ten lambs that received the succulent ration weighed 842 pounds, and they ate 342 pounds oilmeal, 1,373 pounds corn, 970 pounds hay and 2,675 pounds of roots, and they gained a total of 392 pounds, or an average weekly gain of 2.61 pounds per head.

The profit returned from feeding the dry ration was forty-one cents per head and hat from the succulent ration was thirty-eight cents per head.

At our station a ration of oats, corn and oilmeal with hay was fed against a similar ration containing roots. The four lambs fed the dry ration weighed 367.5 pounds, and during the eleven weeks they ate 49.9 pounds oilmeal, 124.8 pounds corn, 392.6 pounds oats and 577 pounds hay, and they gained 116.5 pounds, or a weekly average of 264 pounds per head. Those fed the succulent ration weighed 369 pounds, and they ate forty-five pounds oilmeal, 109.5 pounds corn, 340.5 pounds oats, 612 pounds hay and 225 pounds roots, and they gained 109 pounds, or a weekly gain per head of 2.48 pounds.

The wether lambs fed the dry ration returned a profit of thirty cents per head, and those fed the root ration gave a profit of thirty-four cents per head.

These results do not show a decided difference in favor of either ration, but in feeding large numbers the advantage appears more decidedly in the decreased risk of deaths due to digestive disarrangements.

Roots or Silage.

Roots and silage have been compared for fattening wether lambs without any marked difference in their value becoming apparent. At the Michigan Experiment Station (Bulletin 107) twenty lambs weighing 1,462 pounds were fed fifteen weeks 1,172 pounds oats, 1,172 pounds bran, 13,413 pounds roots, and 2,439 pounds hay, and they gained 589 pounds, or a weekly average gain of 1.7 pounds per head. The twenty weighing 1,490 pounds that received the silage ate 1,172 pounds bran, 1,172 oats, 8,108 pounds silage, and 1,974 pounds hay, and they gained 586 pounds, or a weekly gain of 1.7 pounds per head.

Those receiving the silage ration, according to the method of calculation adopted, returned a profit of twenty-nine cents per head, and those on the ration of roots just about paid for the food they consumed at market prices.

In a similar trial at our station four lambs weighing 367.5 pounds in eleven weeks ate 225 pounds roots, 612 pounds hay, forty-five pounds oilmeal, 109.5 pounds corn and 340.5 pounds oats, and they gained 109.5 pounds, or a weekly gain of 2.48 pounds per head weekly. The four lambs receiving the silage ration weighed 369 pounds, and they ate 223 pounds silage, 509.5 pounds hay, 43.4 pounds oilmeal, 108.9 pounds corn and 334 pounds oats, and they gained 102.5 pounds, or a weekly gain per head of 2.32 pounds.

The feeding of the two preceding rations gave a profit of thirty-four cents per head from the root ration and forty cents per head from that containing the silage.

These trials show us material differences in the feeding value of these succulent foods; if there is any, the rate of gain is in favor of the roots, and the cost of gain favorable to silage.

Corn.

This assuredly is the most fattening farm grain that may be fed to sheep. In relying on it alone, however, there is much difficulty in maintaining the appetites of the sheep and in preventing disorders and deaths. Corn, roots and hay were fed in a ration at the Michigan Experiment Station (Bulletin 107) against other lots of different rations, and the corn ration gave a weekly gain per head of 2.6 pounds, which was only equalled by a mixture of corn and oats. Of the corn ration ten wethers, weighing 830 pounds, ate in fifteen weeks 1,757 pounds corn, 1,190 pounds roots and 1,670 pounds hay, and they gained 443 pounds, or an average weekly gain per head of 2.6 pounds. In another trial at the same station ten lambs, weighing 817 pounds, ate in fifteen weeks 1,612 pounds corn, 964 pounds hay and 2,720 pounds of roots, and they gained 397 pounds, or an average weekly gain per head of 2 64 pounds. In the first trial charging and crediting the lambs at the rate formerly submitted, the profit was fifty-eight cents per head, and in the second trial the profit returned was sixty-two cents per head.

Corn silage and corn fodder were fed in two trials at this station. In the first (Report VII. page 16) three wether lambs, weighing 261 pounds, consumed in eighty-six days 377 pounds corn, 290 pounds corn silage and 150 pounds corn fodder and twenty-two pounds potatoes, and they gained ninety-eight pounds, or an average weekly gain of 2.6 pounds per head. In another trial (Report VIII.) six wether lambs, weighing 495 6 pounds, ate in twelve weeks 703 pounds shelled corn, 409.7 pounds corn silage, and 655.5 pounds corn fodder, and gained 181 pounds, or an average weekly gain of 2.5 pounds per head. The ration fed in the first trial returned a profit of $1.04 per head, and that of the second trial ninety-two cents per head. These are the most profitable gains that have been attained at our station.

Corn and hay were fed for fifteen weeks in the trials conducted at the Michigan Experiment Station. The ten weather lambs weighed 824 pounds, and in fifteen weeks they ate 1,579 pounds corn and 1,095 pounds hay, and gained a total of 328 pounds, or a weekly gain per head of 2.18. At our station five wether lambs, weighing 431½ pounds, ate in eight weeks 427.75 pounds corn and 288.5 pounds hay, and they gained 104½ pounds, or a weekly gain of 2.61 pounds per head. In the trial at the Michigan Station the wethers returned a profit of fifty-nine cents per head. Using the scale of prices before decided upon, and in the trial at our station eighty-seven cents per head profit was received. Cracked corn and hay were fed at the Minnesota Experiment Station (Bulletin thirty-one) to ten wether lambs, weighing 710 pounds, and in twelve weeks they ate 1,103 pounds grain and 849 pounds hay, and gained 211 pounds, or an average weekly gain per head of 1.75 pounds. This ration returned a profit of forty-four cents per head.

Oats.

In beginning to fàtten wether lambs, it is safe to begin the grain feeding with oats. The lambs like them and they will begin to eat them at once. Fed alone, however, they do not produce as great a gain as corn, hence, as the fattening proceeds, the quantity should be gradually decreased. At the Ontario Experiment Station (Report 1884, p. 189) four weather lambs, weighing 416 pounds, were fed in fifteen weeks a total of 735 pounds oats, 1,092 pounds hay and 546 pounds roots, and they gained 156 pounds, or a weekly gain of 2.6 pounds per head. At the Michigan Experiment Station (Bulletin 107) ten lambs, weighing 834 pounds, were fed in seventeen weeks 1,963 pounds oats, 1,160 pounds roots and 1,687 pounds hay, and they gained 379 pounds, or a weekly average per head of 2.12 pounds. Charging the food in the ration at market prices, and crediting them with the advance due to the increase, there is no profit in either of these rations.

Peas.

The best satisfa. n will be obtained from feeding peas when they are split or crushed and fed with other foods. At the Ontario Experiment Station (Report 1884) four wether lambs, weighing 493 pounds, were fed in fifteen weeks, 628 pounds peas, 1,050 pounds hay, and 460 pounds roots, and they had gained 105 pounds, or an average weekly gain of 1.75 per head. Charging the peas at sixty cents per bushel, and the other foods at current prices, and crediting the sheep with the value of the increase, 4.5 cents per head was lost by feeding this ration.

Barley.

This grain has been experimented with for fattening sheep most extensively at the Rothamstead Experiment Station. In one trial (R.A.S. Journal, Vol. 10, 1849, page 296) five wether lambs, weighing 602 pounds, ate in eighteen weeks 630 pounds barley and 1,879 pounds clover chaff, and on this ration the sheep increased 139 pounds, or an average weekly increase of 1.54 pounds per head.

At the Minnesota Experiment Station (bulletin thirty-one) barley was fed to ten wethers weighing 733 pounds, and in twelve weeks they ate 1,268 pounds barley and 630 pounds hay, and they increased 199 pounds, or 1.65 per head weekly. Not knowing the market value of clover hay chaff, the Rothamstead results will be overlooked in estimating the profits of the ration that was fed there. In the instance of the trial at Minnesota Station, charging the barley at forty-five cents per bushel of forty-eight pounds, and the other foods and the lambs at market prices the lambs paid a profit of thirteen cents per head.

Ground barley has given slightly better returns. Four wether lambs, weighing 686 pounds, were fed at the Rothamstead station (R.A.S. Journal, Vol. 10, 1849, page 329) 280 pounds ground barley and 3,867 pounds mangels in ten weeks, and they gained eighty-one pounds, or a weekly increase of two pounds per head. In another trial at the same station (R.A.S. Journal, Vol. 23, 1862, page 91), ground barley was fed with meadow hay chaff to five wethers weighing 589 pounds, and in thirty-two weeks they ate 1,120 pounds barley and 2,899 pounds meadow hay and straw chaff, and they gained 164 pounds, or a weekly increase of one pound per head. Being unaware of the market price of meadow hay and straw chaff this trial will be omitted. In the first trial with ground barley and mangels, the wethers receiving them yielded a profit of forty-three cents per head.

Crushed or grittled barley was fed in the same experiment mentioned in discussing crushed oats, whole wheat, and the mixtures of oats and barley, and wheat and barley. It is stated (R.A.S. Journal, Vol. 24, 1888, page 476) that the eight wethers weighing $959\frac{1}{4}$ pounds, were fed, in 112 days, 658 pounds grittled barley, 2,240 pounds Swedes and 224 pounds hay chaff, and they gained $365\frac{3}{4}$ pounds, or an average weekly gain of 2.8 pounds per head. Charging the barley at forty-five cents per bushel, and the other foods at market prices the increased value of the sheep shows a profit of $1.89 per head from feeding this ration.

Grain Mixture for Fattening Lambs.

There is abundant evidence indicating that the merit of a grain mixture as a part of the ration lies in the fact that the sheep like it better than the unmixed grains, eat more of it, and, as a result, gain more. The fact that they eat more seems to be the chief element in making the profit less than in the feeding of some of the foods unmixed.

Peas and Corn. This mixture was tried in an experiment in feeding whole corn, corn and oats, and corn, peas and oats, to wether lambs. The corn gave the poorest results of all, as far as cost of gain is concerned. The standing of the rations to the rate of gain was as follows: Corn and hay, 2.6 pounds per head weekly; oats and corn and hay, 2.7 per head weekly; corn and peas and hay, 3.15 per head; and the oats, corn, peas and hay, 3.01 per head. The cost of 100 pounds gain was, corn, $3.99; corn and oats, $4.46; corn and peas, $4.20; and the corn, peas and oats, $4.46. The five wethers that received the mixture of corn and peas weighed 428 pounds at the beginning of the experiment, and ate, in eight weeks, 251.9 pounds peas, 251.9 pounds corn, 256 pounds hay, and they gained 126 pounds, or an average weekly gain of 3.1. The peas might be called split and the corn was fed whole. The wethers fed on this ration returned a profit of eighty cents per head.

Oats and Corn. This mixture is likely used more frequently than any other in the west. In the trials at the Michigan Experiment Station (Bulletin 107), the ten lambs receiving corn and oats with roots and hay were only equalled in weekly gain by those fed corn alone. This mixture surpassed bran alone, corn and bran mixed, oats and bran, and another ... corn, oats and bran in weekly gain and in cost of gain. The ten wether lambs fed oats and corn weighed 842 pounds at the beginning of the experiment, and in seventeen weeks they ate 967.5 pounds oats, 967.5 pounds corn, 1,190 pounds roots, and 1,171 pounds hay, and they gained 436 pounds, or an average weekly gain of 2.6 pounds per head. At our station it has been our custom in fattening lambs in the series of trials that have been made in feeding lambs grain continuously from birth, to feed oats at first during the fattening then add corn and finally, if the lambs appear to need it, to add some oilmeal. In one of the trials corn and oats were fed alone throughout the fattening, with hay in addition. Fifteen lambs were fed this ration for twelve weeks. At the beginning of the experiment the fifteen weighed 1,334 pounds, and in twelve weeks they ate 1,523.5 pounds corn, 1,073 pounds oats, 1,320 pounds hay, and they gained 529.5 pounds, or an average weekly gain per head of 2.9 pounds. The profit on the lambs fed on this ration at the Michigan Experimental Station would amount to fifty-four cents. per head, while that from those fed in our trials would be sixty-seven cents, according to the method of estimation that has been used in the previous instances. These figures indicate that both in direct profit and rate of gain the oats and corn mixture gives results superior to most other mixtures, while observation of the conduct of the wethers when being fed this ration justifies the assertion that it is an exceptionally wholesome food for sheep.

Peas, Oats and Corn. In the trial conducted at our station that was before referred to in commenting on the value of peas and oats, one lot of five wethers was fed a grain mixture of peas, oats and corn with hay. The five wethers weighed at the beginning of the experiment 431 pounds, and in eight weeks they ate 164.5 pounds oats, 164.5 pounds corn, 164.5 pounds peas, 300 pounds hay, and gained 120½ pounds, or an average weekly gain of three pounds per head. The profit returned by each lamb fed this ration was seventy-six cents per head, which is slightly below that made by the lots receiving corn and peas as their grain ration, and also less than the amount yielded by those receiving whole corn.

Bran and Corn. This mixture was tried at the Michigan Experiment Station in a feeding experiment including also bran and oats, and bran oats and corn as the distinguishing parts of the ration. The ten wether lambs fed corn and bran gained 357 pounds in the seventeen weeks, or 2.10 pounds per head weekly. The ten receiving oats and bran gained 541 or 2.11 pounds per head weekly, and those receiving a mixture of these foods gained 581 pounds or 2.3 pounds per head weekly. The ten wether lambs weighing 866 pounds that received the corn and bran ate 986.5 pounds bran, 1,190 pounds roots, 1,698 pounds hay, and gained 358 pounds. The profit made by each wether receiving this ration was twenty-one cents per head.

Oats and Bran. This mixture was also tried in the experiment described in the previous paragraph. The fifteen wether lambs weighed 1,258 pounds when the experiment started and in seventeen weeks they ate 1,467.5 pounds oats, 1,467.5 pounds bran and 2,580 pounds hay and gained 541 pounds. Using the prices that have been before adoped in estimating the profit in fattening lambs there was a profit of ten cents per head from feeding this ration.

Bran, Oats and Corn. The results from feeding this mixture are also reported (Bulletin 113) by the Michigan Experiment Station. The trial was made at the same time as those with oats and bran and with bran and corn. The fifteen wether lambs receiving this ration weighed 1,250 pounds and in seventeen weeks they ate 984.3 pounds bran, 1,785 pounds roots, and 2,481 pounds hay and gained 581 pounds. The profit returned by each lamb receiving this mixture of grains was twenty-two cents per head. It will be seen from these trials that the best returns in profit resulted from feeding the corn and bran mixture and the corn, oats and bran ration for both of these surpassed the oats and bran.

Corn and Oilmeal. In the trials at the Michigan Experiment Station (bulletin 113) corn and oilmeal gave high results. Ten wether lambs weighing 829 pounds ate in fifteen weeks 347 pounds oilmeal, 1,388 pounds corn, and 1,152 pounds hay, and they gained 357 pounds or an average weekly gain of 2 38 pounds per head. A profit of forty-one cents per head resulted from feeding this ration.

Cracked corn and oilmeal were fed in a ration at the Minnesota Experiment Station (Bulletin 31). Ten lambs, weighing 722 pounds, ate in twelve weeks 1,427 pounds oilmeal, 1,284.3 pounds cracked corn and 634 pounds hay, and they gained 289 pounds, or an average weekly gain of 2 4 pounds per head. The profit from feeding this grain mixture with hay was fifty-eight cents per head.

Barley and Oilmeal. This mixture was fed in the same experiment as the preceding at the Minnesota Experiment Station (bulletin 31). The ten wether lambs, weighing 757 pounds, ate in twelve weeks 159.1 pounds oilmeal, 1,431.9 pounds barley and 603 pounds hay, and gained 274 pounds, or an average weekly gain of 2.2 pounds per head. Each lamb, according to the prices submitted, returned a profit of thirty-seven cents, which is not so great as that resulting from the ration containing wheat and oilmeal.

Barley and Oats. In the sheep feeding trials at Woburn (R.A.S. Journal, Vol. 24, 1888, p. 476) oats and barley mixed equally by weight, returned a weekly increase of three pounds per head; the oats alone 2.9 pounds, barley alone 2.8 pounds, and the oats and wheat 2 6 pounds per head weekly. Wheat alone did the best of all the grains fed, it giving a weekly increase of 3 6 pounds per head. The eight wether lambs receiving oats and barley weighed 949 75 pounds, and they ate in 122 days 329 pounds oats, 329 pounds barley, 224 pounds hay chaff and 17,561 pounds Swedes, and they gained 384½ pounds. The profit from each lamb was about eighty-five cents per head.

Corn, Oats and Oilmeal. The results that have been submitted from the feeding of different rations will go far towards justifying the practice we have followed in fattening wether lambs when they were not required to be on different rations. In the third period, called fattening, in our grain-feeding trials with lambs that had not been fed grain before weaning, and those that had, have usually fattened on a grain mixture of this kind. They would be started on the oats and fed lightly for two or three weeks; then the corn would be introduced, and for seven or eight weeks the grain portion of the ration would be corn and oats. During the last two or three weeks oilmeal would be added to the ration, and on this mixture the wethers would be finished. Though this mixture has not been fed in a trial against other grains, yet it will not be amiss to submit the gains that our wethers have made on it. In the first trial with this ration eight wether lambs weighing 162.4 pounds ate in fourteen weeks 540 pounds oats, 270.4 pounds corn, 270.4 pounds oilmeal, 1,449 pounds corn fodder, 713 6 pounds roots, and they gained 323.2 pounds, or an average weekly gain of 2 88 pounds. In a second trial ten wether lambs weighing 921 pounds ate 1,171 pounds oats, 412 pounds corn, 388 pounds oilmeal, 973 pounds roots, 431 pounds corn fodder, and 1,002 pounds hay, and they gained 407 pounds, or an average weekly gain of 2.9 pounds. In another trial fifteen lambs weighing 1,261.5 pounds ate in fourteen weeks 1,365 oats, 1,111 pounds corn, 525 pounds oilmeal and 6,583.5 pounds hay, and gained 625.5 pounds, an average weekly gain per head of 2.97 pounds. The profit per head was ninety-three cents in the first trial, and in the second it was thirty cents per head, and in the last there was a profit of twenty-five cents per head.

It should be stated in conclusion that all of the results that are here given as to the profit per head from feeding the sheep these different rations are very conservative. In the first place, it would be fairer to allow more than one cent as the difference between the buying price and the selling price. In addition the charges that are made for the food included in the ration are fully twice as much as they would bring in the market at this time. The results, however, will afford a means of comparison to determine the difference in the profit from feeding different rations, but it should be remembered that these experiments have in many cases been made with lambs of different quality and different breeding. They indicate, however, that fattening sheep affords a certain and a near market for the many products that the farmer raises on his farm.

Mr. RENNIE: In feeding lambs for Easter we made a mixture of pulped roots, cut clover, bran, crushed oats, and a little flaxseed meal. This mixture was put in a trough for the lambs, in addition to the milk, and with this they grew rapidly so that lambs 3½ months old averaged seventy-five pounds each; most of them were Dorset horn, and twin lambs. One Leicester ewe, a single lamb, weighed nearly one hundred pounds. When the ewes are being bred in the fall I consider it important to give them nitrogenous food, such as clover, rape, mixture of oats and bran, and with that treatment we have excellent results. This spring one ewe had four lambs (a Cotswold) and raised three of them. The rams received the same extra care and feeding that was given the ewes, and were given a little flaxseed.

Q. Were the lambs any particular breed?

Mr. RENNIE There were six Dorset horn ewes with twelve lambs, and then there was one Leicester, and one Oxford.

Col. BURTCH: What is your experience with lucerne?

Mr. RENNIE: A number of sheep and lambs died during the spring of 1894, and when opened were found to contain a hard ball of what was supposed to be wool in the stomach; but in taking it to Prof. Panton and having it analysed it was found to be some fibre—mostly fibre—and in taking some of the lucerne hay that the sheep had been feeding on, he found on examination the fibre to be much the same in the lucerne stalk as in those balls. Lucerne hay when cut too ripe and dry is a dangerous food. If cut green before coming into bloom, I do not presume there would be any danger in feeding the hay, or from pasturing on green lucerne. We plowed up all the lucerne on farm and sowed instead the common red clover, alsike and timothy.

Rev. W. F. CLARK considered that this mixture was superior to lucerne clover for feeding purposes.

Q. I would like to ask Mr. Craig what he thinks about Dorset Horn as an anti-dog sheep?

Mr. CRAIG: I do not believe there is any sheep of that kind, I wish we could get some in this country.

Mr. RENNIE: Last fall dogs got among our sheep one night and were making a great noise. When the men got to the place a Leicester was fighting the four hounds. She died afterwards, they did not kill her but she was so excited fighting the hounds that the shock was too much for her. So that is the best anti-dog sheep we have.

BEEF RINGS.

BY W. S. FRASER, BRADFORD, ONT.

Beef ring is a term applied to the union of a number of farmers for the purpose of supplying themselves with fresh meat during the summer months. It is done by killing an animal each week, and dividing it equally among the members in a way that each one receives a boiling piece, a roast, and piece of steak each week. The *modus operandi* is as follows:

In the winter season a meeting is held at which tickets are drawn, to decide the order in which the members are to furnish the animals. Members may exchange tickets after drawing if they find it to be mutually advantageous.

A person is appointed to do the butchering. It is not necessary that he be a professional, but one that has taste to do his work in a tidy manner. A secretary is also appointed. The time for commencing operations is decided at the meeting as also is the price to be paid for butchering which is usually $2.00 per head.

Duties of Butcher. He provides a suitable place for killing, furnished with a hook for each member, on which each man's share is to be hung.

He kills the animal in the evening and cuts it up in the morning, weighs each share, hangs it upon its respective hook before six o'clock, and gives hide, head, heart, and fat to owner of animal.

He keeps an accurate account of the weight of each animal, of the quantity that each one receives per week, and in case of an animal being of inferior quality, he shall consult with the Secretary and decide upon the value of the beef per pound, prices varying from four and a half to six cents per pound.

He changes each week the order in which the cuts are distributed, *e.g.* the cut No. 1 receives this week No. 2 receives next week, and No. 1 takes the place of No. 16.

He renders to Secretary an account at the end of season, of weight of each animal and of weight of meat received by each member, as shown by the following table:

2. Front shank rump, No. 2..... 3. Neck and rump, No. 1........... 4. Flank and roast, No. 2........... 5. Shoulder and roost, No. 4..... 6. Hind shank and roast, No. 3..... 7. Second rib and roast, No. 1..... 8. First rib cut and sirlion..........	—	A's beef.	B's beef.	C's beef.	D's beef.	E's beef.	F's beef.	G's beef.	H's beef.	I's beef.	J's beef.	K's beef.	L's beef.	M's beef.	N's beef.	O's beef.	P's beef.
1. Brisket and roast, No. 5.	1. A.	26	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
2. Front shank and rump, No. 2.....	2. B.	29	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
3. Neck and rump, No. 1..........	3. C.	27	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
4. Flank and roast, No. 2......	4. D.	30	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
5. Shoulder and roast, No. 4.....	5. E.	28	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
6. Hind shank and roast, No. 3.....	6. F.	29	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
7. Second rib cut and roast, No. 1.....	7. G.	25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
8. First rib cut and sirlion	8. H.	27	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
9. Brisket and roast, No 5.........	9. I.	26	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
10. Front shank and rump, No. 2.....	10. J.	28	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
11. Neck and rump, No. 1...........	11. K.	30	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
12. Flank and roast, No. 2.	12. L.	26	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....
13. Shoulder and roast, No. 4.....	13. M.	27	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
14. Hind shank and roast, No. 3.....	14. N.	31	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
15. Second rib cut and roast, No. 1.....	15. O.	25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
16. First rib cut and surlion........	16. P.	27	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
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This time-table represents the way in which the beef is to be divided and weighed out to each person. The diagram represents A's beef being slaughtered and weighed out to the men composing the ring. No. 1 cut goes to No. 1 man the first week; to No. 2 man the second week, and to No. 3 man the third week, etc. This is done by moving the long list of cuts (at the left edge of time-table) down one space for every beef that is slaughtered, which changes the cut for each man. This slip is let down week after week until No. 2 comes opposite No. 1 man, then No. 1 cut is placed opposite No. 1 man again, as all the cuts in one half of the beef is contained in the first eight numbers, and the other half of the beef has the same cuts in it.

A's beef weighs 441, pounds which he is credited with. The numbers below each man's name is what he puts in, and the numbers opposite each man's name is what he takes out.

Duties of Secretary. He furnishes tickets with numbers on, which the members draw from a box, to decide the order in which they are to supply the animals.

He acts as valuator in case an animal is thought by the butcher to be below the standard in quality.

At the close of the season, he takes from the butcher's account, the quantity received by each, and presents to each individual member a statement of this and of the weight of animal furnished and the price per pound of all. If A's animal weighed 400 pounds and he, during the season, received 425 pounds, he must pay for the 25 pounds received at the rate of 6 cents per pound, if all beef has been up to standard. If B furnish an animal that is decided to be worth only 5 cents per pound and all the others are up to the standard, he is charged 6 cents for all meat received except the cuts he received of his own animal which will be charged to him at 5 cents and all the other members will be charged at the rate of 5 cents for B's beef. If a member receive less than the weight of the animal furnished he shall be paid for the amount he is deficient at the rate at which his animal was valued.

Duties of Members. They shall attend meetings, draw their numbers, select butcher and secretary, and decide upon the time when they commence operations.

Each one shall furnish a young well-fatted animal that will dress from 400 to 450 pounds, have it ready when his turn comes, and bring his animal to slaughter house 24 hours before time to kill.

They shall come for their shares of meat the morning after it is killed.

After the season is over they shall attend a meeting at which they will pay or be paid—as the case may be—the amount of the difference between their receipts and the weight of their beef.

The above is the way in which beef-rings have been operated in the township of West Gwillimbury, Simcoe Co., for a number of years. It is simple, easily worked, and gives good satisfaction. Sixteen is the most suitable number of members for a ring-killing every week. Some continue for a term and a half making twenty-four weeks, for the last eight weeks the members pair up and furnish an animal between two. A ring may be operated with only eight members, by killing every two weeks.

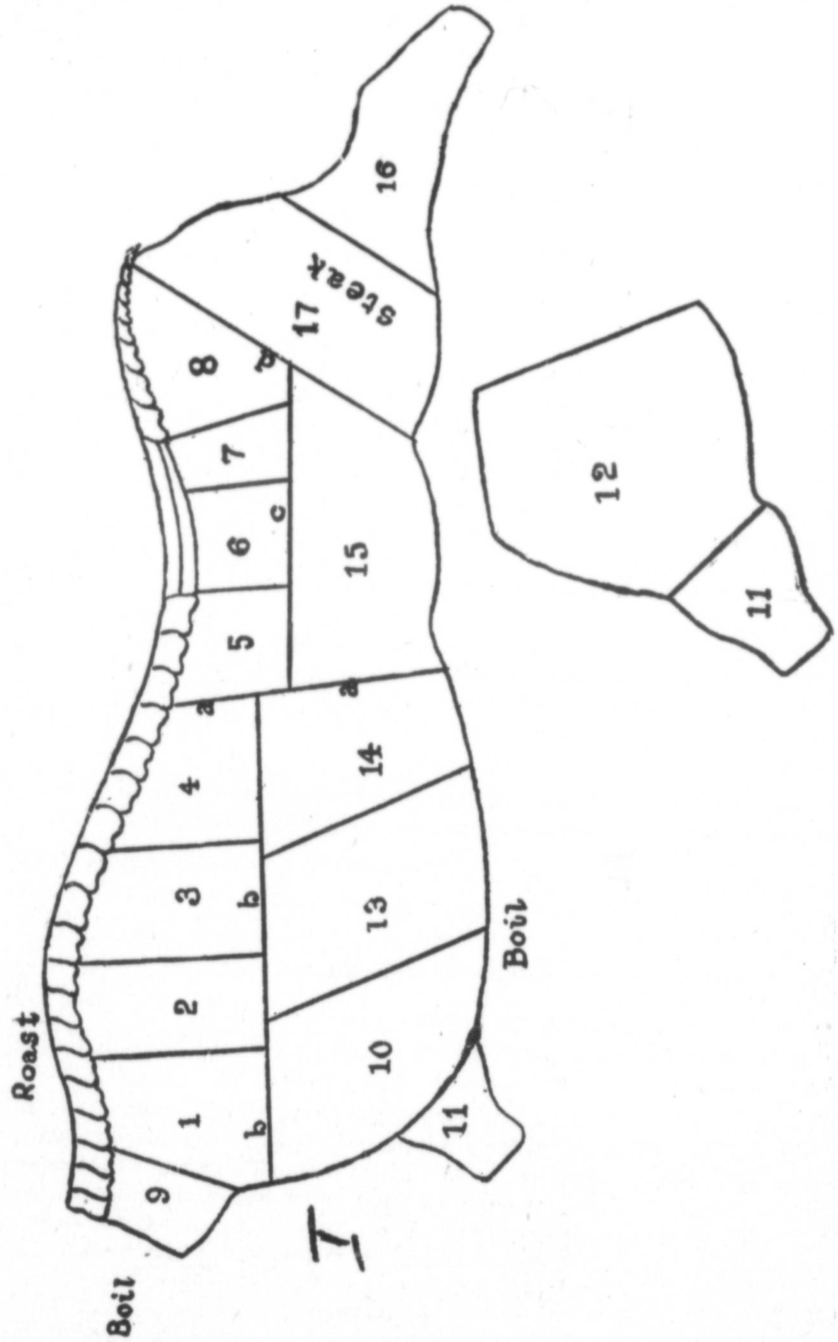
Advantages.

Farmers have fresh meat at first cost.

Fresh beef in the summer is more healthful than salt pork, thereby saving much suffering and perhaps doctor bills as well.

Farmers' wives who have fresh meat at their command have less labor and more pleasure in preparing meals than they otherwise would have.

Fig. 1. Represents one-half of beef lying on the table ready for the saw. Before letting this half down divide it in the middle by running a saw across at "a" between roasts 4 and 5, leaving two ribs on hind quarter. After laying both quarters on the table divide fore-quarter at line "b."



No. 9. Represents neck. Saw neck off leaving three joints on it.
No. 1. Represents roast No. 1. Saw roast No. 1 off, leaving three joints on it.
No. 2. Represents roast No. 2. Saw roast No. 2 off, leaving three joints on it.
No. 3. Represents roast No. 3. Saw roast No. 3 off, leaving three joints on it.
No. 4. Represents roast No. 4. Saw roast No. 4 off, leaving four joints on it.
No. 11. Represents front shank. Saw front shank off above upper joint.

No. 14. Represents second rib cut. Saw it off, leaving five ribs on it.

No. 13. Represents first rib cut. Saw it off, leaving four ribs on it.

No. 10. Represents brisket.

No. 12. Represents shoulder, which lies directly under brisket as represented in Fig. 1.

Then take the hind quarter and divide it at line "d."

No. 15. Represents flank. Cut flank off at line "c."

No. 5. Represents roast No. 5. Saw roast No. 5 off, with three joints on it.

Nos. 6, 7 and 8. Represents sirloin, rump No. 2 and rump No. 1, respectively. Divide these three as near to the same weight as possible.

No. 17. Represents steak. Cut steak into slices giving a slice to each person.

No. 16. Represents hind shank after steak is taken off.

After this half of the beef has been cut up it is divided between the first eight persons, as shown by time table, giving each person a roast, a boil piece, and a slice of steak. Then the other half of beef is taken down and cut up in the same manner.

R. C. Tye (New Hamburg): The Wilmot Beef Syndicate was formed in the spring of 1895 with twenty members. Two of the members were appointed to buy the animals which they did from the drover. The drover agreed to deliver one each week at the slaughter house. No animal was to be over six years old and was to weigh about four hundred pounds dressed meat, for which he was to receive $6 per hundred pounds dressed weight. The butcher was a farmer and a member of the syndicate. He dressed the animal and cut it into twenty portions so that every person would have a different part every ten days. After the meat was weighed it was hung on hooks opposite each person's name. The butcher also acted as secretary and treasurer of the syndicate and received $1.50 for each beef killed; he sold the hide and tallow which went to reduce the price of the beef. The head, heart and liver were taken by the members in turn. The members paid in some money monthly. They settled up in the fall and found that the meat had cost them $5.70 per hundred pounds. They killed twenty-five animals during the summer, and next season they expect to have a good many more members and will either get larger animals or kill twice a week.

Elmer Lick, (Oshawa): We manage our beef-ring somewhat differently to what Mr. Fraser speaks about. We have twenty in our ring. Six of these divide their portions with six others, thus fourteen receive full portions and twelve receive one-half portions. Those who can use twenty to twenty-five pounds per week do not divide their portions. We have strict rules as to the quality of the animals killed. They are to be under three years of age, a steer or heifer in good condition and sound health, weighing dressed from three hundred and seventy-five to five hundred pounds. A committee of three is appointed to whom the butcher refers if any animal is thought to be unsatisfactory. We sign the rules, and at that time draw lots to determine the order in which we are to furnish the animals. After drawing lots, some may make changes which will be mutually advantageous. No. 1 furnishes his animal the Tuesday evening before the first Wednesday in June. The animal is slaughtered on Wednesday evening and cut up ready to take away on Thursday morning. The animal is to be brought Tuesday so that it may be cool before being slaughtered. An animal is killed each Wednesday for twenty weeks. Each person in the ring is to furnish two bags with a shir string at the top of each to hang it up by. One is taken with the meat one week and the other left for the next week's meat. We pay our butcher $2.25. He kills, cuts up, weighs each part, and keeps a strict account of weights, and he also markets the hides. The hide, head, tongue, heart, etc., belong to the person bringing the animal. The butcher cuts the beef into twenty lots, each containing a roast, a boil and a steak. These are weighed out each time and then placed on a table in rotation. After weighing each man's share it is placed in one of the bags and hung on a nail. The bag should have the name of the owner marked on it. Our meat is ready for us early in the morning. It is ready for cooking, all bones being cut properly. At the end of the season we call a meeting to settle for the balances. At this meeting each person, who has received more than he put in, pays for it at a settled price (for two years our price has been six cents per pound; we have lowered to five cents.) Those who have put in more than they have received, are paid at the standard rate. We arrange for next season's ring at the time of settlement, and appoint a president, secretary and managing committee, and also a committee to decide on the quality of the animal. The managing committee are given power to arrange for killing and other necessary arrangements. Our method of keeping the beef is to use steak and roast first, meantime the boil is either put in brine and kept until Monday or placed in a refrigerator. You should not judge the keeping qualities of fresh beef like this, by the keeping qualities of the pieces you buy from a butcher, as the purchased meat has usually been killed several days, and kept by aid of ice. The fresh meat will keep much easier than a person would expect. It was very seldom that we had any to use on Wednesday. One thing that requires care on the part of the butcher is that he should be exact in rotating the lots of meat so that each person would receive all the parts of an animal. Our people are pleased with the ring; in fact, there are several others who would like to join in and enjoy fresh beef of good quality at cost price, but our ring is constantly full.

J. R. RANDALL, * (Newmarket): The first step necessary is to obtain the names of sixteen persons, who are willing to enter into such a contract. There should be sixteen because the carcass can be more satisfactorily divided into that number of shares than any other. They should then meet as early as possible, draw up a constitution and by-laws, appoint their officers, and they will be ready for business when the time arrives, provided every member will do his best to promote the welfare of the society. First, by endeavoring to furnish a first-class young animal, and, second, by bearing in mind that it is a mutual arrangement, that there are but four shanks on a beef, and that you must expect that many, but cannot get more in the sixteen weeks. I would advise having all heifers, because generally there is less proportion of bone, and they fatten better when young, without so much growth; they generally come better within the limits of weight. I enclose herewith a copy of our constitution and by-laws, which may, of course, be altered as desired. In our case the secretary-treasurer and butcher were the same person; there is a good deal of keeping accounts, and it makes a lot of work for one person. The standard price should be fixed as near the market price of good beef as possible. It is by this price that the beef is scored and settlements made at the end of the season. Where a whole share is not required in one family, it may be divided according to an arrangement made between the parties themselves. We have run it successfully for twenty four weeks in one season. After the term had expired some person or persons were appointed to purchase such cattle as were required. It was run for eight weeks, then each member would receive one-half of a whole beef in that time, and each would pay in proportion to the number of pounds of beef received.

CONSTITUTION.

I. This association shall be known as the ——————— Mutual Beef Association, and shall consist of sixteen members, whose object shall be to furnish each member with his quarter of fresh beef weekly during the specified season.

II. The officers shall consist of a president, secretary and treasurer, whose duties shall be such as usually pertains to such offices; also a managing committee of three members, whose duties shall be to provide a suitable place for slaughtering, settle all differences in regard to weight, and quality of animals furnished, and the general oversight of the work; and any vacancy occurring in any office shall be filled by a vote of a majority of members present at a meeting appointed by the society as hereinafter provided.

III. The officers shall continue in office for the period of one year, unless otherwise determined by a majority of said society.

IV. The president and secretary shall be and are hereby empowered to convene all meetings considered necessary by them, and any special meeting at the request of any five members given in writing.

V. Seven members shall constitute a quorum for the transaction of business.

VI. All persons becoming members of this society shall subscribe to the articles of this constitution and be governed thereby.

VII. The annual meeting shall be held at a place and on a day agreed upon, for the purpose of closing up the business of the current year, enrollment of members, election of officers, making arrangements for succeeding year's operations, and for the transaction of such other business as may be brought before the meeting, notice of which meeting shall be given each member by the secretary.

* This information has been supplied by Mr Randall, who is an associate of the Agricultural College, and who has been secretary, treasurer and butcher in connection with the beef-ring near Newmarket for several years.

By-laws.

1. The society shall elect one of its members to the position of butcher (whose duties are hereinafter defined), who may secure some suitable person to perform said duties.

2. Each member shall furnish one heifer or steer, the age of which shall not exceed two years, and weighing about four hundred pounds, suitable for the purposes of the society during the season in his proper turn, said season to consist of sixteen weeks, commencing and ending at such times as may be determined at any regular meeting of the society.

3. The order in which each member shall furnish his animal, shall be decided by lot at the annual meeting, or at a meeting held at least three months prior to the day of first killing.

4. Each member shall deliver his animal at the place of slaughter at or before nine o'clock on the day appointed by the society for the slaughtering of each animal.

5. Each member furnishing an animal shall be entitled to and shall receive the rough tallow, head and heart of the same.

6. The butcher shall be the judge of the suitableness of all animals furnished and may reject any, subject, however, to an appeal to the managing committee.

7. The butcher shall have authority, and it shall be his duty, in fixing the price per pound of each animal delivered, to take into consideration the season of the year when such animal may be furnished, also the quality of said animal when dressed, according to a standard adopted by the society.

8. The butcher shall weigh each carcass when dressed, and keep an account of the same, giving proper credit to the member furnishing said carcass. He shall also cut up and distribute weekly to each member of the society an equal portion of the same, as near as he can judge in the division, and keep a strict account of the amount furnished each member per week, and at the end of each season settlements shall be made with the members of said society, in accordance with the accounts kept by the butcher.

9. The distribution the butcher is required to make in accordance with the foregoing rules, shall be accomplished by placing each member's portion on hooks under their respective names, at the place of slaughter, or at such other place as may be agreed upon by the society.

10. The butcher shall market all hides and pay over to the treasurer the money obtained by him for the same, and shall receive for his services the sum of two dollars per head for all animals slaughtered, cut up and distributed by him.

11. The money obtained by the butcher for hides shall remain as a fund in the hands of the treasurer, for the purpose of defraying the necessary expenses of the society, and settling the differences of accounts between members at the end of each season.

12. No member shall have the privilege of withdrawing from the society without the consent of a majority of said society, and in no case will a member be allowed to withdraw until his accounts are settled with the society.

13. The above articles and regulations governing this association shall remain in full force and virtue unless amended by a two-thirds vote, after a notice of such amendment has been regularly given.

REPORT OF COMMITTEE ON DAIRY EXPERIMENTS.

By Prof. H. H. Dean, Director of Co-operative Experiments in Dairying.

Early in the spring a circular letter was sent to about one hundred leading cheese and butter makers in the Province, together with proper blank forms for making returns to the committee. Printed postal cards were sent to each maker, requesting a return of the blank forms properly filled in not later than November 15th. No respone was made to these, except from a few saying that for various reasons they had been unabled to conduct any experiments during 1895. Written postal cards were sent a second time, to a number of those who were thought to be the most likely to conduct the experiment. The general reply was, that owing to the bad season and pressure of work, they had been unabled to make experiments as requested. It would seem as if the work of 1895, so far as dairying was concerned, was a failure, but it was not altogether such. Money and labor spent in advertising, printed blanks, etc., serves to get the dairy work of the Union before the dairymen of the country, and the small sum of money ($15.38) which is spent, has done considerable good by reminding cheese and butter makers of the need of experimental work in connection with their business. It also shows how little exact work is done in our factories, when out of a whole season's business there was not sufficient accurate data to fill in the blank forms sent out by the committee, and the experiments were in direct line with every day work in the factories. If this work is to be continued successfully it would seem to me advisable to make the following features a part of the system:

I. The Union should aim to secure the co-operative support of the Dairy and Creamery Association in the co-operative experiments of dairying

II. The Union might offer some inducements to men who will conduct successful experiments. This inducement might be in the form of books on dairying, renet, cheese coloring, various dairy utensils. Experiments in agriculture, horticulture, etc., receive these in the shape of grain, trees, plants, etc., and a small outlay in dairy rewards would stimulate makers to be more accurate and observing, and have them to send these observations to the Union where they could be tabulated and summarized for the benefit of the dairy industry. I suggest these features for consideration in the work of 1896, and which is respectfully submitted on behalf of the committee.

THE EFFECT ON THE QUALITY AND QUANTITY OF CHEESE FROM THE PERCENTAGE OF FAT IN THE WHOLE MILK.

A very able, interesting and valuable address was delivered by Prof. Shuttleworth upon the above subject. As this address is embodied in the report of the Chemist, in a previous part of this volume, the reader will be enabled to obtain full information by an examination of this report.

Q. If milk is paid by the fat basis for cheese purposes, our men inform us that the expense to the factory would mean an addition of an extra man, one would not be able to do the work. What would be the additional expense to pay on the line which you have indicated? What would be the necessary expense to the factory to pay by your system?

Prof. SHUTTLEWORTH: In the fat basis he would require an extra man on one or two days of each month. The additional expense in paying on the fat and casein basis is no greater than by the fat basis alone.

Q. Draw off ten pounds of skim milk and add ten pounds of water; the milk shows just about the same quantity of fat, and it would be graded with the same amount of casein, would it not?

Prof. SHUTTLEWORTH: The milk from which has been drawn off ten pounds of skim milk, and to which ten pounds of water have been added, would certainly contain about the same quantity of fat; but this milk would not produce as much cheese. The correct cheese-producing power of such milk would not be estimated either by the pooling system or fat basis, nor by the fat and casein basis.

Q. It must be perfectly clear in the case of paying by fat basis that replacing the skim milk (containing the casein or curd) by water, lessens the amount of cheese that the milk will yield?

Prof. SHUTTLEWORTH: Yes.

Q. Is it your opinion that the quality of the milk for cheese making is more correctly estimated by considering the casein as well as the fat contained in the milk?

Prof. SHUTTLEWORTH: Yes. We find the casein can be calculated in any milk of a known percentage of fat; 2.3 is taken as the average per cent. of casin in milk below 3 per cent. of fat; 2.4 in milk of 3 per cent. and under 4 per cent. of fat; 2.5 in milk of 4 per cent. and under 5 per cent. of fat; 2.6 in milk of 5 per cent. and under 6 per cent. of fat.

Dr. MILLS: It would appear from your investigation in milk at the College, and this investigation has been very extensive, that the casein does not increase proportionately with the fat. Dr. Van Slyke, who has done very useful work along this line has concluded that the ratio between fat and casein in milk is fairly constant, and that the casein varies as the fat varies. If that were so, the fat basis would be a correct basis of distribution. Since casein does not vary as fat, the fat basis does not give a fair distribution; it credits the richer milk with an unproportionately large yield of cheese.

Q. Practically speaking, if cheese makers get used to your plan, will it make more extra work, that is, more than paying by the fat basis alone?

Prof. SHUTTLEWORTH: Practically no more work. For example: In the fat and casein basis, where milk tests 3.5 per cent., casein is 2.4, and this will be simply added to the fat reading, making 5.9 to be entered instead of 3.5.

Mr. ROGERS: I would like to say a word that might be of some help to those that are considering the matter of expense of testing milk in factories. One gentleman here said that they raised objections in his factory and asked $100 a year extra for additional work. By the use of potassium-bichromate, the tests need to be made only once a month, which does not increase the cheesemaker's work very much. It would mean that he would require an extra man one, or at most two days—the time during which these tests are made.

Prof. SHUTTLEWORTH: What additional amount over wages received would you ask, if required to make the tests in paying upon a fat, or fat and casein basis?

Mr. ROGERS: When I ran a factory I usually got labor for that particular day when the test was going on; it would usually be $3 or $4 a month extra.

Dr. MILLS: The fat system is a much nearer approach to a fair method than any other method we know of except the one proposed which considers casein as well as fat.

Prof. SHUTTLEWORTH: Yes. The addition of two to the fat reading give results practically the same as those obtained by the use of numbers, representing the correct percentages of casein where the variations in fat are very little; but the addition of two to the fat reading leads to a greater discrepancy where the percentages of fat in the different lots of milk vary by one-half a per cent. and more.

CO-OPERATIVE TESTING OF SMALL FRUITS.

BY H. L. HUTT, B. S. A., DIRECTOR OF CO-OPERATIVE EXPERIMENTS IN HORTICULTURE.

The committee for horticulture experiments, has for the past two years been giving its attention to the testing of some of the leading varieties of small fruits.

The work along this line seems to be attended with many difficulties, and on this account we are not yet able to give the results of experiments, although we are glad to be able to report progress. There is no difficuly in finding men who are willing to undertake the work. Both last year and this year there were forty more applications for plants than could be supplied. But there is a difficulty in obtaining reports from successfully conducted experiments. There are various reasons for this, some of which are beyond our control. In the first place, as we do not grow the plants they have to be sent out from a nursery, and notwithstanding, all our efforts to have them sent out early, some of them were sent out so late this year, that many of them failed to grow. This was the case with the strawberries. The other fruits, however, were sent out earlier, and more encouraging reports have been received with reference to these. The extreme drouths during the last two seasons made them very unfavorable for setting out young plants. Quite a number of experimenters report failure on this account. Again, most of those who were successful last year with their planting, are unable to report yields, this year, on account of the late spring frosts, which destroyed nearly all the fruit. In a few cases yields are reported from last year's planting of strawberries and raspberries, but they are not sufficient to form a basis for any conclusions as to the relative merits of the different varieties under test.

The experiments undertaken in 1894 were variety tests of small fruits as follows:

Strawberries—Wilson, Bubach No. 5, Williams and Bederwood—twelve plants each.

Raspberries—Marlboro', Cuthbert, Shaffer's Colossal and Golden Queen—six plants of each.

Black Raspberries—Souhegan, Gregg, Palmer and Tyler—six plants of each.

Currants—Fay's Prolific, Victoria, Raby Castle and White Grape—three plants each.

Fifteen lots of plants for each of the four experiments were sent out; sixty persons were thus engaged in last year's experiments. Of these sixty, forty-seven reported last fall on the growth of the plants; thirty seven reported again this fall, most of them reporting that there had been little or no fruit on account of frosts.

This year the same line of experiments was followed, the work being extended by adding to the list a trial of four varieties of gooseberries, viz: Houghton, Downing, Whitesmith and Industry—three plants of each.

With the increased grant, we were able this year to send out twenty lots of plants for each of the five experiments. This making one hundred persons engaged in this year's experiments. Of these one hundred, only fifty-two have yet reported on the growth of the plants this season. Their reports may be summed up as follows:

I. Strawberries.—11 reports, nearly all reporting failure to make plants live.

II. Red and yellow raspberries.—Seven reports, two report all plants living and the rest report one or more plants dead.

III. Black raspberries.—Seven reports; one reports all living, and the rest report, one or more dead.

IV. Currants.—Ten reports; four report all living and the rest report nearly all living.

V. Gooseberries.—Seventeen reports; thirteen report all plants living, and the other four each report but one plant dead.

Although the results so far are not the most encouraging, still we believe the work is a commendable one, and that progress is being made. Like hopeful fruit-growers, we try to take reverses cheerfully, and look forward to better crops, and better reports next year.

TREASURER'S REPORT.

Receipts.	$ c.	Expenditures.	$ c.
Balance from last year	32 33	Agricultural experiments	537 76
Government grant	950 00	Horticultural experiments	116 45
Membership fees	49 40	Dairy experiments	15 00
		Botanical and Entomological experiments	10 00
		Apicultural experiments	4 00
		Expenses connected with annual meeting	92 00
		Salary of editor	80 00
		Balance	176 52
Total	1,031 73	Total	1,031 73

We the undersigned auditors of the Ontario Agricultural and Experimental Union beg leave to say that we have examined the accounts of the Treasurer and find them to be correct.

T. F. PATERSON.
J. F. CLARK.

OFFICERS FOR 1896.

President.................................ELMER LICK, Oshawa, Ont.
Vice-President..........................D. Z. GIBSON, B.S.A., Willow Grove, Ont.
Secretary and Editor..................C. A. ZAVITZ, B.S.A., O.A.C., Guelph.
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COMMITTEES ON EXPERIMENTS.

Agriculture. C. A. ZAVITZ, B.S.A., (Director), DR. MILLS, PROF. SHUTTLEWORTH, P. O. VANNATER, and R. HARCOURT, B.S.A.

Horticulture. H. L. HUTT, B.S.A., (Director), E. LICK, and N. MONTIETH, B.S.A.

Apiculture. B. F. HOLTERMANN, (Director), R. M. HUSBAND, and E. G. EMIGH.

Dairying. PROF. H. H. DEAN, (Director), H. L. BECKETT, B.S.A., and S. P. BROWN.

Economic Botany and Entomology. PROF. J. H. PANTON, (Director), M. W. DOHERTY, B.S.A., and F. C. HARRISON, B.S.A.

Live Stock. G. E. DAY, B.S.A., (Director), N. MONTEITH, B.S.A., W. W. BALLANTYNE, and R. E. COWAN.

THE ANNUAL SUPPER.

Following the large attendance and successful meetings of the Experimental Union during the day, the annual supper of ex-students, students and college officers in the evening was naturally the largest and most successful gathering of the kind ever held at the College.

At the close of the supper, President Mills opened the proceedings with the toast of the Queen, which was honored with three cheers.

HOW CAN THE EX-STUDENTS OF THE AGRICULTURAL COLLEGE MAKE THE BEST USE OF THE LESSONS LEARNED DURING THEIR COLLEGE COURSE?

DR. JAS. MILLS, PRESIDENT AGRICULTURAL COLLEGE, GUELPH, ONT.

1. *Do not find fault with what you see around you.* You may notice bad methods, poor appliances, and the most striking evidence of neglect and mismanagement—things deserving the severest censure; but you must hold your tongue. Farmers will not take advice from beardless boys, nor even from well-developed young men, if they are fresh from college.

2. *Improve your farm.* Do much; say little. Instead of finding fault and giving advice, take off your coat and go to work. Do something. Make an intelligent, persistent effort to improve your farm. There is great room for improvement on many farms. The soil is poorly cultivated, weeds are plentiful, fences are out of repair, and things about the farm buildings present an appearance of the most discreditable neglect—stones here, sticks there, a pile of rails or boards yonder, and an old sleigh or a broken implement somewhere else—all seeming to say that the owner is lazy or devoid of taste. Untidy men ought to give up farming. They are a disgrace to the beautiful country in which we live; and, like the old Quaker, I am disposed to say that the man who allows wild mustard, wild oats, quack grass, or other noxious weeds to take possession of his farm, is working too much land, is lazy, or does not understand his business.

Straighten and repair your fences; then keep them in order. Remove all piles of stones from your fields; you can haul them away to the woods or somewhere else in winter. Rest not, night or day, till your farm is clean—till you have all noxious weeds thoroughly under your control and most of them destroyed. Tidy things up and keep them tidy, around your house, in the yards, and about the farm buildings; and plant some trees (maple, elm, pine and spruce) to shelter and adorn your home.

3. *Implements.* Take good care of your implements and do not buy any more than you really need. The annual waste under this head throughout the Province of Ontario is enormous. Implements of various kinds—plows, harrows, waggons, etc., left out, exposed to rain, frost and snow! What a disgrace and what a loss to the owners! Yet many incur this disgrace and suffer the loss involved therein; and such men, young and old, often have a weakness for buying implements which they could do without, getting them on credit and wearing them out before they are paid for. Do not be guilty of such folly. Keep all your implements, waggons, sleighs and carriages under cover. Keep them in good repair; and let no one persuade you into buying what you can do without till you have the money in hand to pay for it.

4. *Attend closely to your business.* Hard work is the price of success in all honest vocations, and in these days of low prices and intensely keen competition, the man who frequents hotels or spends much time away from his farm, need not expect to succeed.

5. *Be punctual.* Punctuality is an important factor in all kinds of business; and it is to be regretted that farmers generally are looked upon as less prompt and punctual than men in commercial and professional life. Lying is among the disgraceful vices. Men everywhere resent the imputation of falsehood; and yet a great deal of practical lying is done in every-day life by persons, young and old, who thoughtlessly make promises which they neglect or forget to fulfil. Think before you make promises or enter into engagements; then keep your promises and fulfil your engagements to the letter.

6. *Make up your mind to be something more than a mere laborer.* Many farmers' sons in this Province are not making a good use of their time. Far too large a proportion of them are living very listless, useless lives, not well satisfied with their position, but doing little or nothing to improve it, going through the dreary routine of their daily life—eating, working, sleeping; sleeping, eating, working—without any well-directed effort to rise above the condition of mere laborers. Labor is honorable, and no one is degraded thereby; but human muscle alone counts for very little in these days of steam and electricity—very little in the keen competition and amidst the unceasing progress which we see in almost every line of human activity. If any of our ex-students have been dreaming in Sleepy Hollow, we would urge them to wake up, open their eyes and look around. Those who do so, will be surprised at the great changes which have taken place since they fell asleep.

7. *Observe, read and think.* In every community the educated classes are the ruling classes;

> For just experience tells, in every soil,
> That those who think must govern those that toil.

Your education is very defective and you are doing nothing to improve it. Begin to read. Nearly all great men are great readers. It is not necessary to go to a high school or a college to get an education. Some of the best educated men in the country are self-educated—self-made men; and you can acquire a good education if you will only observe, read and think. Read papers, magazines and good books. Read closely, read thoughtfully, and think over what you read. It is wonderful what a man with even one talent can do when he makes a good use of his time.

8. *Take at least one agricultural paper.* You need the information contained in such a paper. It will be of much practical value to you—value in dollars and cents; and without it you cannot keep in touch with the leading agriculturists of the country.

9. *Attend meetings in which matters pertaining to your own occupation are discussed or illustrated,* such as meetings of the Farmers' Institute, the Horse Breeders' Association, the Cattle Breeders' Association, the Sheep and Swine Breeders' Associations, the Dairymen's Association, the Creameries' Association, the Fruit Growers' Association, the Poultry Association and the Bee-Keepers' Association; also the annual Fat Stock Show, and one or two of the leading fairs—not all of these, but as many as you can, and especially those which bear most directly upon your special line of work. But do not spend too much time at fall shows to the neglect of fall work.

10. *Take some part in the affairs of your township, county and Province, and of the Dominion also.* Be not a blind follower of any party. Do your own thinking in such matters; and, if need be, sacrifice a little to put the best men into positions of trust and responsibility and to keep professional demagogues from ruling the country.

11. *Keep out of debt.* Sensible people respect the young man who wears rusty, threadbare clothes and drives in an old buggy or democrat till he gets the means to buy something better. Such a young man has a chance of success, while the one that borrows money to purchase cloths, carriages, implements, or anything else (unless in rare and exceptional circumstances) is almost sure to become a hewer of wood and drawer of water for some money-lender or loan society. Whatever you do, live within your means and pay as you go.. Have nothing to do with mortgages or promissory notes. Get some interest if you can, but do not pay any.

I shall not speak to you about religion and sound morality (strict truthfulness, scrupulous honesty, etc.) as the true foundation of success on the farm as elsewhere. I assume that this important fact is impressed upon your minds from week to week.

Discussion.

The discussion on Dr. Mills' paper was very interesting, lively, and enthusiastic No less than fourteen associates and graduates of the College spoke upon the subject, and the discussion lasted for nearly two hours. The following gives a condensed report of the different speeches:

T. H. Mason, ('76), Straffordville: It was in 1874, I first entered this hall in which we are holding this meeting to-night. To be successful farmers we have to be good business men. If we wish to improve our condition as agriculturists we must make the finest possible articles of food and place them in the markets of the world in the best possible manner. Students of this College are better prepared to do this than the average farmer owing to their having an understanding of the best methods of farming operations. When a young man enters college he is usually at an age at which habits are formed which will last through life. Habits of business—being on time—learned at college are apt to stick to a young man. Young men who learn the habits of being energetic, careful, saving, and business-like in their work are the men who are going to be successful, and who will make this Province of ours what it should be in the future.

R. F. Holtermann, ('80), Brantford: If we have availed ourselves of the opportunities that are placed before us, we are certainly placed under the greatest advantages after we have gone through the course of instruction given at the Ontario Agricultural College. When we are young men, many of us are apt to make mistakes, and we must be fitted for the direct line in which we are engaging in order to succeed. We should have a high standard of proficiency before us, and do the very best in our power to reach it. President Mills advised the students to take an interest in the affairs of the township, county, Province, and Dominion. I think we should be very careful about that. A great many men who have been successful along certain lines have afterwards engaged in politics and by so doing have neglected their business and have met with heavy losses financially. It is good to be cautious.

Oscar Chase, ('82), Nova Scotia: I thank you for the honor you have conferred upon me by calling upon me, but I am no public speaker. I may say I am very pleased to be with you to-night. It is a long time since I had the pleasure of being here before. Our farming is very different in Nova Scotia from the farming in Ontario. We put a great deal of stress upon the raising of apples in our part of the Province. We find it is the most profitable part of farming. I think a great deal more could be done in Ontario in fruit raising than is done at the present time, and done profitably. I was much pleased with President Mills' paper.

T. G. Raynor, ('85), Rosehall: I would still like to be called a student. There have been great improvements made at the College since I was here for my regular course. I feel as if I would like to come back and take the course over again. I am glad on this occasion to be present, and confer with my class mates and with other ex students and also with the present students of the College. I was pleased with what Prof. Myers, of the United States, said this afternoon in regard to the equipment of this College in comparison to that of other Agricultural Colleges. Any young man attending this institution may receive a very profitable training for agriculture, a training that will be profitable through life. I believe we as ex-students should use our influence with the farmers of Ontario to send their sons to this institution to receive valuable instruction. I hope the students may increase year by year at this institution.

R. M. HOLTBY, ('86), Manchester: I am pleased to be here as it is the first time I have had the pleasure of attending an Experimental Union meeting since I left the College ten years ago. When I went in the reading room this afternoon and saw the photograph of our class of 1884-6, I could not help but think of how they are now scattered all over the country. I was much pleased with President Mills' address. We should bring business methods on the farm, practice economy and reduce the cost of production as much as possible.

ELMER LICK, ('87), Oshawa: About fifty of us came here and started the course in 1885—ten years ago, and just after the old barns had been burned. It was a dilapidated looking affair with the old walls still standing. Now, we can see beautiful buildings and excellent appliances for the teaching of agriculture. I feel like calling the place a village now as there are so many fine buildings. In referring to the class to which I belonged, I wish to make a pretty broad statement, which is, that the class of '87 furnished material which pointed out to the country that the instruction given at the Ontario Agricultural College was not only of a practical nature for farm life, but that it was of a high character from an educational standpoint. Besides those actively engaged in farm work throughout Ontario, I have only to mention that Professors J. A. Craig, G. C. Creelman, J. W. Hart and J. H. A. Morgan were members of that class. These men are now successfully filling good positions in agricultural colleges, which shows what the instructions given at this College can equip a man for doing.

A. SHANTZ ('88), Waterloo: I noted very carefully what President Mills said in his address to night, that "we should do much and talk little." I feel that whether I have fulfilled the first part of this advice or not I have always fulfilled the second part to the letter, and I shall do so to-night. I feel it a great honor that I have been called upon to represent our class of '88. The last speaker has just spoken of some of the brilliant lights of his class, but I feel I am representing a class far superior to all preceding ones. In the first place we were considered—and by the fair sex, mind you—the best looking lot of students that had ever entered the College. We were also considered to be the best workers on the farm, and we were a plodding class—as true as mules. Graduates of the College should be able to make a good success of their life work. At the College we get a good knowledge not only of the practical work but also of botany, chemistry, entomology and all the other sciences that are closely connected with agriculture. I would like to know who has more to do with these sciences in his every day work than the farmer.

NELSON MONTEITH, ('89), Stratford: After leaving this institution we must recognize the fact of increased responsibility resting upon us. This College and the staff of this College expect us to do our duty in whatever crisis we may be placed. Dr. Mills' address to night should be quite helpful to us for many reasons. The facts given by him should receive the careful consideration of each one of us.

D. Z. GIBSON, ('91), Willow Grove: I was much pleased with the address of our worthy President. We as ex-students should be very careful not let our preaching get ahead of our practice. Great praise is due to the College for the opportunities afforded to the young men of the country. Students can spend their time at the College to great advantage and learn the best methods to make farming pay. I believe the ex-students are in a much better position to solve the problems of modern agriculture than others, and to pay off the mortgages on the farms when necessary.

W. D. DYER, ('92), Columbus: The President advises the ex-students not to go into debt for implements they can do without. I think this point might be carried too far. I believe in some cases it might be advisable even to go into debt for implements providing that greater profits could be made with those implements than without them. Great stress should be placed on the Presidents advice to "observe, read and think." We should think clearly and deliberately before taking any important steps in connection with our business and thus avoid forming opinions too rashly.

J. B. SPENCER, ('93), London: For a student to glean the most information from the college course, he should spend two or three years at the institution, as the first year furnishes a good foundation for the lessons taught during the second and the third years. We should be very careful not to expend more in preparing our soil than we can get back; not to grow crops except those that will give us the best returns; and not to cultivate varieties extensively, except those which have proven themselves to be superior kinds through experiment. In connection with these various points we can make great use of the Experimental Union. Some ex-students think that they have not the time to bother with experiments. This is a great mistake. The experimental work of the Union is conducted in a very careful and systematic manner and gives great advantages to those who enter earnestly upon the experiments with the object of obtaining definite and practical results.

J. F. CLARK, ('95), Bay View, P. E. I.: Two years ago to-night sixty-four boys gathered around these tables to the annual supper of the Ontario Agricultural and Experimental Union for the first time. That was our freshman year. We came ignorant indeed of the scientific principles that underlie the proper practice of agriculture, save in one thing, we were proficient in the art, I may call it the fine art, of feeding, particularly on oysters, which were on the bill of fare. My constituency to-night is a large one, as I am asked to represent the class of '95, and also the present students. The places of our nativity were, like Mrs. Hemans' "Graves of a Household," "severed far and wide, by mount and stream and sea," for we had representatives from my own beautiful Province down by the eastern ocean, where nature has been so bountiful with her gifts, and from the fertile valleys that lie between the Rockies and the sea; from the old and historic Province of Quebec on the east, and from the new and fertile prairie Province of the west; from the great nation to the south; from Great Britain, the Channel Islands, Bermuda, British India, and last but not least, from all parts of Ontario, in many respects the banner Province of the Dominion. And why did we come? We came because we believed that poverty and the headache from which I suffer to-night were not dispensations of Providence, but two of the effects of one great cause, namely, *ignorance*. We came that we might *know*, that we might learn how to win from nature, with the same expenditure of capital and energy, a *better* and *larger* return; and not only that we might become better farmers, but better *citizens*, better *men*. We found a college suited to our needs, a college where, while we studied scientific agriculture theoretically in the class-rooms, we might learn the practical part in the fields; a college where, while we attained a love for the study of science and the acquisition of knowledge, we retained our love for the old homestead and the farm; a college where we learned how we might make the lovely home more lovely; how we might make that happy home life still more happy. Since we have come there has been very marked progress. A number of new buildings have been erected and fully equipped, and now the College is very fully equipped for its present needs along these lines. Never was the College so well manned as regards its staff as it is to-day, and I feel perfectly safe in saying that, although there may have been times when there were more brilliant students within these halls, there never was a time when there was a larger percentage of the students who were in earnest to improve themselves, not only in the class-rooms and in the fields, but in the Y. M. C. A., literary society and on the campus. In considering this great progress, it is not strange that I should dream of still greater progress in the future. I dreamed a dream, and this is what I dreamed. It was 1950, A.D., and I again visited this place and I did not know it. Great buildings now unthought of adorned the campus to provide accommodation for the greater work of the College. The attendance too, was changed; some eight hundred students found a home in the halls; for the Ontario farmer had at last awakened to his *necessity* and to his *opportunity*. On entering the halls, no smell of coal gas greets us, for I learned that the lighting as well as the cooking was done by electricity. I also learned that electricity had replaced all other forms of motive power on the farm and in the buildings. Indeed I presume that the Professor of Veterinary Science would have to lecture before his class with a stuffed specimen of the equine species when demonstrating the various anatomical peculiarities of the former means of locomotion. There was another thing that was to me particularly striking, and it was what they told me was the Cooking School Department. They also told me that some two hundred of Ontario's rural daughters were there learning the art of cooking and kindred arts. I was also told that many ideal homes were to be seen springing up here and there over the Province. I do not doubt it, for in my hunt for *ideal* homes, where should I expect to find one, if it would not be in some quiet rural place where a graduate of the O. A. C. was at the head of the house, and who had for his companion a graduate of Ontario Agricultural College Cooking School. So indeed were all things changed that could be improved, but there was one thing that could not be improved. It changed not. It was this. As I retired that night I thought I heard a familiar step in the corridors, and I heard a sound. What was it I heard? This is what I heard "All lights out—gentlemen—please." Faithful John still walked the corridors in the second century of his janitorship.

The following comment upon the speakers who took part in the discussion on Dr. Mills' paper occurred in one of the Guelph papers on the day following the meeting: The speakers were certainly an honor to the College, and no better tribute to its work could be given than the progressive and representative young agriculturists whose interest in their alma mater was so deeply manifested.

SCHOOLS OF DOMESTIC ECONOMY AND THEIR ADVANTAGES.

By Miss Bessie Livingstone, Ottawa, Ontario.

A school of domestic economy is an educational institution where practical instruction is given in all the household arts and theoretical instruction in all the sciences which bear directly upon the home life.

The first institution of the study of any branch of household science, in connection with a school or college on this continent, was in the year 1877 when, on the advice of Professor Bragdon, a department of practical instruction in cooking and sewing was inaugurated in LaSalle Seminary (near Boston.) It was the outcome of a feeling that a purely intellectual culture failed to fit woman for the discharge of the home duties which she is called upon to fill, and that, in order to cope with the perplexing social conditions which have been the problem of every nation, and particularly of this new and growing country, a technical knowledge of the details of every day home life is essential.

The trend of popular education has been chiefly along intellectual lines; few colleges now remain closed to women. In the pursuit of science and art every opportunity has been afforded them, but in Canada what provision has been made for the pursuit of the science of housekeeping? This science which is the oldest and most important has been generally looked upon as a knack which women possess intuitively, requiring no systematic instruction by specially qualified teachers. This opinion is no longer held by the educators of other countries.

It is now many years since attention began to be paid to this important branch of instruction is Europe. If I mistake not, Sweden was the first country to establish schools for the teaching of domestic science, but Finland, Holland, Germany, France and the British Isles have followed closely in her wake. At first the desire was to improve the condition of the homes of the uneducated classes, and the pioneer work was chiefly in giving practical lessons in economical, healthful cooking, and object lessons in neatness; now the movement is recognized as one of vital importance in its relation to national and individual life and prosperity.

Our sister country across the border has been quick to profit by their example, and that a deep interest is taken in the subject is testified by the complete course of instruction in household sciences and economics which is given in such institutions as Wisconsin University, Pratt Institute, Brooklyn; Armour Institute, Chicago, and many others, and its introduction into State industrial and public schools shows the light in which it is regarded as an educational factor of the nation.

In many of the state agricultural colleges girls are admitted on an equality with boys in the study of botany, entomology and other sciences of value in practical life, and while the boys are being instructed in agricultural science, the girls receive practical and theoretical training in the sicence of housekeeping.

The instruction given in such a school includes a course of training in household management. This is given by means of lectures on such topics as: "The Systematic Daily and Weekly Routine of Work," as in sweeping, dusting, care of living and sleeping apartments, lectures on laundry work and general cleaning and care of the house from "attic to cellar." The purchase and care of family supplies, the keeping of household accounts, marketing, etc. This knowledge is practically applied, as the housework of the school-boarding department is done by the pupils, each one being required to spend a certain period every day for two weeks in different departments of housework, so that at the end of the term the pupils have had the practical experience of systematic household management and labor, and all this under the supervision of a fully qualified teacher.

Instruction is also given in home sanitation, by means of lectures on topics such as: The situation and care of the house, its surroundings, plumbing, draining, ventilation, heating, lighting, furnishing, and clothing; in a word how to secure and maintain right sanitary conditions—subjects of greatest importance in their bearing on the health of the individual and family. In these, women should be educated in order to properly care for those committed to their charge.

A useful training is given in home nursing, emergencies, and hygiene, the aim being to teach women how to care for sudden illness and accidents and to intelligently follow a doctor's orders when trained assistance is not to be had.

The studies of foods and dietaries is perhaps the branch to which special attention is given. The pupils plan and cook all the meals served in the school and receive daily instruction in: The classes and kinds of food material, vegetable, animal, and mineral, with special reference to their relative importance, modes of preparation, preservation, etc., the selection of food with regard to cost, value, suitability—to season, age and occupation and condition of health. In addition, the student is trained in the economical expenditure of a weekly allowance by being obliged to purchase all supplies for the school.

Special attention is given to the serving of nutritive, attractive, and varied bills of fare for different seasons. The scientific side of the food question is also taken up. The chemistry of foods, composition of foods, chemical changes in the cooking and digesting of foods, effect of light, heat, and air upon food, composition of the body, and the laws which govern it are all subjects for consideration.

The aim of these schools is to give women a special training for their work in home life, as that is the occupation which the majority of women are called to engage in, and which most of them prefer above all others, and it is a duty which, if properly performed, is of greater importance in determining the health, wealth, and happiness of a nation than the duties pertaining to any other calling in life.

We have been a little behind the times in Canada, for there is not a thoroughly equipped school in the Dominion. Good work is being done in some departments of domestic science by the Young Women's Christian Associations of Montreal, Toronto, Hamilton and Ottawa, which are also extending this work to surrounding towns and country, by means of demonstration lectures on cookery, and the keen interest which the introduction of the preliminary work has awakened shows that the day is not far distant when the subject of domestic economy shall be an essential feature of our educational institutions.

The advantages of such an education to Canadian women would be invaluable and particularly to the farmers' daughters, as it tends to remove the feeling of monotony and drudgery so frequently associated with housework; and if in addition to all the other subjects a course of instruction were given on such profitable and interesting topics as beekeeping, poultry raising, fruit raising, and kitchen gardening, the question of "How to keep the girls at home" would be easily solved.

A course of study in the science of living will, I believe, produce as gratifying results in our Canadian homes and people as the investigations and study of scientific farming have done for Canadian farm interests.

THE HONOR ROLL OF 1895.

"Honor to whom honor is due."

C. C. James, Deputy Minister of Agriculture, Toronto.

We stand to-night at the parting of the years, between the old and the new, near the close of the nineteenth century. The young men of this gathering, interested in the development of the oldest of the arts and the newest of the sciences, are looking for light, for information, for guidance. This Union has been formed to carry out experiments, so that from the present and the past a better future may result. You will hear much about experiments with grains and grasses, with bees and stock, and in dairy operations. I propose to review for you some experiments of a higher kind, different somewhat from most of those that you are accustomed to consider but quite as important. With the planning of these experiments you had nothing to do, but with the results you are much concerned—they are taught in your lecture rooms, read in your books and periodicals, and applied in your practice. They are experiments that you can imitate in your lives, in your studies here, in your life work afterwards. They are experiments that cover almost the entire century; they have all closed, in one sense, during the past year. I shall choose six only, five of which ended within a period of six weeks, and I challenge you to produce six others more important, more interesting or more noteworthy in any century. They are experiments in right living, experiments in beneficence, experiments in the higher humanity. They are the records of six men who have laid aside their work for agriculture during the past year and who have passed to their reward, whose monuments are an improved agriculture and of whom the great common people of the world can say "Well done!"

The first upon our list is Amos Cruickshank, of Sittyton, Aberdeenshire, Scotland, who died on May 29th, 1895, at the age of eighty-seven. To men brought up and living in the town and city it may be necessary to explain who the Cruickshanks were. To them the name suggests George and Robert Cruikshank, the caricaturists, and if they turn to biographical dictionaries they will not find the names of Anthony and Amos, though George and Robert will there be duly given places of honor. But to students of the Ontario Agricultural College and to the stock raisers of this Province and of this continent, Amos Cruickshank is known as one of the greatest benefactors of Scotland, of England, of the United States, and of Canada. When the names of many politicians at the present day prominent in British newspapers shall have disappeared and been forgotten the names of Bakewell, Colling, Booth, Bates and Cruickshank will be placed alongside of Arkwright, Watt and Stephenson as those who truly laid the foundation of Britain's wealth and prosperity. When the day comes for reckoning up the growth of British wealth the development of the great pure-breeds of stock will have to be considered, and the names that I have just mentioned will be given an honorable place.

If from old London as a centre you describe a circle with a radius of about 400 miles you will enclose England, Ireland and Scotland, the Channel Islands, Holland and Belgium and a large part of France and Germany. Leaving out the water areas, you will take in about 350,000 square miles of land, a district only one-half larger than the Province of Ontario. And yet within that comparatively small area there have been originated at least four-fifths of all the modern pure breeds of stock—in cattle the Shorthorns, Herefords, Ayreshires, Galloways, Polled Angus, Devons, Kerries, Red Polls, Jerseys, Guernseys, Normandies and Holsteins; in sheep practically all the breeds except the Merino; in horses the Clydesdales, the Shires, the Thoroughbred, the Hackney, the Suffolk Punch, the Cleveland Bay, the Percheron; in swine the Berkshire, the Yorkshires, the Essex and the Tamworths.

We notice further that most of these breeds arose in England and Scotland, and of them all the Shorthorn or Durham breed of cattle, will by many be considered the greatest. Bakewell (1725 to 1794) developed the Leicester sheep and the Longhorn cattle. He died almost in poverty, after amassing and spending a fortune. But he left an impression, an example that gave a new life to the agriculture of the world. Bakewell had succeeded better with sheep than with cattle. Then came the two brothers, Charles Colling and Robert Colling, of Durham County, who began to improve the old Teeswater cattle and developed what we know as the Durham or Shorthorn. We are told that Charles Colling's stock sold in 1810 at an average price of 175 guineas. The Collings retired about 1820. The Shorthorns were then developed into three great families or strains—the Bates, the Booth and the Cruickshank. Thomas Bates built up his herd at Kirklevington, in Yorkshire, from 1810 to 1849, and has to his credit the long list of Duchesses. Thomas Booth began his herd at Killerby and Warlaby, in Durham County, in 1790. His son Richard went to Studeley in Yorkshire and got together a fine herd, which was sold in 1834. In 1835 he inherited his father's Warlaby estate and continued as one of the most successful breeders until his death in 1864. In that year his nephew, Mr. Thomas Christopher Booth, came into possession and continued the good work of improvement until his death in 1878. To show the enterprise of Mr. T. C. Booth it may be mentioned here that when foot and mouth disease played havoc with his fine herd he bought 12 females, descendants of his own stock, for 11,545 guineas. Since the death of Mr. Booth in 1878, the herd and estate have been under the direction of trustees. The youngest heir has come of age this year; hence the great Warlaby sale of June 22nd, when 48 head were sold for $31,620. It is stated that the son will continue the work, and that a new Booth herd will be built up from the reserve of the Warlaby dispersion.

And now as to the third Durham benefactor, Mr. AMOS CRUICKSHANK. In 1837, he and his brother Anthony came down from the far north to Durham and bought a shorthorn heifer. Sittyton gradually became famous and in time drew buyers from England, the United States, Canada, in fact from every part of the English-speaking world. Amos Cruickshank was a Scotchman, of the very best type. Mr. Wm. Duthe, of Aberdeenshire, a friend and follower of this pioneer, wrote about him in December, 1894, thus: "He is really a wonder—so fresh and clear in mind and memory, and so loyal in spirit to God and all that is good, with that quietness of manner and unassuming speech that is apt to conceal from a stranger the strong intellect, the mature judgment and the high principle which combine to form such a noble character."

The farmers and stockmen of Ontario have gained much from the work of Bates, the Booths and the Cruickshanks. They have been benefactors of the whole world, and though titles and monuments in Westminster have not usually been given to such as they, their work will some day be appreciated when others more noisy and more clamorous shall have been forgotten.

There are many herds in Ontario and in the United States that have been built upon Cruickshank blood, and during the past season English buyers have paid a high compliment to Scotch breeding by going north and bidding high prices for Scotch Shorthorns to improve their herds. The great sale of the past year may be mentioned when Mr. Duthie, of

Collynie, and Mr. Marr, of Uppermill, sold forty-seven Shorthorn bull calves for $14,000, an average of nearly $300 a head. One calf, eight months old, was sold for 235 guineas to an Englishman. Mr. Amos Cruickshank, as I have stated, died May 29th, 1895, at the age of eighty-seven. For nearly sixty years he had carried on his work in that northern country; he had worked in a quiet and unostentatious manner, but with such success that Cruickshank blood has found its way to the Royal stables. The story of his life, of his slow but sure methods, of his thorough-going honesty, should be known by every farmer's son. He had many difficulties to contend with, and his location was not the most favorable, but he proved to the world that after all it is what is in a man, rather than what is around him, that decides his fate. A large portion of the stock wealth of Ontario is traceable back to Aberdeenshire, and we pay our humble but sincere respect to the memory of "the grand old man of Sittyton."

HERMANN HELLRIEGEL was born at Anhalt, Germany, in 1831, and died in October, 1895. Who was he, and what did he do? In the announcement of his death to the National Society of Agriculture, at Paris, of which he was a foreign member, it was said that he was "the immortal author of the discovery of the fixation of gaseous nitrogen by leguminous plants through the medium of their root nodules." Remember that this was said by a Frenchman in regard to a German. Science knows no distinction of race or boundary lines; it tries to forget the siege of Paris. To place his great discovery, made in 1868, in its true light, we must review rapidly the history of the nitrogen question. In 1838 the French chemist Boussingault published the results of his investigations into the mode of plant feeding. He concluded that plants were unable to assimilate free nitrogen. From 1849 to 1856 another French chemist, Ville, carried on a series of experiments whereby he concluded that some plants do absorb free nitrogen from the air. The question now became a live one; the scientists of France, Germany and England ranged themselves on two sides, and year by year waged a battle royal over this important question in agriculture. In 1877 Schloesing and Muntz proved that nitrification, or the forming of nitrate in the soil, is the result of the work of microscopic organisms. There was still a perplexing question to be solved—these nitrates are most important in the feeding of cereals, but played no part, had no effect in promoting the growth of such plants as clover, peas and beans (leguminous plants), although the latter contained in leaf, stalk and root much more nitrogen than the cereals. What was the explanation? In 1886 there was read before a meeting of German naturalists at Berlin a paper containing investigations by Hellriegel and Wilfarth, in which they proved conclusively that the nodules on the roots of the leguminous plants were filled with micro-organisms (bacteroids), and these in some way help the plants to obtain free nitrogen from the air. The great importance of this discovery, its confirmation of one of the practices of agriculturists and the importance of its application are so well known to students of agriculture that we need not dwell upon it. This nitrogen question is one of great interest to the scientist and of great value in practical agriculture. Plants grow in a great ocean of atmospheric nitrogen, but, Tantalus-like, they are unable to drink the draughts that touch their very lips. The production of nitrogen compounds in such forms as plants can assimilate is one of the chief aims of drainage, cultivation, green manuring and fertilizing, and the rotation of crops. The foremost chemists and biologists of Europe and America have for nearly a century been engaged upon its study, and among the successful contributors to the solution of this question Prof. Hellriegel takes a foremost place, and at his death we deem him worthy of a place on our Honor Roll.

CHARLES VALENTINE RILEY, was born at Chelsea, London, England, on September 18th, 1843, and died at Washington, U.S., a few weeks ago. He was therefore but fifty-two years of age, the youngest of the noble benefactors whom we commemorate, but his comparatively short life was crowded with industry, and many results have followed that have benefited not agriculture alone but the people of America as a whole.

After receiving a fair education in England and on the continent he came to America in 1860 at the age of seventeen. For four years he lived on an Illinois farm, whence he went to Chicago as entomological editor of the *Prairie Farmer*. In 1868 he was appointed State Entomologist of Missouri, a position that he held for nine years. The nine annual reports that he issued from this then wild western state, attracted the attention of the scientific world. Darwin congratulated him, and *The Entomologist's Monthly Magazine* of London, in 1876 referred to him as "the foremost economic entomologist of the day." From Missouri he went into the service of the Federal Government, being first chief of the United States Entomological Commission, and shortly after Entomologist to the United States Department of Agriculture. He resigned his position during the present year, and soon after met his death from being thrown from his bicycle.

What of his work? He suggested to the French Government a prevention for the Phylloxera that was devastating their vineyards, viz., the use of American stock for the vines, and was awarded a gold medal as a special honor; along with Dr. W. S. Barnard he devised the cyclone nozzle for spraying; he worked out the life history and locations of the periodical Cicadas, both seventeen-year and thirteen-year; he contributed reports upon the scale insects, hop plant louse, and a thousand and more other insects that are to day the works of reference of students of entomology in all countries; and he was the principal leader in brining the economic entomology of America and of Canada to the place which it occupies to day, the first place in the world. But one story connected with his life work is worth telling in greater detail. About 1868 a scale insect known as the Cottony Cushion scale (*iceryia purchasi, markell*) gained a footing in the orange groves of California. It increased steadily until in 1886 the citrus groves were in danger of complete destruction and the fruit growers were in despair. Prof. Riley began the study of the pest. He ascertained that it had probably come from Australia, where it was held in check by other insects. He appealed to Congress for financial aid and was refused. Nothing daunted, he induced the Secretary of State to allow him to send two of his assistants to the Melbourne Exposition then in progress. They went and sent back consignments of an Australian lady-bird beetle (*Vedalia Cardinalis*). This was in 1888. Prof. Henry of Wisconsin was in California in 1889, and he reported the result as miraculous. He said "Without doubt it is the best stroke ever made by the agricultural department at Washington." The Australian lady-bird beetle has almost anniliated the scale. The experiment cost not over $2,000; it has saved and added to the country millions of dollars. No one need ever question the practical bearing of entomology upon agriculture. The prosperous fruit industry of California is one of Riley's lasting monuments. Let me close this brief memorial of this great man who has been honored by the entomological societies of Great Britain, France, Germany, Belgium, Switzerland, and Canada, by a few words from one of his friends and associates, Prof. C. S. Packard, of Brown University (*Science*, December 6th, 1895, p. 745) "Biologist, artist, editor and public official, the story of his struggles and successes, tinged as it is with romance, is one full of interest. Beginning life in America as a poor lad on an Illinois farm, he rose by his own exertions to distinction, and to become one of our most useful citizens in science, both pure and applied. [His nature was a many-sided one and his success in life was due to sheer will power, unusual executive force, critical judgment, untiring industry, skill with pencil and pen, and a laudable ambition, united with an intense love of nature and of science for its own sake. This rare combination of varied qualities, of which he made the most, rendered him during the thirty years of his active life widely known as a public official, as a scientific investigator, while of enonomic entomologists he was *facile princeps*."

DR. EPHRAIM W. BULL was born in Washington street, Boston, March 4th, 1806. In the garden about his house he began his study of nature. In 1832, through ill-health, he gave up his practice as a Boston physician and moved out to Concord. Reports differ as to how the Concord grape originated. Some say it was a chance seedling in his garden, others that he found it in the woods. It was exhibited at the annual exhibition of the Massachusetts Horticultural Society in 1853 and gained a $100 prize offered by Horace Greeley for the best native grape suited for general cultivation. From the Concord have come many other famous grapes, among which it may be mentioned the Niagara, Pocklington, Worden, Martha, Lady Washington, Jefferson, Moore's Early, the Brighton, the Diamond, and the Esther. Dr. Bull himself says of the Esther: "I have long cherished the desire to name the best grape after my mother, and I have called this one by her name because I feel it is as near perfection as I shall ever attain." He reaped little pecuniary reward from his valuable work, he was reduced to poverty in his old age; friends sent him some assistance, but the last two years were spent in a charitable home, where he died in his ninetieth year.

When we remember that the Concord and the Niagara are the two greatest wealth-producing grapes of eastern America we can realize the value of the contribution made to horticulture from the work of this man. He had been at one time a Senator of his native State, he had been a respected and valued member of the Massachusetts Board of Agriculture; he had been the intimate friend of the Concord philosophers—but he outlived them all and died a poor man—poor in worldly possessions, but rich in the respect and estimation of the people.

Louis Pasteur: The greatest genius of the nineteenth century, one of the greatest benefactors of the human race.

Louis Pasteur was born December 27th, 1822, in Tanners street in an obscure village of Jura, (Dole), in eastern France, in sight of the Alps. His parents were, as we say, obscure. His father, Jean Joseph Pasteur, was a journeyman tanner. He had fought with the French army in Spain from 1811 to 1815, and then resumed the humble but honest calling of a tanner. He had received little or no education, but a friend of the family says "If he had received an education he would have made his mark." The son Louis received a good education, passing from school to school until finally he reached the *Ecole Normale Supèrieure* in 1843. He was a good student, not brilliant, says his college chum, Jules Marcou, of Harvard, and he began to drink in the lectures on chemistry and sit enraptured at the experiments performed by the skilful old man who assisted the lecturers. Marcou says: "I have seen him, at the end of some of those lectures with his eyes filled with tears, ready to cry, so much was he moved by what he had heard and seen."

In 1846 he was appointed assistant in chemistry at the Normal School, and his career of usefulness began. His fifty years of marvelous discoveries can be sketched only in outline and reference made to only those that appear to be the most important. He steadily advanced in his work, moving from Paris to Dijon, thence to Strasburg where he was married, thence to Lille in 1854. He now began his work upon ferments. Working with his microscope he found various fermentations always accompanied by the presence of certain living organisms. Liebig, one of the founders of agricultural chemistry had propounded a theory of fermentation based entirely upon chemical decomposition. Pasteur was a chemist, not a biologist, but he undertook the new field and thoroughly worked it. He investigated first the fermentation of milk and then of wine, and he proved conclusively that living organisms are the cause of fermentations. In 1866 appeared his memorable work upon the study of wine (*Etudes sur le vin, ses maladies, etc.*,). The wine industry was in a languishing condition. He determined how to check the diseases of wine by heating, the method since known as Pasteurization, and how to promote the proper fermentations. He saved the great wine industry of France, and established the principles whereby wine is now made the world over. He made possible the production of vinegar on a cheaper plan. He laid the foundation for dairy bacteriology; in fact, we may say that he originated the whole science of bacteriology which is playing so important a part in the study of dairy products, of the preservation of food, of the production of food, and even of the make-up and changes in the very soil itself. This alone would be sufficient work to immortalize any man, but we must remember that it was practically the outcome of the first work of Pasteur done between the ages of thirty and forty. We have not time to refer to the controversy whereby Pasteur in France and Tyndall in England proved that spontaneous generation is an impossibility. Even theology received an impetus from his work.

In 1850 a disease of the silk worm appeared in France, and by 1863 the annual product had been reduced from 57,000,000 pounds to 8,000,000. This industry was on the point of extinction. Even the Emperor, Napoleon III., was concerned. Pasteur was appealed to. He consented to try, although he knew nothing of the industry. For five years he worked, and in 1870 published "Studies on the disease of silk worms." He had solved the problem, and saved one of the greatest industries of France and the peasants were his ardent worshippers.

The Franco-Prussian war had driven the German brewers from France and brewing was on the decline. After recoving from an illness that almost cost him his life but left him a partial invalid for the rest of his days, Pasteur settled down from the turmoil and disquietude of the war and began the study of beer and brewing, and in 1876 published his "Studies on Beer, its diseases, etc."

His genius now took a higher flight. The herds and flocks of France were being decimated by the terrible disease, anthrax. He now became a physiologist and worked over the whole history and cause of the disease from the beginning. He brought his exact training in chemistry to bear upon a work in which speculation had played an important part, and after mastering fowl cholera he gave the world anthrax vaccine, and with his own experiments demonstrated to a delighted and astonished scientific world that anthrax can be controlled and prevented.

He saved the herds and flocks of France, but human life is held of higher value, and the recent discovery of anti-toxine in the case of diphtheria is an outcome of his method of investigation and procedure. We all remember the marvellous story of his treatment of hydrophobia. Contributions from enthusiastic admirers were offered, and the Pasteur Institute, with its magnificent equipment, arose in Paris, which became the Mecca for hydrophobia patients. Our story of this great man, this master mind, is about told. He died September 29th, 1895, and was buried with national honours. The President of France, the senators and the common people, followed the funeral car of the man who had saved the flocks and herds from disease, who had brought back the silk industry of the peasants, who had re-established many of the great industries of the town and city, who had made possible the wonderful achievement of modern surgery, and laid the foundation for the magic science of bacteriology. He gave France and the world millions upon millions, and he took in return but $5,000 a year for himself and his family after him. Eliza Priestly, writing of his work in *The Nineteenth Century* for June, 1888, said: "If Pasteur had chosen to keep 'his secrets' to himself, and to sell his scientific wares, he would by this time have been the richest man in the world; but now at the end of a long career he is simply what he was at the beginning—a professor of chemistry, in receipt of a professor's salary." Let me quote the words of one of his followers, Prof. Conn: "No man who has lived in history has done so much for humanity. No other person will be remembered by posterity as having had such an influence upon the world in the way of discovering facts which advance the health and prosperity of mankind." But perhaps the proudest achievement he attained, viewed from the standpoint of a scientist, was earning the right to the claim that Prof. Conn has applied to him, "Pasteur never makes mistakes." The French papers gave his will as follows: "This is my testament. I leave to my wife all that the law allows me to leave her. May my children never depart from the path of duty, and always have for their mother that love which she deserves."

Last on our list comes the veteran Rev. Lorenzo Lorain Langstroth, or as he has been respectfully and reverently known for so many years, "Father" Langstroth, who died October 6th, within six weeks of being eighty-five years of age. He was born in Philadelphia on December 26th, 1810. He graduated from Yale in 1831, and, after acting as tutor at his alma mater for a short time, entered the ministry at Andover, Mass., in 1836. In 1840 through ill health he resigned, and varied his life between teaching, preaching and out-door work. In 1838 he started as a beekeeper with two hives. Year after year he worked with his bees in spare hours after teaching. His apiary was in the attic of his Philadelphia home. The Bevan bar hive was then in use. Bars or strips of wood were laid across the top of the hive to which the bees attached their cells, and when it was desired to remove the comb production the honey had to be cut away from the sides. Thus the bars could be lifted out with their load of sweetness attached. Langstroth added bars to the sides and bottom and the movable frame was originated. It was patented in 1852, but the inventor was beset by law suits and never reaped any pecuniary reward. But the beekeepers of the world were enriched, and wherever the modern hive is set up there we find a monument to the memory of this venerable benefactor of mankind. His health failed, and he retired from active work. From time to time he returned to his favorite pursuit, only to enrich the field of apiculture. In 1853 he published his book, "The Hive and Honey Bee," which has become the beekeeper's cherished classic. In 1858 he removed to Oxford, Ohio, and in 1887 he settled in Dayton, of this same state, where he remained. In 1892 appeared his "Gleanings in Bee Culture." His latter years were not spent in luxury or even in favorable circumstances. He died a poor man. In September of this year he came to Toronto to attend the annual meeting of the North American Beekeepers' Association, and his presence was the greatest attraction. On October 6th he was assisting in the communion service at a Presbyterian church in Dayton when he was suddenly overtaken by death.

Mr. A. T. Root, of Medina, Ohio, one of the foremost apiculturists of America, and a pupil of Father Langstroth, pays this tribute to him:

"He was a wonderful talker as well as writer,—one of the most genial, good-natured, benevolent men the world has ever produced. He was a poet, a sage, a philosopher and a humanitarian, all in one; and best of all, a most devoted and humble follower of the Lord Jesus Christ. His fund of anecdotes, pleasant memories and incidents was beyond that of any man I ever knew, and his rare education and scholarly accomplishments only added to it all."

Father Langstroth lived a long life of usefulness, he gave his energies to the development of a very important branch of agriculture, he enriched an industry that is almost as old as the human race; and he was not selfish, for he gave more than he got. During the last years of his life donations to his comfort were made by his many friends, and he went away from Toronto richer by the hearty contributions of his loving friends. The last thing we shall say of him is that he was loved best by those who knew him best.

Let us draw our conclusions.

Scotland gave us Cruickshank; England, Riley; Germany, Hellriegel; France, Pasteur; and America, Bull and Langstroth. But they gave them to the world, for the results of their work are known and appreciated and applied in every civilized country where agriculture has got beyond its primitive condition. We may fairly challenge any other year to produce six such men.

The review of the work of these six men proves most conclusively that within the past century agriculture has made wonderful progress, it has been raised to a higher level. Where will agriculture be at the close of the twentieth century? Who then will be recalled as benefactors? Will there be enrolled in the list of agricultural reformers anyone from this Canada of ours, anyone from this Agricultural College, anyone from the gathering in this room to-night? It is quite possible; let us hope that it may be so. These men all rose from obscurity; they had difficulties to contend with just such as you have; they were no better at the start than you, but what grand use they made of their opportunities!

They did not seek for wealth or fame or glory in the fields of military life, of politics, or of commerce, but in agriculture, in agricultural chemistry, in biology, in allied physiology, in entomology, in horticulture and in apiculture,—in those fields that lie close to the foundations of a nation's prosperity,

They were generous and unselfish, they made the world richer. Two died in comparative poverty, the Scottish breeder was probably the richest of all at his death—and yet their work has resulted in adding millions annually to the wealth and comfort of the world.

They were not all physically strong. Dr. Bull gave up his practice at twenty-six because of ill health, and then lived to be nearly 90; Langstroth was more or less an invalid, but rounded out eighty-five years; Cruickshank was eighty-seven; Pasteur, after being partially paralyzed for many years of his greatest success, died at seventy-three; Hellriegel was sixty-four; and Riley, by an unfortunate accident, was cut off at fifty-two. They were not specially gifted with strength, but their combined ages were 451, an average of seventy-five.

Though you will find only two of the six mentioned in the new Century Cyclopedia of names, and that to the extent of nineteen lines in all, yet when history comes to be written in fairness and in greater truthfulness you will find these men holding honored places when many whose names now occupy a large place in the public press have been utterly forgotten.

Finally these men lived lives of honesty, industry and of true reverence, and the world is better morally for their having lived. As students of agriculture, anxious for the improvement of our calling and our country's prosperity, it is our opportunity to honor them, it is our privilege to enjoy the benefits of their work, and it is our duty to emulate them in those qualities that made them useful, great and good.

ADDRESSES BY VISITORS.

Colonel Burch, Editor American Sheep Breeder, Chicago, Ill.

The President of this magnificent institution and the young men connected with it should advise the Government of this Province to establish a ladies' department or a cooking department in connection with the college. I like Ontario well, and I like your institution here both as a school and for its experimental work. I believe it cannot be surpassed on the American continent unless it is with experiments in sheep raising, in which work I believe Prof. Henry and Prof. Craig beat the world. Prof. Craig is a leader in his line of investigation, and I do not know whether he was born in the United States or in Canada. The United States is a good place to be born in. It is a good place to immigrate to. The most enterprising city in the world is Chicago, and we have got there fifty thousand Canadians, and thirty thousand of them, Mr. President, are from the fair Province of Ontario. We would be pleased if we could get thirty thousand more. I do not want to take all the boys over there. Chicago is no better than here in very many respects, and in many things not so good. You have a magnificent field here in which to place your young men at work.

I may say that Ontario is the nursery for fine women, where ladies on the farm are every day brought in touch with everything that is beautiful. I have been over Ontario for two straight months at a stretch and mostly with farmers. I have been in half a hundred Ontario farm homes and have found good living, books, magazines, flowers and art and the dozen and one things that go to make homes happy. It is not very much trouble to love the ladies in such homes as these.

I congratulate the members of the Ontario Agricultural College upon the excellent work being done. I had the pleasure and the privilege last summer of examining your experimental work in company with your enterprising experimentalist, Prof. Zavitz, who is at the head of this experimental department. What I saw in connection with this department was a revelation to me. I never saw anything to equal it before—magnificent demonstration of practical experimental work. It was certainly a revelation to me. I want to have Mr. Zavitz over the line, and some day we will have him by a big salary; you can bet your life on that. We have got some of your men already. From the experimental department I went to the dairy department, and saw in the practical dairy work the evidence of high art. I do not wonder any longer that you came up to Chicago and captured all the prizes.

Mr. Chairman and President, this is a splendid occasion—grand one. Young gentlemen, you are here as freshmen and juniors and seniors, and some of you I have shaken by the hand and have been pleased with the opportunity. I want to tell you this particularly, that you should profit by your instruction at this institution, such an opportunity comes but once in a lifetime. Some time ago I was to deliver an address as substitute for Fred. Doyle in a small town in Michigan. His secretary met me at the station. It was a day when the wind was in the north-west, and the fierce blasts were sweeping everything before them. As we walked along I noticed a paper whirling around in front of us for about a block. I said there is something on that paper, and in an instant his foot was on it and it was soon picked up. The first thing I noticed was an advertisement on one side of it and on the other side it read: "Lost, yesterday, somewhere between sunrise and sunset, two golden hours, each set with sixty diamond minutes; no reward is offered, for they are gone forever." And now, young men, here is your opportunity to make Ontario magnificent and prosperous. You have a splendid country with all its rich resources and agricultural advantages, and above all you have splendid men. How I like to look at Canadian sons. There is so much frankness; so much freedom; so much study of purpose. The American is always on the wing, he is a speculator, he is never satisfied to stay at one place, he wants lots of business, he is always in a hurry to get righ, he is nervous, anything he has is for sale.

You have good government. Your cities are the best governed cities I have visited. Toronto, London, Guelph, Chatham, Brantford, Hamilton, have all got splendid government—protection, love, authority. I admire you for it. You are now in possession of one of your greatest men as your Minister of Agriculture. He is enterprising, energetic, enthusiastic in his great work.

I want to offer from my heart of hearts this little sentiment: Your gracious sovereign, Queen Victoria, Queen of Queens; may she live to be a hundred years old and rule over the greatest empire the world has ever seen.

PROF. J. A. MYERS, DIRECTOR AGRICULTURAL EXPERIMENT STATION, MORGANTOWN, WEST VIRGINIA, U. S. A.

I have listened to your exercises with a great deal of pleasure and interest. There are many things that have impressed me very much, and I want to say that I propose to go home and recommend that we establish a professorship of soup, and establish a "fire department." Now you may think I am talking fun in the presence of our friend here, Miss Livingstone. I only assume it in this way. There is a great deal in this education of our girls and our young men for the affairs of life. A good professor of soup in New York city in any of its first-class restaurants or hotels can command a larger salary than I presume you pay to the president of your institution. You go to the Fifth Avenue Hotel and you will find the professor of soup there gets $10,000 a year, and has a vacation of three months to go to Europe and visit the various hotels and restaurants in France and Germany. So you see that is a department of industry that requires a considerable amount of attention. Any of you who will go to that high degree of excellence will find ample fields open for you. They apply a more eloquent title to professor of soup by calling him the *chef*. You may think that we Yankees over there do not cook right; that we do not get enough to eat, and what we do eat we do not eat it right. Now, gentlemen, I want to say that for the first five years of my life I was starved, I never had enough to eat, but I have this advantage, I digest everything I do eat. I never tried it, but I could digest a nail if I could eat it. Now your president gave you some excellent good advice this evening. I listened to it with a great deal of pleasure, but he missed some things; he did not have time to cover everything. One of those he missed is this: "Be sure and do not attend to other people's business." I have seen more prople get into trouble by attending to other people's business than in any other way. There is another thing: "Do not neglect small matters." We are apt to go through life failing to see a good many of the small points as we go along. There is another point the president missed. I will excuse him for it as this is just a little one that is of a very serious character. You young men who are going out of the College bear this in mind: embark out fully equipped for life, and the first thing to do after graduating from College is to attempt matrimony and be married just as soon as you want to, and come to the United States and live.

GEO. E. CASEY, M.P.

Mr. President, ladies and gentlemen: I am very much ashamed of myself for the fact that this is the first time I have visited this great College in the Royal city of Guelph, I am sorry I have not had more time to-day to see the wonders of this institution and more time to-night to say what I think about them. You can imagine my position at this hour of the night. I think we should feel greatly indebted to our friends from the United States for the gentlemanly and gracious manner in which they have spoken of Canada and this institution. The Government can provide for the people of the country opportunities of education, for all the duties of life, and the graduates of this Institution should be of help to the country. The Government has done her duty nobly; I say it with pride, for I am proud of Ontario for taking up agricultural education and, without regard to party, in the carrying on of this institution. What has sprung from it? I am proud of the grand success of the agricultural education and of the agricultural industry. I am proud to find young men, graduates of this institution taking up and carrying on work of this Agricultural Experimental Union, and making it of so much benefit and use to the community at large. It is the co-operation of graduates. It is a pleasure to see the young men taking such an interest in this important work, and the young graduates of the college taking such an interest in agricultural affairs generally. I have taken great pains to compare what I have seen at this institution with what I have known about other experimental farms in other parts of Canada, and I hope to see even more of your work at this place to-morrow.

The proceedings of the evening were enlivened by songs from J. F. Beam, Black Creek, Ont., the College orchestra and the College quartette club.

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