TWENTIETH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

SIXTEENTH ANNUAL REPORT

OF THE

AGRICULTURAL AND EXPERIMENTAL UNION

1894.

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

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TWENTIETH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND EXPERIMENTAL FARM,

1894.

GUELPH, January 2nd, 1895.

To the Honorable JOHN DRYDEN,

Minister of Agriculture:

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

In this Report the work of the year 1894 is briefly reviewed under the following heads:

PART I. REPORT OF PRESIDENT.
PART II. REPORT OF PROFESSOR OF GEOLOGY AND NATURAL HISTORY.
PART III. REPORT OF PROFESSOR OF CHEMISTRY.
PART IV. REPORT OF PROFESSOR OF VETERINARY SCIENCE.
PART V. REPORT OF HORTICULTURIST.
PART VI. REPORT OF AGRICULTURIST.
PART VII. REPORT OF FARM SUPERINTENDENT.
PART VIII. REPORT OF EXPERIMENTALIST.
PART IX. REPORT OF PROFESSOR OF DAIRYING.
PART X. REPORT OF MANAGER OF POULTRY DEPARTMENT.
PART XI. REPORT OF PHYSICIAN.
APPENDICES—I. TO V. INCLUSIVE.

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

JAMES MILLS,
President.

MINISTER OF AGRICULTURE,

HON. JOHN DRYDEN, TORONTO.

Ontario Agricultural College and Experimental Farm, Guelph, Affiliated with the University of Toronto, and under the Control of the Minister of Agriculture.

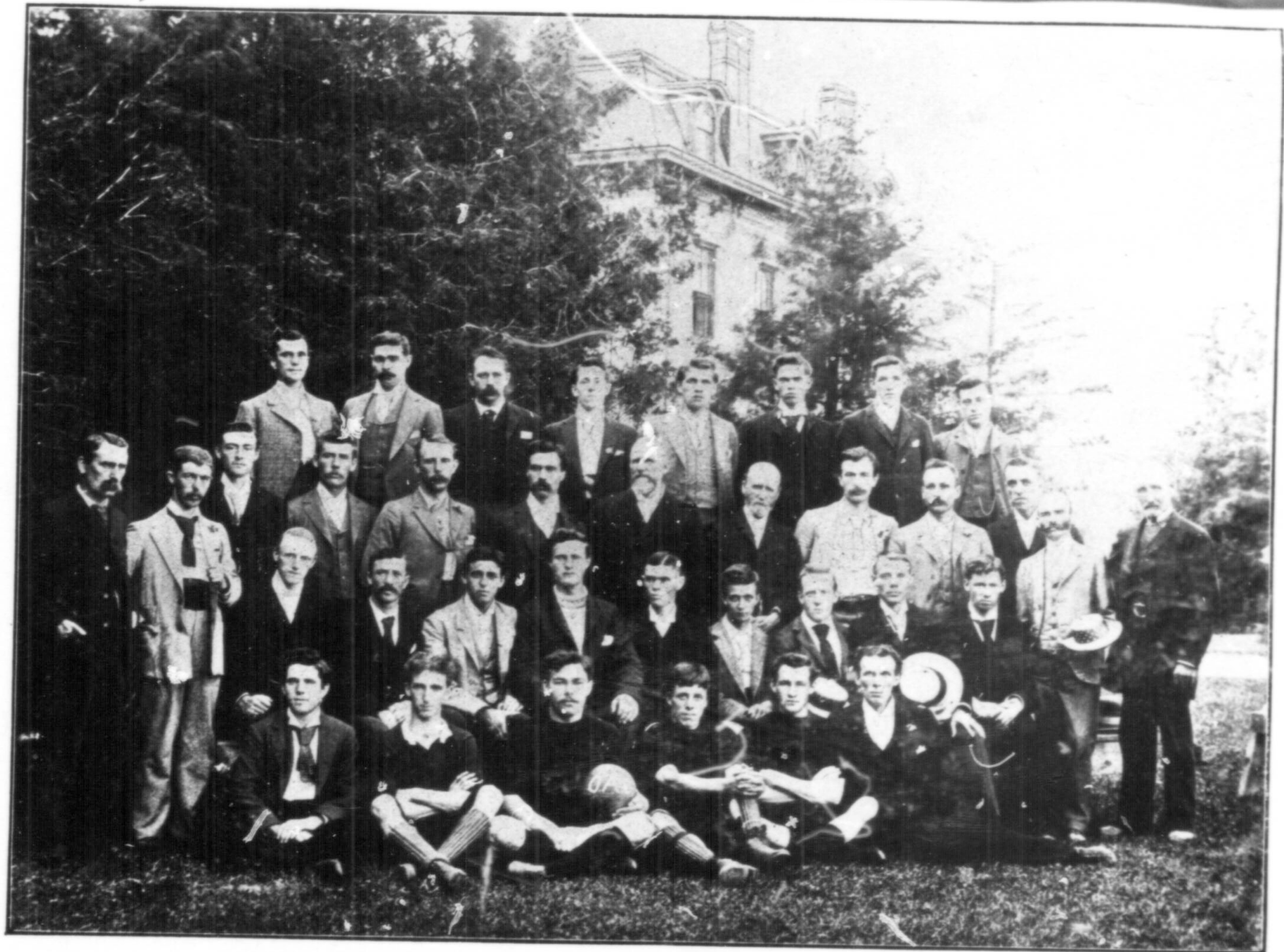
OFFICERS, 1894.

JAMES MILLS, M.A., LL.D.,	President.
J. HOYES PANTON, M.A., F.G.S.,	Professor of Geology and Natural History.
A. E. SHUTTLEWORTH, B.A. Sc.,	Professor of Chemistry.
J. HUGO REED, V.S.,	Professor of Veterinary Science.
H. H. DEAN, B.S.A.,	Professor of Dairy Husbandry.
J. B. REYNOLDS, B.A.,	Assistant Resident Master.
WILLIAM 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 and Librarian.
L. G. JARVIS,	Manager of Poultry Department.
R. HARCOURT, B.S.A.,	Assistant Chemist.
CAPTAIN WALTER CLARKE,	Instructor in Drill and Gymnastics.
A. McCALLUM,	Bursar.

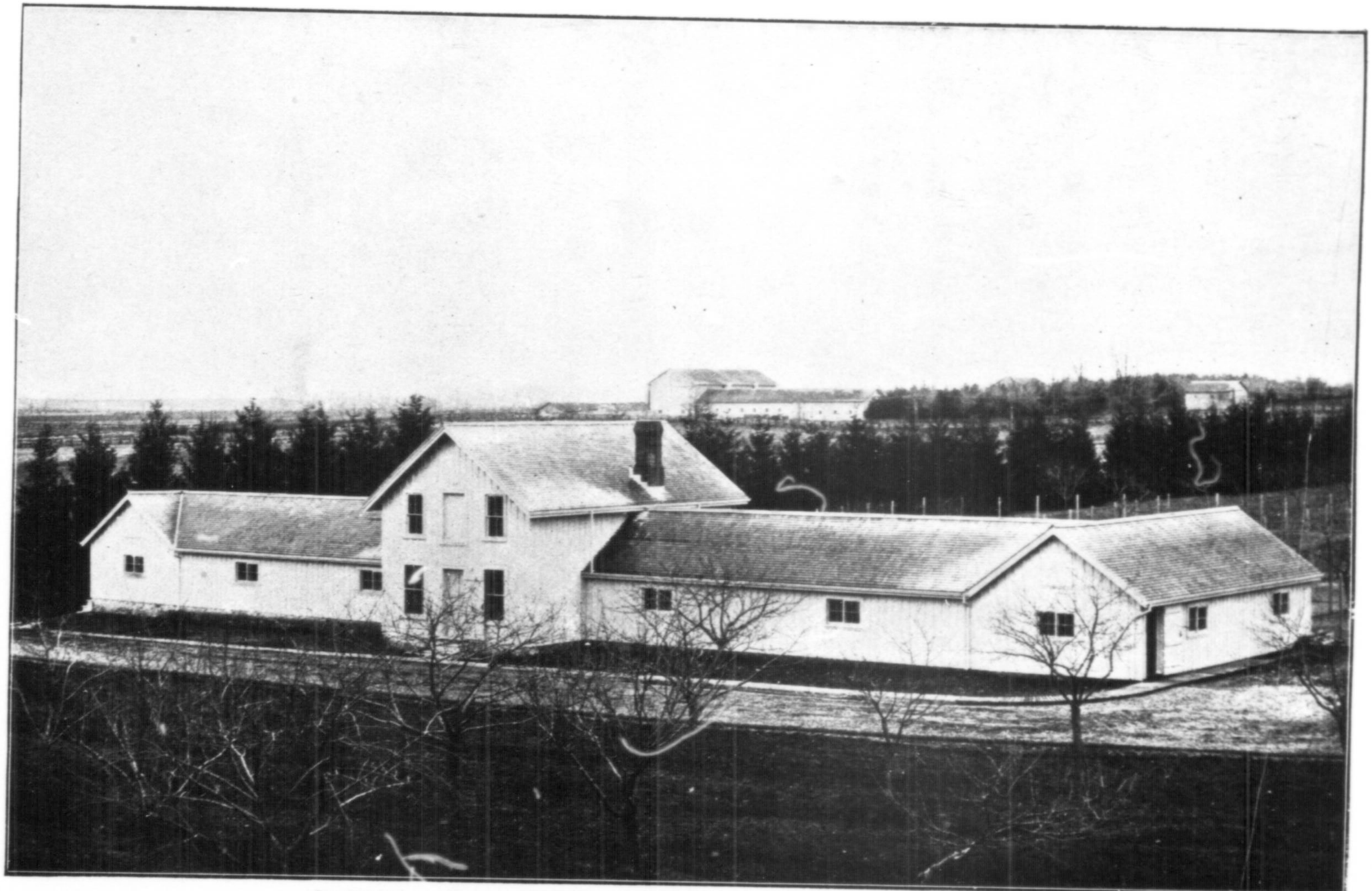
ADVISORY BOARD.

C. C. JAMES, M.A.,	Deputy Minister of Agriculture, Toronto.
JOHN I. HOBSON,	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

Chairman of Board, ... JOHN I. HOBSON.
Secretary of Board, ... C. C. JAMES.



SECOND YEAR STUDENTS AND MEMBERS OF STAFF, JUNE, 1894.



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PART I.

REPORT OF THE PRESIDENT.

The year of 1894 has been in every respect a very pleasant and successful year in the history of the Ontario Agricultural College and Experimental Farm. There has been perfect harmony among the officers of the Institution, and the work in every department has been carried on with exceptional vigor. A careful perusal of the different sections of this report will, I think, convince any one that our College is not only furnishing a liberal and thoroughly practical education to the students within its halls, but is doing in sever departments a work of inestimable value for the province at large.

A Step in Advance.

The most noteworthy step in advance which we have taken during the year, has been the establishment of a Poultry Department. We have erected new poultry buildings, with office, pens, yards, hospital, boiler-room, store-rooms, and everything else necessary for the breeding and management of poultry, not on an expensive scale, but according to the most approved methods. We think we have everything that can be desired in the way of equipment, we have purchased first-class stock, and have Mr. L. . Jarvis, one of the best poultrymen in the Dominion, for our manager. A cut giving a front view of House No. 1, Poultry Department, will be found at the beginning of this report. For further particulars about this department, see Part X. of this volume.

Students in Attendance.

The attendance of students during the year has been very satisfactory. In the Fall Term, which closed on the 22nd ult., every room in the College was occupied, and four of our students had to find board and lodging outside. In Appendix I. to this report, it will be seen that the number on the roll in the general course was 180; in the dairy course, 103; and in the short course for teachers, 7—making a total of 290 in the year 1894.

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 1894, forty-one were so nominated, and as a consequence, were exempted from the payment of tuition fees. The counties represented were the following:

Brant, Bruce, Carleton, Dufferin, Dundas, Durham, Essex, Glengarry, Grey, Halton, Huron, Lambton, Lanark, Leeds, Lennox, Lincoln, Middlesex, Muskoka, Ontario, Oxford, Peel, Perth, Peterboro', Prescott, Prince Edward, Russell, Simcoe, Stormont, Victoria, Waterloo, Wellington, Wentworth, and York.

FEES.

Ontario students not nominated by county councils pay a tuition fee of $20 a year, and non-residents (from other provinces, Great Britian, 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.

ANALYSIS OF COLLEGE ROLL (See Appendix I.)

1. *General Course.*

(1) From Ontario.

Counties, etc.	*Students.*
Addington	2
Brant	2*
Bruce	6
Carleton	2
Dufferin	1
Dundas	6
Durham	2
Elgin	1
Essex	2
Frontenac	3
Glengarry	6
Grenville	1
Grey	4
Halton	3
Hastings	1
Huron	4
Lambton	5
Lanark	2
Leeds	2
Lennox	3
Lincoln	3
Middlesex	6
Muskoka	2
Northumberland	1
Ontario	5
Oxford	5
Parry Sound	*3
Peel	3
Perth	6
Peterborough	2
Prescott	3
Prince Edward	2
Russell	5
Simcoe	9
Stormont	1
Victoria	1
Waterloo	3
Wellington	4
Wentworth	3
York	5
Toronto	13
	143

(2) From other Provinces of the Dominion.

Provinces, etc.	*Students.*
British Columbia	3
Nova Scotia	2
North-West Territories	1
Prince Edward Island	3
Quebec	3
	12

(3) From other countries.

Countries.	*Students.*
Bermuda	2
England	12
France	1
India	1
Ireland	2
Scotland	4
United States	2
Wales	1
	25

Total—180.

2. Dairy Course.

Counties, etc.	*Students.*	*Counties, etc.*	*Students.*
Addington	1	Ontario	2
Brant	1	Oxford	9
Bruce	2	Peel	1
Dufferin	1	Perth	5
Dundas	5	Peterborough	2
Durham	1	Prince Edward	1
Elgin	4	Renfrew	1
Frontenac	1	Russell	2
Grenville	1	Simcoe	3
Grey	1	Stormont	1
Haldimand	3	Victoria	2
Haliburton	1	Wellington	14
Halton	2	Wentworth	5
Hastings	4	York	3
Huron	4		
Lanark	3	Cape Colony	1
Leeds	3	New Brunswick	1
Lennox	2	Nova Scotia	1
Middlesex	6	Newfoundland	1
Norfolk	1		

Total—103.

From an examination of this analysis, it will be seen that students in both courses came from all parts of the province. Forty counties were represented in the General Course; and thirty-four in the Dairy Course. For the General Course, the county of Simcoe sent 9; Bruce, 6; Dundas, 6; Glengarry, 6; Middlesex, 6; and other counties, a smaller number. In the Dairy Course, the largest number was from Wellington, which had a representation of 14. There were 9 from Oxford, 6 from Middlesex, and 5 each from Dundas, Perth, and Wentworth.

Seventy-nine and four-ninths per cent. of the students in the general course came from the Province of Ontario, and over seventy per cent. of the total number were farmers' sons. Of the 103 in the Dairy Course, all but four were from Ontario.

Religious Denominations.

1. Students in General Course.

Presbyterians	60	Roman Catholics	4
Methodists	51	Friends	2
Episcopalians	41	Protestant	1
Baptists	14		
Congregationalists	7	Total	180

2. Students in Dairy Course.

Methodists	40	Disciple	1
Presbyterians	40	Protestant	1
Episcopalians	10	Roman Catholic	1
Baptists	8		
Friends	2	Total	103

Age of Students in General Course.

10	16 years of age.	10	24 years of age.
18	17 "	4	25 "
35	18 "	4	26 "
23	19 "	3	27 "
28	20 "	1	28 "
18	21 "	2	29 "
13	22 "	1	30 "
9	23 "	1	32 "

Average age—20 years.

Changes in Staff.

There have been two changes in our staff during the past year.

Dr. W. O. Stewart, of Guelph, was appointed college physician in the month of August, to fill the vacancy caused by the death of the late Dr. McGuire. Dr. Stewart is a young man, well and favorably known in the county of Wellington. He stands well with the profession in Guelph and is doing the college work quite satisfactorily.

The only other change in 1894 was the appointment of L. G. Jarvis, of London, October 1st, as manager of our new Poultry Department. Mr. Jarvis has had ample experience in the breeding and feeding of fowl, and he is everywhere acknowledged to be one of the two best poultry judges in the Dominion of Canada. He comes to us strongly recommended, not only by the Ontario Poultry Association, but by the principal poultrymen in all parts of Ontario; and I have no doubt that his work at the college will be a source of strength to the institution and a benefit to the province at large.

Library.

A considerable portion of the sum voted annually under this heading, is spent in purchasing papers and journals of various kinds for the use of students in the reading room. We take the principal Toronto and the Guelph dailies, and papers on general agriculture, live stock, dairying, horticulture, apiculture, poultry, entomology, and those branches of science which have a somewhat direct bearing on the work done in the college class-rooms. The remainder of the money is spent in purchasing books for our library, which now contains over 6,000 volumes that treat more or less directly of the different subjects embraced in our course of study and apprenticeship.

During the past year, F. C. Harrison, B.S.A., under the direction of Professor Panton, has had charge of the library and has continued his work of classification and indexing. As this work progresses, the library becomes more and more useful to both students and instructors.

Geology and Natural History.

Our equipment for the study of geology is ample, and our collection of rock specimens, fossils, and minerals has been so nicely and systematically arranged by Professor Panton that the study of the subject has become simple and interesting to an unusual degree. We have sixteen cases representing the geological formations from the lowest to the highest—from the Laurentian to the modern surface deposits—arranged side by side along one wall of the college museum, and in each case are found typical samples of the rock and fossils of the formation which the case represents. The samples in each case are labelled, and a note is pasted to the lid giving information as to the non-occurrence of the formation or the place of its occurrence in Canada. Besides these cases, arranged to show the formations as they occur, we have forty-two other cases of valuable minerals, which the students are required to examine and classify, indicating the formation or formations in which each specimen is found, and paying special attention to the economic minerals in the collection.

The number of weeds and insects sent to the college for identification is increasing rom year to year. A considerable part of Professor Panton's time is spent in reporting on animal and vegetable pests, and in furnishing written information as to the remedy or remedies which should be applied in each case.

Mr. Harrison, under the direction of Professor Panton, sprayed the greater part of our orchard last spring for the prevention of the apple scab and the destruction of the various insects which attack both apples and plums, and the results proved quite satisfactory; but a number of the trees were cut down to make way for the new poultry buildings, and the work of the year was thus interfered with. We intend to repeat the experiment next spring

All our students attend lectures in the forenoon, and in the afternoons the first and second year men devote their time alternately to study and manual labor. Such has been our method, but we have recently made a change whereby the second year students spend their afternoons alternately at labor in the outside departments and practical work in the botanical laboratory, instead of study in charge of a master. In consequence of this change, our second year men are enabled to devote some time to the analysis of flowers, the first steps in microscopy, and the study of rust, smut, etc.; and by the practice in laboratory methods thus gained, they are prepared for more advanced and thorough work when they become third year students.

For full information regarding the work of this department, see Professor Panton's report in Part II. of this volume.

Chemical Work for the Dairy.

Much of the work done in the chemical laboratory during the past year has been of an eminently practical character. In addition to his lecturing and a considerable amount of other work, Professor Shuttleworth, with the help of his assistant, Robt. Harcourt, B.S.A., has carried on an elaborate series of experiments in the analysis of milk and cheese for the dairy department:

(1) To determine the ratio of casein to fat in poor, medium, and rich milk.

(2) To determine whether the fat in milk is the exact measure of its cheese-producing power; in other words, to determine whether the amount of cheese made from poor, medium, and rich milk is always in exact proportion to the amount of fat contained in the milk.

(3) To find a just and satisfactory rule or method for paying the patrons of cheese factories for their milk.

Prof. Shuttleworth's investigations along these lines are of great value. They will be of much interest to all classes of dairymen, and I commend his report, in Part III. of this volume, to farmers and cheese-makers throughout Ontario.

Tuberculosis, etc.

In Part IV. of this volume, Dr. J. Hugo Reed, our veterinary surgeon, has reported our losses of live stock from diseases and other causes in 1894. Our most serious losses were caused by tuberculosis in our dairy herd. Dr. Reed's report contains a full account of the tests which he made and of the results in each case. From his statement of the facts and my own observation of a number of the *post mortem* examinations, I am of opinion:

(1) That the tuberculin test is reliable but very rigid, frequently giving as high a reaction where the traces of the disease are almost, if not entirely, microscopic as where they are clearly manifest and widely diffused.

(2) That the indiscriminate application of the test would result in the slaughter of animals which might perform their legitimate functions and die or be sent to the block without injury or risk to the health of either man or beast.

It is, however, proper that I should report one fact which was to me more alarming than anything else in connection with our tests, viz., that J.J. Mackenzie, B.A., bacteriologist, Toronto, found the *bacillus tuberculosis* in milk from one of our condemned cows —a cow which showed no signs of disease while she was alive. In fact this cow, a young Holstein, appeared to be perfectly healthy, and when she was slaughtered her udder was found to be free from disease, but tubercles were well and clearly developed in her lungs and liver.

In view of all the facts, I think the time has come when some legislative action should be taken to protect the community against meat and milk which contain the germs of this fatal disease.

Bacteriology in Relation to Milk.

The importance of studying the bacteriology of milk is becoming more clearly manifest every day; and as a first step in the direction of protecting the people of Ontario against the danger from bovine tuberculosis, the Hon. John Dryden, Minister of Agriculture for the province, has instructed me to arrange at once to give the students in our dairy school a course of lectures on bacteriology in relation to milk and practical instruction in Pasteurization, that is, in destroying by heat all the disease germs that may be in the milk. The difficulty is to destroy the germs without injuring the flavor of the milk, and to do so with cheap apparatus and but little trouble.

It would certainly be a great boon for a person to be furnished with an inexpensive and convenient means of removing all doubt about the healthfulness of the milk and cream which his children use from day to day. It is our intention to provide at once for our dairy school the best appliances that can be obtained for this purpose, and to that end we have sent one of our graduates, who has made a special study of bacteriology, to Chicago University, Illinois University, Yale, Harvard, the Wesleyan University (Middletown, Conn.), and one or two other institutions and places, to learn the latest methods of investigation in lacteal bacteriology and obtain the cheapest and best apparatus for the Pasteurization of milk. On his return, he will give a short course of lectures and detailed practical instruction to the students in our dairy school.

Horticultural Department.

This department has been moving forward during the past year. H. L. Hutt, B.S.A., our horticulturist, has given the students of the second year a full and thoroughly practical course of lectures on horticulture, and both first and second year men a considerable amount of practical instruction in grafting, pruning, hybridization, the potting of plants, etc. Wm. Squirrel, the head gardener of the department, under Mr. Hutt, rendered excellent service throughout the year in looking after the large amount of work which was done on the walks and in the garden, orchards, lawn, arboretum, and forest tree clumps. Our florist and assistant gardener, Arthur James, also did good work in the management of the college greenhouses (six in number), so as to show students and others the best methods of growing hot-house vegetables and taking care of plants in such a way as to keep them clean and healthy and have a regular succession of bloom throughout the year.

An important part of Mr. Hutt's work has been in connection with the new fruit experiment stations which were established by the Department of Agriculture in different parts of the province last year. In conjunction with L. Woolverton, M.A., Secretary of the Ontario Fruit Growers' Association, Mr. Hutt has visited the stations already established and has spent some time in examining localities that have been mentioned as places suitable for new stations. This work will be continued from year to year, and we hope soon to have some valuable information to publish under this head.

For a full account of the year's work in this department, see Mr. Hutt's report in Part V. of this volume.

Farm and Live Stock.

G. E. Day, B.S.A., our agriculturist, has given entire satisfaction in his lectures on agriculture and live stock to the students of all the years. He has also given special instruction in arithmetic, English grammar, composition, and spelling, two hours every alternate afternoon, to some students whose early education has been neglected. He has kept the pedigrees of our cattle, sheep, and swine; has issued certificates for all stock sold, and has attended to a somewhat voluminous correspondence connected with his department. Mr. Day has been anxious for some time to commence a series of experiments on the feeding of cattle, sheep, and hogs; but hitherto we have not been able to arrange our stables, sheds, and pens in such a way as to do the work satisfactorily. We hope, however, to have things in shape to commence work on this line at an early date.

Mr. Wm. Rennie, our Farm Superintendent, has devoted his undivided and unremitting attention throughout the year to the men and students at work on the farm and amongst the live stock. Mr. Rennie has been at his post late and early, hot and cold, wet and dry. It would be impossible for any man to give closer personal attention to his own farm than Mr. Rennie has given to the work of the College farm during the past year; and the results are that our men and students have done more and better work than at any time in the past fifteen years, the farm is cleaner and in much better condition than ever before, and our stock has been brought through the year in good condition with a mere trifle for the purchase of grain, bran, etc., compared with the expenditure under this head in the years gone by.

Amongst the items referred to in Mr. Rennie's report, Part VII. of this volume, are fencing and draining. With very little extra outlay for labor, beyond that of the students and our ordinary farm help, a large amount of much needed fencing and underdraining was done during the year—work that has greatly improved the appearance of the farm and has added not a little to its value. I might also speak of grading and gravelling done on the road northwest of the college farm; but a reference to Mr. Rennie's report will better serve the purpose.

Experimental Plots, Etc.

The development of experimental work on the college farm during the last few years may be understood from the following statement as to the number of plots used from year to year:

In 1886	56	plots	were used	in experimental	work.
" 1889	464	"	"	"	
" 1890	625	"	"	"	
" 1891	1,045	"	"	"	
" 1892	1,523	"	"	"	
" 1893	1,612	"	"	"	
" 1894	1,705	"	"	"	

In the last four years, this department has distributed over 23,000 packages of choice grain throughout the province.

Our experimental grounds have been somewhat enlarged during the past year, and the work in the department has been carried on with greater vigor and success than usual; 337 varieties of grain have been tested, 226 of roots, 178 of potatoes, and 110 of fodder corn; and over 700 plots have been devoted to experiments in the selection of seed, dates of seeding, application of fertilizers, growing mixtures of grain, and harvesting of crops at different stages of maturity; also in different methods of cultivating fodder corn, roots, and potatoes, and in preparing potatoes for planting, etc.

During the year, 131 varieties of grain which had been grown on our plots for five years in succession were dropped out of the tests, and a few promising new varieties were imported. Some of those dropped, were fairly good varieties; but they were not amongst the best. Hence their removal from the list.

Much attention in this department has been given of late to the selection of seed, with a view to improve the quality of the best varieties which we now have.

I commend the report of Mr. Zavitz, our experimentalist, in Part VIII. of this volume, as one of the most valuable reports ever issued by our experimental department.

Co-operative Experiments.

In addition to his work on the college farm, our experimentalist carries on a large number of co-operative experiments throughout the province, for the purpose of testing our best varieties of grain, roots, potatoes, Indian corn, etc., under various conditions of soil and climate, and to ascertain the results produced by certain fertilizers in different localities: 1,340 such co-operative experiments were made in 1894, and 7,721 plots were used for the purpose. The following tabulated statement indicates in a general way the character of the work done under this head:

Numbers of experiments.	Names of experiments.	Number of plots required for each.	Class of experiments.	Number of plots used for these tests by farmers over Ontario. 1891.	1892.	1893.	1894.
1	Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure, with oats.	5	Fertilizers.	70	165	322	318
2	Testing nitrate of soda, superphosphate and nitrate of soda mixed, and no fertilizer, with rape	3					
3	Ascertaining the relative value of four varieties of millet	4	Fodder crops.	196	470	894	897
4	Growing lucerne as a crop for fodder	1					
5	Testing six promising varieties of corn	6					
6	Testing five promising varieties of turnips	5	Root crops.	350	705	1,230	1,310
7	Testing five promising varieties of mangels......	5					
8	Testing five promising varieties of carrots.......	5					
9	Testing five promising varieties of spring wheat.	5	Grain crops.	2,026	4,348	4,735	4,794
10	Testing five promising varieties of barley........	5					
11	Testing six promising varieties of oats	6					
12	Testing four promising varieties of peas	4					
14	Testing five promising varieties of fall wheat....	5					
13	Testing six promising varieties of potatoes	6	Potato crops.	......	.....	. ....	402
				2,642	5,688	7,181	7,721

For the results of this work in 1894, see the report of the Experimental Union in Appendix VII. of this volume.

Experimental Dairy.

The work in this department deserves special notice. Mr. T. C. Rogers, our dairyman, under Prof. Dean, made a number of useful experiments during the year in milk-testing, the setting of milk, the effects of different kinds of food on the percentage of fat, etc., all bearing directly on questions which arise with practical dairymen from time to time; and specially important work was done in the cheese department by Prof. Dean and Mr. A. T. Bell, of Tavistock. Very valuable experiments were made systematically throughout the cheese-making season, to determine whether the cheese made from poor, medium, and rich milk varies exactly in quantity and in quality according to the percentage of fat in the milk—in other words, to determine whether the amount of fat in milk is the exact measure of its cheese-producing power. For a full statement of the results of these experiments, see Prof. Dean's report in Part IX. of this volume.

Dairy School.

The second 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 103 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 fair 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 early in November for the session to commence on the 14th January, 1895 :

The Dairy School in connection with the Ontario Agricultural College, Guelph, will re-open January 14th, 1895, and remain in session to the 15th March—for a period of two months. Our buildings and equipment are now complete, and we are at length 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 our stables, 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 department, under competent instructors, students will make cheese and butter on a large scale, learn how to run cream separators, and be given full and repeated instruction in the use of the Babcock tester and the lactometer, together with directions as to the simplest and fairest way 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 will be 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 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 these 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 the farm. The department is furnished with hand separators, butter-workers, printers, etc ; and full instruction is given by our own butter-maker, Mr. T. C. Rogers, 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 peculiarites of dairy cows, in a live stock class-room provided for the purpose.

We can accommodate 16 to 20 in this course, and we hope to see the full number in attendance throughout the session. Applicants may enter on or after the 15th 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.* A. T. Bell, Tavistock, Ont. Assistant, R. W. Stratton, Straffordville, Ont.

2. *Milk-testing.* T. B. Millar, London, Ont., Instructor and Inspector for Western Dairymen's Association.

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

4. *Butter-making.* J. B. Muir, Avonbank, Ont., Assistant in Butter Department, F. J. Sleightholm, B.S.A., Instructor with Travelling Dairy for 1894.

5. *Home Dairy.* T. C. Rogers.

Lectures.

A course of fifty lectures will be given as follows :

Professor of Dairying. Thirty 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.

Lecturer on Agriculture. 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.

Mathematical Master. Six lectures on mathematics and bookkeeping, explaining fully the decimal system.

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

Certificates.

Certificates of standing 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 40 per cent.; for second-class honors, 60 per cent.; and for first-class honors, 75 per cent. To obtain this certificate students must attend at least *seven weeks* during the course and take regular work in all the branches of the factory course.

To any one 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 $5 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 can be obtained in Guelph (a mile and a-half from the College) at $3 to $3.50 a week, and at $3 for a limited number close to the College grounds.

Working Clothes. Every 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 special suits must be kept clean throughout the session.

Home Dairy Course. A charge of $2 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 the regular course.

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 1895.

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

Candidate 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.

Travelling Dairy.

Our Travelling Dairy was at work from the 1st May to the 17th December. It was in charge of F. J. Sleightholm, B.S.A., and J. Hume, the former of whom had charge as instructor and the latter as butter-maker. The territory covered during the season embraces the counties of Halton, York, North Wentworth, Brant, Kent, Essex, Elgin, and Norfolk. 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.

Class Room Work.

Our class-room work went on as usual during the past year. Seven candidates wrote for the degree of B.S A., in the University of Toronto, and passed creditably in all the subjects. A fair proportion of the first and second year students gained a respectable standing in our College Examinations, but the number of failures is so large that it deserves more than a passing notice. (See class-lists in Appendix IV. to this report.)

Arithmetic, English Grammar, and Composition.

The greatest trouble which we have with our students arises from their lack of preparation in the fundamental branches of a Public School education. Even those who bring certificates of having passed the entrance examination for admission to the High Schools, are often found grossly ignorant of Arithmetic, English Grammar, and Composition. They have been taught grammar to no purpose. They do not understand the first principles of the subject, and they cannot spell the ordinary words which they have been using since they began to speak. This fundamental deficiency tells against them in every subject, and the result is a discouragingly large number of failures at the end of each term, varying from 30 to 55 per cent. of the total number of candidates.

No doubt a more rigid matriculation examination would remove the difficulty, but experience has taught us that the application of this remedy would exclude from the College a large proportion of our best students ; so, at present, the only suitable and effective remedy which we can think of is a Preparatory Department for the instruction of those who have not had the training necessary to fit them for the regular College work.

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 :

Prof. W. J. Alexander, University College	2nd year Literature.
J. M. McEvoy, B.A. LL. B., London, Ont	Political Economy.
J. J. Ferguson, B.S.A., Smith's Falls	1st year Chemistry.
F. C. Harrison, B.S.A., Guelph	1st year Hygiene.
" " "	1st year Literature.
" " "	1st year Botany.
" " "	2nd year Literature.
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 candidates is as follows :

Brown, W. J	Dunboyne, Elgin County, Ont.
Ferguson, J. J	Smith's Falls, Leeds, Ont.
Graham, W. R.	Belleville, Hastings, Ont.
Kennedy, P. B.	Sarnia, Lambton, Ont.
McCallum, W	Guelph, Wellington, Ont.
Sleightholm, F. J.	Humber, Peel, Ont.
Spencer, J. B.	Brooklin, 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-one passed in all the subjects, and four were starred as indicated in the list. The diplomas were presented by the Hon. James Young, of Galt, at our closing exercises on the 30th June; and the names of the recipients are as follows, excepting the four that have stars opposite their names:

Buchanan, John	Hensall, Huron, Ont.
Carrick, C. S	Kincardine, Bruce, Ont.
Christian, A. H	Danforth, York, Ont.
Cook, J. H	Gordonville, Wellington, Ont.
Doherty, M. W.	Eglinton, York, Ont.
Duffett, G. P.	Adolphustown, Lennox, Ont.
Elliott, Wm	Galt, Waterloo, Ont.
Henderson, R. H.	Rockton, Wentworth, Ont.
High, A. M	Beamsville, Lincoln, Ont.
Kennedy, W. A.	Apple Hill, Glengarry, Ont.
Kidd, D. F.	Cookstown, Simcoe, Ont.
King, A. A.	Cookstown, Simcoe, Ont.
Lailey, F. T.	Johnston's Crossing, Colchester, N.S.
Laird, J. G.	Toronto, York, Ont.
Reinke, C. E.	Sarnia, Lambton, Ont.
Robertson, G. A	Ancaster, Wentworth, Ont.
Rowe, G. F.	Kingston, Frontenac, Ont.
*Shorey, S. C	London, England.
S mpson, A. E.	Harrowsmith, Addington, Ont.
*Smyth, F. L.	Hamilton, P.E.I.
*Traviss, C. H.	Tormore, York, Ont.
*Vipond, J. M.	Holt, York, Ont.
Wheatley, John	Donegal, Perth, Ont.
Widdifield, J. W	Blackwell, Lambton, Ont.
Wilson, E. E.	Brampton, Peel, Ont.

First-Class Men.

The work in the College is divided into five departments, and all candidates who get an aggregate of 75 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 1894, arranged alphabetically:

First Year.

1. *Clark, J. F.*, Bay View, P.E.I., in five departments: Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
2. *Carlyle, S. G.*, Chesterville, Dundas Co., Ont., in two departments: Agriculture and Veterinary Science.
3. *Campbell, W. G.*, Brantford, Brant, Ont., in two departments: Agriculture and Mathematics.
4. *Lang, L. W.*, St. Marys, Perth, Ont., in five departments: Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
5. *Lewis, G.*, Ballymote, Middlesex, Ont., in one department, viz., Agriculture.
6. *Paterson, T. F.*, Lucknow, Bruce, Ont., in four departments: Agriculture, Natural Science, Veterinary Science, and Mathematics.
7. *Summerby, W. L.*, Russell, Ont., in four departments: Agriculture, Natural Science, English Literature, and Mathematics.

* To take supplemental examinations: Shorey, in Agricultural Chemistry; Smyth, English Grammar; Traviss, English Literature; Vipond, English Literature.

Second Year.

1. *Buchanan, John*, Hensall, Huron, Ont., in one department, viz., Mathematics.
2. *Kennedy, W. A.*, Apple Hill, Glengarry, Ont., in two departments: Agriculture and Mathematics.
3. *King, A. A.*, Colchester, Nova Scotia, in one subject, viz., Agriculture.
4. *Kidd, D. F.*, Cookstown, Simcoe, Ont., in one department, viz., Veterinary Science.
5. *Robertson, G. A.*, Kingston, Frontenac, Ont., in three departments: Agriculture, Natural Science, and Mathematics.
6. *Wheatley, John*, Blackwell, Lambton, Ont., in four departments: Agriculture, Natural Science, Veterinary Science, and Mathematics.
7. *Widdifield, J. W.*, Siloam, Ontario County, Ont., in one department, viz., Agriculture.

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 1894:

Gold Medallist—John Wheatley, Blackwell, Lambton, Ont.

First Silver Medallist—G. A. Robertson, Kingston, Frontenac, Ont.

Second Silver Medallist—W. A. Kennedy, Apple Hill, Glengarry, Ont.

First Year Prize Men.

Agriculture and Dairying—1st, J. F. Clark, Bay View, P.E.I.; 2nd, T. F. Paterson, Lucknow, Bruce, Ont.

Natural Science—1st, J. F. Clark; 2nd, W. L. Summerby, Russell, Russell, Ont.

Veterinary Science—1st L. W. Lang, St. Marys, Perth, Ont., and T. F. Paterson; 2nd, J. F. Clark.

English Literature and Composition—1st, J. F. Clark; 2nd, W. L. Summerby.

Mathematics and Bookkeeping—1st, J. F. Clark; 2nd, T. F. Paterson.

General Proficiency—1st, J. F. Clark; 2nd, T. F. Paterson; 3rd, W. L. Summerby and L. W. Lang.

Special Prize in Bee Keeping, offered by W. F. Clarke—E. Rive, Guelph, Ont.

Second Year Prize Men.

Agriculture, Live Stock, and Dairying—1st, A. A. King; 2nd, John Wheatley.

Natural Science—1st, John Wheatley; 2nd, G. A. Robertson.

Veterinary Science—1st, D. F. Kidd; 2nd, John Wheatley.

English Literature and Political Economy—1st, F. T. Lailey; 2nd, John Wheatley.

Mathematics—1st. G. A. Robertson; 2nd, W. A. Kennedy.

General Proficiency—1st, John Wheatley; 2nd, G. A. Robertson; 3rd, W. A. Kennedy; 4th, J. W. Widdifield; 5th, A. A. King.

Special Prize for Essay on Fat Stock Show—1st. A. E. Simpson; 2nd, A. H. Christian.

Closing Exercises.

Our closing exercises took place on the 29th June. The day was fine, and the attendance of visitors was exceptionally large. Our new hall, which holds about 900 people, was filled and everything passed off very pleasantly. The Hon. James Young, of Galt, presented the diplomas, and a number of gentlemen from Guelph and the surrounding country assisted in the presentation of medals, prizes, and honor certificates.

The George A. Cox Scholarships.

Amongst the distinguished visitors present at the closing exercises, were George A. Cox, Esq., President of the Canadian Bank of Commerce, and Mrs. Cox; and in the course of the proceedings, Mr. Cox gave us a very pleasant surprise by announcing that for some time to come he would give the College $100 a year to be awarded in scholarships as we might determine; and the result was that we were able to make the following announcement to the students who entered in October and are now in attendance:

The George A. Cox Scholarships, $100. George A. Cox, Esq., President of the Canadian Bank of Commerce, has very kindly and generously offered five scholarships of $20 each, to be paid in money to the students who shall rank highest in each of the five departments of instruction in the year, provided—

(1) That the candidate take not less than 40 per cent. of the marks in each subject embraced in the year's work, and attain a first-class rank in the department in which the scholarship is awarded.

(2) That he complete the second year work and take an associate diploma within two years from the date at which the scholarship is awarded—$10 of the money to be paid at the end of the first year, and the remaining $10 at the completion of the second year.

No student shall receive more than one of these scholarships. If two or more scholarships are won by one student, or if any scholarships or portions of scholarships are not awarded or paid on account of non-attendance or other causes, they may be awarded in each case to the student who stands next highest in that or any other department, provided he complies with the conditions laid down in provisos (1) and (2) of the preceding paragraph.

Note.—To be ranked first-class in a department, it is necessary to obtain 75 per cent. of the aggregate number of marks allotted to the subjects in that department.

Valedictory Prize.

A prize of $10 in books is offered annually to the second year students for a valedictory address, and the competition for the honor is usually keen. The subject last year was "The Beautifying of Country Homes," and there were several competitors; but none of them reached the required standard of excellence. Hence no valedictory prize was given in 1894.

Summer School for Teachers.

For the second time, we sent out a circular announcing a short summer course of lectures with practical instruction in agriculture and kindred branches for public school teachers; but there was little or no response, owing to a change in the regulations of the Department of Education whereby agriculture has been removed from the list of public school studies.

Seven teachers came and spent the month of July very pleasantly in studying agriculture, live stock, butter-making, chemistry, geology, botany, and entomology. The lectures and practical instruction given throughout the month were the same as were given to the much larger class of 1893; and the total cost to each teacher for the month's board, lodging, and tuition was $12.

This work must, of course, be discontinued so long as the present regulation is in force.

Visitors.

On the 17th February, the College was favored with a visit from Lord and Lady Aberdeen. Their Excellencies, accompanied by Captain Kindersley, Mr. Ferguson, and Private Secretary Campbell, arrived here early in the day and proceeded at once to the dairy school, which they inspected throughout with the most minute attention to every detail of work and instruction. They then visited the dairy stable and farm buildings, to see the live stock, and afterwards went to the President's house for lunch, where they were joined by the Hon. John Dryden and Mrs. Dryden, Vice-Chancellor and Mrs. Mulock, of Toronto; Mayor and Mrs. W. G. Smith, of Guelph; James Innes, M.P., and Mrs. Innes, and Donald Guthrie, Q.C., M.P.P., and Mrs. Guthrie. After lunch His Excellency delivered a short but very happy and appropriate address to the students in one of the class-rooms. The party then visited the chemical and botanical laboratories, the gymnasium, and college dormitories, after which they took a drive through the city of Guelph, and their Excellencies, after spending a short time in the curling rink, proceeded to the City Hall, where they held an informal reception from 4 to 5 p.m. Immediately after the reception, the party partook of a very nice luncheon which had been prepared by order of the mayor and aldermen of the city, and their Excellencies left by the 5.40 train for the east.

This visit from their Excellencies was very much appreciated; and the unanimous verdict was that they are worthy representatives of Her Majesty the Queen—bright, clever, intelligent, and easy to entertain.

We have had a constant stream of visitors at the college throughout the year; and in the month of June, we had the pleasure of entertaining over 10,000 excursionists (chiefly farmers), who came to inspect the farm and our equipment for work in the different departments of the institution.

Farmers' Institutes.

After ten years' service in organizing and directing the Farmer's Institutes of the province, I decided to make way for someone who could devote his whole time to the work. At the last meeting of the Central Farmers' Institute, I ventured to suggest a change; and the result was that the Minister of Agriculture soon after appointed F. W. Hodson, of the *Farmer's Advocate*, London, to take charge as Director or Superintendent of Institutes.

Mr. Hodson is in many respects well qualified for the position. He has had a thorough training in the practical details of general farming and stock raising; he is well-versed in journalism; he is a hard worker, and has an unlimited amount of energy and perseverance. I have no doubt the institutes will do an increasingly useful work under his management.

A list of institute meetings, arranged by Mr. Hodson for January, 1895, will be found in Appendix VI. to this report.

Financial Statement.

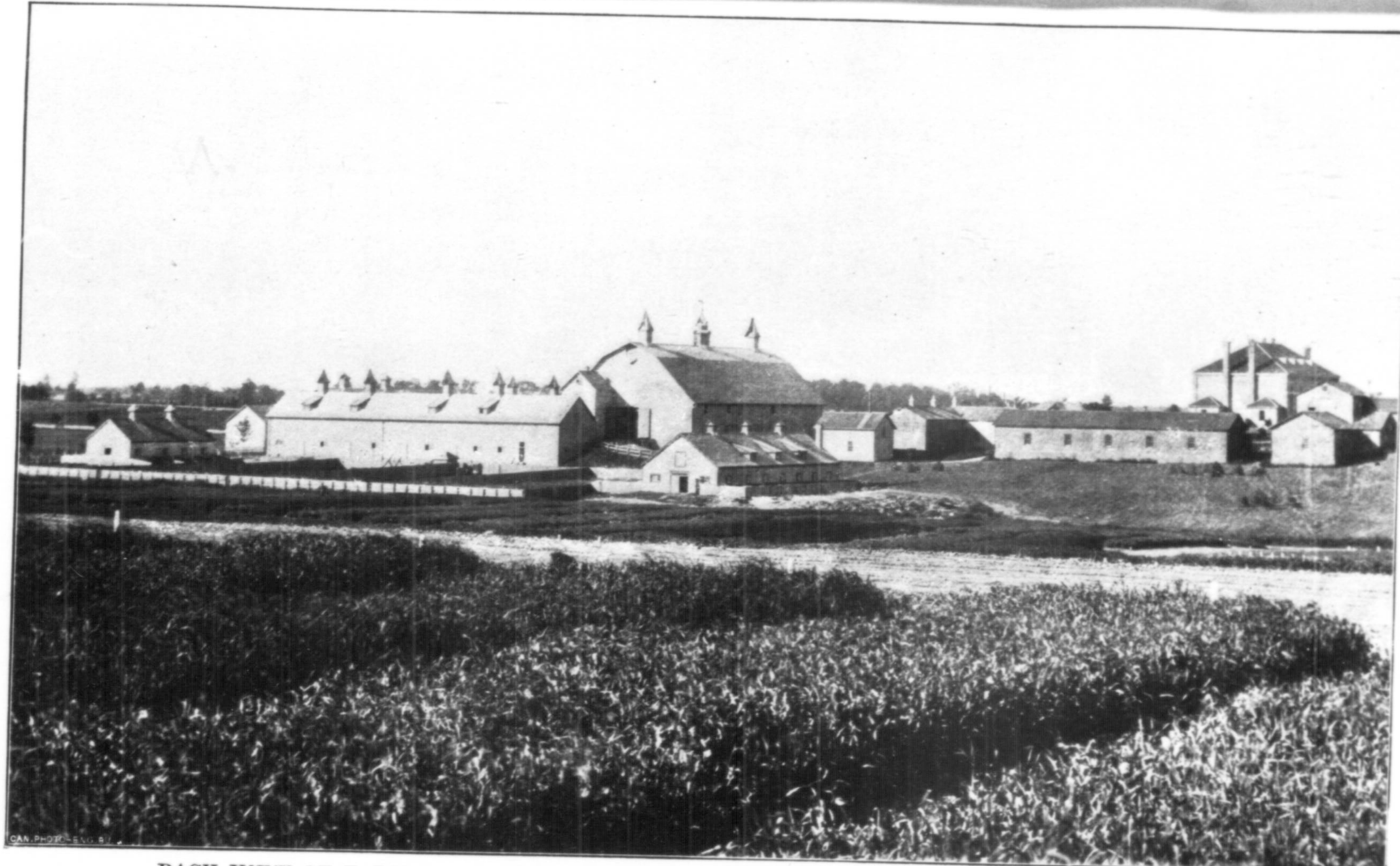
For a statement of the revenue and expenditure of the different departments, see Appendix V. to this report. It will be observed that the total unexpended balances on the year's operations in all departments is $5,142.48.

Conclusion.

With the addition of our new poultry buildings, 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.

Our most urgent needs for the immediate future are a large building for the work of the experimental department, and five or six dwelling houses for members of the staff.

JAMES MILLS,
President.



BACK VIEW OF FARM BUILDINGS AND GYMNASIUM, TAKEN FROM EXPERIMENTAL GROUNDS.

CARPENTER SHOP AND FARM BUILDINGS, TAKEN FROM TOP OF COLLEGE

PROFESS

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PART II.

REPORT OF THE

PROFESSOR OF NATURAL HISTORY AND GEOLOGY.

To the President of the Ontario Agricultural College:

SIR,—From a perusal of the report which represents the work accomplished in the Department of Natural History during 1894, it will readily be seen that considerable has been done beyond the work of the classroom. It is very gratifying to notice, from year to year, a greater desire among farmers to know more of the scientific principles which underlie the operations in agriculture, and that they recognize the Ontario Agricultural College as an important source from which such knowledge can be obtained.

Many inquiries have been sent to this department during 1894 regarding insects and plants beneficial or injurious to agriculture. In a subsequent part of this report a list of plants and insects received for identification is given.

In order to appeal to the *eyes* and even *hands* of students, as a means of making lasting impressions upon their minds, we have added still further to our excellent collection of charts, lantern slides, and specimens, and as far as time permitted introduced practical work into the classroom. The practical analysis of plants and examination of insects, together with the use of the microscope, are being emphasized in the second year more than formerly. In the first year, students in botany make an analysis of a plant in each lecture and identify it from the data observed during the examination of the plant. In the third year, we have added another half day to practical work in microscopy, so that three lessons are now given weekly instead of two. This arrangement enables students in microscopy to give more attention to the preparation of specimens and a practical study of the subject.

In the advance which has been so characteristic in the study of life, as it is expressed in the animal and plant, we have been striving to keep in line, and from year to year have added to our work by more thorough and practical teaching, where time and equipment have permitted. During 1894 further progress has been made by the purchase of additional apparatus, the preparation of a room for photography, and the study of cryptogamic botany, as it relates to the crops of the garden, orchard and field.

The appointment of an assistant has enabled us to accomplish much which could not have been done otherwise. As demonstrator in microscopy, he is able to give time to the preparation and examination of specimens for practical work, while a portion of his time is also necessarily required in the library as acting librarian, indexing reports, etc., and in the museum labelling and arranging specimens.

1. Museum.

Here a decided improvement has been made in our collection of birds. Through the kindness of the Minister of Agriculture, we had donated to the museum 200 birds from the collection exhibited at Chicago to illustrate the birds of Ontario. Before adding this valuable lot to our own we repainted the cases, selected the best typical birds from our own, and classified the whole according to the classifiication now followed by the American Orinthological Union. The collection now presents an excellent appearance, and is arranged so as to be of great assistance to the students who desire to study economic orinthology.

We have also added 150 unmounted birds to our list for use in the class-room. These embrace most of the insectivorous birds found in Ontario, and will be of great value in connection with the study of economic entomology. They are numbered and labelled in such a way as to be readily examined by the students who may wish to handle and compare them thoroughly.

P. P. Smith, a student of the second year, from Bermuda, has kindly donated some interesting specimens, such as a cow-fish, a flying-fish, and fragments of coral.

J. F. Clarke, also a student of the second year, has added some specimens of Triassic rock from Prince Edward Island, to our geological collection.

F. C. Harrison, B. S. A., presented 80 specimens of mounted plants collected around Ithaca, N. Y., during the summer of 1894.

2. Library.

The books of the library have been re-arranged, and a large amount of indexing accomplished duing this year. These changes have been of great convenience to both officers and students.

The number of volumes now in the library is over six thousand. 164 volumes have been added this year; these may be grouped as follows: Reports, 29; Herd Books, 5; Botany, 8; Geology, 2; Agriculture, 11; Chemistry, 4; Literature, 5; History, 2; Biography, 10; Poultry, 1; Mathematics, 6; Dairying, 34; Horticulture, 32; Entomology, 2; General Science, 2; Parliamentary Reports, 10; Political Economy, 10.

3. 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.*

Journal of Commerce, Montreal; Canadian Baptist, Toronto; Christian Guardian, Toronto; Canada Presbyterian, Toronto; Monthly Weather Review, Toronto; Presbyterian Review, Toronto; Sheep Breeder and Wool Grower, Chicago; Manitoba Weekly Free Press, Winnipeg; Canadian Horticulturist, Grimsby; Canadian Entomologist, London, Ont.; Bee Journal, Beeton; North York Reformer, Newmarket; Acton Free Press, Acton; Ontario Evangelist, Erin, Ont.; Evangelical Churchman, Toronto, Farmers' Review, Chicago; Canadian Independent, Toronto; Rural Home Journal, Kentucky; Canadian Churchman, Toronto; Canadian Independent, Toronto; Canadian Evangelist, Toronto; Canadian Bee Journal, Brantford; Poultry Journal, Beeton; Farmers' Home, Ohio; Farmers' Review, Chicago.

(b) *Furnished by the College.*

Daily Globe, Toronto; Daily Mail, Toronto; Daily Empire, Toronto; Daily Mercury, Guelph; Daily Herald, Guelph; Rural Canadian, Toronto; Grip, Toronto; Poultry Review, Toronto; Farmers' Advocate, London, Ont.; Canadian Stock Raisers' Journal, Toronto; Nor'West Farmer, Winnipeg; Breeders' Gazette, Chicago North British Agriculturist, Edinburgh, Scotland; American Garden, Greenfield, Mass.; Cultivator and Country Gentleman, Albany, N.Y.; Scientific American, New York; Live Stock Journal, England; American Dairyman, New York; Literary Digest, Boston; Canadian Agricultural and Home Journal, Peterborough'; Hoard's Dairyman, Ft. Atkinson, Wis.; Maritime Agriculturist, Sackville, N.B.; Science, New York; Garden and Forest, New York; Scientific American Supplement, New York.

4. Practical Work.

Experiments have been carried on in spraying which show conclusively that where it is done thoroughly at the proper time the work will be successful in preventing losses from insects and parasitic plants.

The use of Bordeaux mixture not only prevents the growth of injurious fungi, but has a most marked effect upon the health of the leaves, sprayed trees retaining their foliage a much longer time than unsprayed ones, and the leaves presenting a most healthy appearance. In the use of fungicides, we made our first application before the buds began to swell, the solution being 1 lb. of copper sulphate in 25 gals. water; the second, before bloom and after the foliage had appeared. In this case we used Bordeaux mixture, made of 5 lb. sulphate of copper and 4 lb. fresh lime in 40 gals. water. The third application was made immediately after bloom, and the fourth from 12 to 15 days after. I am inclined to think that the mixture may be successful with a pound less of copper sulphate, which forms a very simple formula to remember, namely: 1 lb. copper sulphate, 1 lb. lime, and 10 gals. water. This, of course, is the same as 4 lb. copper sulphate, 4 lb. lime, and 40 gals. of water; but expressed as above is readily remembered, and may be made in any quantity desired by simply increasing the number of pounds and gallons of material used.

In preparing Bordeaux mixtures care requires to be exercised. The copper compound can be dissolved readily in warm water, but takes much longer time in cold. If a bag containing the compound be suspended in the water at the top of the vessel, the whole will dissolve readily. As one gallon of water will dissolve a pound of the sulphate, a few gallons of water may be used at first and the remainder added afterwards. The lime should be *fresh* and should be slaked, and then enough water added to make a creamy whitewash; this may then be poured into the copper sulphate solution. It is an improvement to strain it while adding it to the copper compound, especially if there are any particles of dirt, etc., present, which might have a tendency to clog the nozzle of the sprayer. The balance of the water having been added the whole is thoroughly stirred and ready to use. To avoid delay the sulphate of copper may be dissolved some time beforehand and a solution always ready which would represent, say 1 lb. copper sulphate for each gallon of water, then all that is necessary is to take as many gallons of this as the formula requires pounds of copper sulphate, and add milk of lime as above described.

Some have experienced failure from the fact that the lime has not prevented the corrosive effect of the copper compound, but if the lime is good and fresh a mistake is not likely to occur if the above proportions are followed.

However, there is a simple test which may be applied. Get an ounce of ferrocyanide of potassium and dissolve it in a pint of water, add a drop or two of this at a time when you are pouring in the milk of lime. As long as there is not plenty of lime added a dark brown color will appear as each drop falls on the mixture; but as soon as the ferro-cyanide solution fails to give a color enough milk of lime has been added. In making Bordeaux mixture it will be remembered that it should be done in earthen or wooden vessels. Powdered copper sulphate will dissolve more readily than uncrushed. Bordeaux mixture gave excellent results against "apple spot" and "gooseberry mildew."

Spraying kerosene emulsion upon our apple trees affected with bark lice, on the 12th of June, when the young lice were observed to be moving from under the scales, was followed by excellent results. A second application was made about ten days after.

An examination of the young wood in October revealed very few scales, and in most cases none on the twigs, showing that we had kept the young lice from spreading.

Ordinary kerosene emulsion is made of one-half pound hard soap, two gallons kerosene and one gallon water. The emulsion being diluted with nine parts water.

Sour milk may be used in making the emulsion, then all that is necessary is to stir together one gallon sour milk and two gallons kerosene.

Our best results in preventing injuries from the cabbage fly (*anthomyca brassicae*) were obtained from the use of tar paper upon the plant. Pieces of tar paper, three inches square, were used. These were cut half way across and the plant put in the slit about the centre of the square and then planted. This method (first used at the Wisconsin experiment station) has been followed in several places and has been very effective. As the paper fits closely to the plant and has a strong smell, it keeps the fly from laying its eggs upon the young plants.

The McGill Brothers, of London, Ontario, sent some of their "Tree Protectors" during the summer and desired us to try their success in trapping codling moths. These funnel-shaped protectors are fastened around the trunk of the tree, a few feet from the ground. On the under side and in the upper part a piece of tow is placed for the purpose of affording the larvæ a hiding place. I placed the "protectors" representing the sizes, 1 (largest), 2, 3, 4, upon twenty-five trees, and obtained the following results:

Size.	No. of codling moth larvæ caught on each tree.	Total.
1.	55, 57, 49, 40, 39, 59	299 on 6 trees.
2.	44, 118, 23, 18, 18, 10, 14, 15	260 on 8 trees.
3.	10, 7, 10, 10, 8, 12, 11	68 on 7 trees.
4.	2, 6, 1, 5	14 on 4 trees.
	Total	641 on 25 trees.

Or an average of 25 worms per tree.

I observed upon the old trees that many of the pupæ were well in the bark and not many in the tow; but in the young trees, where the bark was smooth, they were largely in the tow, thus showing how important it is to clean off the rough bark. Sizes 1 and 2 were applied to trees in an old orchard, and sizes 3 and 4 to trees in a young one.

The year 1894 has been very unfavorable for spraying. During the early part of the season rain fell daily, so that it was almost impossible to get a suitable time to spray. High winds often prevailed when the rain ceased and thus the conditions were most unfavorable to effective results. About June 10th warm weather set in and supplied conditions very suitable for the development of fungoid pests, and these continued for most of the summer months. Yet, notwithstanding such adverse conditions, our spraying was followed by good results.

There is no doubt insects and fungi can be controlled by the use of insecticides and fungicides applied in this way. To destroy insects four ounces of Paris green were added to forty gallons Bordeaux mixture and applied as a combined insecticide and fungicide.

In this department 125 different kinds of seeds were identified, and also a large amount of work done to secure the data presented in Bulletin XCVIII. ("Impurities in Clover Seed"), and printed in this report.

Seventy-five insects and 128 plants have been identified, and information regarding their habits, etc., supplied to correspondents.

Many letters were received asking for information upon spraying, etc. As this is a comparatively new thing and very little known about it, the replies in many cases necessitated much care and time. One correspondent sent a letter containing twenty-five questions, and wrote saying he thought it would require a book to answer his questions fully.

The following is a list of the different species of insects and plants that have been identified and reported upon during 1894; but this does not give the number of specimens sent, for in several cases the same species was received from different localities.

The appearance of the "army worm" (*Leucania unipuncta*) near Petrolea, having caused considerable alarm, I have in another part of the report given some notes upon its life history and habits. I have also given some notes upon anthracnose of the raspberry, as it seems to be quite common in several parts of Ontario, judging from the ques-questions sent regarding it.

Insects Received and Identified During 1894.

Scientific name.	Common name.
Soperda calcarata	Poplar borer.
Mytilaspis pomorum	Bark louse.
Agriotes communis	Wire worm.
Anthomyia ceporum	Onion maggot.
Callosamia Promethea	Promethea Emperor moth.
Monohammus scrutator	Pine tree borer.
Pieris rapæ	Cabbage worm.
Agrotis sub-gothica	Striped cut worm.
Hæmotobia serrata	Horn fly.
Phytoriomus punctatus	Clover leaf beetle.
Iulus multistriatus	Millipede.
Tmetocera ocellana	Bud moth.
Siphonophora avenæ	Grain louse.
Tinea biselliella	Clothes moth.
Hypoderma bovis	Ox bot.
Monomorium pharaonis	Common ant.
Diabrotica bi-vittata	Cucumber beetle.
Lumbricus terristris	Earth worm.
Piophila casei	Cheese skipper.
Trichodectes scalaris	Cattle louse.
Graptodera chalybea	Grape beetle.
Saperda candida	Two-striped borer.
Coleophora Fletcheri	Cigar-case insect.
Coccinella	Lady bird.
Ephestia Kuhniella	Flour moth.
Leucania unipuncta	Army worm.
Helochara commensis	Spittle insect.
Calandra granaria	Granary weevil.
Podisus placidus	Placid soldier bug.
Caloptenus femur-rubrum	Grasshopper.
Silvanus surinamensis	Grain beetle.
Hylastes trifolii	Clover root borer.
Diapheromera femorata	Walking-stick insect.
Tremex Columba	Pigeon tremer.
Trichobasis punctatus	
Euphoria India	Indian cetonia.
Hæmatopinus ensysternus	Cattle louse.
Tischeria malifoliella	Apple-leaf miner.
Dryocampa rubicerreda	Spring maple worm.
Hæmatopinus urius	Hog louse.
Desmoceras palliatus	Elder borer.
Clisiocampa Americana	American tent caterpillar.
Catastega aceriella	Maple leaf worm.

Plants Received and Identified During 1894.

Chimaphila umbellata	Prince's pine.
Cichorium Intybus	Chicory.
Artemisia biennis	
Ambrosia artemisiæfolia	Ragweed.
Bromus secalinus	Chess.
Brassica sinapistrum	Wild mustard.
Polygonum Pennsylvanicum	Large smartweed.
Camelina sativa	False flax.
Spergula arvensis	Spurrey.
Zanthoxylum Americanum	Prickly ash.
Antennaria plantaginifolia	Everlasting.
Cerastium viscosum	Mouse-ear chickweed
Lithospermum arvense	Redroot pigeonweed.
Trifolium arvense	Rabbit-foot clover.
Silene inflata	Bladder campion.
Aralia quinquefolia	Ginseng.
Hieracium	Hawkweed.
Poa compressa	Wire grass.
Apios tuberosa	Ground nut.
Sagittaria variabilis	Arrowhead.
Souchur arvensis	Perennial sow thistle.
Anthemis arvensis	Chamomile.
Xanthinia spinosum	Spiny clotbur.
Carex lupulina	Sedge.
Poa protensis	June grass.
Festuca elatior	Tall fescue.
Lolium perenue	Perennial rye grass.
Agrostis vulgaris	Red top.
Phalaris intermedia	Canary grass.
Actaea spicata	Baneberry.
Agropyrum tenerum	
Poa trivialis	Rough meadow grass.
Sisymbrium Sophia	Flixweed.
Cheniopodium Botrys	Jerusalem oak.
Echium vulgare	Blueweed.
Vaccaria vulgaris	Soapwort.
Arternisia Absinthium	Wormwood.
Alopecurus aristulatus	Water fox-tail.
Eleocharis palustris	Spiked rush.
Carex vulpinoides	Sedge.
Scirpus absovireus	Bulrush.
S. criophorum	Rush.
Carex irrigua	Sedge.
C. aquatilis	Sedge.
Glyceria fluitaus	Manna grass.
Calamagrostis longifolia	
Glyceria Canadensis	Rattlesnake grass.
G. nervata	Rattlesnake grass.
Poa serotina	False redtop.
Panicum glabrum	Panic grass.
P. crus-galli	Barnyard grass.
P. capillare	Witch grass.
Elymus Canadensis	Wild rye.
Calluna vulgaris	Heather.
Sombucur Canadensis	Common elder.
Euonymus Americanus	Strawberry bush.
Amarantus paniculatus	Prince's feather.
Plantago lanceolata	Rib grass.
Rubus Canadensis	Low blackberry.
Pyrus arbutifolia	Choke-berry.
Cicuta maculata	Water hemlock.
Glœosporium venetum	Raspberry anthracnose.
Glœosporium fructigenum	Apple rot.
Roestelia aurantiaca	Quince rust.
Morielia fructigena	Plum rot.
Taphrina pruni	Plum pockets.
T. deformaus	Peach leaf curl.

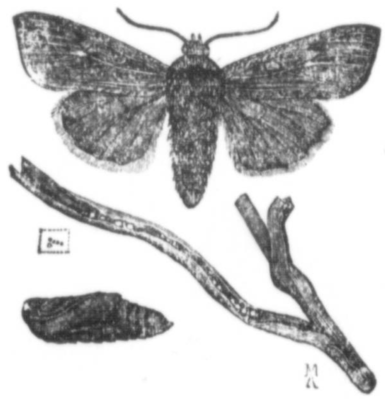
Army Worm (*Leucania unipuncta*). This insect has a preference for grass on low, wet soils, but often feeds upon wheat, oats, corn, timothy, and other grasses.

It is more likely to make its appearance in a rainy season than a dry. This fact may account for its presence during the early summer of 1894. With favorable seasons it may become very numerous and a source of trouble by the worms migrating from field to field in search of food. Although the moth which gives rise to the "army worm" is seen from time to time, yet it is rarely that they reach such numbers as to cause alarm.

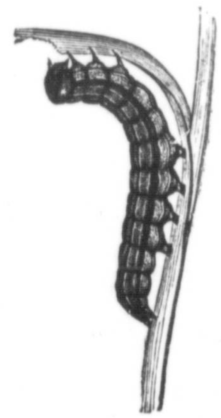
During 1894 they have been much more common than in former years. Specimes of the larvæ were sent the writer from Little Britain, near Lindsay, and from Alvinston, near Petrolea. At the latter it appeared in such numbers that a correspondent reported 60 tons of hay and 300 acres of oats destroyed by the millions of " worms " which seemed to devour everything in their way. The specimens sent from this place were badly infested by the larvæ of a Tachnia fly (*Nemoræa leucaniæ*), a great parasitic enemy of the " army worm." It is likely this parasite will largely ward off an attack in '95.

It is generally found that where the " army worm " reaches such numbers as to form so-called armies migrating in search of food, this parasite appears in great numbers and exercises a most beneficial effect in destroying the " worms " and thus preventing an attack the following year.

The larva of the " army worm " is about $1\frac{1}{2}$ inches in length, of a dull grey color, with black stripes and numerous lines of white along the back. The underside of the body is greenish, and the head a pale yellow, with brown lines on the side. When migrating they usually move in one direction and are very active.



THE MOTH.



THE CATERPILLAR.

As soon as fully developed, which takes about three to four weeks, they burrow into the ground and enter the pupa condition; this state lasts for about two weeks, when the moths appear. Some of the specimens were put in boxes; in three days they entered the pupa condition, and in twelve the moths appeared. The moth is fawn-colored, with a small white spot near the centre of the front wings. The width of the wings when spread is about $1\frac{1}{2}$ inches. The eggs are usually laid in tufts of dead grass, but may be found upon blades of grass and even upon old cornstalks.

Remedies. The " army worm " has many enemies among birds and parasitic insects so that it rarely reaches such numbers as to become a source of alarm.

1. Burning over pastures and meadows in the spring or fall prevents their increase. As the insect breeds largely in rank grass, such as is seen bordering swamps, it is well to burn such in the spring or fall and thus destroy the wintering quarters of the insect.

2. Where the worm has appeared, a good plan is to plow a furrow with its perpendicular side next the field to be protected, and as the worms collect in it failing to climb the steep side, you can destroy them.

3. Where Paris green may be safely used, it may be sprayed upon the plants likely to be first attacked by the advancing worms.

I have referred to the above insect on account of its being one of the most interesting cases of the injury done by an insect during the summer of '94, especially in the localities from which the specimens came. As the attack created considerable alarm, I have no doubt the above description of the insect and its habits will be read with interest by many and prove instructive to some.

RASPBERRY ANTHRACNOSE (*Glœosporium venetum*)—Many enquiries have been received desiring information regarding this parasitic fungus upon the raspberry. Specimens were frequently received which seems to indicate that the trouble is quite common. On this account I have thought a brief description of the disease may be of use in enabling readers to identify the fungus.

Raspberry canes affected are sometimes spoken of as attacked with "cane rust" or "sun scald."

The blackcap variety seems most liable to attack, but it also appears on the red.

On the shoots attacked, small purplish spots irregularly scattered on the surface appear; these, as the season advances, enlarge and assume an ash-colored appearance in the centre, with purplish border surrounding each spot. At first the spots are very small, but, as the disease develops, the spots unite and show a more lengthened than oval shape.

RASPBERRY ANTHRACNOSE.

These spots are also found upon the leaf-stalks and even the leaves themselves; but they are most characteristic upon the canes, where they are readily seen.

It is in the second year that the effects of the fungus show themselves, especially when the canes bear fruit. If the canes are badly attacked the fruit never fully developes and the leaves present an unhealthy appearance, turning yellow and then brown.

The best results in the treatment of this disease have been obtained from the use of dilute Bordeaux mixture (4 lbs. copper sulphate, 4 lbs. fresh lime, and 50 gallons water.) 1st application, early in the spring before the leaves open; 2nd, soon after the young canes appear, and these only sprayed; 3rd, about two weeks later spray young canes again; 4th, the young canes just before blooming. Cut out and burn the fruiting canes each summer as soon as the crop is gathered.

DISEASES AFFECTING THE GRAPE.

Having received replies from 551 persons to whom circulars were sent through the medium of the Department of Agriculture for information regarding diseases affecting the grape, the writer is able to present a summary of these replies, and, as the time is now opportune, give a description of four of the most common parasitic plants attacking the grape, and also give information as to the best means to prevent the spread and effect of these diseases.

Of the correspondents making returns, 120 report Downy Mildew, 105 Powdery Mildew, 106 Black Rot, and 14 Anthracnose.

The county of Welland reported 60 per cent. loss, Wentworth 70 per cent., Lincoln 75 per cent., and Essex 50 per cent.

As to varieties most liable to attack, 116 correspondents report Rogers' hybrids, 35 Concord, 23 Clinton, 20 Niagara, 15 Brighton, and 12 Delaware.

The year 1889 is frequently referred to as the season when these diseases were first noticed to any considerable extent, and they have been on the increase since. Grape growers are awakening to the importance and necessity of fighting these foes, as may be seen from the fact that of those in communication with the Department in reply to the circular above referred to, 59 report using sulphur, 45 Bordeaux mixture, 12 copper sulphate, 10 ammoniacal solution of copper sulphate, and 3 eau celeste. The consensus of opinion is that favorable results followed the use of the above named fungicides, especially in the case of the Bordeaux mixture.

Thirty-two persons report that they found farmyard manure to favor the development of these fungoid pests. Many find ashes an excellent fertilizer for the grape vine.

FUNGOID PESTS.

The grape being a plant that produces a large amount of foliage and fruit, it is not a matter of surprise that it should have a number of enemies among insects and parasitic plants. In this bulletin we wish to direct the attention of readers to four plants that are found affecting the grape injuriously, by deriving their nourishment from it as parasites upon its leaves, canes and fruit.

No group of plants has received more attention, since the establishment of experiment stations, than what is called the fungi, and no investigations have been more productive in practical results than those which have been followed to ascertain the nature and remedy for plant diseases, caused by species of fungi. Until the microscope was discovered and its manipulation simplified, we knew very little concerning the life history of these pests, most of them being exceedingly minute.

GENERAL CHARACTERISTICS OF THE FUNGI.

The fungi include most of these parasites, that commence life from a spore which to some extent corresponds to a seed, the starting point for the higher forms of plant life, as the grape, etc. Spores are exceedingly small, most of them microscopic, have a very thin covering, germinate from no particular point, and have no embryo. Thus you will perceive they differ very materially from a seed, which is visible, has a well-defined covering, germinates from a particular point, and contains an embryo, that develops into a plant capable of producing flowers and seeds.

The fungi also differ from other plants in having no green coloring matter (*Chlorophyll*) in them, and thus cannot elaborate food from inorganic material; they must derive their food from material elaborated by plants that do possess Chlorophyll. They therefore live on organic matter, some on dead, such as mushrooms, others on living, such as mildews, smuts, etc. The latter are true parasites, and are very injurious by sapping the vitality from the plants upon which they are found. Among these fungi we find four frequently parasitic upon the grape. Before discussing these specific forms, it may be of service to the reader to outline the usual development of a parasitic fungus from the germination of spores till spores are again produced. Spores being exceedingly small are readily transported by the wind, and soon reach a suitable place for germination upon some plant, which is termed the host. The minute germinal thread which at first appears soon penetrates the tissue of the host plant and continues growing among the cells, from the contents of which it derives nourishment. As growth proceeds, thread-like structures (*hyphæ*) increase, and usually form quite a complicated mass (*mycelium*) pervading the tissues of the affected plant. The growth of this has a very disastrous effect upon the plant attacked, by lessening its vitality and general growth. At the proper time certain structures arise from the mass (*mycelium*). These vary much in the different fungi; but all are concerned in the production of spores, which falling upon proper places and surrounded by favorable conditions, soon germinate and perpetuate the disease.

This first form of spore (summer spore) is usually developed early in the season and in great numbers, their use being the rapid spread of the fungus. Their vitality is chiefly confined to the season in which they are produced; but later in the season, among the threads of the mass, more complicated structures appear. The elements they contain mingle together and give rise to much more durable spores (winter spores) which are destined to carry the trouble into another season.

They are capable of surviving more adverse conditions than the summer spores. By burning up affected material in winter or early spring, before the winter spores have germinated, we can prevent to a considerable extent the spread of a fungus. Remembering this outline, for it is much the same in all these parasitic fungi, the reader will be in a position to understand the following descriptions of certain specific forms feeding among the tissues of the grape.

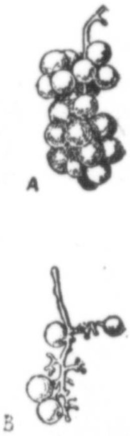
Downy Mildew or Brown Rot (*Peronospora viticola*).

This fungus which moisture seems to favor, attacks all green portions of the grape and appears about June. As soon as a spore falls upon the leaf it germinates, and the germinal thread penetrates the tissue and passes between the cells, not into them; but small growths develop on the penetrating threads and these (*haustoria*) dip into the cells and abstract nourishment for the growing fungus. An examination of these minute threads by a microscope reveals no partitions, such as are observable in the threads of "Black Rot." As development continues the thread-like structures of the fungus increase and form a mass (*mycelium*) which pervades the host-plant; from this arise minute stalks, that made their appearance through the small opening (*stomata*) on the undersides of the leaves, usually several in one opening. (See fig. 1.) They appear in such numbers as to form patches of a mouldy or frost-like appearance; opposite to these on the upper side of the leaves are pale green spots, which gradually turn brown, indicating a sickly condition of the leaf. These stalks under the microscope present quite a tree-like form as seen in the figure, and bear on the ends of the branches many oval bodies (*conidia*) which drop off as soon as they mature. If they reach favorable conditions, the contents soon break up and spores are formed; these pass out, each capable of moving about, and after reaching a proper resting place, they germinate and the fungus again develops, as already described. These are summer spores and aid in spreading the fungus rapidly. Later in the season, about autumn, the winter spores are produced among the threads of the mycelium by a sexual process. They have much thicker walls and are fitted to withstand the adverse conditions of winter, and thus carry the trouble into another year. Hence the advisability of destroying leaves, etc., that might be suspected of having these winter spores upon them. When the shoots are attacked it is indicated by dark colored spots slightly depressed, but not so deep as in the case of Anthracnose. Affected fruit fails to develop, it gradually becomes withered and brown. (See fig. 2.) Hence the term "Brown Rot" applied to distinguish it from "Black Rot." In the latter the berries are very much wrinkled and dried up. (Compare figures A and B.)

The Downy Mildew in its growth bears a close resemblance to the fungus causing "Potato Blight," described by the writer in the O. A. C. Report for 1886. A great many "blights" on different plants, turnips, lettuce, onions, cabbage, etc., are caused by parasites in the order (*Peronosporeæ*) to which the above belong.

Fig. 1.

Fig. 2.



A

B

Remedies. 1. Eau celeste, a mixture of copper sulphate ammonia and sodium carbonate (see under "Conclusions" at the end of this bulletin) has been used very successfully against Downy Mildew by spraying as follows: 1st application ten days before the vines blossom; 2nd just after the blossoms fall, and 3rd, about two weeks later. 2. The Bordeaux mixture, copper sulphate, lime and water, as also referred to in the conclusions, is effective.

Black Rot of the Grape (*Laestadia Bidwellii.*)

This fungus, aided by moisture and high temperature, is often associated with rank and succulent growth. It affects leaves, shoots and berries, usually making its appearance in June, in the form of circular reddish brown spots, of lighter color in the centre. They are more distinct on the upper surface of the leaf, than on the lower. Around these diseased parts, minute dark colored pimples can be seen. These show the various stages in the growth of the fungus which we shall describe, when referring to the attack upon the fruit. On the shoots the disease causes long brown spots somewhat depressed. It is not in the attack upon either leaves or shoots that much damage is sustained, but when the fungus reaches the fruit. The berries are attacked shortly after the leaves show the presence of the disease. The trouble often shows itself as a small brownish spot on the surface, near the stem end; this gradually spreads and covers the whole surface, changing in color, till it becomes quite black and the berry eventually withers, assuming a dry, shrivelled-up condition. (See figs. A and B, showing unaffected and affected fruit.) An examination of the surface reveals many small black pimples in which the fungus can be detected; these pustules can be seen by the eye, but sections of them under the microscope show many interesting stages in the life history of this parasite.

Its thread-like structures with partitions during development not only grow between the cells but in some cases penetrate them. Among the tissues of the shrivelled berries minute cavities are seen in which spores are developed. These cavities may be quite near each other, but contain entirely different forms of spores, for we find four kinds connected with the spread of this fungus. When mature the spores escape through minute openings on the surface of the pimples referred to.

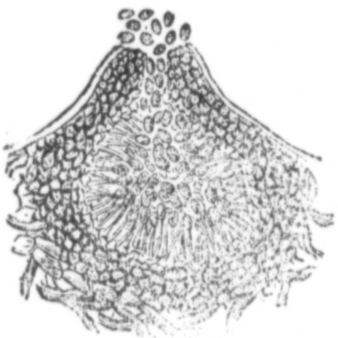


Fig. 3.

Fig. 4.

Among the most important germs in spreading the fungus during summer are the *Stylospores*, oval in outline and borne on very small stalks attached to the walls of certain cavities, (*pycnidia.*) As soon as mature they separate from the stalks and pass out of an opening on the top of a pimple. (See fig. 3.) Other cavities (*spermagonia*) give rise to still smaller and more elongated spores (*spermatia*) which mature and also pass out through an opening.

Ascospores, oval in outline, are not developed till the "rot" has been fully matured, and may be seen upon diseased berries in the spring. They are winter spores and are concerned in the perpetuation of the fungus from season to season. On this account it is very important to destroy them as far as possible. The cavities (*perithecia*) containing these are largely occupied by flask-shaped organs (*Asci*), (see fig. 4) in each of which are eight of these oval spores; these on reaching maturity escape from the cavities to find a new starting point on the plant.

Conidia, a fourth form of spore, are not so common as the others and are more usually found growing upon the surface of the pimples, than in cavities inside; they are oval and appear at the ends of stalks, showing well-marked divisions, from which they drop off, when mature. The *Stylospores* and *Ascospores* are the most important in the propagation of "Black Rot."

Remedies. 1. Some have succeeded in preserving the fruit from attack by enclosing the bunches in paper bags, as soon as the flowers are fertilized. 2. Spraying with Bordeaux mixture (see Conclusions) is a very successful fungicide against "Black Rot."

POWDERY MILDEW. (*Uncinula spiralis.*)

This fungus is quite different from either of the preceding in its form and habit; it prefers a dry atmosphere and confines its attack largely to the external portions of the affected parts. It appears about midsummer in the form of grayish white patches on the upper surface of the leaves, sometimes on the shoots and even berries. After it has developed for a time it throws up erect threads, each bearing single spores (*conidia*) at its summit; they drop off, and are followed by others taking their place, (see fig. 5.) and thus keep up a supply of summer spores. When the season advances many peculiar, minute, nutlike structures (*perithecia*) (see fig. 6.) are developed among the threads of the mass (*mycelium*). Within these, in small flask-shaped bodies (*Asci*), the winter spores (*Ascospores*) are developed, to continue the disease another year.

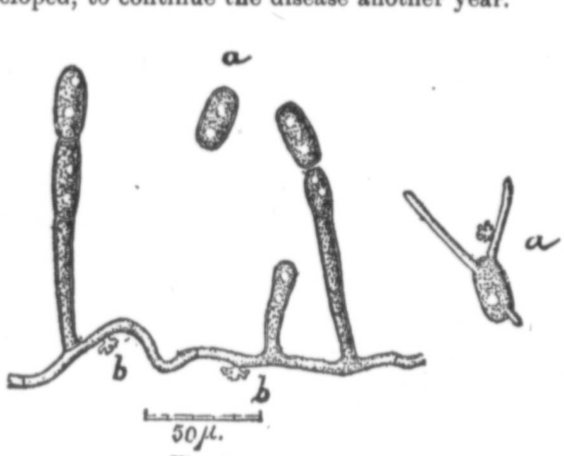


Fig. 5.

Fig. 6.

Remedies. 1. Sulphur has been very successful against this mildew by applying it, 1st. Twelve days before bloom; 2nd, when the plants are in bloom, and 3rd, three weeks later. 2. Bordeaux mixture is also successful.

ANTHRACNOSE (*Sphaceloma ampelinum.*)

Continued damp weather favors the development of this fungus, which may be found on all green parts, but more especially on the cane where it appears as small brown marks, which sometimes unite and form somewhat lengthened spots, the centres of which are sunken with a well raised border. The growing fungus does not extend deeply into the tissues, although the central area is depressed; but the affected parts rupture and spores are produced on the ends of mycelial threads; these drop off and form new centres of the disease. (See fig. 7). On the leaves it produces minute brownish spots of lighter color in the centre and raised borders surrounding the whole.

When the berries become affected, they show brownish or blackish specks with a more or less circular outline; the centres of these become gray, and surrounding this sometimes a conspicuous red ring appears with a dark border on the outside of it. This presents such a characteristic appearance, that the term "Bird's-eye Rot," (See fig. 8) has been applied to the disease. Berries attacked do not wither or turn brown as those referred to in "Black Rot" and "Brown Rot"; but the portion affected becomes somewhat wrinkled, and the berries assume an irregular shape. The spores of this seem to live during the winter upon the diseased portions of fruit, leaves or shoots.


Fig. 7.

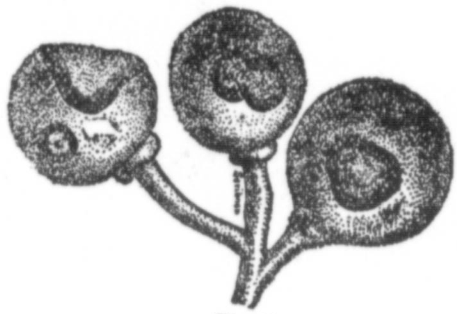


Fig. 8.

Remedies.—Sulphur has given good results. But it would be a great improvement to spray the canes with a solution of copper sulphate (1 lb. copper sulphate in 20 gals. water) before the buds start. The careful and thorough application of Bordeaux mixture, as directed in the Conclusions of this bulletin, will be followed by but very slight if any attacks upon the grape, by the four parasitic plants discussed.

Conclusions.

From a study of the nature and habits of the fungi discussed in this bulletin, we make the following conclusions:

1. Destroy as far as possible all affected material, such as diseased leaves, canes and berries.

2. Before the buds start spray with a solution of copper sulphate (1 lb. in 25 gals. water).

3. After growth starts spray once at least before the vines bloom, using Bordeaux mixture (see below); if twice, make the first application as soon as the leaves appear and the second just before blooming.

4. After bloom, as soon as the fruit sets, make three applications at intervals of 12 to 15 days, with the Bordeaux mixture.

The coloring of the berries by this mixture may be overcome by using in the last application an ammoniacal solution of copper carbonate (see below); or it may be removed by dipping the fruit in a solution of vinegar (2 quarts vinegar in 10 gals. water) and then rinsing it in clean water.

5. The best fungicides to prevent the diseases of the grape are (*a*) copper sulphate, 1 lb. in 25 gals. water, for early treatment; (*b*) Bordeaux mixture, 6 lb. of copper sulphate, 4 lb. fresh lime, 45 gals. water. In making this we grind the copper sulphate and dissolve it in a few gals. of water, slake the lime with about 6 gals. of water; after cooling strain it through some coarse sacking into the barrel that contains the copper sulphate solution and stir it well, adding the rest of the water necessary to make up the mixture; (*c*) eau celeste, 2 lb. copper sulphate, $2\frac{1}{2}$ lb. washing soda, 2 pints ammonia and 25 gals. water. Dissolve the copper sulphate in 2 gals. of water, the $2\frac{1}{2}$ lb. washing soda in another vessel of water, mix these and when chemical action has ceased add 2 pints of ammonia; (*d*) ammoniacal solution copper carbonate; 3 oz. copper carbonate, 2 pints of ammonia, 25 gals. water. Dissolve the 3 oz of copper carbonate in 2 pints of ammonia, and when about to use dilute with 25 gals. water. Of these the Bordeaux mixture is likely to rank first.

6. These mixtures can be applied with great efficiency by using a knapsack sprayer with Vermorel nozzle or a barrel pump, drawn upon a stone-boat between the rows.

IMPURITIES IN CLOVER SEED.

Notwithstanding the advancement that has been made in the thorough cultivation of land by the farmers of Ontario, we find the number of species among weeds is on the increase.

This likely arises from a tendency among farmers to introduce seed from other places and not confine themselves for seed to the product of their own farms. Among the seed frequently changed, we may place clover, which on account of its size and form is very difficult to rid of impurities; on this account we may consider it as being a chief source of the introduction of weeds into many farms. The writer obtained sixty samples of clover seed from various parts of Ontario for the purpose of examining them in reference to their purity, cleanliness and vitality. These samples were obtained from wholesale seedsmen, seedsmen selling on commission, and from farmers. The results from an examination of these are interesting, as they show a marked difference in the number of weeds found in each.

In testing the samples three things were kept under consideration:

1. The *purity* of the seed; that is, the extent to which it was true to its kind.

2. The *cleanliness* of the seed; referring to its freedom from the seeds of weeds and foreign substances such as bits of stone, glass, etc.

3. The *vitality* of the seed with reference to its germinating power, when placed under favorable conditions.

Testing seeds for these three characteristics is now becoming quite a common practice among seedsmen of reputation, both in the United States and Canada; and thus we find almost invariably in connection with the wholesale seed houses a *testing-ground*, the presence of which has a great tendency to strengthen the confidence of customers.

In England and Germany the law demands seedsmen to guarantee the *vitality*, *purity* and *cleanliness* of the seeds offered for sale.

This has had a most beneficial effect upon the seed sold in those countries to farmers and gardeners, but it does not interfere with export trade, so that while great care may be exercised to sell a good article at home, yet a much inferior may find its way into our country. Much loss is sustained yearly from seed being not *true* to name, not *clean* and low in *vitality*, and as yet there seems no redress for the unfortunate purchaser in Ontario. It is claimed that most seedsmen are sufficiently jealous of their reputation to be a safeguard against imposition. This may be true to some extent, but it is feared there are many who run the risk of selling seeds they would not if they knew the law was ready to protect the unlucky purchaser. There is no doubt the use of "testing-grounds" by seedsmen has lessened the trouble very much.

We would scarcely imagine that men would stoop to grind up quartz, sift and color it, so as to adulterate clover seed, and yet this has been conclusively shown to have been followed by some. Cases have occurred in which men have had hundreds of pounds of this spurious material sold to them in adulterated clover seed. Clover seed may be considered one of the most impure seeds in the market.

In making our observations, one-half ounce of the seed was taken from the sample obtained and the number of weed seeds, particles of sand, dirt, etc., carefully counted. The species of weed seed was also noted. One hundred seeds were tested for *vitality* by placing them in conditions favorable to germination, such as moisture, suitable temperature and darkness. The number that sprouted showed the per cent. vital.

The vitality of seeds can be fairly well ascertained by placing seeds between sheets of blotting paper laid on sand, and keeping the paper moist. The samples should be where the temperature is not lower than that of the air. If it can be kept about 75° to 85° F. all the better. Some place the seeds on a piece of flannel and cover them also with flannel. The whole is placed in a saucer or plate, kept moist in a warm room and allowed to germinate. If one hundred seeds are used the number germinating indicates the per cent. vital.

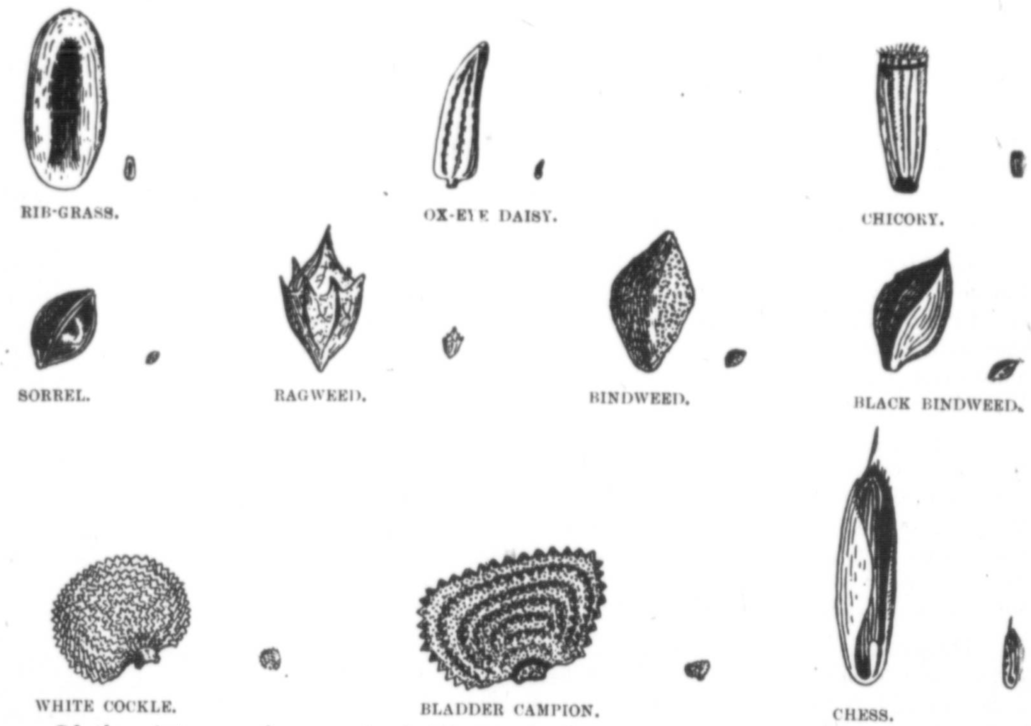
If seeds are scattered upon a piece of black cardboard the foreign grains, etc., can be readily detected.

Tabulated statement showing impurities in Clover Seed.

Where from.	No. of weed seeds in ½ oz.	Other impurities, sand, etc	Per cent. of weed seeds.	No. of weeds to clover plants in a square yard.		Kind of clover.	Vitality per cent.	Kind and number of weed seeds.									
								Grass.	White cockle.	Sorrel.	Campion.	Chicory.	Rib-grass.	Ragweed.	Smart-weed.	Chess.	Black bindweed.
Uxbridge ..	117	some	.58	4	to 789	A	93	103	3	10	1						
“ ..	135	much	1.44	10	733	R	94	92	27	......	....	4	12				
“ ..	420	“	2.1	17	776	A	92	206	78	103	....	7	19				
Guelph	485	little	5.17	38	705	R	90	273	61	72	....	5	61	3	....	10	
Lindsay	607	some	6.07	24	769	A	93	550	24	....	....	26	....	....	....	..	7
*Toronto	......	clean	......	......	......	R	95										
“	9	“	.09	.3	793	A	95	7	2								
* “	6	“	.06	.4	743	R	98	3	2	1							
“	30	some	.3	1	792	A	96	21	9	6	....	4					
Guelph	47	little	.5	4	739	R	92	25	7	12	3						
St. Marys .	78	“	.39	3	790	A	94	61	9	7	....	....	....	....	....	1	
* “ ..	2	much	.02	.15	743	R	93	2									
*London	4	little	.04	.31	743	R	95	2	....	2							
“ ...	64	much	.32	2.5	790	A	96	40	12	......	....	....	12				
*Hamilton ..	4	clean	.04	.31	743	R	98	4									
“ ..	57	fair	.28	2	791	A	97	12	42	......	....	....	....	....	....	..	3
Toronto	168	some	.8	6	787	A	91	100	56	......	....	2	....	....	....	2	8
* “	2	clean	.02	.15	743	R	94	2									
Bowmanville.	4	some	.04	.31	743	R	94	1	....	3							
“	22	clean	.11	.8	792	A	96	8	....	3	9	1	....	....	....	1	
*Toronto	4	“	.04	.31	743	R	97	1	....	1	2						
“	34	fair	.17	1	792	A	87	14	....	11	9	....	....	....	....	1	
Waterford ..	16	“	.17	1	742	R	90	4	4	5	3						
“ ..	1,824	clean	9.	72	721	A	83	4	....	1,820							
Simcoe	9	little	.09	.7	742	R	79	....	....	9							
“	120	“	1.2	9	734	R	89	4	....	116							
† “	4,540	much	22.7	180	613	A	49	....	....	4,540							
St. Marys ..	748	little	3.7	29	764	A	91	34	....	714							
Vaughan	540	fair	5.7	42	701	R	89	....	....	......	....	...	540				
St. Marys ..	106	“	1.1	8	735	R	87	85	....	12	1	2	. .	....	5	..	1
Guelph	51	“	.54	4	739	R	83	12	4	30	....	4	....	1			
Brantford ..	16	clean	.17	1	742	R	83	5	....	6	....	2	....	....	....	3	
Guelph	4	some	.04	.31	743	R	87	4									
“	51	fair	.54	4	739	R	90	28	....	10	13						
“	1,712	much	8.5	67	726	A	69	720	360	540	....	92					
Embro	2	clean	.01	.1	793	A	93	2									
“	1	“	.01	.07	743	R	93	....	....	......	....	....	1				
Woodville ..	6	“	.06	.4	743	R	89	6									
“ ..	36	“	.18	1	792	A	90	4	32								
Huron Co ...	43	fair	.45	3	740	R	92	10	....	27	....	2	4				
“ ...	765	much	3 8	30	763	A	87	300	22	443							
Guelph	805	fair	4.02	31	762	A	90	39	....	742	....	22	....	2			
“	36	clean	.3	2	741	R	92	2	....	34							
Middlesex ..	14	much	.07	.5	792	A	89	6	7	......	....	1					
“ ..	8	“	.08	.61	743	R	84	8									
Kingston	16	“	.08	.61	793	A	65	....	15	......	....	1					
“	1	clean	.01	.07	743	R	97	1									
Bruce Co	120	fair	.06	4	789	A	89	63	15	39	..	3					
“	8	clean	08	.61	742	R	94	5									
Oshawa	82	“	.82	6	737	R	89	67	3	7	....	....	....	....	5		
Waterloo Co.	2	“	.02	.15	743	R	95	2									
Dundas	5	“	.05	.3	743	R	93	3									
“	200	fair	1.	7	786	A	84	22	....	175	....	.. .	....	3			
Russell Co ..	15	clean	.16	1	742	R	92	10	1								
Owen Sound.	210	some	1.05	8	785	A	82	160	30	18	....	2					
Guelph	55	fair	.27	2	791	A	85	17	33	......	....	....	5				
*Toronto	1	clean	.01	.07	743	R	94	1	....	......	....	....	....	....	4		
* “	10	“	.05	.03	793	A	93	3	7								
Kingston	7	“	.07	.49	742	R	92	....	...	2	....	....	4	....	....	..	1
Toronto	15	“	.07	.5	792	A	91	....	5								

1 lb. of alsike clover=640,000 seeds. 1 lb. of red clover=300,000 seeds. Rate of sowing used in the above calculations: Alsike, 6 lb. to the acre; red clover, 12 lb. to the acre. Under the column "Kind of clover," A indicates alsike, R red. * Were obtained from wholesale seedsmen. † A sample as obtained from a farmer before cleaning. 117 weeds in ½ oz. alsike would give 22,464 weeds in an acre. 135 weeds in ½ oz. red clover would give 51,840 weeds in an acre.

The following figures represent the forms of the seeds of some of the most common weeds, enlarged and natural size:



Of the sixty samples examined, 53 contained grass seeds; 27, seeds of white cockle (*Lychnis vespertina*); 32, sorrel (*Rumex acetosella*); 8, Campion (*Silene inflata*); 17, chicory (*Cichorium intybus*); 9, rib-grass (*Plantago lanceolata*); 4, ragweed (*Ambrosia artemisiaefolia*); 3, smartweed (*Polygonum Pennsylvanicum*); 5, chess (*Bromus secalinus*); 5, black bindweed (*Polygonum convolvulus*).

CONCLUSIONS.

1. The number of seeds present is of more importance than their weight in determining the number of weeds.

2. The presence of weed seeds is far more serious than any adulteration from pieces of quartz, gravel, wood, etc.

3. It is a great mistake to buy cheap seed, as it is likely to possess poor vitality by being old and to contain the seeds of weeds. Seedsmen who sell pure seed require expensive machines to clean it, and therefore cannot be expected to sell their seed as cheap as those who take but little pains to have a good article.

Nos. 6, 8, 12, 13, 15, 18, 21, 57, 58 were obtained from wholesale seedsmen; No. 27, a sample from a firm before it had been cleaned, while most of the others were from commission merchants or farmers.

4. Among the most common foreign seeds likely to be in clover are: Grass seeds, white cockle, sorrel, rib grass, ox-eye daisy, chicory, smartweed, chess, black bindweed, false flax and thistle.

5. Every farmer should have a collection of the seeds of weeds. It would not be a difficult matter to collect a sample of each; this would be of great assistance in identifying the seeds of weeds which might become a great pest.

6. Farmers should examine carefully all new seeds from other places. A very few weed seeds in half an ounce of seed will be thousands in what is required to sow an acre. (See table.)

7. The samples examined were quite true to name; the vitality of the seeds was high, many reaching over 90 per cent. It is usual to deduct 8 per cent. from the laboratory test to represent the field vitality, where conditions are not so favorable to germination.

HOW TO PREVENT SMUT.

Clean Seed. If there are no smut spores upon the grain sown, there will not likely be smut upon the plants that grow from it.

Hot Water. It has been conclusively shown that smut spores upon wheat or oats can be destroyed by immersing the grain for fifteen minutes in water at a temperature of 132°F. This not only destroys the smut spores, but hastens the germination of the grain and improves the general growth of the plants. The difficulty in this treatment is to maintain a temperature of 132°, for if it falls below 130° or rises beyond 135, the remedy is likely to fail.

Any way by which this temperature of 132°F. can be kept up and the grain immersed in it twelve to fifteen minutes may be adopted. Some persons take two vessels, one containing water at 110°F to 120°F, the other water at 132°F. Whatever quantity of grain is taken each time for treatment, it should be much less in bulk than the water into which it is to be immersed. The grain is put into a basket or bag made from loosely woven material, so as to permit the water to pass in and out readily without the grain straining through.

The grain is first put into No. 1 a minute or two, raised up and down a few times so that it may be thoroughly wet, and heated so as not to lessen the temperature of No. 2, into which it is next plunged and moved about for twelve to fifteen minutes, so as to be thoroughly saturated. It is very important to keep the temperature of the water in this vessel at 132°; if it sinks below add warm water and if it rises above add cold water, never allowing it to reach higher than 135° or lower than 130°. The grain, after having been raised and lowered into No. 2 several times for twelve to fifteen minutes, is lifted out and cooled, either by dipping it into cold water or by pouring cold water upon it.

Considerable smut may be removed before treating with hot water, by placing the grain in a vessel of cold water and stirring it about for thirty minutes. The smutty grains will float to the top and may be skimmed off.

Chemical Solutions. In treatment by using solutions of chemical compounds, there is always a risk of injuring the germinating power of the grain.

But this method has been long followed with much success, usually more in the case of wheat smut (bunt) than that upon oats (loose smut).

In both cases the *hot water* remedy ranks the most successful. There are many solutions that have been tried, but we shall refer to only two. It is generally believed that a strong solution used for a short time is better than a weak one for a longer period, especially where the seed is to be sown by a seed-drill. When grain is allowed to soak for a long time, it does not readily pass out of the drill, and hence using a stronger solution for a shorter time is preferred.

The following are among the best solutions that have been tried:

1. One pound *Copper Sulphate* (blue vitriol) dissolved in three gallons of water. Wet the grain thoroughly with this solution and then dry it gradually or sprinkle slaked lime upon it.

2. Three pounds of *Copper Sulphate* dissolved in five gallons of water. Wet the grain thoroughly and dry by sprinkling plaster or slaked lime upon it and mix well. This quantity will be about sufficient for fifteen bushels of grain.

3. One pound *Copper Sulphate* dissolved in twenty gallons of water. Allow the seed to remain in this twelve to fifteen hours and put it in lime water for ten minutes and then dry.

4. One pound *Potassium Sulphide* (liver of sulphur) dissolved in ten gallons of water. Allow the grain to steep in this twelve hours, stirring it from time to time so as to thoroughly mix; then spread the grain so as to dry.

5. One pound *Potassium Sulphide* dissolved in twenty gallons of water. Steep the grain in this twenty-four hours.

In closing this report I wish to express my thanks to yourself and to the Minister of Agriculture for the liberality and readiness shown to supply the equipment asked for from time to time, for the purpose of increasing the usefulness of the department over which I have the honor to preside.

Your obedient servant,

J. HOYES PANTON,
Professor of Natural History.

ONTARIO AGRICULTURAL COLLEGE,
December 31st, 1894.

PART III.

REPORT OF

THE PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College:

SIR,—It affords me pleasure to submit herewith the report of the department of Chemistry for 1894.

The changes in the order of lectures and in the text-books in my department, recommended in my report of last year and authorized by you, have proved to be wise changes. The plan of requiring the students of the third year to pay for the chemicals used by themselves, instead of paying a fee, has operated satisfactorily to all concerned.

More samples of soil, marls, wood ashes, fertilizers, etc, have been sent to our laboratory for analysis this past year than any other year since my appointment. In cases of general interest, we undertake, as far as time permits, the examination of the above materials; but in no case, since no charge is made, do we undertake analysis of a private nature, calculated to advance the interests of certain individuals or companies.

During the year just closing, and immediately after the conclusion of the third year examinations in May, we devoted several weeks to official analysis in connection with the American Association of Official Agricultural Chemists. The time thus spent was devoted to the investigation of the several methods of determining phosphoric acid in its different forms, proposed by the official reporter on phosphoric acid. The importance of this kind of work to the science of agriculture cannot be overestimated. My assistant, Mr. R. Harcourt, and myself were joined in this work by Messrs. Ferguson, McCallum and Kennedy, all of whom were members of the graduating class of 1894. To these gentlemen, I beg to extend my thanks for their assistance in ascertaining the best methods of determining phosphoric acid in soils, manures, feeding-stuffs, etc.

My report is arranged under the following heads:

The Composition of Cheese and Whey in Relation to each other.

Analysis of Soils from Lake Temiscaming District.

Analysis of Fish Manure.

Analysis of varieties of Turnips, Swedes, and Mangels.

Effects of thinning on the Composition of Roots.

THE COMPOSITION OF MILK, CHEESE, AND WHEY IN RELATION TO ONE ANOTHER.

An extensive chemical analysis of milk, cheese, and whey was begun by us early in May last, to study the constituents of milk in their relation to the yield of cheese. This line of study was suggested by the excellent work upon the investigation of cheese commenced at Geneva, N.Y., in 1891, and by important conclusions drawn therefrom. It is to study this question from the standpoint of Ontario conditions, as well as to bring new facts to light, that this line of chemical investigation has been entered into.

The principal points of the present investigation are:

1st. The degree of uniformity in the proportion of fat to casein in our milk.

2nd. The relation of the fat contained in our milk to its cheese-producing power.

3rd. The proportion of the fat of the milk lost in whey by our method of cheese-making.

4th. Fat as a basis in apportioning dividends to patrons.

5th. The average composition of our milk, cheese, and whey.

Compounds Contained in Milk, Cheese, and Whey.

Water. Milk contains about 87.6, cheese 34.6, and whey 93.4 per cent. of water.

Fat. The fat of milk, cheese, and whey is a mixture of glycerol salts of several acids, and is the same substance that forms so large a portion of natural butter. Milk contains about 3.5, cheese 35.5, and whey 0.24 per cent. of fat.

Casein. This is the chief nitrogenous substance in milk, and is commonly called curd. This curd or casein can be precipitated in milk by acids or by the use of rennet. Milk contains about 2.3, cheese 22.1, and whey 0.13 per cent. of casein.

Albumen. Albumen is similar in composition to casein; but, unlike it, is not thrown down or made insoluble by acids or the action of rennet. In cheese-making, the albumen passes more or less completely into the whey. The amount in milk is about 0.7, in cheese 1, and in whey 0.76 per cent.

Total Solids. By this term are meant all the compounds (except water) taken together.

Plan of Securing Samples for Analysis.

The milk used was from our herd of twenty cows. Each cow's milk was tested with a Babcock tester as soon as drawn, and the milk from the herd divided into two lots according as it indicated a high or a low per cent. of fat. Lot L represented milk low in fat; lot H milk high in fat. In addition, milk was purchased from two or more neighboring farmers and added to lot L or H, according to whether the per cent. of fat was low or high. After being thoroughly mixed, 300 pounds were taken from each lot and put into separate vats to be made into cheese. From each vat a sample for chemical analysis was taken; and to replace these samples, equal quantities from lots L and H were added to their respective vats. The milk of each vat, being exactly 300 pounds, was made into cheese by a skilful maker, under exactly similar conditions. Cheese was made in this way every day during the first week of May and of June. Samples of milk were taken for analysis on the 2nd and 7th days of May, and 4th, 6th and 8th days of June. The cheese and whey of these dates were also sampled and analyzed. The following tables give duplicate analyses of these samples of milk, cheese and whey.

Lot H represents the rich milk, in which the per cent. of fat is 3.915. It took an average of 9.4 pounds of this milk to make one pound of cheese. Lot L represents the poor milk, containing 3.302 per cent. of fat and requiring 10.3 pounds of milk to make one pound of cheese. Out of the following tables we have selected all the full duplicate analyses and have made from them our general averages for milk, whey, green cheese, and cheese one month old.

COMPOSITION OF MILK, CHEESE AND WHEY.—FIRST PERIOD.

Lot H.	Per cent. of water. Milk.	Cheese.	Whey.	Per cent. of solids. Milk.	Cheese.	Whey.	Per cent. of fat. Milk.	Cheese.	Whey.	Per cent. of casein. Milk.	Cheese.	Whey.	Per cent. of albumen. Milk.	Cheese.	Whey.	Pounds green cheese from 100 lb. milk.
May 2nd I	87.756	36.061	93.170	12.244	63.939	6.830	3.474	33.775	.125	2.181	17.337	.356	.744	....	.412	....
II	88.235	35.752	93.747	11.765	64.248	6.253	4.325	31.619	.183	....	....	.355	....	....	.332	....
Average	87.995	35.906	93.458	12.005	64.090	6.542	3.899	32.697	.154	2.181	17.337	.355	.744	....	.372	9.91
May 7th......... I	87.743	35.931	93.180	12.257	64.069	6.820	3.462	32.994	.406	2.280	21.712	.068	.757	2.356	.800	....
II	88.061	36.089	94.902	11.937	63.911	5.098	3.908	....	.350	2.230	22.725	.068	.588	1.037	.813	....
Average	87.902	36.010	94.042	12.098	63.990	5.958	3.685	32.994	.375	2.255	22.218	.068	.672	1.697	.806	9.75
June 4th I	87.343	34.700	92.920	12.657	65.300	7.080	4.387	37.687	.216	2.445	20.981	.039	.561	.956	.892	....
II	86.710	34.052	92.952	13.290	65.918	7.048	4.290	38.601	.191	2.445	20.800	.071	.742	1.300	.822	....
Average........	87.026	34.376	92.936	12.973	65.624	7.064	4.338	38.144	.203	2.445	20.890	.055	.651	1.128	.857	11.25
June 6th I	86.893	33.628	....	13.108	66.372	....	3.660	36.546	....	2.556	22.903	....	.725	.609	....	....
II	86.875	33.287	....	13.125	66.713	....	3.650	35.437	....	2.181	22.868	....	1.056	.713	....	....
Average....	86.883	33.457	....	13.116	66.543	....	3.655	35.991	....	2.368	22.885	....	.891	.661	....	10.91
June 8th I	87.081	34.747	93.269	12.919	65.253	6.731	4.004	34.274	.186	2.631	22.025	.143	.491	.706	.757	....
II	87.142	35.115	....	12.858	64.885	....	3.996	33.961	.210	2.162	22.356	.151	.971	.837	.744	....
Average	87.111	34.931	93.269	12.888	65.069	6.731	4.000	34.117	.198	2.396	22.190	.147	.781	.772	.750	10.83
Average of all	87.383	34.936	93.426	12.616	65.063	6.574	3.915	34.788	.232	2.329	21.104	.156	.747	1.064	.696	10.53
Lot L.																
May 2nd I	87.897	35.216	93.175	12.103	64.784	6.825	3.446	33.806	.120	2.131	17.212	.200	.694	....	....	....
II	87.951	35.167	93.200	12.049	64.833	6.800	3.518	34.456	.164	2.081	....	.187	.637	....	....	....
Average.........	87.924	35.191	93.187	12.076	64.809	6.813	3.482	34.131	.142	2.106	17.212	.193	.665	2.568	....	9.25
May 7th........ I	88.086	36.117	93.196	11.914	63.883	6.804	3.237	33.221	.249	2.380	21.931	.100	.651	....	.800	....
II	88.166	36.167	93.191	11.834	63.833	6.809	3.149	32.201	.325	2.460	....	.093	.477	....	.913	....
Average.......	88.126	36.142	93.193	11.874	63.858	6.807	3.193	32.211	.287	2.420	21.931	.096	.564	1.572	.875	9.19
June 4th I	88.113	35.682	....	11.887	64.318	....	3.091	33.872	.214	2.176	22.162	.065	.730	1.769	.985	....
II	88.119	35.001	95.180	11.881	64.999	4.820	3.070	34.525	.210	2.256	23.034	.065	.556	1.103	.891	....
Average........	88.116	35.341	95.180	11.884	64.659	4.820	3.080	34.196	.212	2.216	22.598	.065	.643	1.436	.938	9.42
June 6th I	87.837	35.021	....	12.163	64.979	....	3.140	35.126	....	1.993	22.381	....	....	.725	....	....
II	87.680	34.779	....	12.320	65.221	....	3.248	35.087	....	2.100	21.525	....	....	2.100	....	....
Average........	87.758	34.900	....	12.242	65.100	....	3.194	35.106	....	2.046	21.953	....	.779	1.412	....	9.92
June 8th I	87.469	35.700	94.032	12.521	64.300	5.968	3.564	33.584	.205	2.362	20.637	.068	.831	....	.889	....
II	87.425	35.804	93.399	12.575	64.196	6.601	3.564	33.468	.235	2.293	....	.059	.963	....	.890	....
Average.........	87.447	35.752	93.715	12.548	64.248	6.284	3.564	33.526	.220	2.327	20.637	.063	.897	1.359	.889	10.33
Average of all	87.874	35.465	93.819	12.115	64.535	6.181	3.302	33.834	.215	2.223	20.866	.104	.709	1.669	.900	9.62

Table showing average composition of milk, whey and cheese.

——	Water.	Total solids.	Fats.	Casein.	Albumen.	Sugar, ash, etc.
Milk.						
Average of 18 duplicate determinations of 9 distinct samples	87.687	12.318	3.546	2.279	0.704	5.789
Average for 1893 at 48 American factories.	87.280	12.72	3.77	2.48	0.69	5.78
Whey.						
Average of 12 duplicate determinations of 6 distinct samples	93.435	6.564	0.239	0.130	0.759	5.436
Average for 1893 at 48 American factories.	93.00	7.00	0.38	0.86		5.76
Green Cheese.						
Average of 10 duplicate determinations of 5 distinct cheeses	34.601	65.399	35.511	22.103	1.082	6.703
Average for 1893 at 48 American factories.	36.84	63.16	33.90	23.32	....	5.94
Cheese one month old.						
Average of 12 duplicate determinations of 6 distinct cheeses	32.529	67.471	36.061	18.607	5.328	7.475

The above table shows a marked degree of uniformity between Canadian and American averages.

As a check upon the amount of the fat of the milk retained in the cheese, fat determinations of cheese were made directly, and also by difference between the fat lost in the whey and that contained in the milk. Making allowances for the difficulty of determining accurately the fat in cheese, owing to its somewhat uneven distribution, the figures in the last two columns of the following table, obtained by direct determination and by difference, agree closely, and point to a conclusion entirely in accordance with that arrived at by the Geneva station, viz , that "the loss of fat in cheese-making is quite independent of the amount of fat in milk." Another feature brought out in this table, and one which reflects credit upon the maker, is the small amount of the fat of the milk lost in the whey.

Table showing pounds of fat in cheese and whey from 300 pounds of milk.

	Date.	Pounds of milk.	Per cent. of fat in milk.	Per cent. of casein.	Ratio of fat to casein.	Pounds of fat in 300 pounds of milk.	Pounds of cheese from 300 pounds of milk.	Ratio of fat to green cheese.	Pounds of fat in yield of whey.	Pounds of fat in yield of cheese. By direct determination.	Pounds of fat in yield of cheese. By difference.
L..	June 4.....	300	3.080	2.216	1:0.71	9.24	28.25	1 : 3.0	.58	9.66	8.66
	May 7.....	300	3.193	2.420	1:0.75	9.58	27.50	1 : 2.8	.78	8.86	8.80
	June 6.....	300	3.194	2.046	1:0.64	9.58	29.75	1 : 3.1	.....	10.44	....
	May 2.....	300	3.482	2.106	1:0.60	10.45	27.75	1 : 2.6	.39	9.47	10.06
	June 8.....	300	3.564	2.327	1:0.65	10.69	31.00	1 : 2.8	.59	10.39	10.10
	Total....	1,500	3.302	2.223	1:0.67	49.54	144.25	1 : 2.9	....	48.82	....
H..	June 6.....	300	3.655	2.368	1:0.65	10.97	32.75	1 : 2.9	....	11.79	....
	May 7.....	300	3.685	2.255	1:0.61	11.05	29.25	1 : 2.6	1.02	9.65	10.04
	May 2.....	300	3.899	2.396	1:0.59	11.70	29.75	1 : 2.5	.41	9.73	11.29
	June 8.....	300	4.000	2.445	1:0.56	12.00	32.50	1 : 2.7	.53	11.09	11.47
	June 4.....	300	4.338	....	....	13.01	33.75	1 : 2.5	.54	12.87	12.47
	Total....	1,500	3.919	2.366	1:0.60	58.73	158.00	1 : 2.6	....	55.13	....

The best method of paying for milk delivered at cheese factories is a subject of great importance to cheese-makers and patrons of cheese factories. Certainly the old method, viz., that of paying for milk according to weight alone, is not satisfactory. Of late there is a tendency, particularly among American cheese men, to pay according to the amount of fat contained in the milk. The justice of this method evidently depends upon the constancy between the per cent. of fat and the yield of cheese.

In the table the percentages of fat are arranged in the order of their amounts in both L and H, giving a range from 3.080 in L to 4.338 in H. In this table also the L and H samples are separately grouped to give an average for L samples, representing milk low in fat, and for H samples, representing milk high in fat. An examination of the figures under "ratio of fat to casein" reveals a gradual decrease with some variation in the proportion of casein to fat as the milk increases in richness. By comparing the groups it will be seen that L, with an average of 3.302 per cent. of fat, gives on an average 0.67 of one pound of casein to one pound of fat; and H, with an average of 3.919 per cent. of fat, gives on an average 0.60 of one pound of casein to one pound of fat. While it would not do to conclude hastily from these tests, covering only one week in each of two months, that milk containing 4 per cent. of fat contains less casein in proportion to its fat than milk which contains 3 per cent. of fat, still it must be admitted that these results point in that direction. Below are given the results of tests along this same line made by the Geneva Station (Bulletin 68, New Series). Samples of milk were collected once each week through the entire season from the herd which gave milk richest in fat and also from the herd which gave milk poorest in fat. The average results secured from each of these two herds during the season were as follows:

—	Average per cent. of fat in milk.	Average per cent. of casein in milk.	Pounds of casein for one pound of fat in milk.
Herd giving milk poorest in fat..........	3.33	2.20	0.66
Herd giving milk richest in fat.....	4.08	2.57	0.63

These results show that the milk poorest in fat contained a trifle more casein for each pound of fat in milk; but, for all practical purposes, the results may be regarded as showing uniformity in the relation of fat to casein in factory milk from different herds.

Our averages for the milk poorest in fat and for the milk richest in fat are practically the same as those of the Geneva poorest and richest milk; their tests cover one day of every week throughout the season and our tests cover the first week of May and of June; the conclusions drawn from their results and from ours are the same, viz., that the poorest milk contains more casein for each pound of fat, but Geneva found a difference of 0.03, while we found a difference of 0.07.

From the milk having more casein for each pound of fat, more cheese for each pound of fat would be expected, than from the milk having less casein for each pound of fat. What are the facts? Fifteen hundred pounds of milk L, containing an average of 3.302 per cent. of fat or a total of 49.539 pounds, yields 144.25 pounds of green cheese, being 2.9 pounds of cheese for each pound of fat. The same weight of milk H, containing an average of 3.919 per cent. of fat or a total of 58.73 pounds, yields 158 pounds of green cheese, being 2.6 pounds of cheese for each pound of fat. Under exactly similar conditions of handling, the rich milk yields $13\frac{3}{4}$ pounds more cheese than the poor milk, but the poor milk makes $\frac{3}{10}$ of one pound of cheese more for every pound of fat than does the rich milk.

Suppose L and H to represent two patrons, each supplying 1,500 pounds of milk. L's milk yields 144.25 pounds of cheese and H's milk 158. Then, if the cheese nets 9 cents, patron L should receive 144.25×9 or \$12.98; and H, 158×9 or \$14.22. Had these patrons been paid according to weight of milk alone, each would have received equal shares. In all, 302.25 pounds of cheese were made, netting 9 cents a pound, $302.25 \times 9 =$ \$27.20 would be divided equally, each patron receiving \$13.60. Accordingly, patron L, supplying the poor milk, would be paid 62 cents too much, and patron H 62 cents too ittle.

Second Period.

The principal points being investigated in the chemical analyses of milk, cheese and whey, now in progress at this College, the plan of securing samples for analyses, and the results obtained during May and June, are given on page 20. During those two months, particularly May, there was plenty of rain, and pasture was abundant.

The average percentage of fat of the samples of milk (five in number) testing 3.6 and over, was 3.915, or practically 4. It took an average of 9.4 lb. of this milk to make one pound of cheese; the milk contained an average of one pound of fat to .60 lb. of casein, and it yielded 2.6 lb. of cheese per one pound of fat. The average percentage of fat of the samples (five in number) testing under 3.6, was 3.302. It took 10.3 lb. of this milk to make one pound of cheese. The milk contained one pound of fat to .67 lb. of casein; and it yielded 2.9 lb. of cheese per one pound of fat. That is to say, the milk high in fat made more cheese per pound of milk, contained less casein per pound of fat, and yielded less cheese per pound of fat than the milk low in fat. The investigations outlined on page 20 are being continued along exactly the same lines.

Herewith are given, in comparison with those already published, the results for July and August. During this experimental period the weather was unusually dry; and the pasture was less abundant than during May and June. The average of all full duplicate determinations shows that the milk of May and June contained .059 per cent. less fat and .019 per cent. more casein than the milk of July and August.

The table below gives the composition of the milk and that of the cheese and whey obtained from it, on four different dates for lot L, or milk low in fat, and lot H, or milk high in fat. The figures showing the composition of the milk of any particular date and vat, and those of the cheese and whey made from that milk occur on the same line of averages. In lot H the milk of Aug. 2nd and July 31st was the richest in fat, containing a little over 4 per cent. The percentage of fat in the cheese of these dates is about one higher than that in the cheese of July 5th, made from milk containing 3.819 per cent. of fat, and about 3.5 higher than that in the cheese of July 7th, made from milk containing 3.489 per cent. of fat. In lot L, with slight exceptions, a similar relation is evident, *i.e.*, cheese relatively rich in fat comes from milk relatively rich in fat, while cheese relatively low in fat comes from milk relatively low in fat. It can also be said of the whey that the percentage of fat is relatively high or low as the percentage of fat in the milk from which it was made was relatively high or low. The relation in the fat of the milk, the cheese and the whey observed above, was not so evident in the May and June analyses. The fat of the milk being held mechanically in the curd, and tending to separate from it and to rise to the surface, variations in conditions attending coagulation, milling, etc. would materially influence the amount of fat retained by the curd. If exactly similar conditions in every detail could be secured, the fat in the whey would probably vary fairly regularly with the quantity of fat in the milk. In lot H, with one exception, the yield of cheese is in the order of (though not necessarily proportional to) the percentages of fat—the richest milk yielding the greatest quantity of cheese. The exception is in the low yield of cheese on July 31st. It may be accounted for, however, by the gassy condition of the curd of that date, resulting probably, as analysis showed, in a drier and consequently lighter cheese. In lot L, upon the same date, a similar deficiency in yield of cheese occurs. The curd of this cheese was also gassy; and analysis showed a relatively dry cheese. The percentages of fat in the other three samples of milk, and also their yields of cheese are very close. In lot H the average percentage of fat in the milk was 3.849; and it took 9.7 lb. of this milk to make one pound of cheese. In lot L the average percentage of fat in the milk was 3.153; and it took 11.18 lb. of milk to make one pound of cheese. That is, a given weight of rich milk makes more cheese than an equal weight of poor milk.

Composition of Milk, Cheese and Whey.—Second Period.

		Per cent. of water.			Per cent. of solids.			Per cent. of fat.			Per cent. of casein.		Per cent. of albumen.			Pounds of green cheese from 100 lb. milk.
		Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Milk.	Cheese.	Whey.	
Lot H.																
July 5th	I	87.495	34.885	92.936	12.505	65.115	7.064	3.850	35.522	.249	2.518	23.587	....	1.250	1.012	
	II	87.289	34.679	93.004	12.711	65.321	6.996	3.789	36.050	.211	2.500	23.306	....	1.594	.981	
Average		87.392	34.782	92.970	12.608	65.218	7.030	3.819	35.786	.230	2.509	23.446	.744	1.422	.996	10.41
July 7th	I	87.546	34.358	93.393	12.454	65.642	6.607	3.483	33.293	.254	2.300	23.425	1.112	2.543	1.062	
	II	87.464	34.665	93.424	12.536	65 335	6.576	3.495	32.594	.236	2.175	22.568	1.237	3.088	1.012	
Average		87.505	34.511	93.408	12.495	65.489	6.591	3.489	32.943	.245	2.237	22.996	1.175	2.816	1.037	10.25
July 31st	I	87.285	32.691	93.036	12.715	67.309	6.964	4.065	36.386	.341	2.356	23.362	.844	1.781	1.062	
	II	87.306	32.018	93.111	12.694	67.982	6.889	3.967	36.867	.297	2.468	23.400	.744	1.975	.993	
Average		87.295	32.354	93.073	12.704	67.646	6.926	4.016	36.626	.319	2.412	23.381	.794	1.878	1.027	9.82
August 2nd	I	86.989	34.293	93.050	13.011	65.707	6.950	4.092	36.268	.346	2.193	21.837	1.119	.900	1.000	
	II	86.995	34.217	93.036	13.005	65.783	6.964	4.058	36.525	.320	2.181	21.381	1.156	1.719	.972	
Average		86.992	34.255	93.043	13.008	65.745	6.957	4.075	36.396	.333	2.187	21.609	1.137	1.309	.986	10.50
Average of all		87.296	33.975	93.123	12.703	66.057	6.872	3.849	35.438	.281	2.336	22.858	.986	1.856	1.011	10.24
Lot L.																
July 5th	I	88.208	34.755	92.887	11.792	65.245	7.113	3.126	33.802	.276	2.287	24.381	.914	1.850	.875	
	II	88.255	34.969	92.572	11.745	65.031	7.428	3.154	33.174	.276	2.600	25.075	.681	1.200	.956	
Average		88.231	34 862	92.729	11.768	65.138	7.271	3.140	33.488	.276	2.443	24.728	.812	1.525	.915	.941
July 7th	I	88.022	35.802	93.677	11.978	64.198	6.323	2.941	31.637	.190	1.918	23.137	....	......	.887	
	II	88.310	35.829	93.601	11.690	64.171	6.399	2.994	31.642	.233	1.975	22.412	....	......	.943	
Average		88.166	35.815	93.639	11.834	64.185	6.361	2.967	31.640	.211	1.946	22.774	1.110	3.601	.915	9.00
July 31st	I	87.803	34.148	93.302	12.197	65.852	6.698	3.328	33.885	.277	2.037	22.950	.956	1.743	1.012	
	II	87.912	33.591	93.172	12.088	66.409	6.828	3.289	33.851	.285	2.012	22.493	1.019	2.257	.918	
Average		87.857	33.869	93.237	12.142	66.131	6.763	3.308	33.868	.281	2.024	22.721	.988	2.000	.965	8 83
August 2nd	I	88.191	35.410	93.361	11.809	64.590	6.639	3.294	33.974	.287	2.037	22.968	1.113	1.607	.887	
	II	88.294	35.342	93.286	11.706	64.658	6.714	3.101	33.903	.279	1.918	22.725	1.138	1.712	.981	
Average		88.242	35.376	93.323	11.757	64.624	6.676	3.197	33.938	.283	1.977	22.846	1.126	1.660	.934	9.16
Average of all		88.124	34.980	93.232	11.875	65.019	6.767	3.153	33.233	.262	2.097	23.267	1.009	2.196	.932	9.00

Table showing pounds of fat in cheese and whey from 300 pounds of milk.

—	Date	Pounds of milk.	Per cent. of fat in milk.	Per cent. of casein.	Ratio of fat to casein.	Pounds of fat in 300 lb. of milk.	Pounds of cheese in 300 lb. of milk.	Ratio of fat to green cheese.	Pounds of fat in whey from 300 lb. of milk.	Pounds of fat in yield of cheese.	
										By direct determination.	By difference.
Lot L..	July 7th	300	2.967	1.946	1 : 0.65	8.823	27.00	1 : 3.06	.576	8.542	8.247
	July 5th	300	3.140	2.443	1 : 0.77	9.420	28.25	1 : 2.99	.749	9.460	8.671
	August 2nd	300	3.197	1.977	1 : 0.61	9.591	27.50	1 : 2.86	.771	9.332	8.820
	July 31st	300	3.307	2.024	1 . 0.62	9.921	26.51	1 : 2.67	.768	8.975	9.153
	Total.........	1,200	3.153	2.098	1 : 0.66	37.755	109.26	1 : 2.89	2.864	36.309	34.891
Lot H..	July 7th	300	3.489	2.237	1 : 0.64	10.467	30.75	1 : 2.93	.659	10.129	9.808
	July 5th	300	3.819	2.509	1 : 0.65	11.457	31.25	1 : 2.72	.618	11.223	10.839
	July 31st	300	4.016	2.412	1 : 0.60	12.048	29.50	1 : 2.44	.862	9.804	11.186
	August 2nd	300	4.075	2.187	1 : 0.53	12.225	31.50	1 : 2.57	.895	11.464	11.330
	Total.........	1,200	3.849	2.336	1 : 0.60	46.197	123.00	1 : 2.66	3.034	42.620	43.165

On July 31st 300 lb. of milk, lot L, containing 9.921 lb. of fat, yielded less cheese than the same weight of milk, lot L, July 7th, containing 8.823 lb. of fat. Why less cheese from the richer milk? The table of composition shows that the milk of July 31st was the highest in fat and second to the highest in casein of all other samples in lot L. The same table shows that the milk of July 7th was the lowest in fat and in casein of all the samples in lot L. Basing the yield of cheese only upon the composition of the milk, a greater quantity of cheese would be expected from the milk of July 31st than from the milk of July 7th. More actual water-free cheese was obtained from the former milk; but analysis proved that the cheese of the 7th was the wettest and that of the 31st the driest in lot L. This difference in the quantity of moisture retained in the cheese is sufficient in itself to account for the lighter cheese from the richer milk. The above table also shows in lot L more cheese on July 5th than on Aug. 2nd. This is another instance of the poorer milk yielding the greater quantity of cheese. The poorer milk contained only .171 lb. less fat, but 1.398 lb. more casein than the richer milk. The cheese produced from these two samples of milk contained practically equal weights of water. The whey produced also contained practically equal weights of casein and of fat. It would, therefore, appear to be the excess of casein in the poorer sample of milk that enabled this milk to yield a greater quantity of cheese. The analysis reveals a difference in the amount of casein in the cheese of these dates, which is exactly equal to the difference in the casein of the milk of the same dates. This fact is consistent with the above opinion, viz., that the greater weight of cheese from the milk lower in fat was owing to its greater quantity of casein.

In lot H, the lowest yield of cheese occurred on July 31st, and the highest yield on August 2nd. The milk of the 2nd contained only .177 lb. more fat and .675 lb. less casein than the milk of the 31st, but the cheese of August 2nd was two pounds heavier than the cheese of July 31st. Why should there be this difference in the quantities of cheese from equal weights of milk, varying in fat by only .059 per cent.? Three facts in explanation are brought out by analysis, viz., the excess of fat in the milk of the 2nd was not lost in the whey, but was retained in the cheese; the excess of casein in the milk of the 31st was partly lost in the whey; and the cheese of the 31st contained 1.25 lb. less moisture than the cheese of the 2nd. The curd of the 31st was gassy. That of the 2nd was normal. This is another example of gassy curd yielding dry, light cheese.

The milk of July 5th contained, on the whole, .99 lb. more fat, and .816 more casein than the milk of July 7th. Both samples produced normal curd. The analysis of the cheese and whey of these dates showed that the excess of fat and part of the excess of casein in the milk of the 5th were not lost in the whey, but remained in the cheese. A greater yield of cheese, therefore, might be expected on the 5th, and this was the case. As only part of the increased weight in the cheese of the 5th was due to water, the excess of fat and of casein in the milk of the 5th must have contributed to the increase in the weight of the cheese of the 5th.

The average percentage of fat and casein in the milk of July 5th, 7th, 31st and August 2nd, in lots L and H, are arranged, in the above table, in the order of the percentage of fat. The figures, under ratio of fat to casein, show considerable irregularities in the amount of casein per pound of fat. For example, in the richest milk, containing 4.075 per cent. of fat, there is .53 lb. of casein to one pound of fat; while in the milk poorest in fat, containing only 2.967 per cent., there is .65 lb. of casein to one pound of fat. Yet the richest samples do not necessarily contain the lowest amount of casein per pound of fat. For instance, in lot H, the casein in the first and second samples is represented by .64 and .65 respectively, and in lot L, in the third and fourth samples, by .61 and .62 respectively. Notwithstanding these individual irregularities, the average percentage of casein is 2.098 in lot L, and 2,336 in lot H; and the average quantity of casein per pound of fat is .66 lb. in lot L, and .60 lb. in lot H. These figures indicate the tendency of milk rich in fat to be also rich in casein; but that the relative increase in the casein is less than that in the fat.

Lots L and H, the former being milk low in fat and the latter being milk high in fat, represent equal quantities of milk, each being 1,200 lb. The above table shows that the 1,200 lb. of rich milk contained 8.442 lb. more fat and made 13.74 lb. more cheese than the 1,200 lb. of poor milk. But the two richest samples of milk yielded the least, and the two poorest samples the greatest quantities of cheese per pound of fat in the milk. The figures in the column under "Ratio of fat to cheese" clearly indicate a decrease in the proportion of cheese to fat in milk as the samples of milk increase in richness.

Third Period.

The following is a report of the analyses made during September, October and November, together with a summary of all former results. The data along each of the lines of investigation, viz (1) the fat in relation to the casein in milk; (2) the fat of the milk in relation to the yield of cheese; (3) the quantity of the fat of the milk lost in the whey; (4) the fat of the milk as a basis in apportioning dividends to patrons, and (5) the composition of milk, cheese and whey are strikingly concordant in the three periods into which the experimental season is divided.

In all, one hundred and eighty complete analyses, representing thirty distinct samples each of milk, cheese and whey have been made. No variations in methods from those outlined in the first period have been made. But the milk purchased to supplement that from our own herd, as explained above, was not procured from the same parties throughout the experimental season. This circumstance lessens the value of the figures giving general averages in composition.

By comparing the figures in this table showing average of all with similar figures, first, for May and June, and secondly, for July and August, it will be seen that there is practically no difference in the composition of the respective products in these three periods. But by comparing these same figures of lot L with lot H in the above table, and in the other two periods above referred to, at least two products, milk and cheese, contain higher percentages of water in lot L than in lot H, higher percentages of fat in lot H than in lot L, a slightly higher percentage of casein in the milk of lot H than in the milk of lot L, and, in two of the periods, a higher percentage of casein in the cheese of lot L than in the cheese of lot H. These facts show that the composition of the cheese varies nearly as the composition of the milk from which it is made.

Composition of Milk, Cheese and Whey.—Third Period.

—	Per cent. of water.			Per cent. of solids.			Per cent. of fat.			Per cent. of casein.			Per cent. of albumen.			Pounds of green cheese from 100 lb. milk.
	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	
Lot H.												T. N.				
September 4th.... I	87.340	35.593	93.146	12.660	64.407	6.854	3.885	34.792	.409	2.250	21.481	1.206	.925	......	......	......
September 4th.... II	87.388	35.751	93.073	12.612	64.249	6.927	3.889	34.812	.408	2.318	22.231	1.243	.969	......	......	......
Average	87.364	35.672	93.108	12.636	64.328	6.890	2.887	34.802	.408	2.284	21.856	1.224	.947	1.731	......	10.41
September 6th.... I	87.521	35.392	93.281	12.479	64.608	6.719	3.849	35.664	.280	2.143	21.543	.950	.950	1.387	......	......
September 6th.... II	87.577	35.330	92.894	12.423	64.670	7.106	3.821	35.221	.294	2.237	21.206	.925	.938	1.850	......	......
Average	87.549	35.361	93.087	12.451	64.639	6.912	3.835	35.442	.287	2.190	21.374	.937	.944	1.618	......	10.41
October 2nd...... I	87.147	34.500	93.114	12.853	65.500	6.886	4.119	35.385	.285	2.212	22.206	1.050	1.050	.744	......	......
October 2nd...... II	87.204	34.652	93.125	12.796	65.348	6.875	4.034	35.155	.274	2.356	21.866	.993	.919	1.002	......	......
Average	87.175	34.576	93.119	12.824	65.424	6.880	4.076	35.270	.279	2.284	22.036	1.021	.984	.873	......	10.83
October 4th I	87.708	34.785	93.262	11.292	65.215	6.738	3.695	34.936	.302	2.231	21.593	.968	.894	1.494	......	......
October 4th II	87.781	34.985	93.357	12.219	65.015	6.643	3.689	35.194	.268	2.262	22.250	.962	.944	1.125	......	......
Average	87.744	34.885	93.309	12.255	65.115	6.690	3.692	35.065	.285	2.246	21.921	.965	.919	1.309	......	10.41
November 6th.... I	86.898	34.332	92.908	13.102	65.668	7.092	4.019	35.020	.220	2.417	21.175	.918	.851	1.181	......	......
November 6th.... II	86.989	33.918	92.930	13.011	66.082	7.070	3.980	34.879	.211	2.487	21.150	.956	.825	.862	......	......
Average	86.943	34.125	92.919	13.056	65.875	7.081	3.999	34.949	.215	2.452	21.162	.937	.838	1.071	......	10.75
November 8th.... I	87.207	33.918	93.091	12.793	66.082	6.909	3.925	35.065	.198	2.375	22.950	.787	.675	.587	......	......
November 8th.... II	87.211	34.009	93.157	12.789	65.991	6.843	3.931	34.866	.208	2.418	22.675	.818	.675	.737	......	......
Average	87.209	33.963	93.124	12.791	66.037	6.876	3.928	34.965	.203	2.396	22.812	.802	.675	.662	......	10.41
Average of all	87.331	34.763	93.111	12.669	65.231	6.888	3.903	35.082	.279	2.309	21.804	.981	.884	1.139	......	10.53
Lot L.												T. N.				
September 4th.... I	88.454	36.131	93.435	11.546	63.869	6.565	3.138	32.914	.253	2.018	22.962	.993	.850	1.450		
September 4th.... II	88.561	36.041	93.387	11.429	63.949	6.613	3.126	33.151	.245	2.087	22.850	.912	.775	1.400	......	......
Average	88.507	36.086	93.411	11.487	63.914	6.589	3.132	33.032	.249	2.052	22.906	.952	.813	1.425	......	9.00
September 6th.... I	88.521	36.092	93.412	11.479	63.908	6.588	2.943	32.118	.231	2.218	23.375	.918	......	1.693	......	......
September 6th.... II	88.584	36.181	93.384	11.416	63.819	6.616	2.908	32.375	.194	2.043	23.056	.915	......	1.819	......	......
Average	88.552	36.136	93.398	11.447	63.864	6.602	2.925	32.246	.212	2.130	23.213	.916	.682	1.756	......	8.91
October 2nd...... I	87.757	36.191	93.111	12.243	63.809	6.889	3.547	33.604	.226	2.300	22.587	.987	.937	.375	......	......
October 2nd...... II	87.925	35.885	93.143	12.075	64.115	6.857	3.478	33.526	.227	2.181	22.172	1.106	1.049	.784	......	......
Average	87.841	36.038	93.127	12.159	63.962	6.873	3.512	33.565	.226	2.240	22.379	.996	1.003	.679	......	10.16
October 4th I	88.090	35.909	93.290	11.910	64.091	6.710	3.353	34.218	.243	2 281	22.662	.956	.912	.788	......	......
October 4th II	88.029	36.014	93.264	11.971	63.986	6.736	3.373	34.007	.238	2.268	21.925	.968	1.013	1.575	......	......
Average	88.059	35.961	93.277	11.940	64.039	6.723	3.363	34.112	.240	2.274	22.293	.962	.962	1.181	......	9.91
November 6th I	87.755	34.924	93.059	12.245	65.076	6.941	3.458	33.884	.233	2.450	22 531	.862	.725	.727	......	......
November 6th II	87.609	34.663	93.100	12.391	65.337	6.900	3.306	33.752	234	2.368	22.843	.912	.807	.950	......	......
Average	87.682	34 793	93.079	12.318	65.207	6.920	3.382	33 818	.233	2.409	22.687	.887	.766	.838	......	9.94
November 8th.... I	88.007	34.767	93.171	11.993	65.233	6.829	3.379	34.043	.267	2.293	23.125	.831	.656	......	......	......
November 8th.... II	87.949	34.997	93.286	12.051	65.003	6.714	3.477	33.942	.196	2.275	23.093	.800	.582	......	......	......
Average	87.978	34.882	93.228	12.022	65.118	6.771	3.428	33.992	.231	2.284	23.109	.815	.619	1.003	......	9.41
Average of all	88.103	35.649	93.253	11.896	64 349	6.746	3.290	33.461	.232	2.232	22.764	.921	.822	1.153	......	9.55

To produce one lb. of cheese, it takes on an average one lb. more of the milk containing 3 290 percentage of fat than of milk containing 3.903. By referring back to the results of May and June and of July and August, it will be seen that to produce one pound of cheese it took, in the former period, .9 of one pound more of milk containing 3.302 percentage of fat than of milk containing 3.915, and, in the latter period, 1.47 lb. more of milk containing 3.153 percentage of fat than of milk containing 3.849. The average percentage of fat in milk L of the 30 fat determinations made during the season, is 8 248. This milk yielded one lb. of cheese per 10.64 lb. of milk. While the average percentage of fat in milk H of the 30 fat determinations made during the season, is 3 889. This milk yielded one pound of cheese per 9.5 lb. of milk. The figures show that it took practically one pound more of the poorer than it did of the richer milk to make one pound of cheese.

Table showing Average Composition of Milk, Cheese and Whey.

—	Water.	Total solids.	Fat.	Casein.	Albumen.	Sugar, etc.
Milk.						
Average of 18 duplicate determinations of 9 samples, May and June	87.687	12 318	3.546	2.279	0 704	5.789
Average of 10 duplicate determinations of 5 samples, July and August	87.576	12.423	3.605	2.260	0.981	5.575
Average of 22 duplicate determinations of 11 samples, September, October and November	87.641	12.358	3.657	2.283	0.861	5.550
Average of all	87.634	12.366	3.602	2.274	0.848	5.638
Average for 1893 at 48 American factories	87.280	12.72	3 77	2.48	0.69	5.78
Whey.						
Average of 12 duplicate determinations of 6 samples, May and June	93.435	6.564	0.239	0.130	0.759	5.436
Average of 18 duplicate determinations of 9 samples, July and August	93.168	6.831	0.268	0.954		5.590
Average of 24 duplicate determinations of 12 samples, September, October and November	93.182	6.817	0.255	0 951		5.612
Average of all	93.261	6.737	0.254	0.931		5.546
Average for 1893 at 48 American factories	93.000	7.000	0.38	0.86		5.76
Green cheese.						
Average of 10 duplicate determinations of 5 samples, May and June	34.601	65.399	35.511	22.103	1.082	6.703
Average of 14 duplicate determinations of 7 samples, July and August	34.287	65.713	34.720	23.103	1.801	6.086
Average of 20 duplicate determinations of 10 samples, September, October and November	35.192	64.807	34.246	22.278	1.141	7.143
Average of all	34.693	65.306	34.825	22.494	1.341	6.644
Average for 1893 at 48 American factories	36.84	63.16	33 90	23.32		5.94

This table gives the average composition of milk, whey and cheese calculated from the full duplicate analyses for each period of the experimental season, viz., May and June, July and August, and September, October and November. Any duplicate analysis in which one or more constituents were not determined, has been rejected in compiling this table. It will be seen that there is very little variation in the figures giving the composition of milk in the above three periods, and practically none in the case of whey. There are variations in the figures for cheese in the above periods. But these are due probably to the difficulty of sampling cheese for analysis. For milk the average of all is taken from 50 duplicate analyses of 25 distinct samples; that for whey is taken from 54 duplicate analyses of 27 distinct samples; and that for cheese is taken from 44 duplicate analyses of 22 distinct cheese.

Table Showing Pounds of Fat in Cheese and Whey from 300 Pounds Milk.

	Date.	Pounds of milk.	Per cent. of fat in milk.	Pounds of fat in 300 pounds of milk.	Pounds of cheese from 300 pounds of milk.	Pounds of fat in yield of whey.	Pounds of fat in yield of cheese. By direct determination.	Pounds of fat in yield of cheese. By difference
L	September 6th	300	2.925	8.775	26.75	.579	8.625	8.196
	September 4th	300	3.132	9.396	27.00	.679	8.918	8.717
	October 4th	300	3.363	10.089	29.75	.648	10.148	9.441
	November 6th	300	3.382	10.146	29.75	.629	10.060	9.517
	November 8th	300	3.428	10.286	28.25	.627	9.602	9.659
	October 2nd	300	3.512	10.536	30.50	.609	10.237	9.927
H	October 4th	300	3.692	11.076	31.25	.765	10.957	10.311
	September 6th	300	3.835	11.505	31.25	.771	11.075	10.834
	September 4th	300	3.887	11.661	31.25	1.096	10.875	10.565
	November 8th	300	3.928	11.784	31.25	.547	10.926	11.237
	November 6th	300	3.999	11.997	32.25	.575	11.271	11.422
	October 2nd	300	4.076	12.228	32.50	.746	11.462	11.482

Although there is considerable difference in the amount of fat contained in 300 pounds of milk of different dates, there is very little difference in the amount of fat in the whey of different dates. The figures in the last column, under fat in cheese by difference, show that, in rich milk, a greater quantity of fat becomes entangled in the curd, and thus found in the cheese than in poor milk.

Table showing ratio of fat to casein, and relation of fat in milk to yield of cheese.

	Per cent. of fat.	Per cent. of casein.	Ratio of fat to casein.	Pounds of fat in 300 pounds milk.	Pounds of green cheese from 300 pounds milk.	Ratio of fat to green cheese.
L. Samples of milk	2.925	2.130	1 : 0.72	8.775	26.75	1 : 3.03
	3.132	2.052	1 : 0.65	9.396	27.00	1 : 2.87
	3.363	2.274	1 : 0.67	10.089	29.75	1 : 2.94
	3.382	2.409	1 : 0.71	10.146	29.75	1 : 2.93
	3.428	2.284	1 : 0.66	10.286	28.25	1 : 2.74
	3.512	2.240	1 : 0.63	10.536	30.50	1 : 2.89
L. Average for Sept., Oct. and Nov.	3.290	2.231	1 : 0.67	59.228	172.00	1 : 2.90
L. Average for May and June	3.302	2.223	1 : 0.67	49.539	144.25	1 : 2.90
L. Average for July and August	3.153	2.098	1 : 0.66	37.755	109.26	1 : 2.89
Average for all	3.248	2.184	1 : 0.66	....	....	1 : 2.89
H. Samples of milk	3.692	2.246	1 : 0.60	11.076	31.25	1 : 2.82
	3.835	2.190	1 : 0.57	11.505	31.25	1 : 2.71
	3.887	2.284	1 : 0.58	11.661	31.25	1 : 2.69
	3.928	2.396	1 : 0.61	11.784	31.25	1 : 2.56
	3.999	2.452	1 : 0.61	11.997	31.25	1 : 2.70
	4.076	2.284	1 : 0.56	12.228	32.50	1 : 2.65
H. Average for Sept., Oct. and Nov.	3.902	2.309	1 : 0.59	70.251	189.75	1 : 2.70
H. Average for May and June	3.919	2.366	1 : 0.60	58.731	158.00	1 : 2.60
H. Average for July and August	3.849	2.336	1 : 0.60	46.197	123.00	1 : 2.66
Average for all	3.890	2.337	1 : 0.59	....	....	1 : 2.65

The above table, showing ratio of fat to casein, contains six duplicate analyses of the percentages of fat and of casein in lots L and H of September, October and November. It gives averages of percentages of fat and of casein for the three periods of the experimental work, viz.: May and June, July and August, and September, October and November. It also reports separately the season's averages of fat and of casein in lots L and H. The figures in the third column show the decimal of a pound of casein to one pound of fat in the milk. The L average for all represents duplicate analyses of 15 distinct samples, or 30 single determinations; and the H average for all represents duplicate analyses of 14 distinct samples, or 28 single determinations. The figures giving percentages of casein do not show a regular proportional increase with the increase in the percentage of fat. The most that can be said as to the increase of casein, is, that a number of rich samples of milk give a slightly higher percentage of casein than a number of poor samples. This is shown by the averages in the table. But there are instances, in the above table, or poor milk being comparatively high in casein, and vice versa. Similar instances occur all through the season's tests. While a number of samples of milk averaging high in fat tend, as above stated, to average slightly higher in casein, the increase in the casein is apparently quite independent of the increase in the percentage of fat. That the casein does not increase proportionately as the fat, is shown clearly by the figures in the third column under ratio of fat to casein. As a result of dividing continuously increasing percentages of fat into nearly constant percentages of casein, the ratio must widen as the percentages of fat increase.

Since the fat and the casein of milk go to form fully 55 per cent. of the weight of its cheese, and since the fat of milk varies considerably, but casein slightly, it follows that equal quantities of milk of increasing percentages of fat yield under normal conditions increasing quantities of cheese, but that the yield of cheese per pound of fat gradually decreases. Consequently fat alone cannot accurately determine the cheese-producing power of milk. The above table shows that L samples, averaging for the whole season 3.248 percentage of fat, yield 2.89 pounds of cheese per pound of fat; while H samples, averaging for the whole season 3.890 percentage of fat, yield only 2.65 pounds of cheese per pound of fat.

But while fat alone does not accurately determine the cheese-producing power of milk, it is preferable, as a basis for apportioning dividends, to the common methods, i. e., according to weight of milk. A careful study of the results of our season's tests from the important standpoint of apportioning dividends, leads me to believe that for milks varying in fat from three to four per cent. a number, representing the average percentage of casein in such milks, might be added to each fat reading; that this sum of fat and casein would be a much fairer basis than that of fat alone for distributing dividends to patrons.

In the table below, fifteen average determinations of fat and casein of distinct vats of milk, both in milk high and in milk low in fat, are arranged in periods, in order to show the ratio, (1) of fat to yield of cheese, and (2) of fat plus casein to yield of cheese. For each period, are given the total pounds of milk, the total pounds of fat plus casein, the average percentages of fat and casein, and the average ratio of fat to cheese, and of fat plus casein to cheese. In every period, the average ratio of fat to yield of cheese is wider for milk low in fat than for milk high in fat. The season's average gives .24, or practically one-quarter pound more cheese per pound of fat in L than in H milk; while the average ratios of fat plus casein to yield of cheese in milk low in fat, and in milk high in fat, are practically the same for corresponding periods; and the season's average gives identically the same yield of cheese per pound of fat plus casein with L milk, averaging 3.248 of fat, as with H milk averaging 3.890 of fat.

Date.		Pounds of milk supplied.	Percentage of fat in milk.	Percentage of casein in milk.	Sum of fat plus casein.	Ratio of fat to yield of green cheese.	Ratio of the sum of the fat and casein to the yield of green cheese.
Lot L.							
Period 1	June 4th	300	3.080	2.216	16.062	1 : 3.0	1 : 1.70
	May 7th	300	3.193	2.420	16.401	1 : 2.8	1 : 1.67
	June 6th	300	3.194	2.046	16.404	1 : 3.1	1 : 1.80
	May 2nd	300	3.482	2.106	17.268	1 : 2.6	1 : 1.60
	June 8th	300	3.564	2.327	17.514	1 : 2.8	1 : 1.77
	Total	1,500	3.302	2.223	83.649	1 : 2.9	1 : 1.70
Period 2	July 7th	300	2.967	1.946	15.645	1 : 3.06	1 : 1.72
	" 5th	300	3.140	2.443	16.242	1 : 2.99	1 : 1.73
	August 2nd	300	3.197	1.977	16.413	1 : 2.86	1 : 1.67
	July 31st	300	3.307	2.024	16.743	1 : 2.67	1 : 1.58
	Total	1,200	3.153	2.098	65.043	1 : 2.89	1 : 1.67
Period 3	Sept. 6th	300	2.925	2.130	15.597	1 : 3.03	1 : 1.71
	" 4th	300	3.132	2.032	16.218	1 : 2.87	1 : 1.66
	Oct. 4th	300	3.363	2.274	16.901	1 : 2.94	1 : 1.76
	Nov. 6th	300	3.382	2.409	16.968	1 : 2.93	1 : 1.75
	" 8th	300	3.428	2.284	17.108	1 : 2.74	1 : 1.65
	Oct. 2nd	300	3.512	2.240	17.358	1 : 2.89	1 : 1.75
	Total	1,800	3.290	2.231	100.150	1 : 2.90	1 : 1.71
Whole season		4,500	3.248	2.184	248.842	1 : 2.89	1 : 1.69
Lot H.							
Period 1	June 6th	300	3.655	2.368	17.787	1 : 2.9	1 : 1.84
	May 7th	300	3.685	2.255	17.877	1 : 2.6	1 : 1.63
	" 2nd	300	3.899	2.181	18.519	1 : 2.5	1 : 1.60
	June 8th	300	4.000	2.396	18.822	1 : 2.7	1 : 1.72
	" 4th	300	4.338	2.445	19.836	1 : 2.5	1 : 1.70
	Total	1,500	3.915	2.329	92.841	1 : 2.6	1 : 1.69
Period 2	July 7th	300	3.489	2.237	17.289	1 : 2.93	1 : 1.77
	" 5th	300	3.819	2.509	18.279	1 : 2.72	1 : 1.70
	" 31st	300	4.016	2.412	18.870	1 : 2.44	1 : 1.56
	August 2nd	300	4.075	2.187	19.047	1 : 2.57	1 : 1.65
	Total	1,200	3.849	2.336	73.483	1 : 2.66	1 : 1.67
Period 3	Oct. 4th	300	3.692	2.246	17.898	1 : 2.82	1 : 1.74
	Sept. 6th	300	3.835	2.190	18.327	1 : 2.71	1 : 1.70
	" 4th	300	3.887	2.284	18.483	1 : 2.68	1 : 1.69
	Nov. 8th	300	3.928	2.396	18.606	1 : 2.56	1 : 1.67
	" 6th	300	3.999	2.452	18.819	1 : 2.70	1 : 1.71
	Oct. 2nd	300	4.076	2.284	19.050	1 : 2.65	1 : 1.70
	Total	1,800	3.902	2.309	111.183	1 : 2.70	1 : 1.70
Whole season		4,500	3.890	2.324	277.507	1 : 2.65	1 : 1.69

The following table makes it clear, (1) that in paying according to weight of milk patron L, whose 1,500 pounds of milk tests 3.302 percentage of fat, receives 69 cents more than the relative value of his milk; while patron H. for the same weight of milk, testing 3.915 percentage of fat, receives 69 cents less than the relative value of his milk; (2) that in paying according to percentage of fat, the loss and gain upon the same milks are 59 cents, being just 10 cents better than the former method, but in this case it is the patron having the poorer milk who loses, and the patron having the richer milk who gains; and (3) that in paying according to percentage of fat plus casein, the discrepancy is reduced to an insignificant amount. Similar conditions are traceable in this table through the other two periods of the season's tests.

2.274 is the average percentage of casein calculated from fifty analyses of the above quantities of milk. It is this percentage of casein that was added to the percentages of fat in apportioning dividends upon the basis of fat, plus casein. This number is certainly applicable to milks averaging between 3.248 and 3.890 percentage of fat; it explains why two per cent. added to the fat reading gives a fairer basis for apportioning dividends than adding nothing, one per cent., or three per cent.; but it must not be accepted as final and applicable for very rich or very poor milk without further investigation.

Patron.	Pounds of milk supplied.	Pounds of cheese produced.	Patrons receive for milk supplied according to weight of cheese.	to weight of milk.		to percentage of fat.		to percentage of fat and casein.	
			Value.	Value.	gains.	Value.	Losses or gains.	Value.	Losses or gains.
			$ c.	$ c.	cts.	$ c.	cts.	$ c.	cts.
L in May and June	1,500	144.25	14 42	15 11	+69	13 83	-59	14 32	-10
H " " "	1,500	158.90	15 80	15 11	-69	16 39	+59	15 89	+ 9
L " July and August	1,200	109.26	10 92	11 61	+69	10 44	-48	10 90	- 2
H " " "	1,200	123.00	12 30	11 61	-69	12 78	+48	12 32	+ 2
L " Sept., Oct., and Nov	1,800	172.00	17 20	18 08	+88	16 54	-66	17 15	- 5
H " " " "	1,800	189.75	18 97	18 08	-89	19 62	+65	19 03	+ 6

Conclusions Drawn From the Season's Tests.

1. Taking the average of several samples, a relatively larger yield of cheese is obtained from relatively richer milk, but the increased yield of cheese is proportionately less than the increased percentage of fat in the milk.

2. Under normal conditions of milk, curd, etc., the percentage of fat in cheese varies closely with that in the milk from which it is made.

3. Under normal conditions of milk, curd, etc., a slightly higher percentage of fat is found in whey from rich than from poor milk.

4. The development of a gassy curd decreases the yield of cheese from a given quantity of milk.

5. Casein in milk does not increase proportionately as the fat.

6. Milk poor in fat makes more cheese per pound of fat than milk richer in fat.

7. That the greatest degree of care must be exercised in handling milk from the time it is drawn from the cow until made into cheese, to secure a maximum yield of cheese.

8. While fat as a basis in distributing dividends, is fairer than the common method, a still fairer basis is the sum of the fat and the casein of the milk. This sum is obtained by adding an average percentage of casein to the fat reading.

ANALYSIS OF SOILS FROM LAKE TEMISCAMING DISTRICT.

Early in the spring, two samples of soil from the Lake Temiscaming district were procured for analysis, through the Government agent for that district. One sample, a humus, represents the surface soil; the other, a clay, the soil underlying this humus. The extent of this new district is greater than is generally known. It contains about 1,000,000 acres of first-class farming land. This land is rolling, well watered, and timbered. Mr. Neven, who has surveyed the townships north of Lake Temiscaming, reports that out of five townships there would not be over one hundred acres of bad land. These remarks also may be applied to the land south, between the lake and the Montreal river, and excepting a rough belt of probably five miles just to the south of the river, to the land stretching beyond for seventy or eighty miles. The district possesses good timber of several varieties such as white pine, black and yellow birch, spruce and tamarac. There are also said to be some splendid flats of sugar maple. The atmosphere is not damp; and consequently a low winter temperature is not felt as a corresponding temperature would be in a damp atmosphere. In winter, there is usually plenty, though not an excessive, amount of snow. The spring is not late, and the climate is well suited for agricultural purposes. The soil over the district is apparently very uniform, consisting of a surface soil of humus, eight or nine inches in depth, beneath which is a clay of excellent quality.

The following table gives the composition of these soils:

	Clay.			Humus.		
	I.	II.	Average.	I.	II.	Average.
Moisture	1.700	1.710	1.705	7.568	7.595	7.581
Insoluble matter	74.660	74.880	74.770			
Organic "	3.650	3.690	3.670	....	....	15.453
Soluble silica	0.312	0.255	0.283			
Alumina (Al_2O_3)	5.820	5.619	5.719			
Peroxide of iron (Fe_2O_3)	4.000	4.000	4.000			
Phosphoric acid (P_2O_5)	0.292	0.203	0.247			
Sulphuric acid (SO_3)	0.192	0.213	0.202			
Br. ox. of Manganese (Mn_3O_4)	0.583	0.544	0.563			
Lime (Ca. O.)	0.977	0.732	0.854			
Magnesia (Mg. O.)	2.180	1.850	2.010			
Potash (K_2O)	1.980	....	1.980			
Soda (Na_2O)	0.331	....	0.331			
Undetermined	....	....	3.666			
Total	....	....	100.00			
Nitrogen	....	....	0.160	....	....	0.492

The constituents of chief importance to be determined in a soil are phosphoric acid, nitrogen, and potash. A soil containing sufficient amounts of each of these constituents, and having right physical properties, is fertile. A soil is said to be rich in the above constituents when they are present in the following quantities: Nitrogen, 0.15; phosphoric acid, 0 20, and potash 1.0 per cent. Therefore, as to plant food in the above clay soil, it is abundant.

That plant food in soils may yield abundant crops, a soil must possess such physical properties as warmth, a proper degree of moisture, porosity, etc.

Solar heat, as the sun's rays, is the greatest source of heat of practical importance in relation to the production of crops. Dark colored soils absorb the most and radiate the fewest rays, properties enabling such soils to attain the highest temperature. The surface soil of humus covering the Lake Temiscaming district is of this character, a matter of very great importance to any agricultural district. This surface of humus, by tillage, will become mixed with the underlying clay and improve the clay's porosity. It is this property of porosity that gives to a soil the capacity to absorb and retain moisture. Clay soils naturally possess a high absorptive power for salts in solution. This absorptive property for potash, ammonia and phosphoric acid has been shown to be due to hydrated oxides of iron and aluminium, which constituents abound in the clay of this district. By the gradual mixing of this clay with the overlying humus, a soil of most excellent agricultural properties will be formed.

ANALYSIS OF FISH MANURE.

Mr. S. Oku, of Tokio, Japan, who paid our College a visit last January, left with us a sample of fish manure brought from Japan, expressing a desire to have it analyzed. It appears that large quantities of this manure are procurable in Japan; and the authorities of that country are considering the question of its exportation as a manure.

It was found to contain the following percentage composition:

Moisture	
Ash	8.120
Organic matter	10.220
Nitrogen	81.656
Phosphoric acid	11.230
Potash	0.906
	0.234

This material is similar in composition to the whole herrings received from British Columbia in 1890. (See Annual Report of 1890.)

Prof. C. C. James, in the above report, has said: "It will thus be seen that a most excellent fertilizer can be produced from any one or all of the samples of fish refuse sent here for analysis by (*a*) extracting the fat or oil; (*b*) removing the excess of moisture by drying; (*c*) thoroughly pulverizing. The fertilizer thus produced would be rich in nitrogen and phosphoric acid, but would be deficient in potash. To make a complete fertilizer of it an addition of sulphate of potash might be made."

ANALYSIS OF VARIETIES OF TURNIPS, SWEDES AND MANGELS.

The following table gives the percentage of dry matter, and yield of dry matter in tons per acre, of the several varieties of turnips, Swedes, and mangels selected by the Agricultural Committee of the Ontario Agricultural and Experimental Union, as promising varieties to be tested over Ontario during the summer of 1894:

Varieties.	Per cent. of dry matter.	Average weight of root.	Yield of roots per acre.	Dry matter per acre.
		lbs.	Tons.	Tons.
Turnips and Swedes:				
Jersey Navet (93)	10.182	1.757	20.40	1.51
Early American Red Top	7.112	1.522	18.01	1.28
Hartley's Bronze Top	9.825	.953	11.37	1.12
Carter's Prize Winner	6.896	.920	10.27	.71
Carter's Elephant (93)	10.182	.945	9.84	1.00
Mangels:				
Giant Yellow (intermediate)	10.04	2.47	30.88	3.10
Long Red Selected	10.70	2.51	30.08	3.218
Warden Prize Orange Globe	11.60	2.05	24.88	2.886
White Silesian	14.69	1.78	21.20	3.114
Mammoth Red (intermediate)	10.70	1.70	20.72	2.598

For information regarding the yields of these roots over Ontario, see the report of the Ontario Agricultural and Experimental Union appended to this annual report.

The dry matter of roots being almost wholly digestible, the yield of dry matter rather than the yield of fresh material, determines the relative merits of varieties from the standpoint of yield. Carter's Elephant, on account of the higher percentage of dry matter, though yielding nearly one-half ton per acre less fresh material than Carter's Prize Winner, produces actually one-quarter of a ton per acre more food. The White Silesian mangel, yielding 21.20 tons of fresh material, produces, because of its high percentage of dry matter, practically as much actual food as other varieties yielding as much as 30 tons of fresh material per acre. The time is fast coming when farmers, in selecting varieties of roots, will consider the percentage of dry matters as well as yield per acre.

EFFECTS OF THINNING ON THE COMPOSITION OF ROOTS.

Varieties.	In fresh material.							Calculated to water-free substance.					
	Water.	Ash.	Crude Protein.	Amides.	Nitrogen-free extract.	Crude fibre.	Crude fat.	Ash.	Crude Protein.	Amides.	Nitrogen-free extract.	Crude fibre.	Crude fat.
Mangels:													
Unthinned 1	.....	.913	.167	.104	10.161	.800	.061	7.480	1.369	.852	88.252	6.554	.496
2	.....	.908	.168	.107	10 151	.811	.061	7.440	1.376	.876	83.171	6.645	.496
Average.	87.795	.910	.167	.105	10.156	.805	.061	7.460	1.372	.864	83.211	6.599	.496
12 inches 1	....	.849	.164	.105	8.574	.771	.060	.068	1.435	.997	81.478	7.327	.573
2	....	.848	.151	.093	8.577	.791	.063	8.059	1.559	.884	81.507	7.517	.601
Average	89.477	.848	.157	.099	8.575	.781	.062	8.063	1.497	.940	81.492	7.422	.587
20 inches.......... 1	.....	.940	.150	.096	8.762	.755	.054	8.738	1.394	.892	81.454	7.019	.502
2	......	.915	.152	.096	8.771	.770	.053	8.506	1.413	.892	81.537	7.158	.493
Average..........	89.243	.927	.151	.096	8.766	.762	.053	8.622	1.403	.892	81.495	7.088	.497
Swedes:													
Unthinned 1	......	.596	.185	.078	10 063	1.123	.166	4.881	1.515	.639	82.409	9.196	1.359
2	......	.609	.180	.072	10.062	1.122	.166	4.987	1.474	.590	82.401	9.190	1.359
Average..........	87.789	.602	.182	.075	10.062	1.122	.166	4.934	1.494	.614	82.405	9.193	1.359
12 inches 1	.... .	.575	.197	.082	9.280	1.007	.179	5.080	1.740	.724	81.980	8.895	1.581
2	......	.572	.206	.099	9.248	1.026	.169	5.053	1.819	.874	81.696	9.063	1.484
Average	88.680	.573	.201	.090	9.264	1.016	.174	5.066	1.779	.799	81.838	8.979	1.532
20 inches 1	....	.533	.166	.067	8.482	1.187	.169	5.026	1.565	.631	79.989	11.193	1.593
2	.... ..	.541	.172	.076	8.602	1.039	.174	5.102	1.622	.716	81.120	9.798	1.640
Average	89.396	.537	.169	.071	8,542	1.113	.171	5.064	1.593	.673	80.554	10.495	1.616
Turnips:													
Unthinned 1	91.577	.818	.800	.338	5.292	1.072	.103	9.711	9.497	4.012	62.828	12.727	1.222
2	.....	.844	.706	.250	5.497	1.025	.101	10.020	8.382	2.968	65.262	12.169	1.199
Average..........	......	.831	.753	.294	5.394	1.048	.102	9.865	8 939	3.490	64.045	12.448	1.210
12 inches 1	95.674	.623	.762	.444	1.712	.733	.052	14.401	17.614	10.263	39.575	16.944	1.202
2	......	.621	.762	.443	1.590	.754	.056	14.355	17.614	10.240	36.754	17.430	1.294
Average..........	......	622	.762	.444	1.651	.743	.054	14.378	17.614	10.251	38.164	17.187	1.248
20 inches 1	95.351	.553	.806	.530	1.882	.803	.074	11.895	17.337	11.400	40.503	17 272	1.592
2	......	.583	.812	.530	1.866	.788	.070	12.540	17.466	11.400	40.137	16.950	1.505
Average..........	....	.568	.809	.530	1.874	.795	.072	12.217	17.401	11.400	40.320	17.111	1.548

The above table gives the percentage, composition of mangels, Swedes, and turnips cultivated at three different distances apart in the drill. The drills were a little over 27 inches apart. Complete analysis was made of samples unthinned, thinned to 12 inches, and to 20 inches in the drills.

Sampling.

In each instance, half-a-dozen roots were taken; and these roots were of such sizes that the sum of the weights of the six equalled six times the weight of the average weight per root of the entire plot. They were then washed clean, and, after being wiped dry, were cut into a pulp. From the thoroughly mixed pulp a sample representing about two pounds was taken for analysis.

Effects of Different Distances on Composition.

It is probably unnecessary to say that each kind was sown on the same date, and also harvested on the same date; and cultivation throughout was alike. Consequently, any variation in the composition of turnips, Swedes, or mangels left unthinned, thinned to 12, or to 20 inches, would be due to these different distances between the plants in the drills.

In all cases the percentage of water is two to three lower in the unthinned roots than in those thinned to 12 or to 20 inches in the drills. While, in the mangels and turnips, the percentage of water is practically the same where 12 as where 20 inches apart, it gradually increases from unthinned to thinned to 20 inches in the Swedes. In every instance the percentage of ash in the dry matter is least in the unthinned roots. In the mangels it gradually increases with an increase in the distance between the plants; but the dry matter in the turnips and Swedes at 20 inches apart is no greater than at 12 inches. In each, the crude protein is least in the unthinned, and most where thinned to 12 inches. The amides are also least in the unthinned roots. But the nitrogen-free extract is considerably higher in the dry matter of the unthinned roots than in that of the thinned roots. The decrease in the quantity of nitrogen-free extract is much more in the turnips than in either the Swedes or mangels; while the crude fibre in the thinned roots is more than in those unthinned, especially in the turnips. Evidently unthinned roots mature earlier than thinned roots, but the quality of the food contained in them is not so good as that in roots thinned out.

—	Per cent. of dry matter.	Average weight of root.	Yield of roots per acre.	Dry matter per acre.
		lb.	tons.	
Swedes:				
1. Unthinned	12.211	.46	22.60	2.760
2. 4 inches	11.781	1.06	27.78	3.273
3. 8 inches	11.989	2.07	29.75	3.567
4. 12 inches	11.320	2.79	27.25	3.085
5. 16 inches	11.186	3.76	27.10	3.031
6. 20 inches	10.604	4.24	25.00	2.651
Fall Turnips:				
Unthinned	8.423	.18	20.37	1.716
4 inches	5.710	1.28	37.50	2.141
8 inches	4.908	2.60	39.15	1.921
12 inches	4.326	3.89	37.88	1.639
16 inches	4.501	4.99	37.27	1.678
20 inches	4.649	5.42	32.40	1.506
Mangels:				
Unthinned	12.205	.69	38.79	4.734
4 inches	11.471	1.50	39.80	4.565
8 inches	10.713	2.46	37.85	4.055
12 inches	10.523	3.12	35.90	3.778
16 inches	9.391	3.73	33.85	3.179
20 inches	10.757	3.96	29.10	3.130

The above table shows the effects of thinning on the percentage of dry matter, the size of the roots, and the yield yer acre. With one or two slight exceptions there is a gradual decrease in the percentage of dry matter with an increase in the distance between the plants in the drills. Without one exception, the average weight of roots increases as the distance between the plants in the drills increases. But the largest roots do not necessarily give the greatest yield per acre. The third column of figures shows an increase in yield as the distance between the plants increases to 8 inches; but beyond this distance the yield gradually decreases as the distance increases. Regardless of size of roots, Swedes thinned to 8 inches in the drill, turnips thinned to 4 inches, and mangels unthinned yield greater quantities of dry matter than when grown at other distances apart. But bearing in mind the deficient quality of the dry matter in unthinned roots, it would be advisable to grow a few hundred pounds less dry matter per acre to obtain an increased quality of food. *Swedes* clearly give the highest yield of food of the best quality *thinned to a distance of 8 inches;* turnips, though they yield the most pounds of dry matter thinned to 4 inches, only lose about 220 pounds of dry matter per acre thinned to 8 inches. This loss is counterbalanced by the enhanced quality of the dry matter. Both yield and quality considered, *8 inches appears to give the best results.*

CONCLUSIONS.

There are two lines of investigation that press themselves most urgently upon our attention for the coming year. The one is further analysis of milk, cheese and whey in connection with cheese-making; the other is an examination into the conditions of the soil of even well-tilled farms which is not producing the quantities of certain crops which they formerly produced.

To meet the expenses in these connections, we shall require an increased grant.

I again beg to call your attention to our need of the basement of the chemical laboratory for an analytical class-room.

I am, respectfully yours,

A. E. SHUTTLEWORTH,
Professor of Chemistry.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec. 31st, 1894.

PART IV.

REPORT OF THE

PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of presenting to you my second annual report. During the sessions since my last report I have delivered lectures to the first year students on veterinary anatomy and veterinary *materia medica*, and also a course of practical stable lectures. To the second year students I have lectured on veterinary pathology, veterinary obstetrics and the laws of breeding, and have also delivered a course of lectures on "practical horse." To the special dairy class I gave a course of lectures on the ordinary diseases and accidents to which the dairy cow is subject. To all my lectures the students paid good attention, and the knowledge thereby gained will no doubt be valuable to those who will have the care and breeding of stock under their charge in after life. Outside of my work in the class-room I have given professional attention to the stock of the farm, and I am pleased to say that with the exception of sheep the losses have been comparatively very light. Below will be seen particulars.

Horses. We have had a few cases of indigestion, some wounds, calks, sore shoulders, sore necks, etc., but no fatal or even serious cases of any kind.

Cattle. We had a few cases of abortion in cows, a few cases of metritis, some of retention of the placenta, a couple of partial paralysis, a couple of difficult parturition, a few of impaction of the rumen, etc., all of which made complete recoveries. I must acknowledge that the comparative immunity from loss in cattle and other stock is, to a large extent, due to the careful feeding and general care given by the foreman, Mr. Lamb, who is very attentive and very careful in carrying out instructions. We lost two animals. One was the imported polled Angus bull. I was telephoned for one Sunday evening to go up to see him, but he died before I arrived. A post mortem revealed the formation of an abscess in the throat, which had ruptured internally and caused death very suddenly by suffocation. The other fatal case was that of a grade cow. At first she showed symptons of ordinary impaction of the rumen, with tympanitis. I treated her for such and she showed signs of improvement, but the symptoms returned, and for considerable time they could be relieved only to return again. The symptoms were so persistent that we became satisfied that there was some mechanical obstruction in the stomach or intestines. As she would eat very little we nourished her with flaxseed gruel, etc., but eventually she died, and a post mortem revealed a ball of woody fibre, the size of a large hen's egg, in the *pylorus* (the passage from the fourth stomach into the intestine). This ball was not firmly fastened, and no doubt at times its position became altered, allowing the passage of a certain amount of ingesta, when it would again insinuate itself into the passage, and that accounted for the intermission of the symptons. The obstruction was composed of very fine fibre resembling wool. Mr. Rennie and myself examined it very carefully and came to the conclusion that it was a collection of the fibre of lucerne, of which the animal had eaten considerable. It appears to us that if lucerne be ripe, or nearly so, a portion of the fibre becomes indigestible, and the fibres accumulate and form a ball, which in some cases may act as this one did. In order to make more sure we requested Prof. Panton to examine it. He tested for animal and vegetable matter and pronounced it vegetable. He also macerated a quantity of lucerne and obtained a like fibre.

Sheep. We lost a number of sheep and lambs from different causes. One ewe died from gangrenous metritis; one ram from concussion of the brain, received from fighting; and a yearling ram from the same cause. A few died from diseases of the liver, similar to that of last year, but I think we have done with that trouble now, as the supply of roots fed has been limited, and we think the disease was caused by feeding too much roots containing saccharine matter. We lost a few young lambs from a collection of wool in the pylorus. It is impossible to prevent lambs swallowing more or less of their dams' wool, and it has a great tendency to collect and form a ball which, if of sufficient size, cannot pass through the pyloric orifice, but becomes fastened there and by stopping the passage causes death Then we lost a number of yearlings and a few older ewes from a collection of woody fibre, similar to that found in the cow, obstructing the pylorus. I am of the opinion that lucerne is not safe food for any animal, unless it be cut and cured when rather green. When matured it becomes very dry and woody, and portions of it become quite indigestible. I treated all the lambs this year again regularly with a decoction of pumpkin seeds, in order to prevent loss from tapeworm, and I am pleased to state that I succeeded, as we had no trouble whatever from these pests. In all cases where death occurred from any cause I held a post mortem and examined very carefully for tapeworm, but did not find any. The following is the mode of treatment I adopted: I cut or broke all seeds, then put them in a pot with water, and placed the pot on the stove and let the water come to a boil, then set it back on the stove and let it simmer for 6 to 8 hours, and afterwards strained the fluid; we then drenched each lamb with the product of from one to two and a-half ounces of the seed, according to the size of the lamb. This was done every ten days or two weeks from the middle of May until the middle of August. It entails a good deal of work, especially the preparation of the decoction, but I think the result paid for the trouble, as we have had no losses from tapeworm the two years we have practiced this treatment, and for many years previous the losses from this cause were very heavy. I trust we have now got rid of the worm entirely.

Pigs. There were some losses of newly born pigs, but other than that we lost but two animals, one of which died from inflammation of the bowels, and the other, a young Berkshire boar, died, apparently, from excitement and exhaustion, as a post mortem revealed all organs healthy.

DEHORNING OF CATTLE.

As instructed by you, on the 7th of June I dehorned 16 head of dairy cattle. I used a saw to operate, I had no shears and could not conveniently procure a pair. I have never seen the operation performed with shears, but am of the opinion that the saw is fully as good. As dehorning is not practiced in this section this was my first experience, except an isolated case here and there. I succeeded very well, with no after bad results, except a little trouble in protecting against flies, and the collection of pus in the cavities in two animals. I watched the animals closely, and was informed by Mr. McGillivray, the dairy cattle man, that none of the cows missed a meal or failed in their milk. The little trouble we experienced was caused by the excessively hot weather which followed the operation. I do not consider hot weather a good time for the operation; in my opinion it should be performed in temperate weather, not in the extremes of either heat or cold. Under such circumstances I do not think there would be any trouble, nor do I think the animals would require any after treatment whatever. I also think that the time is near at hand when the operation will be more generally performed, especially in dairy herds. As to the cruelty of the operation it is certainly painful for the time, but it requires only from five to ten seconds per horn with the saw, and still less with shears; then the torture is over, and the cattle become more quiet and peaceable with each other, and under such circumstances cannot injure each other, and will doubtless yield a greater supply of milk.

Tuberculosis.

In my last report I stated that I was carrying on experiments with Prof. Koch's lymph as a diagnostic medium and also as a cure for tuberculosis in the dairy herd at the O.A.C. I have finished the experiments and am now in a position to report the details for testing with the lymph called "tuberculin" as follows: A ten per cent. solution of the lymph in a one per cent. solution of carbolic acid is used. The temperature of the animal is taken, the hypodermic syringe and needle and also the point of injection (I usually select the loose skin just behind the shoulders) are sterilized with, say, a five per cent. solution of creolin or other good disinfectant; then from three to four cubic centimeters (17 drops a c. c.) of the prepared lymph are injected hypodermically into the animal. The temperature is then taken about every hour for from 15 to 18 hours, or longer if it be a suspicious case and the reaction be not well marked. An increase in temperature (called the reaction) of two degrees or over is supposed to indicate the existence of tubercle. If the reaction should not reach two degrees, I would not like to condemn the animal. Considerable difference of opinion exists as to the accuracy of the test, some claiming that it is unreliable and will in some cases condemn healthy animals, and in others fail to cause a reaction in diseased ones. Within the last two years, I have had considerable experience with it, both in the dairy herd and in private practice, and also in witnessing the post mortems of cattle tested by others (the figures of which tests I have seen), and my experience is that in no case does it condemn an animal that is not diseased. Whether it invariably causes the reaction in diseased animals I am not prepared to say, as that is a point very hard to determine, it being possible to do so only by the indiscriminate slaughter of all animals tested, whether condemned by the test or not.

Below the figures of the tests in a few cases are given in order to illustrate thoroughly the manner of testing; but in the majority of cases I give merely the degree of reaction, and in cases that were slaughtered, the post mortem appearances.

No. 1 *Guernsey Cow.* Temperature before injection 100 4-5. Injected 4 c.c. lymph at 6.45 a.m.

		Deg.			Deg.
Temperature at	7.45 a.m.	$100\frac{4}{5}$	Temperature at	4.00 p.m.	$102\frac{1}{5}$
	9.00 "	101		5.00 "	$103\frac{1}{5}$
	10.00 "	$101\frac{1}{5}$		6.00 "	$103\frac{1}{5}$
	11.00 "	$100\frac{4}{5}$		7.00 "	$103\frac{1}{5}$
	12.00 m.	101		8.00 "	$103\frac{3}{5}$
	1.00 p.m.	$101\frac{2}{5}$		9.00 "	$104\frac{4}{5}$
	2.00 "	$101\frac{3}{5}$		10.05 "	$102\frac{4}{5}$
	3.00 "	102			

This cow was slaughtered and the post mortem revealed extensive and diffused disease of both pulmonary and digestive organs. We at the same time slaughtered her calf about 10 weeks old (one of twins, the other being still-born) that had suckled its dam, and we found the respiratory apparatus perfectly healthy, but the digestive and genital organs very extensively diseased.

No. 2 *Guernsey Cow.* Temperature before injection 99 4-5. Injected 4 c.c. lymph at 7 a.m.

		Deg.			Deg.
Temperature at	7.50 a.m.	$100\frac{2}{5}$	Temperature at	3.05 p.m.	103
	9.05 "	$100\frac{3}{5}$		6.05 "	$105\frac{4}{5}$
	10.05 "	101		7.05 "	$105\frac{4}{5}$
	11.05 "	$100\frac{4}{5}$		8.05 "	$106\frac{1}{5}$
	12.05 p.m.	$101\frac{3}{5}$		9.05 "	107
	1.05 "	102		10.10 "	$105\frac{2}{5}$
	2.05 "	$102\frac{2}{5}$			

This cow was slaughtered and the post mortem revealed diffused and extensive tubercular deposits in both thoracic and abdominal viscera.

No. 1 *Jersey Cow.* Temperature before injection 101. Injected 3 c c. lymph at 6.40 a.m.

		Deg.			Deg.
Temperature at	10.15 a.m.	$101\frac{1}{5}$	Temperature at	5.15 p.m.	$101\frac{1}{5}$
	12.05 p.m.	$101\frac{1}{5}$		7.55 "	$101\frac{1}{5}$
	2.15 "	$101\frac{1}{5}$		9.00 "	101
	3.35 "	$101\frac{1}{5}$			

This cow, as will be seen, did not react, the highest point reached in 15 hours being but 1-5 of a degree higher than the starting point, while an animal in perfect health will often vary much more than that in the same time.

By the foregoing figures the mode of testing can be readily understood, therefore I will not in what follows give the full figures. In many cases the animals were tested more than once, and in such cases I will give the degree of reaction in each test and also the post mortem appearances.

	Degree of reaction.	Conclusion.
No. 1 *Ayrshire Cow*	2-5 degrees.	Sound.
No. 1 *Grade Cow*	1 "	"
No. 1 *Holstein Cow*	2 3-5 "	Condemned.

This cow was slaughtered and the post mortem revealed the bronchial glands and both lungs extensively diseased.

No. 3 *Guernsey Cow.*	Tested Oct. 1893.	Reacted 6 degrees.
	" Dec. 1893.	" 5 "

Post mortem revealed a large tubercular deposit in the liver, and extensive disease of the bronchial glands and right lung. Left lung slightly inflamed.

No. 1 *Holstein Heifer.*	Tested Oct. 1893.	Reaction 5 1-5 degrees.
	" Dec. 1893.	" 5 4-5 "

Post mortem revealed the bronchial glands and both lungs extensively diseased.

No. 2 *Ayrshire Cow.*	Tested Oct. 1893.	Reaction 3 3-5 degrees.
	" Dec. 1893.	" 1 1-5 "

Post mortem revealed the apex of right lung affected in the early stage. Well marked tubercles in substance of left lung.

Devon Grade Heifer.	Tested Oct. 1893.	Reaction 6 1-5 degrees.
	" Dec. 1893.	" 5 1-5 "

Post mortem revealed well-marked and extensive tubercular deposits in the bronchial glands and in the substance of both lungs.

No. 6 *Grade Cow.*	Tested Oct. 1893.	Reaction 4 3-5 degrees.
	" Dec. 1893.	" 3 3-5 "

Post mortem revealed the peritoneum diseased and attached to the abdominal walls. Large tubercular abscess in the liver, and the bronchial glands affected.

Guernsey Bull.	Tested July 1893.	Reaction 5 4-5 degrees.
	" Oct. 1893.	" 4 1-5 "
	" Dec. 1893.	" 3 3-5 "

Post mortem revealed the bronchial gl ls and the substance of both lungs extensively tubercular.

No. 2 *Jersey Cow.*	Tested Dec. 1893.	Reaction 1-5 degrees.	Sound.
No. 1 *Jersey Cow.*	" "	" 2-5 "	"
No. 1 *Grade Cow.*	" "	" 4-5 "	"
No. 2 *Grade Cow.*	" "	" 5 1-5 "	Condemned.

Post mortem revealed slight but well marked tubercular deposits in the bronchia glands.

No. 3 *Grade Cow.* Tested Dec. 1893. Reaction 3 4-5 degrees.

Post mortem revealed a small tubercular deposit in the liver.

No. 1 *Ayrshire Cow.* Tested Dec. 1893. Reaction 4-5 degree. Sound.

Jersey Heifer. Tested Dec. 1893. Reaction 4 1-5 degrees. Condemned.

Post mortem revealed extensive disease of the bronchial glands, diffused tubercular deposits in the substance of both lungs. Left lung slightly inflamed.

No. 1 *Guernsey Calf.* Tested Dec. 1893. Reaction 2-5 degree. Sound.

Holstein Heifer. Tested Dec. 1893. Reaction 5 1-5 degrees. Condemned.

Post mortem revealed the bronchial glands, left lung and the liver extensively affected.

No. 1 *Holstein Bull Calf.* Tested Dec. 1893. Reaction 4 4-5 degrees.

Post mortem revealed the bronchial glands affected and diffused tubercular disease of the liver.

Jersey Bull Calf. Tested Dec. 1893. Reaction 3-5 degree. Sound.

No. 2 *Guernsey Bull Calf.* Tested Dec. 1893. Reaction 4-5 degree. Sound.

No. 2 *Holstein Calf.* Tested Dec. 1893. Reaction 1-5 degree. Sound.

Ayshire Bull Calf. Tested Dec. 1893. Reaction 2-5 degree. Sound.

Ayrshire Bull. Tested Feb. 1894. Reaction 0 degree. Sound.

No. 2 *Holstein Cow.* Tested Feb. 1894. Reaction 2-5 degree. Sound.

Jersey Grade Heifer.	Tested Dec. 1893.	Reaction	4 3-5 degrees.	Condemned.
	" Feb. 7, 1894.	"	3 "	
	" " 27, "	"	1 1-5 "	

This calf was sent to Professor Smith, of the Ontario Veterinary College, and the Professor informed me that the post mortem revealed tubercle in the bronchial glands, but only upon microscopical examination.

No. 4 *Grade Cow.*	Tested May 1894.	Reaction	0 degree.	Sound.
No. 5 *Grade Cow.*	" "	"	1-5 "	"

No. 2 *Guernsey Bull Calf.*	Tested Dec. 1893.	Reaction	1 degree.
	" Feb. 1894.	"	1 "
	" May 1894.	"	1 2-5 "

No. 2 *Holstein Bull Calf.*	Tested Dec. 1893.	Reaction	1-5 degree.
	" Feb. 1894.	"	0 "
	" May 1894.	"	0 "

No. 3 *Guernsey Heifer Calf.* Tested May 1894. Reaction 3-5 degree.

(This calf was about 7 weeks old.)

It will be seen that the tests did not condemn the above three calves; but as they were the produce of diseased parents, it was not considered wise to keep them for breeding purposes and I was instructed to slaughter them. Professor Mackenzie came up from Toronto, and we held very careful post-mortems on them, but could find no trace of the disease, which demonstrates the fact that the disease is, at least, not necessarily congenital, even though both parents should be affected.

No. 4 *Guernsey Cow.*	Tested October, 1893.	Reaction	5 degrees.
	" December, 1893.	"	1 1-5 "
	" Feb. 7, 1894.	"	2 4-5 "
	" Feb. 27, 1894.	"	1 2-5 "
	" May, 1894.	"	0
	" June, 1894.	"	1 4-5 "

Post mortem revealed the bronchial glands and left lung extensively diseased.

No. 3 *Holstein Cow.*	Tested October, 1893.	Reaction	5 4·5 degrees.
	" December, 1893.	"	1 2·5 "
	" Feb. 7, 1894.	"	1 1·5 "
	" Feb. 27, 1894.	"	1 2·5 "
	" May 1894.	"	2 "
	" June 1894.	"	4·5 "

Post mortem revealed the laryngeal glands extensively diseased, liver adherent to diaphragm, and slight disease of the bronchial glands.

No. 1 *Ayrshire Heifer.*	Tested December, 1893.	Reaction	4 2·5 degrees.
	" Feb. 7, 1894.	"	3 "
	" Feb. 27, 1894.	"	3·5 "
	" May 1894.	"	0
	" June 1894.	"	0

Post mortem revealed slight but well-marked tubercles in the bronchial glands.

No. 1 *Guernsey Heifer.*	Tested December, 1893.	Reaction	0 3·5 degrees.
	" May 1894.	"	5 2·5 "
	" June 1894.	"	4 4·5 "

Post mortem revealed extensive tubercular disease of the bronchial glands.

Red Polled Heifer.	Tested December, 1893.	Reaction	4 4·5 degrees.
	" Feb. 7, 1894.	"	3 3·5 "
	" Feb. 27, 1894.	"	1 3·5 "
	" May, 1894.	"	4 "
	" June, 1894.	"	2 2·5 "

Post mortem revealed extensive tuberculosis of the bronchial glands.

Red Polled Cow.	Tested October 1893.	Reaction	3 3·5 degrees.
	" December, 1893.	"	1 4·5 "
	" Feb. 7, 1894.	"	1 "
	" Feb. 27, 1894.	"	0 4 5 "
	" May, 1894.	"	1 2·5 "
	" June, 1894.	"	1 "

Post mortem revealed diffused tuberculosis of the bronchial glands and both lungs. The liver adherent to the diaphragm with suspicious nodules.

Ayrshire Bull Calf.	Tested December, 1893.	Reaction	0 2·5 degrees.
	" Feb. 27, 1894.	"	5 "
	" May, 1894.	"	5 "
	" June, 1894.	"	2 "

Post mortem revealed slight disease of the bronchial glands and extensive disease of the substance of both lungs.

No. 3 *Ayrshire Cow.*	Tested October, 1893.	Reaction	4 1·5 degrees.
	" December, 1893.	"	3 2·5 "
	" Feb 7, 1894.	"	0 4·5 "
	" Feb. 27, 1894.	"	0 2·5 "
	" May, 1894.	"	0 3 5 "
	" June, 1894.	"	1 "
	" August, 1894.	"	0

This cow was then injected with 4 c.c. lymph every Monday morning from September 3rd until November 12th, 1894, inclusive, making in all eighteen injections. In the meantime she lost her sight.

When slaughtered the post mortem revealed diffused and extensive tuberculosis of the bronchial glands, pleuro adherent to the thoracic walls, lung substance healthy, diffused disease of the serous lining of the stomach, stomach adherent to the diaphragm and abdominal walls, mesenteric glands very much enlarged and containing considerable quantities of tubercular matter, well marked inflammation of portions of the floating colon, extensive tubercular disease of the uterus, the mucous membrane of which was very largely diseased.

No. 2 *Ayrshire Heifer.*	Tested December, 1893.	Reaction	5 2 5	degrees.
	" Feb. 7, 1894.	"	5 1·5	"
	" Feb. 27, 1894.	"	1 1 5	"
	" May, 1894.	"	0 2·5	"
	" June, 1894.	"	1 3·5	"
	" August, 1894.	"	0 2·5	"

This heifer was then injected every week the same as the last-mentioned, making in all seventeen injections.

The post mortem revealed the bronchial gland and pleura extensively diseased, a few small tubercles in the right lung, liver and the mesenteric glands slightly diseased.

No. 3 *Ayrshire Heifer.*	Tested October, 1893.	Reaction	3 2·5	degrees.
	" December, 1893.	"	2 2·5	"
	" Feb. 7, 1894.	"	0 1·5	"
	" Feb. 27, 1894.	"	0	
	" May, 1894.	"	0 2·5	"
	" June, 1894.	"	0 1·5	"
	" August, 1894.	"	0 1·5	"

This heifer was then injected as the last-mentioned, making in all eighteen injections.

The post mortem revealed tubercular deposits in pharyngeal glands, a large tubercle in the liver, the mesenteric glands slightly affected, and some small tubercles in the lung substance.

It will be seen that quite a number of the animals were tested several times, especially the three last mentioned, with a view to ascertain whether the lymph has any curative powers if injected repeatedly. The post mortems of these animals did not indicate any such action. In fact in some cases, especially in the Ayrshire cow, No. 3, the indications point rather to the fact that repeated injections tend to diffuse the disease. Towards the last, this cow did not do well; she went blind without any appreciable cause. She was well looked after, and the stable in which we had her and the others isolated was well ventilated. In my opinion she would soon have died from inflammation of the intestines, as there was well marked inflammation, of apparently a subacute form, in considerable portions of the floating colon; and I could account for the inflammation in no other way than from the effects of the diffused and extensive tuberculosis of the coats of the intestines and subjacent organs. It will also be noticed in animals that were tested several times, that the reaction was well marked only on the first, or the first two injections. It appears in many cases to require a considerable time to elapse between injections in order to get a reaction. This of course teaches us that there is little reliability to be placed upon the effects of tests after the first.

Note the facts in the cases of the Ayrshire bull calf and the Guernsey calf No. 1. Both of these animals passed the test the first time, but the reaction in both cases was well marked in the second test. This is hard to explain, as I do not think it possible that they could have received the germs of the disease in the meantime, as they were kept in the stable after it had been thoroughly disinfected. It may be that they contained the germs at the first injection, but in such an early stage that they had not become sufficiently localized to cause a reaction; or, as I have already stated, it is possible that an animal may be diseased and still not react. I think the first theory the more probable.

As to the disease being hereditary, opinions differ. That the predisposition to the diseases is congenital is generally admitted; but whether the disease itself is congenital (that is, whether an animal, the produce of diseased parents, has tuberculosis when born) is a point on which opinions differ. It is claimed by some that germinal tuberculosis never does occur, that is, that the offspring cannot acquire the disease from the seed of either parent, but that it may be possible for the foetus to acquire the disease through the maternal circulation, if the dam be affected. I favor this theory; and if it is correct, we can see that there is no danger of the offspring inheriting the disease from the sire in any case, but of course the predisposition to contagion can be transmitted by the sire. Our experiments go to demonstrate the fact that congenital tuberculosis is at least not common. Note the No. 1 Guernsey cow's calf. This calf suckled his dam, and the post mortem revealed the respiratory organs healthy, but extensive tubercular diseases of the digestive organs. As will be seen by the post mortems recorded here (and it is also a well-known fact), the respiratory organs are the favorite seat of the disease. Are we not therefore warranted in assuming that the calf was born healthy and if fed on pure milk would in all probability have remained so, but being reared on the milk of his dam, which was very extensively diseased, it acquired the disease from the milk. The baccillus in the milk first coming into contact with the digestive organs, lodged there and multiplied, while, if the disease were congenital, we should expect to find it in the respiratory organs. In my last report I stated that I did not consider that there was danger in using the milk of a tubercular cow, unless the udder or lacteal apparatus is diseased. Since then I have had reason to change my mind on this point, as Prof. Mackenzie discovered the baccillus of tuberculosis in the milk of cows in which the post mortems revealed these organs free from the disease, the baccillus no doubt gaining access to the milk through the circulation of the blood. Note also the three calves, No. 2 Guernsey calf, No. 2 Holstein bull calf and No. 3 Guernsey calf. These three were the progeny of diseased parents, and I am informed were reared as follows: Allowed to suckle the dam for a few days after birth and then taken from her and fed the mixed milk of the herd. Whether they received the germs in the milk or not is impossible to say, but if so not in sufficient numbers to affect them, as the post mortem revealed all organs healthy, which also shows that the disease is not often congenital, nor yet in all cases easily acquired. I think the disease is much oftener contracted by the inhalation of the germs than by their introduction into the stomach.

As regards the efficiency of the test, I have come to the following conclusions It may be that it will not always condemn a diseased animal, but I have never known it to condemn a healthy one. The first test is the only one upon which much dependence can be placed. The injection of the lymph has no physiological effect on a healthy animal beyond possibly exciting a very slight degree of fever for a few hours While in a diseased animal, besides exciting a much better-marked fever, it is often followed by general disturbance, such as loss of appetite and condition, diminished supply of milk, a tendency to abort, etc. The degree of reaction does not determine the extent of the disease; but I have noticed that in cases where the reaction has taken place shortly after the injection, say six to ten hours, the animal has had rather extensive disease, while in a case where the reaction was longer in manifesting itself, say twelve to eighteen hours, there was but slight disease. In some cases it requires a very careful post mortem to discover the disease. In the case of the No. 3 grade cow this was noticed. All that was found in her was a small nodule in the liver. I think it probable that in cases where the injection of the lymph has caused a reaction and no disease has been discovered in the post mortem (as some claim), the reason is that a sufficiently careful post mortem has not been held, as mostly any organ in the body, even the brain or spinal cord, may be the seat, and if the disease be slight it is often hard to find.

Respectfully submitted,

J. HUGO REED, V.S.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, December 31, 1894.

PART V.

REPORT OF THE HORTICULTURIST.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my report for the Horticultural Department for the year 1894. I take pleasure in doing so, because I feel that, although in some respects I have made but a beginning in the work to be done, yet the beginning has been successful. I am pleased to say that the work has been lightened by the hearty support and encouragement I have received from yourself and the other members of the staff, the respectful attention of the students to one so lately of their number, and the faithful performance of duties by the men over whom I have charge. When entering upon my duties here a year ago I fully realized the responsibilities resting upon me, and from the past year's experience I feel assured that, with a continuance of such co-operation the Horticultural Department will become more and more valuable to the institution and the country at large, as well as more creditable to the Government which so liberally supports it.

The report of the year's work can be most conveniently given under the following headings:

I. Teaching.

II. Management of the Horticultural Department.

III. Fruit Experiment Stations.

I. TEACHING.

This being a college as well as an experimental farm, our first duty here is to give instruction to the students. The instruction is given by means of lectures in the class-room and practical work in the greenhouses, orchards, and gardens. Lectures on horticulture are given twice a week throughout the year to the second-year students, and are illustrated as far as possible by specimens and object lessons in the class-room. The following is a brief outline of the work covered in the course of lectures:

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.

PRODUCTION OF NEW VARIETIES.—Species and varieties; natural and artificial pollination; crossing and hybridizing.

PROPAGATION OF VARIETIES.—By cuttings, layers, grafting, and budding.

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, peaches, 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.

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.—Barn-yard 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 hot-beds and cold frames; transplanting.

Forcing Garden Crops.—Illustrated by growth in the green-houses of radishes, lettuce, onions, tomatoes, cauliflowers, cucumbers, melons, rhubarb, mushrooms, etc.

Garden Crops.—*Roots*—Beet, carrot, parsnip, salsify, radish, turnip. *Tubers*—Potato, artichoke. *Bulbs*—Onion, leek, garlic. *Stems*—Asparagus. *Leaves*—Cabbage, lettuce, spinach. *Leaf-stalks*—Celery, rhubarb. *Flowers*—Cauliflower, broccoli. *Seeds*—Peas, beans, corn. *Fruit*—Melon, citron, squash, pumpkin, egg plant, cucumber, tomato, pepper. *Herbs*—Sage, savory, mint, etc. *Fungi*—Mushrooms. 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.

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.

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.

FLORICULTURE.

Soil for house plants; methods of potting; propagation 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.

During the past year quite an addition has been made to the list of horticultural books in the library, and from time to time various books have been recommended for reading in connection with the lectures. The examinations are based partly on the students' reading, as well as on the lectures. The following are a few of the books recommended on the different subjects treated:

Fruits.—Downing's Fruits of America; The American Fruit Culturist (Thomas); Barry's Fruit Garden; Small Fruit Culturist (Fuller); The Nursery Book (Bailey).

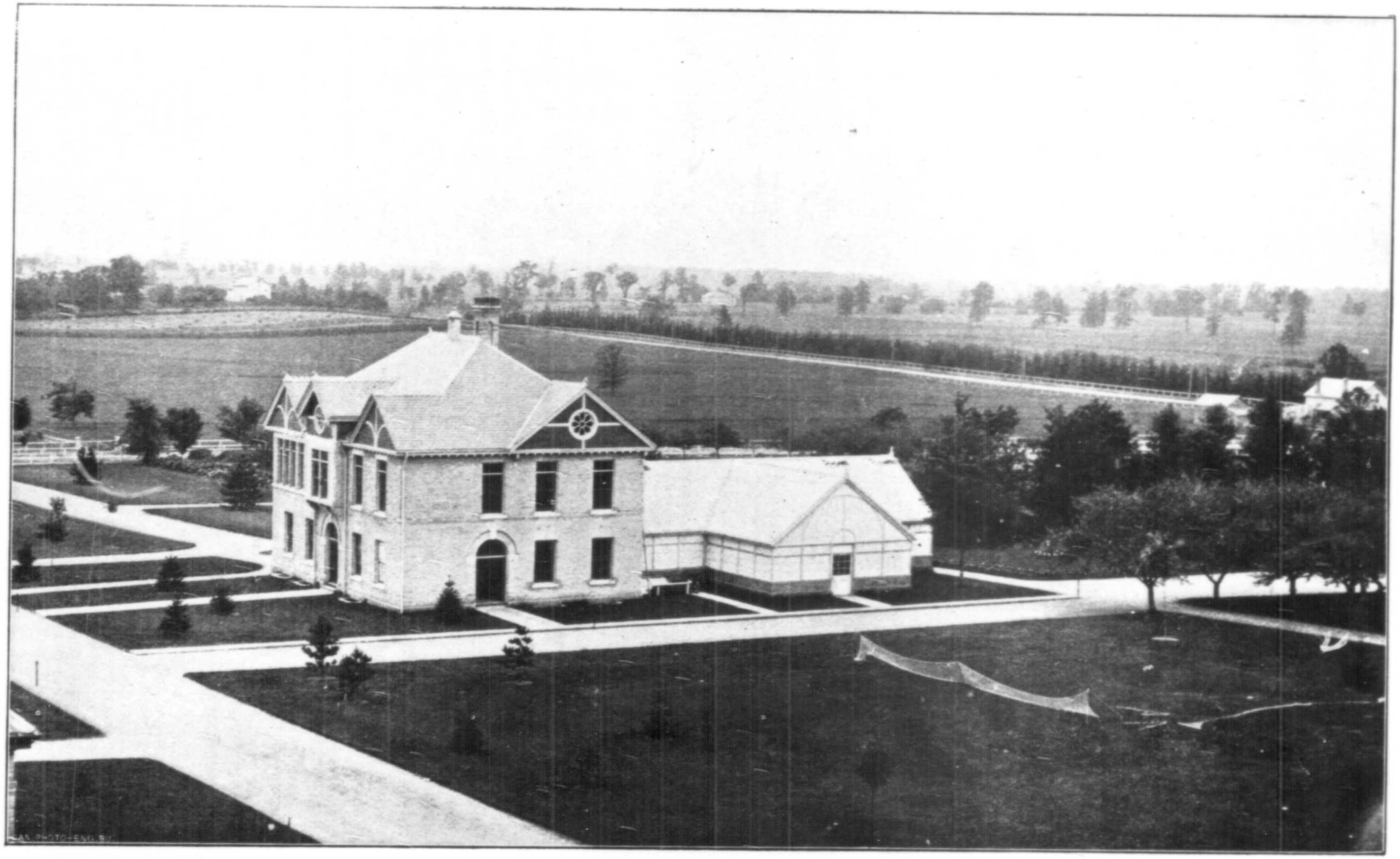
Vegetables.—How to Make the Garden Pay (Greiner); Gardening for Profit (Henderson); Success in Market Gardening (Rowson); The Vegetable Garden (Vilmorin-Andrieux).

Landscape Gardening.—Ornamental Gardening for Americans (Long); Landscape Gardening for Farmers (S. C. Moon in Report Penn. Board of Agr., 1889).

Arboriculture.—Practical Forestry (Fuller); Trees of North-Eastern America (Newhall); Ontario Forestry Reports.

Floriculture.—Your Plants (Sheehan); Vick's Home Floriculture; Practical Floriculture (Henderson.)

Practical Instruction, besides that obtained from their regular work in the greenhouses and garden and orchard, was given during the winter to both first and second year students in the various methods of grafting fruit trees and ornamental plants. In the early spring they received practice in pruning raspberries, currants, gooseberries, etc.; and later on in the season, when the fruit trees were in bloom, they received instruction in production of new varieties by crossing and hybridizing. All of these operations being performed by the students themselves, they took great interest in the work. It is the intention during the coming season to emphasize this method of practical instruction as much as possible by having the students perform for themselves, under close personal supervision, the various operations that may be carried on in the greenhouse, garden, and orchard.



BOTANICAL LABORATORY AND GREENHOUSES.

HAULING IN HAY, JUNE, 1894.

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II. MANAGEMENT OF THE HORTICULTURAL DEPARTMENT.

THE GREENHOUSES.

In extent and completeness our greenhouses are probably unequalled by those of any similar institution on the continent. There are six of these enclosing an area under glass of a little over seven thousand square feet. I will mention the different houses in order of arrangement, giving a brief account of the uses to which each has been put.

The Forcing House is 64 x 20½ feet inside measurement. This house was originally intended for growing roses, being built with benches ranging one above the other from the front to the back of the house. We have thought advisable, however, to devote it to the forcing of vegetables during the winter months. On one of the lower benches radishes and lettuce were grown in succession all winter. In the spring these were followed by muskmelons. The former yielded abundantly, and the latter, although not a decided success, showed that melons may be grown in the greenhouse if attention is paid to artificial pollination. One of the finest crops raised in this house last winter was cauliflower. Sixty of these were grown on one of the centre benches, on a space 24 feet long by 3½ feet wide, the soil on the bench being but 4½ inches deep. They made rapid growth and every one of them headed, forming beautiful, compact, tender "curds," averaging from 7 to 9 inches in diameter. This crop was followed by lettuce, and that again by garden peppers; both of which yielded well. On one of the upper benches, 3 feet wide, two rows of tomatoes were planted and trained on wire trellises. Bees not being in the house to fertilize the blossoms, this was effected by shaking the trellises. The fruit set well and the vines bore steadily for the greater part of the winter, yielding a good crop. The growing of vegetables under glass in winter is a branch of horticulture that needs developing, and will no doubt prove quite profitable. Already some of our most enterprising growers have made a start in this direction. At Grimsby two large greenhouses have been erected for this work, and for the past two or three seasons have been shipping large quantities of tomatoes to the city markets, many of them going to the New York market, where they sell at from 30 to 50 cents per pound.

It is our intention to give more attention to this work in the future, and, if possible, find out to what extent it may be profitably carried on. During the coming winter we intend utilizing the space under the benches by growing mushrooms and forcing rhubarb. The latter is already up several inches high and will soon be ready for use. During the summer and fall the forcing house was used for growing chrysanthemums, of which more will be said later on.

The Propagating House, like all of the other houses, is 64 feet long inside. It is fitted up with a propagating bench 3 feet wide, running the entire length of the house. Nearly all of the many thousands of plants required for bedding every year, and which are propagated by means of cutting, are started on this bench in 3 inches of clear, gritty sand. As soon as well rooted they are potted off into 2-inch pots. At one end of this house we have had put in a propagating oven in which, by means of a close fitting glass top and extra heating pipes coiled in a tank of water below, a very moist atmosphere and steady high temperature can be maintained. In this "oven" hard-wooded and slowly-rooting plants can now be readily started.

Along the wall of this house are three tiers of shelves, running the full length of the house on which such plants as gloxinias, achimenes and tuberous begonias are stored after blooming. In the early spring, when these plants were in bloom and out of this house, these shelves came in very useful for starting the seed potatoes used for very early planting. Being thus fully exposed to the light, the sprouts on the potatoes were short, stout and green, and when planted came up rapidly, giving potatoes a couple of weeks earlier than could have been obtained from unsprouted tubers.

The Horticultural Laboratory is 64x11½ feet inside, and is fitted up with a wide central walk and benches on each side. This house is for the use of the students in doing practical work, and carrying on original investigations. To facilitate this work, the benches on each side of the walk are divided into sections four feet long, each student having for his own use two sections, one being a slate-covered bench on which to keep pot-grown plants, and the other a bench of soil six inches deep, in which plants are grown. On the former, during the past winter, were kept such plants as geraniums, coleus and fuchsias, on which the various methods of grafting were practised. Petunias, also, were grown for practice in artificial pollination. On the soil benches were grown such plants as potatoes, tomatoes and cucumbers, which were not only useful as affording a means of studying the habits and requirements of these various economic plants, but they each yielded a good crop at a season of the year when such things as new potatoes, fresh tomatoes and green cucumbers had a high scarcity value.

After the students had finished their work in this house in the spring, it was given up to the growing of English forcing cucumbers. These occupied the house for the greater part of the summer. The vines were trained up the sides to the ridge in the centre of the house, forming a long green arch, which, when hanging full of fine large cucumbers ranging from one to two and one-half feet in length, was a sight greatly admired by many hundreds of summer visitors.

The following five varieties were grown :

Empress of India, averaging 19 cucumbers to a vine, and the cucumbers averaging 14 inches in length. The most productive variety tried.

Carter's Model, averaging 18 cucumbers to a vine, and the cucumbers avering 20 inches in length.

Rollison's Telegraph, averaging 17 cucumbers to a vine, and cucumbers averaging 18 inches in length. One of the finest quality.

Duke of Edinburgh, averaging 16 cucumbers to a vine, and cucumbers averaging 18 inches in length. Soon becomes yellow and tough.

Chapin's Wonder, averaging 14 cucumbers to a vine, and cucumbers averaging 22 inches in length. Some of the finest specimens of this variety measured 34 inches in length.

The Intermediate House is 64x17 feet, and is fitted up with three-feet side benches and a five-feet centre bench. It contains a varied lot of greenhouse plants, but principally those which are being grown from time to time to keep up the succession of bloom in the conservatory, the plants being at a stage of growth intermediate between those being started in the propagating house and those in bloom in the conservatory. The greater number of plants in this house at the present time are geraniums, cinerarias, calceolarias, stevias and begonias.

Although this house is amply large enough to bring on all the plants required for inside bloom, yet it will, by no means, accommodate the many thousands of plants which have to be grown every year to fill the large flower-beds on the lawn. These, after being changed from 2-inch to 4-inch pots early in the spring, are put outside under hot-bed and cold frame sashes, and gradually hardened off by raising or removing the sashes during fine weather, so as to prepare them for their final removal to the flower-beds.

The Tropical House is 64x20 feet inside, with an eight-foot centre bench and three foot side benches. By means of extra heating pipes this house is kept at a steady high temperature, in which tropical plants grow luxuriantly. It is stocked with a great variety of rare ornamental and useful plants.

We have been endeavoring to get a good collection of economic plants that will be useful for instructive purposes. Among those to be found in this house are the following: *Musa Cavendishii*, a dwarf species of the banana, one of the plants of which is at present bearing a large truss of fine fruit. *Citrus aurantium*, the orange; *Citrus limonum*, the lemon; *Ficus Carica*, the fig; *Olea europæa*, the European olive, which furnishes the olive oil of commerce; *Punica Granatum*, the pomegranate; *Cocus nucifera*, the cocoanut palm; *Phytelephas macrocarpa*, the ivory-nut palm, the nut of which is manufactured into buttons, umbrella-handles, door-knobs, etc.; *Cycus revoluta*, the sago palm, from the pith of which a kind of sago is obtained; *Coffea arabica*, the coffee tree;

Piper nigrum, from the dried berries of which are obtained both the white and black pepper of commerce; *Cinnamomum camphora*, from the roots, stems and leaves of which camphor is obtained by distillation; *Zingiber officinale*, the underground stem of which gives the ginger of commerce; etc.

The Conservatory, our largest house, is 64x25 feet inside, with a wing 20x25 feet, the ridge being 20 feet high. Running all around the sides of the conservatory are stages for the display of plants in bloom. On these we aim to keep up a succession of bloom of some kind the whole year round. At present (Nov. 15) the great attraction is the show of chrysanthemums. We have about seventy different varieties of these, and grow, on an average, four pots of each variety. Seventy seedlings were tried this year, but none of them have proved equal to already-named varieties. The chrysanthemum bloom lasts for six weeks or two months, and is a great attraction while it lasts. During the past three weeks hundreds of visitors from far and near have visited the conservatory, and many have declared it the finest display they ever saw. We wish that more of our farmers with their wives and daughters could see the conservatory at this time of the year.

After the chrysanthemums are over, the succession of bloom is kept up with such plants as begonias, salvias, geraniums, pelargoniums, primulas, cinerarias, calceolarias, lilies, hyacinths, tuberoses, fuchsias, etc. Along with these are staged such plants as rex begonias, coleus, acalyphas, ferns, etc., which are remarkable for their beauty of foliage.

In the centre of the house is a fountain, with a circular stone basin 12 feet in diameter and three feet deep, in which water lilies and other aquatic plants are grown.

In the 14-foot space enclosed by the walks running the length of the house, are grown those larger plants and trees which require all the height of the house. Among those grown here are a number of the Australian blue gum trees (*Eucalyptus globulus*), India-rubber trees (*Ficus elastica*), Australian silk oaks (*Grevillea robusta*), several varieties of Araucarias, a couple of century plants (*Agave Americana*) over thirty years of age and standing about 10 feet high, some large specimens of New Zealand flax (*Phormium tenax*), besides a number of club, date, rattan and other palms.

Labelling Greenhouse Plants.

That a collection of plants such as we have here may be of value to students and of interest to visitors, the plant should be plainly labelled. The ordinary wooden labels on which the name is written with a lead pencil, may do very well for commercial greenhouses; but where plants are kept for instructive purposes or for display, these do not meet the requirements. In our endeavor to get a good kind of label, we have at last hit on one that is giving great satisfaction, and one which might be of value in other public greenhouses or even in private conservatories.

It consists of a celluloid card, on a wire support. The celluloid we get from an organ factory in the city, and is the waste from the facing of the organ keys. It is 1-16 of an inch thick, and we have it cut into two sizes of labels, a small one $1\frac{1}{4}$ x 3 inches for ordinary sized plants, and a large one $1\frac{1}{2}$ x $3\frac{1}{2}$ inches for larger plants. On these cards both the botanical and common names are neatly printed, the botanical names being syllabified and accentuated so that students may readily become familiar with their proper pronunciation.

The ink used for the printing is a glossy, black paint, made of drop black and varnish, thinned with turpentine, so that it will flow readily from a pen point. It soon dries and is not affected by water.

The support for the card is made of No. 16 steel wire, which should be galvanized to prevent it rusting. The wire is cut 8 or 10 inches long and a small coil made in the centre by wrapping it tightly about a $\frac{3}{8}$-in. rod. The celluloid card is held firmly between the loops of the coil and can be set at any desired angle by bending back the coil on the supports which are stuck in the pot.

This makes a label which is at once neat, legible, cheap and durable. During the past year all of the plants in the greenhouses have been labelled with such labels, and as a result students at work in the houses soon become familiar with the names of the plants and naturally take much more interest in them.

Some of these labels may be seen in the photograph of the conservatory.

THE LAWN.

The lawn and grounds surrounding the various buildings require a good deal of labor and attention during a greater part of the year. The lawn itself, which covers an area of about twenty-three acres, has been gone over regularly with the mower and kept smooth and well shorn. The many tree and shrubbery clumps dotted about the lawn have been trimmed and kept well cultivated. The grass edges, bordering the walks, drives and shrubbery clumps, estimated at six or seven miles in length, have all been gone over with the edging knife and kept neat and trim; and many of the drives have been improved with an additional covering of screened gravel. During the winter the drives were kept in good condition by running over them after every heavy fall of snow with a large land roller, a practice which might with advantage be employed on many a country road. The large flower beds in front of the College building and the smaller ones on other parts of the lawn were set out with new designs and the plants carefully attended to throughout the season. With the attention given, the plants made excellent growth, and from June till November presented a sight which was greatly admired by the many thousands of excursionists from all parts of the country. During the year much improvement has been effected in different parts of the grounds. At the rear of the shop and tool sheds the grounds have been levelled and seeded and a number of trees planted out. About the new dairy and poultry buildings, the grounds have also been levelled and seeded and a number of new walks and drives laid out and gravelled.

THE VEGETABLE GARDEN.

The vegetable garden is five and four-fifths acres in extent. By a system of close cropping it is made to yield enough of all vegetables, with the exception of potatoes, to supply the needs of the College.

The severe drouth during the summer somewhat checked the growth and reduced the yield of early crops; but the long period of favorable weather following greatly helped the later maturing ones, and these yielded abundantly.

Although a number of the leading varieties of mostly all kinds of garden crops are grown, no attempt has yet been made to measure and compare the yields from different varieties. This is a branch of the work we hope soon to be able to undertake. In the meantime we are putting the garden in a suitable condition for carrying on such work. This fall it has all been thoroughly underdrained—something it has long needed. Next spring we intend having it deeply subsoiled and all stones near the surface removed. In this way it is hoped to make the soil not only more friable, but more productive.

ORCHARDS AND FRUIT PLANTATIONS.

This is by far the least developed branch of work belonging to this department, and one which with the best of management will take a number of years to become what it should be. The trees making up our apple orchard are scattered in several different places. Those in the orchard planted in 1881 are more an object of pity than pride; year after year the trees here and there have succumbed to the attacks of borers; and during the past season more than half of what remains of this orchard has given place to the new poultry buildings and yards.

The new orchard was started in 1890. It consists of 112 apple and 20 pear trees. All of the young trees set at that time have done fairly well. Some, however, were older trees transplanted from the old orchard; and most of them, although they have lived, have been so stunted that they will have to be replaced with young trees.

The grape vines set out at the same time were this year put on a trellis, and bore a small quantity of fruit. Usually the vines in this section have to be laid down and covered for winter protection. Last year one upright cane from each vine was left uncovered, and all came through the winter without injury. This year we are following up that experiment and training each vine on a combination of the Renewal and Kniffen systems. The vines trained according to the Renewal system are laid down and covered with earth in the fall; those trained according to the Kniffen system are left unprotected on the trellis. In this way we hope to find out to what extent winter protection is necessary for grapes in this section.

A plantation of small fruits, consisting of currants, gooseberries, raspberries and strawberries was also set out in 1890. The currants have made a good growth; and all, with the exception of the black varieties, yielded a good crop this year. The gooseberries also yielded well, although the bushes have in the past been considerably weakened by a leaf-spot fungus (*Septoria ribis*) which causes the leaves to fall prematurely in August. Those sprayed this year with the Bordeaux mixture retained a luxuriant foliage till late in the season, which will no doubt add greatly to their vigor and productiveness another year. Spraying with Paris green proved very effective in keeping both currant and gooseberry bushes free from the worm (*Nematis ventricosus*) which usually defoliate the bushes.

The red and white varieties of raspberries have all done well, and this year produced a fair crop considering the dry season. The black caps, however, have nearly all been killed out with the raspberry anthracnose (*Glœosporium venetum*), a fungus affecting the canes. As soon as another plantation can be put out we hope to be able to show that this disease can readily be held in check by spraying with copper sulphate solution of Bordeaux mixture. At present there are not enough of the bushes left to experiment on.

The strawberry crop this year was considerably lessened by late spring frosts which occurred on May 14th and again on May 28th. Although the leaves were not injured, the injury to the blossom was soon apparent in the blackening and drying up of the pistils or centre of the flower. Fruit trees in bloom at the same time were not injured, probably owing to the warmer temperature of the atmosphere at a somewhat higher altitude.

An old strawberry bed which had already fruited for three years was allowed to fruit again this year, and very clearly showed the folly of leaving old beds for so long a time. Another lot that had borne only one crop yielded a fair crop again this year. The new bed set out last fall was not allowed to fruit, the blossoms being picked off. This has made excellent growth and promises well for next year. The plants have been covered this fall with a mulch of coarse strawy manure, which will be raked off and left between the rows in the spring. This protects the plants from the alternate freezing and thawing in the early spring, and helps to retain the usually much needed moisture later on in the season.

Arboretum and Tree Clumps.

In 1890 a collection of forest trees consisting of several varieties of maples, English and American ash, elms, oak, hickory, butternut, walnut, birch, basswood, mountain ash and catalpa, also several varieties of conifers such as larch, spruce and pine, was planted on four acres of a hillside in field No. 4, facing the College. With the exception of the catalpas (*Catalpa bignonioides*), which are too tender for this section, nearly all have made a very good growth. They are planted in rows eight feet apart each way, and are kept well cultivated and trimmed. The different varieties of evergreens and deciduous trees are irregularly grouped so as to present, when viewed from a distance, a very pleasing appearance.

In 1887 three acres of a similar plantation was put out in field No. 3. These trees have made a rapid growth and are now so large that cultivation is difficult, and is in fact almost unnecessary as the trees make such a dense shade that grass or weeds cannot well grow under them.

This plantation serves a good purpose in screening from view a large gravelly knoll and a couple of gravel pits, and presents instead a varied mass of light and dark green foliage.

A clump of European larch in field No. 2, much nearer the College, answers a similar purpose. These trees were set out in 1881, and have long since become so large that cultivation has been stopped and the trees left to take care of themselves.

The clump of walnut trees in the experimental field at the back of the College was put out at the same time. These have been kept well cultivated and have made a good growth. Many of the trees are now six or eight inches in diameter, and will in time become valuable for timber.

In 1890 and 1891 two hundred and forty young elms were planted along the sides of the farm lane. These have, on the whole, made a very unsatisfactory growth, some much worse than others. On examination early in the spring it was found that forty of them were badly infested with the flat-headed borer (*Chrysobothris femorata*), and later on in the season all were found to be more or less affected with a fungus (supposed to be that described as *Dothidella ulmea*), which blights the leaves and young twigs, causing the latter to become brittle and flattened in portions where it is readily broken off with the wind. With the aid of a knife and a bit of wire all of the borers that could be found were dug out and destroyed, and early in June the trunks of all the trees were washed with a solution of soft soap and carbolic acid to prevent the beetles depositing their eggs on any of the other trees. The fungus was discovered too late in the season to be treated. Next year we hope to be able to take this in time and try upon it the efficacy of the copper sulphate solution and Bordeaux mixture.

III. FRUIT EXPERIMENT STATIONS.

The Need of Such Stations.

One of the most progressive movements during the year along horticultural lines has been the establishing of a number of fruit experiment stations in different parts of the province.

For a number of years the fruit growers of Ontario have felt the need of some means whereby the different varieties of fruits, both old and new, could be properly tested and their relative merits for different sections of the country made known to the public. To try and meet this need various schemes have been proposed; but until this year none have appeared practical enough to meet the approval of the Department of Agriculture and receive the desired support from the Government.

Plan of Organization.

The plan at last adopted provides for the establishment of ten experiment stations located in different parts of the province, so as to meet as far as possible the varied conditions of location and climate. Instead of purchasing land for each station a successful fruit grower is selected, who has already under cultivation a good orchard or plantation, containing a number of varieties of the particular fruit or fruits to which he is to give special attention in testing. He is supplied from time to time with whatever additional varieties are thought necessary to be tested. The complete results of such tests are to be reported at the end of the season to the Secretary of the Fruit Growers' Association, and the Horticulturist at the Ontario Agricultural College, this work being under the joint control of the Agricultural College and the Fruit Growers' Association.

To compensate him for his trouble each experimenter is to receive a sum of money sufficient to repay him for his extra labor in connection with this work.

This plan meeting the approval of the Government, an appropriation of $1,000 was made at the last session of the Legislature for commencing the work.

A Board of Control, representing the Agricultural College and the Fruit Growers' Association, was appointed as follows:

James Mills, M.A., LL.D., O.A.C., Guelph, President.

L. Woolverton, M.A., Grimsby, Secretary.

H. L. Hutt, B.S.A., O. A. C., Guelph.

A. M. Smith, St. Catharines.

A. H. Pettit, Grimsby.

*D. Nicol, Cataraqui.

The first meeting of the Board of Control was held at the College, April 4th, 1894, when the work of organization was completed and five stations decided upon.

Stations Established.

After some considerable correspondence four stations were established as follows:

1. At Leamington, Essex County, under W. W. Hillborn, for peaches and strawberries.
2. At Craighurst, Simcoe County, under G. C. Caston, for apples.
3. At Winona, Wentworth County, under Murray Pettit, for grapes.
4. At Trenton, Bay of Quinte district, under W. H. Dempsey, for apples and pears.

Each of these men is a thorough-going, practical fruit grower, and has under cultivation a large number of varieties of those fruits to which he is to give special attention in testing. Last spring they were supplied with a number of additional varieties which it was thought advisable to test.

Inspection of the Stations.

In company with Mr. L. Woolverton, Secretary of the Fruit Growers' Association, it was my pleasant duty during the summer to make a tour of inspection to each of the stations This we did, visiting each station at the most opportune time for gaining information relative to the various kinds of fruit grown there. In every case we were pleased to be able to report that good work was being done, and that in time valuable results may be expected.

Reports of Experimenters.

Early in the season Mr. Woolverton and I met and drafted blank forms on which to record systematically all the information that may be desired as to the planting, cultivation, management, bearing, etc., of each variety grown at each station. Other forms were also drafted on which to record all the desired particulars as to the origin and description of both plant and fruit of each variety. These forms were printed and forwarded to each experimenter to be filled out from careful notes taken during the season. At the close of the season valuable reports have been received from each station. These are too voluminous to be published here, but will be published in full, together with full particulars as to the organization and establishment of the stations, in a separate report now in course of preparation by the Secretary of the Board of Control.

Other Stations to be Established.

The original plan provides for the establishing of ten stations. The object being as far as possible to spread the work so as to meet the requirements of all sections of the country, and at the same time confirm by a number of reports the results obtained.

*Deceased.

The establishment of other stations will depend upon two things: First, the granting by the Legislature of a larger appropriation for carrying on the work. This we have no doubt will be forthcoming at the next session, as the desirability of the results and the success attained so far in obtaining them will warrant a doubling of the grant next year. Second, suitable men in suitable localities must be found for carrying on the work. This is a matter that requires careful consideration, as the success of the work depends largely upon the capability of the men chosen as experimenters. With this object in view Mr. Woolverton and I have visited several sections where it was thought advisable that stations should be established. One of these is the Beaver Valley, in Grey county, which has proved itself peculiarly adapted to plum growing. Here it is thought that Mr. John Mitchell, of Clarksburg, a very successful plum grower, would be a suitable man for conducting experimental work. Mr. Mitchell's appointment as an experimenter will be recommended at the next meeting of the Board of Control. This and one or two other stations, it is hoped, will be established during the coming season.

All of which is respectfully submitted.

W. L. HUTT,
Horticulturist.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec. 31, 1894.

PART VI.

REPORT OF THE AGRICULTURIST.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my second annual report. My work during the past year has followed closely the plan outlined in my last year's report, special pains being taken to make the work as practical as possible. With this object in view, special attention has been given to the handling and judging of live stock, including cattle, sheep, and swine.

Lectures have also been given on the construction and arrangement of farm buildings, in which the College barns and stables have been used as object lessons: their faults criticized, and improvements suggested.

Besides lectures in live stock, the students have received a course in general agriculture; and an effort has been made to adapt the subject to the capacity of the students, the practical being given prominence with the beginner, and the scientific and more theoretical, reserved for the more advanced.

During July, a short series of lectures on agriculture was given before the public school teachers who took advantage of the summer course. The lectures were given with the object of outlining what might be taught in the public schools, and of briefly indicating the method in which it might be presented.

During the past year, nothing has been done in experimental feeding. I trust that during the coming year we shall be able to commence a number of valuable experiments with cattle, sheep and hogs.

At present our buildings are not well adapted to experimental feeding. With a small outlay, the building which was erected a few years ago as an extra sheep pen, and which is very little used at present, could be converted into a convenient building for experimental cattle and sheep. An experimental piggery is also needed, and a building which would answer the purpose could be erected at a small cost. If such arrangements can be made, we shall be well equipped for carrying on this highly important work.

Your obedient servant,

G. E. DAY,
Lecturer on Agriculture.

GUELPH, December 29th, 1894.

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PART VII.

REPORT OF FARM SUPERINTENDENT.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of herewith submitting my report of the Farm Department for the year 1894.

Notwithstanding the very dry season, all the crops on the farm were excellent. The grain crop, however, not being all threshed, I am unable to give the exact number of bushels of each variety to the acre. Following is a summary of the work done during the year:

Messrs. Lamb and Stephen have charge of the cattle, sheep and pigs. In winter they are allowed three students one hour in the morning, from 5 a.m. to 6 a.m., to assist in feeding; and two students in the afternoon to prepare food, groom cattle, etc.

FEEDING AND CARE OF LIVE STOCK.

Cattle: In winter the cattle are fed as follows: a mixture composed of cut hay, chaff, ensilage, and pulped roots. None of the breeding stock except the milch cows, receive any grain. The milch cows are given every day about three pounds of crushed grain and bran. The feeding steers, seventeen in number, weighing at present (December) nearly 1,200 pounds each, are receiving the same allowance as the milch cows. An increase of grain will be given in the spring.

In summer the breeding stock are turned out to pasture, and towards fall when the pasture becomes dry, corn and rape are hauled to the fields for the cattle, sheep and pigs.

In summer the cattle are each week rubbed over with seal oil and crude carbolic acid, one tablespoonful of the latter to one quart of the former. This prevents the horn fly and other insects from annoying them. The oil is applied with the sponge, and care is taken not to miss any part of the animal.

Sheep: In winter, the breeding sheep are fed as follows: in the morning they are fed the same mixture as the cattle; at noon, pea straw; and in the evening, clover hay. After lambing, the ewes receive in addition a little grain and roots. In summer, they are on pasture without grain.

Pigs: The pigs number at present, 12 full-grown for breeding and 28 young animals. The average age of the latter is two months. The food used is the refuse of the College, cooked and mixed with 58 lb. of bran and middlings of equal quantities. The cost per day for bran and middlings 40c., refuse from college equal to 3 bushels of roots 24c., total 64c. Cost of food per day for each animal 1.6c.

Last summer we had roots to cook for pigs continuously. The sugar beets until the 1st of August, at which time we commenced using mangels from the field, boiling both tops and roots.

The following live stock is kept for educational purposes:

8	breeds of	cattle, 1	male and	2	females	of	each	breed.
9	"	sheep, 1	"	6	"	"	"	
5	"	swine, 1	"	2	"	"	"	

Horses: The following are the winter rations: In the morning, (5 o'clock) the same as milch cows, viz., a mixture of cut hay, chaff, ensilage and pulped roots, with 2 lb. of crushed hay and bran; at noon, 3 lb. cut hay with 2 lb. grain; in the evening, carrots and cut hay only.

When spring work begins, they are fed cut hay and 5 lb. of crushed grain and bran each, three times per day—morning, noon and night.

In the winter season Mr. Benson and the students perform all the work on the farm, viz., threshing, cutting feed, crushing grain, pulping roots, cutting up fallen trees, and clearing up the wood land; also hauling and spreading manure for next season's hoe crops, hauling ice for College and dairy. Students drive the teams and perform the work on the farm in turns.

Permanent Improvements Made During the Year.

A new 4-foot sidewalk was constructed on the public road from College to the limit of city of Guelph. Mr. McIntosh, of the mechanical department, had charge of this, the work being performed by the students.

The public road running southwest from Brock Road was graded and gravelled for 100 rods within the past month. The gravel was taken from the hill opposite No. 3 field. Most of it was very coarse, but this difficulty was overcome by carefully spreading and having a foundation six or seven feet in width paved with the large stones (from 3 to 5 inches in size) in the centre of the road-bed. This was carefully covered with fine gravel and sand. It is the intention to keep all loose stones raked into the ruts and rolled frequently.

Fences: Many of the fences were in a very dilapidated condition, causing considerable annoyance with neighboring cattle getting into the crops. There have been constructed nearly three miles of new fence this season, of the following design: round 6-inch cedar posts, 20 feet apart, 3½ feet in the ground, seven wires, each 2 strands of No. 12 twisted, the top wire barbed, spaced as follows from the bottom,—5, 6, 6, 8, 9, 9, inches. The intention is to stay the horizontal wires with upright rods or wires. 90 rods have been stayed with No. 14 wire, 2 feet apart. This is put firmly and neatly around each horizontal wire and fastened top and bottom. One person can stay from 20 to 30 rods per day, according to the distance stays are put apart. No. 7 steel rods fastened to the horizontal wires with washers are a better support for the top and bottom wires, but as the cost is more than five times that of No. 14 wire, it is a question which to adopt.

The cost of fence complete: wire 22c., posts 10c. per rod; the labor of digging the holes, setting the posts, etc., was performed by the students, with the exception of one man. The labor may be estimated at 10c. per rod. Total cost without stays 42c. per rod. Cost of staying with No. 14 wire, 2½ feet apart, 5c. per rod; with No. 7 steel rods and washers, 2½ feet apart, 28c. per rod. The above makes a very neat, durable and cheap fence.

Underdraining: 600 rods of underdraining was done on the farm this spring. I understand two unsuccessful attempts have been made to drain the pond in No. 14 field. With the spirit level it was found that it could be drained by connecting with an 8 inch drain in No. 1 field. The contract was let to Henry Prange, of Breslau, at 50c. per rod for digging and laying tiles through No. 13 field, 60 rods, which were put down from 5 to 7 feet deep; main drains and laterals in No. 14 field were put down 2½ to 3 feet deep, price 25c. per rod, 6-inch tile were used the first 60 rods, balance of main drain 5 and 4-inch and the laterals 3 inches. There is now no dryer land on the farm.

No. 12 field was sown with oats the 27th of April. During the wet weather in May about five acres of this field was covered with water, although it was closely tile drained; but they were too shallow and had not a proper out-let. With the spirit level, it was found that a few inches of fall could be got by connecting with a 6-inch drain in No. 10 field. The fall is only ½ inch to the rod. 5 and 4-inch tile were used in the main drain and 3-inch for laterals. They are working nicely, and although a portion of the oats was covered with water in the spring, at harvest they were a fair crop.

Rotation of Crops.

As no system or rotation of crops has been practised on this farm for years past some of the fields are greatly in need of a change from grain to grass and *vice versa*. It is the intention to adopt the four years' course system, as follows: 1st and 2nd years, grass, (meadow and pasture); 3rd year, hoe crops, viz.: roots, potatoes, corn and peas; 4th year, wheat, oats and barley, seeded in spring with grass seed, principally common red clover. With fields Nos. 19 and 21, which are nearly a mile from the barns, it is the intention to follow a three years' course for convenience and to increase fertility without manure, 1st and 2nd years, grass; 3rd year grain and re-seeded with grass, (principally clover.)

Field Crops.

Field No. 1, 20 acres: Pasture for dairy cows; about 8 acres was cut for hay.

Field No. 2, 17 acres: 9 acres rye, a very heavy crop; the balance of 8 acres, Poland White oats, sown April 18th and harvested August 1st, a good average crop. This field was seeded with grass on April 18th, the following mixture: 6 lb. red clover, 3 lb. alsike, 4 lb. timothy, and 2 lb. perennial rye grass.

Field No. 3, 16 acres: Mandscheuri barley, sown (drilled) April 17th and 18th, and harvested 19th and 20th July; more than an average crop; seeded with grass seed, same mixture as No. 2.

Fields 4 and 5, 24 acres: Pasture for sheep and dairy cows. This is fall plowed for peas next spring.

Field No. 6, 20 acres of Prussian Blue peas, sown 25th and 26th of April, and harvested the first week in August. A good average crop; not threshed yet.

Field No. 7, 20 acres of Siberian oats, sown 23rd and 24th of April, and harvested 8th and 9th of August. More than an average crop; not threshed yet.

Field No. 8, 20 acres: 17 acres of Danebrog oats and 3 acres of tall white Marrowfat peas. Harvested peas 27th and 28th July; oats, 6th and 7th of August.

Field No. 9, 20 acres of meadow: a very heavy crop.

Field No. 10, 14 acres: 8 acres corn (Salzer's North Dakota), sown 30th and 31st of May; about 2 acres cut green and fed to dairy cows, and balance put in silo 26th and 27th of September. Yield, 15 tons per acre. Balance 6 acres potatoes, Crown Jewel, Pearl of Savoy, Empire State, and Rural New Yorker No. 2. 1½ acres of each. Harvested 18th-20th of October. Total yield 900 bushels.

Field No. 11, 20 acres of meadow, principally lucerne clover; a heavy crop.

Field No. 12, 17 acres of improved Besthorn oats; not threshed yet; only a moderate crop. This field required underdraining, which was done in June.

Field No. 13, 15 acres: 12 acres of Oderbrucher barley, sown 19th and 20th of April and harvested 21st and 22nd of July. A medium crop; not threshed yet. 3 acres Kennakulla barley, sown 20th of April and harvested 27th July. Average crop; not thrashed yet.

Field No. 14, 23 acres: 6 acres of mangels, of following varieties: Long Red, Yellow Intermediate, Yellow Globe, and Golden Tankard; 1½ acres of each variety; sown 1st and 2nd of May; harvested 10th-12th October. 2,500 bushels.

Sugar beets, green top and red top, 1½ acres each. Sown 3rd of May and harvested October 15th. Yield 1,100 bushels.

Carrots, White Intermediate, ½ acre. Sown 5th May and harvested October 25th. Yield 325 bushels.

Swede turnips, 4½ acres, Bronze Top, Rennie's Prize, and Carter's Prize Taker. Sown 21st of June, and harvested October 26th and 27th. Yielding 2,800 bushels.

9 acres of rape, 4½ acres sown 21st of June, which yielded abundantly. As soon as ready for use, a portion was cut each day and hauled to the pasture fields to feed to the cattle, sheep, and pigs. Second sowing 4½ acres; sown 18th and 19th of July. This lasted until Christmas.

Field No. 15, 24 acres of permanent pasture. Seeded 15 years ago.

Field No. 16, 20 acres of ensilage corn: Mammoth Cuban and Leaming, sown 29th and 30th of May and put into silo September 17th-26th. Yield 15 tons per acre.

Field No. 19, 30 acres. 17 acres spring wheat, 3 varieties, Herrison Bearded, Pringle's Champion, and Blue Stem. Sown 16th and 17th of April. Harvested 1st-3rd of August; good average crop.

13 acres fall wheat, 4 varieties, Dawson's Golden Chaff, American Bronze, Golden Drop and Bulgarian. The first named yielded 35 bushels per acre, the others about 30 bushels. This field is seeded with the same grasses as Nos. 2, 3, 12 and 13.

Field No. 21: 12 acres of meadow (lucerne clover). Plowed end of July, and sown with fall wheat August 31st and September 1st—3 varieties, Early Genesee Giant, Dawson's Golden Chaff, and American Bronze.

Spring Seeding.

All land intended for spring seeding was thoroughly cultivated and plowed the previous fall. The land is prepared in spring as follows: first harrowed, then cultivated with a spring tooth cultivator, again harrowed, and then the grain drilled in. Finally it is harrowed and rolled, and at the same time all stones are picked.

Fall Plowing and Cultivation.

Field No. 1: Grass land, intended for roots next season. It was plowed the last week in September, afterwards twice harrowed. Middle of October cultivated with broad share cultivator. Again harrowed, and finally manured with well-rotted barnyard manure, 20 loads to the acre. This will lie on the surface until planting time in the spring, when it will be gang-plowed.

Fields Nos. 6, 7, and 8 were gang-plowed as soon as grain was harvested, then twice harrowed, cultivated with broad share cultivator, again harrowed, and finally plowed.

Annual Sale.

The annual sale of surplus live stock was held October 3rd, on the farm. Notwithstanding a heavy rain during the forenoon, there was a good number of buyers. The following animals were sold: 7 young cattle, $242.00; 48 sheep, $510.00; 48 pigs, $700.00; total, $1,452.00.

Farm Accounts.

I beg to suggest that a separate account be kept for the farm. At present the thirty cows belonging to the dairy department are pastured in summer and supplied with hay, ensilage and roots in the winter from the farm, without the farm having credit. The four horses for the experimental department, two for garden, and two for College are fed by the farm department and no credit allowed. By this means accurate data as to the management of the farm and its financial results would be secured.

Respectfully yours,

WM. RENNIE,
Farm Superintendent.

Ontario Agricultural College,
Guelph, Dec. 31, 1894.

PART VIII.

REPORT OF THE EXPERIMENTALIST.

To the President of the Ontario Agricultural College :

SIR,—I have the honor of herewith submitting for your consideration the work conducted in the experimental department during the year 1894. During the past year there has been progress made in connection with the experimental work of the Agricultural College. The experimental grounds have been extended, the number of plots has been increased, several new and prominent varieties of grain and roots have been imported, and the number of packages of seeds and fertilizers distributed to the farmers throughout Ontario has increased considerably. Although the season has been unfavorable for some of the kinds of farm crops, still, on the whole, we have a greater number of successful experiments to report than in any previous year. In fact the number of failures has been but few. I wish to draw your attention to the great need of an experimental building, that we may be better enabled to carry on the work in the experimental department.

THE EXPERIMENTAL GROUNDS.

The experimental grounds now cover an area of about forty acres. During the past year they have all been in one compact block, instead of forming parts of some three or four different fields as in former years. This is an improvement, as the work in connection with the experimental department is greatly facilitated in not having the plots distributed over different sections of the farm. The fields which were formerly known as number 17 and number 18 have been joined together. These form the present experimental grounds. These have been divided into plots which numbered over 1,700, during the present year. The plots vary from $\frac{1}{12}$ to $\frac{1}{300}$ of an acre in size. The plots are mostly laid out in ranges four rods wide and eighty rods long. A road, one rod wide, is left between each two ranges and also along the ends of the ranges. The driveway, which passes between the chemical laboratory and the main college building, is continued northward running through the experimental field and dividing the ranges into two equal parts. This driveway is about 24 feet in width and 85 rods in length. It can be clearly seen that the whole system of plots is very compactly and systematically arranged. These various roads allow easy access to all plots, either for the object of harvesting the crops or for visitors to drive through and examine the different varieties which are being tested. There are in all about five miles of road throughout the experimental grounds.

EQUIPMENT FOR AGRICULTURAL EXPERIMENTS.

We are now getting fairly well equipped for the work of conducting experiments on the field plots. Several implements have been constructed in such a way that they are well fitted for careful experimental work. For instance, a grain drill has been made which will sow ten different varieties of grain at one time without mixing. The tubes are exactly one link apart, and all the grain left in the drill can be completely removed from it in a very short space of time. A wagon rack has been made by which the crop of two plots can be drawn from the field to the threshing barn without the varieties becoming mixed, and without the loss of any of the grain on account of its becoming shelled. A large scale, which will weigh from one quarter of a pound to three tons, is placed in the loft of the experimental barn, and the product of the plots is weighed as soon as harvested. A small separator called the "Little Giant," made by John Abell, Toronto, has been reconstructed in such a way that it can be thoroughly cleaned out after each plot is threshed. This machine is run by a tread power and both are situated in the experimental barn.

During the busy season of harvest, when there are about 400 different plots of grain all ripening in a few weeks time, it is absolutely necessary to carry on several operations simultaneously, such as cutting, hauling, weighing, threshing and cleaning the products of the various plots. The "Little Giant" separator is, therefore, in operation from morning till night during nearly every day from the commencement until the close of the harvest.

The Experimental Department in its Relation to the Farm Proper.

These two departments are quite distinct, but at the same time one department very frequently receives advice and assistance from the other. During the early part of the year, the farm proper cut the timber and plowed for the first time several acres of new land, lying at the east corner of the experimental grounds. After this was accomplished the experimental department brought a man from Hamilton, who blasted nearly all of the stumps with dynamite.

The grounds have been again plowed and levelled and about 20 plots of winter wheat have been sown in one portion. The dynamite generally removed the entire stump and the roots immediately underneath the stump, leaving, of course, many of the lateral roots, which can be removed from the land without a very great deal of labor. We expect to have all this new land divided into experimental plots in a short time.

All the varieties of grain, potatoes, roots and corn which were grown in the farm department during the past year were those varieties which had made the best records in the trial grounds. In most instances they had been tested from three to five years. Some of them were varieties which had been secured in this province, while others were originally imported by the experimental department from France, Germany, Russia, Italy and other foreign countries.

The Experimental Department in Relation to the System of Co-operative Experiments in Agriculture Conducted by the Farmers of Ontario.

The Ontario Agricultural and Experimental Union, which is an association composed of officers, students and ex-students of the Agricultural College, has been in existence for the past sixteen years. At first, the principal work of the association was to meet annually at the College and hold a two days' meeting, during which time addresses on agricultural subjects were delivered and discussed.

In 1886, a committee was appointed to consider the best plan of carrying forward co-operative experiments in Agriculture. During that year there were twelve experimenters. From that day up to the present, the work has gradually and substantially developed, until during the present year no less than 1,340 farmers throughout this province were engaged in conducting these co-operative experiments. The seeds and fertilizers are sent out from the experimental department each year, and the Experimental Union pays part of the expense for distribution. The summary results of all the successful tests are presented annually at the meeting of the association. Much interest and enthusiasm has been manifested in this work, and we believe that great good is being accomplished in many ways, and the experimental department feels well paid for the time and labor devoted to this very important feature of experimental work in Ontario. It is a strong connecting link between the farming community and the Agricultural College.

Exhibits.

During the past six years, the experimental department has had an exhibit at one or more exhibitions. In 1889, 1890, 1891 and 1892, an exhibit was placed at the leading exhibitions of Ontario, among which Toronto and London might be mentioned. In 1893, the experimental department placed an exhibit at the World's Columbian Exhibition, which is described in the College Report of last year. During the present year, we prepared an exhibit for the Central Exhibition held in Guelph, during the third week in September. The exhibit consisted of grain in jars and in head, of roots, and of corn. The leading varieties of grain were shown, and the specimens of mangels, carrots, turnips, sugar beets and kohl rabi were the largest on the exhibition grounds. The following short description of the exhibit was published in one of the Guelph newspapers:

THE ONTARIO AGRICULTURAL COLLEGE EXHIBIT.

"Mr. C. A. Zavitz, Experimentalist at the Ontario Agricultural College, has a very tastily arranged collection of grain in head and straw, and roots, at the north end of the horticultural building upstairs, and is constantly surrounded by a crowd of sightseers in quest of the information he is always ready to give. His carrots, mangels and turnips are the largest in the show, while the sugar beets, used for feeding purposes, are fine specimens. A most interesting feature are the wheats which have led in the experiments of the College and the Agricultural Union for the past two or three years. Dawson's Golden Chaff has given the best results, and is becoming a great favorite. The American Bronze and Standard wheats are also shown, among many others."

Correspondence.

The correspondence in connection with the experimental work is increasing year by year, and is becoming very heavy. During the present year, we have received as high as seventy-nine letters in one day, and an average of about forty letters a day for several weeks at different seasons of the year. Some of these were reports of experiment; but in very many cases questions were asked regarding a great variety of subjects connected with agricultural work.

Visitors to the Experimental Department.

Thousands of farmers visited the institution during the month of June, and nearly all examined the experimental grounds as well as they could in their very limited stay at the College. At that season of the year the plots present a very good appearance; but as the crops are yet so small, but little information can be gleaned regarding the leading varieties. The winter wheats, however, are so far advanced that many important points can be gleaned regarding the characteristics of the different varieties. The crops on the root, potato, and corn sections of the experimental grounds are exceedingly small in the month of June, and the Swede turnips and rape plants have not yet made their appearance. A good general outline, however, of the experimental work can be gleaned even from a short visit through the experimental grounds during the month of June, and we believe that a greater interest is created in regard to the operations of the experimental department. They can observe the extent of the work and the careful and systematic manner in which it is conducted, and thus will likely take a deeper interest in reading the reports of the results when issued.

There are many visitors who come to the institution during the months of July and August, at which season of the year the plots are in the most favorable condition for inspection. Some persons spend a considerable amount of time in examining the various crops, and comparing one variety or one system of cultivation with another. It is in this way that the visitor can reap the greatest advantage by a trip through the experimental field. It would take several days for a person to examine closely all the crops under experiment.

Experiments in Grain Growing.

The plots devoted to the grain experiments varied from $\frac{1}{100}$ to $\frac{1}{12}$ of an acre in size. The plots used for nearly all the grain experiments were exactly 100 links long and ten links wide, thus being $\frac{1}{100}$ of an acre in area. Experiments were conducted with varieties, dates of seeding, methods of seeding, selection of seed, different quantities of seed per acre, grain cut at different stages of maturity, spring barley sown in the autumn to form a mulch for wheat in winter, and with grain sown in mixtures.

Variety Tests with Grain.

During the past six years all the Ontario varieties of grain which could be obtained have been grown on the experimental plots. Besides the Ontario grains, varieties were imported from Germany, Italy, Sweden, Russia, England, Scotland, Switzerland, Hungary, Greece, Sicily, Egypt, Japan, New Zealand, Australia, and the United States. All the Ontario kinds are grown side by side with the foreign varieties for comparison. In oats, barley, spring wheat, and peas, we have been successful in obtaining some very superior varieties which had never been grown in Ontario previous to the time they were introduced by our Station. The results given of these tests are certainly worthy of very careful study, as perhaps in no other place in America have there been so many varieties tested so carefully for such a length of time. The varieties which have made the best records have been grown in larger quantities and the seed distributed through the mail to the farmers of Ontario, or sold in larger quantities at moderate prices. Some 23,000 packages of choice seed have been sent out over the province during the past four years, and some of the varieties are being grown quite extensively. Nearly the whole of the grain grown on the fields in the farm department during 1893 were varieties which were first grown on the larger plots. The grain for sale is handled by the farm department, of which Mr. Wm. Rennie is superintendent.

Besides the varieties being grown in small plots, and the best ones grown in larger plots, all the varieties are grown in single rows with 100 grains in each row. The rows are one rod long and one foot apart. This gives a grand opportunity to confirm the results of the same varieties on the plots. The habits of growth of all kinds are studied quite closely, and when they can be found growing in different places and upon soil differing slightly in character, a much better opportunity is afforded to determine which variety is most affected by rust, which variety possesses the strongest straw, etc. From the single rows the collection is made for exhibition purposes. The land where the single rows are grown, is treated similarily to that of the larger plots. By making the exhibition collection from this source, the plots are left entirely undisturbed, and, as the greatest accuracy is practised in our plot work, the results may be considered to be of a very reliable nature.

The rainfall in the month of May was exceedingly heavy, surpassing that for the same month for several years previous; during March, June, July, and September it was about average; and during April and August exceptionally light. The temperature from April to September in 1894, was slightly higher than for the ten years previous.

FIELD PLOT EXPERIMENTS.

Barley, Comparative Test of 50 Varieties.

Fifty varieties of barley were grown in 1894. Of this number twenty-six were two-rowed, fourteen six-rowed, and ten hulless varieties. Among thirty-seven kinds, which were grown on the experimental plots for five successive years previous to 1894, only eleven of the leading kinds were sown in the spring of the present year. There were, therefore twenty-six varieties discarded after five years' trial. Fourteen varieties were grown for four years, three for three years, nine for two years, and three for one year. They were all sown broadcast at the rate of 100 lb. per acre, upon plots exactly 1-100 of an acre in size. Equal amounts of grain were sown upon the different plots. Seeding took place on April 24th. The land was a mild clay loam, was manured at the rate of fifteen tons per acre of farmyard manure in the spring of 1893, and produced a crop of potatoes that season. The yields per acre have been estimated from the actual yields of the plot.

BARLEY, COMPARATIVE TEST OF 40 TWO-ROWED AND SIX-ROWED VARIETIES.

Varieties.	Seed obtained from—	No. of rows per head.	Results for 1894. Date of maturity.	Results for 1894. Weight per measured bushel.	Results for 1894. Straw per acre.	Results for 1894. 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.
			July.	lb.	tons.	bush.	lb.	tons.	bush.
Grown for six years:									
1 Mandscheuri	Russia	6	23	51.06	1.96	85.02	50.76	1.79	**61.42**
2 Oderbrucker	Germany	6	22	52.38	1.89	75.27	53.65	1.59	**55.38**
3 Scotch Improved	Ontario	6	20	50.25	1.73	71.48	51.63	1.50	**54.50**
4 French Chevalier	France	2	29	51.88	2.53	65.23	51.98	1.90	**54.04**
5 Empress	England	2	31	52.63	1.91	59.90	52.27	1.89	**51.82**
6 Common Six-Rowed	Ontario	6	20	49.25	1.70	64.58	52.29	1.42	**51.35**
7 Improved Cheyne	England	2	29	50.63	2.57	55.27	52.27	2.00	**50.21**
8 Thanet	"	2	30	50.56	1.93	53.13	52.18	1.82	**49.44**
9 Early Black	France	6	28	49.38	1.34	56.77	50.23	1.47	**49.21**
10 Kinna Kulla	Sweden	2	30	52.19	1.71	53.65	51.62	1.78	**47.94**
11 Two Rowed Italian	France	2	31	53.06	2.39	40.10	52.68	2.01	**47.85**
Grown for five years:									
12 Cape	New Zealand	6	26	47.81	1.66	70.31	47.32	1.40	**54.06**
13 Mensury	Ontario	6	19	49.13	1.74	66.94	51.11	1.88	**52.11**
14 New Zealand Chevalier	New Zealand	2	29	52.63	2.13	59.38	52.77	1.96	**51.48**
15 Early Minting	England	2	29	52.44	1.92	55.33	52.17	1.91	**51.39**
16 Italian	Italy	2	28	52.88	1.71	57.81	54.26	1.83	**50.76**
17 Australian	Germany	2	29	55.25	1.75	47.92	52.89	1.79	**50.70**
18 Diamond	"	2	29	52.19	1.70	43.75	51.96	1.56	**42.51**
19 Very Early Lapland	Russia	2	18	48.69	1.49	50.52	47.74	1.20	**41.78**
Grown for four years:									
20 California Brewing	United States	6	26	48.44	1.51	62.25	46.16	1.49	**58.84**
21 Imperial Six-Rowed	Ontario	6	19	51.19	1.53	61.21	51.95	1.49	**57.68**
22 Martin West	United States	2	23	54.19	2.27	69.92	54.27	1.72	**52.58**
23 Six-Rowed Baxter's Improved	Ontario	6	21	51.00	1.55	52.08	51.83	1.48	**52.02**
24 California Chevalier	United States	2	28	51.50	2.13	53.00	51.58	1.94	**51.20**
25 Highland Chief	"	2	28	53.50	1.73	50.79	52.30	1.73	**50.95**
26 Duckbill	Ontario	2	29	53.56	1.58	46.88	52.32	1.69	**50.72**
27 Carter's Prize Prolific	England	2	28	52.63	2.20	52.21	52.53	1.86	**49.58**
28 Salzer's California Prolific	United States	2	28	52.94	1.58	44.40	52.46	1.66	**48.53**
29 Carter's Goldthorpe	England	2	30	52.13	2.63	46.48	51.66	1.91	**47.17**
Grown for three years:									
30 Gold Foil Hansfords	United States	2	27	52.38	2.30	60.29	51.99	2.01	**47.63**
31 Two-Rowed Canadian	Ontario	2	26	52.25	1.87	53.40	52.15	1.64	**42.67**
32 Selected Canadian Thorpe	"	2	26	52.06	2.10	54.17	51.22	1.65	**40.72**
Grown for two years:									
33 Four-Rowed	United States	6	19	50.19	1.55	58.33	51.55	1.35	**51.72**
34 Black	"	2	23	50.75	1.73	57.04	51.38	1.52	**48.72**
35 Vermont Champion	"	2	22	51.63	2.10	50.13	53.32	1.78	**48.32**
36 Jarman's Selected Beardless	England	2	28	52.31	......	58.73	50.31	......	**43.32**
37 Jarman's Golden Champion	"	2	28	51.31	2.26	49.48	49.61	1.67	**35.49**
Grown for one year:									
38 Scotch	United States	6	21	49.38	1.71	56.00	49.38	1.71	**56.00**
39 North Western	"	......	21	49.06	1.62	44.92	49.06	1.62	**44.92**
40 Success	"	6	18	47.63	1.45	39.71	47.63	1.45	**39.71**

The barley crop gave an average of 56.3 bushels of grain per acre in 1894, which was 15 bushels per acre more than the average of all the varieties grown in 1893. This was somewhat above the average of the past six years, which shows a yield of 49.7 bushels of

grain per acre. The average yield of straw in 1894 was 1.88 tons, while the average for the past six years was 1.68 tons. The weight per measured bushel, however, in 1894 was only 51.4 lb., while in 1893 it was 52.1 lb. A study of the results given in the table will show the great difference in varieties as regards both quality and quantity of grain produced. The reader's attention is specially drawn to the column at the right hand side which gives the average yields of the varieties for the number of years which they have been grown.

Varieties discarded: After growing 37 varieties of barley side by side for five years in succession, previous to 1894, 26 varieties of this number were dropped from the experiment during the present year, and only eleven of the leading kinds have been tested this season. The varieties discarded were as follows: German Golden Drop, Improved Golden Melon, Selected Chevalier, Kalina, Hallett's Pedigree, Improved Beardless, Peerless White, Phoenix, Imperial, English Golden Drop, English Malting, Improved Imperial, Probsteier, Cheyne, Golden Melon, Inyel, Beardless, Carter's Prize Prolific, Pfanen, Two-Rowed Spreading, Scotch Chevalier, Annats, Scholey's Chevalier, Italian Rice, Emperor and Dutch.

Comparison of six rowed and two-rowed varieties: In 1894 the six-rowed varieties gave an average of about ten bushels per acre more than the average of the two-rowed varieties under experiment. In regard to the weight per measured bushel and straw per acre, however, the opposite to this took place, as the two-rowed varieties gave an average of 2½ lb. more per measured bushel and one-third of a ton of straw more per acre than the average of the six-rowed barleys. All the varieties, which gave the largest average yield per acre during the past year were six-rowed barleys, and those which gave the largest yield of straw per acre, and the greatest weight per measured bushel were all two-rowed varieties. The two-rowed varieties have made a poor record in 1894 as compared with the six-rowed barleys.

Leading varieties in 1894: The five varieties which gave the largest average yield per acre were as follows: Mandscheuri 85 bushels, Oderbrucker 85.3, Scotch Improved 71.5, Cape 70.3 and Martin West 69.9.

The five varieties which gave the heaviest weight per measured bushel were as follows: Australian 55.3 lb., Martin West 54.2, Highland Chief 53.5, Two-Rowed Italian 53.1 and Duckbill 53.6.

The five varieties which gave the largest yield of straw per acre were: French Chevalier 2.5 tons, Improved Cheyne 2.6, Carter's Goldthorpe 2.6, Two-Rowed Italian 2.4, and Gold Foil Hansford's 2.3.

The five varieties which were the earliest to reach maturity were, Success, Very Early Lapland, Mensury, Imperial Six-Rowed and Four-Rowed.

The five varieties which gave the largest average number of grains per head were Scotch Improved, Common Six-Rowed, Mensury, Cape and California Brewing.

Yields of 10 Varieties of Hulless Barley.

Ten varieties of hulless barley have been grown on the trial plots during the past two years, and six of the number for five years in succession. These barleys have been obtained from different countries, namely, Hungary, Sweden, France, Australia, Germany, United States and Ontario. Only one of the ten varieties was obtained in this province, namely, Black Hulless. The standard weight per measured bushel of the hulless varieties would, of course, be 60 pounds. The ten varieties gave an average of 61.6 pounds per measured bushel during 1894. This is one half pound greater than the average of the past six years. The average yield of grain per acre in 1894 was 36.5 bushels, while that of the past five years was 35.2. The Hungarian variety, which was imported from Hungary in 1889, and which made a fine record for three years, has not done quite so well during 1893 and 1894. The Black Hulless gave the largest yield per acre of the ten varieties tested during the past season; but, as the straw of this variety is exceedingly weak it is apt to do very poorly in unfavorable seasons. The Hungarian variety possesses a straw which is stiffer than that of nearly all of the other hulless varieties.

Varieties.	Seeds obtained from—	Number of rows per head.	Results for 1894.				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 five years :			July.	lb.	tons.	bush.	lb.	tons.	bush.
1 Hungarian	Hungary	6	22	57.75	1.70	35.10	59.23	1.56	**39.18**
2 Black Hulless	Ontario	6	23	63.94	1.49	43.65	63.59	1.57	**38.57**
3 Guymalaya	Sweden	6	23	57.88	1.45	34.90	58.30	1.22	**36.66**
4 Large Skinned	France	2	20	60.06	1.77	37.72	60.01	1.45	**29.78**
5 Skinless	Australia	6	17	62.06	1.13	33.85	61.05	1.04	**26.45**
6 Three-Rowed	Germany	6	24	62.88	1.25	31.77	60.50	1.15	**24.83**
Grown for two years :									
7 Purple	United States	6	23	65.13	1.38	42.50	63.52	1.74	**41.70**
8 Guy Mayle	"	6	22	63.06	1.08	37.50	62.78	1.12	**40.35**
9 Winnipeg No. 2	"	6	22	60.94	1.33	34.17	60.42	1.56	**37.89**
10 Smooth Hulless	"	6	23	62.50	1.67	34.27	62.25	1.57	**36.84**

Peas, Comparative Test of 46 Varieties.

There were 46 varieties of peas grown in the experimental department during 1894. Seventeen of these varieties have been grown side by side for four years, seventeen for three years, and three for one year. As the peas which were sown in 1891 did not germinate evenly, the results for that year were never published. The varieties numbered 1, 2, 3, 4, 5, 6, 7, 8, 10 and 11 were all sown on April 24th, and the remainder on April 25th.

The grain was sown with a grain drill which contained ten tubes, the tubes being one link (7.92 inches) apart. The quantity of grain sown varied from two to five bushels per acre, according to size of the grain, and the manner of growth of the various kinds. As the varieties of peas and barley were sown in alternate plots to prevent the peas from mixing, the soil would, of course, be very similar in both cases. The plots were each one-hundredth of an acre in size. The yields per acre have been estimated from the actual results from the plots.

The average yield per acre of the 46 varieties of peas grown in 1894 was 27.8 bushels. This was about one bushel per acre less than the average for the past four years. The weight per measured bushel, however, was a little heavier during the past season than the average since 1890, which was 60.8 lb.

The Early Britain pea, which stands at the head of the list in yield per acre among seventeen varieties grown for four years, was only surpassed this year by the White Wonder, which was imported from New Zealand in the spring of 1889. The Early Britain has a purple blossom and a brown colored pea, and is one which is making a good record for itself.

The Mummy and the Prussian Blue, both Ontario varieties, stand very close in yield of grain per acre, and take the lead of all the Ontario kinds which have been grown for four years.

The Tall White Marrowfat heads the list among seventeen kinds grown for three years with an average of 35.5 bushels per acre, and an average weight of 61.2 lb. per measured bushel. It is a large white pea, and one which has done well in the trial grounds.

COMPARATIVE TEST OF 46 VARIETIES OF PEAS.

Varieties.	Date of maturity.	Results for 1894.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for four years :		lb.	tons.	bush.	lb.	tons.	bush.
1 Early Britain	Aug. 2	61.03	1.66	39.95	59.88	1.27	**37.14**
2 White Wonder	" 1	63.88	1.25	41.77	62.77	1.09	**35.94**
3 Mummy	" 2	64.00	1.50	38.38	63.48	1.53	**34.72**
4 Prussian Blue	" 6	62.00	1.28	30.73	62.30	1.33	**34.23**
5 Field (New Zealand)	July 31	62.06	1.46	36.47	62.69	1.27	**33.72**
6 Brown (New Zealand)	Aug. 3	60.75	1.51	36.47	59.29	1.55	**33.57**
7 Princess Royal	July 31	60.88	1.33	30.73	60.07	1.21	**32.06**
8 Black-Eyed Marrowfat	Aug. 1	61.50	1.40	29.90	61.35	1.43	**31.70**
9 Blue (New Zealand)	" 4	62.06	1.46	32.92	61.94	1.21	**30.73**
10 White-Eyed Marrowfat	" 1	62.56	1.65	26.77	61.92	1.43	**30.69**
11 Early Racehorse	July 29	61.75	1.37	29.27	62.91	1.24	**30.04**
12 Multipliers	Aug. 3	62.50	1.45	25.00	61.83	1.56	**28.83**
13 Sweet Jessie	July 27	62.13	1.39	36.88	62.26	1.09	**28.20**
14 Selected Maple	" 19	60.81	.82	34.38	62.30	.69	**26.90**
15 Glory	Aug. 2	61.75	1.21	31.25	61.04	1.24	**26.41**
16 Perfection White	" 1	60.13	1.08	25.83	59.73	1.21	**24.98**
17 Hero of Reading	July 28	60.13	.99	26.88	60.11	1.10	**24.72**
Grown for three years :							
18 Fall White Marrowfat	Aug. 1	61.69	1.77	35.88	61.16	1.74	**35.56**
19 Canada Cluster	" 1	63.19	1.28	30.73	62.00	1.67	**33.78**
20 New Canadian Beauty	July 30	62.00	1.13	24.17	61.87	1.41	**31.92**
21 Golden Vine	Aug. 1	63.63	1.33	27.45	61.94	1.56	**31.68**
22 Cleveland's Advancer	" 4	60.25	1.35	31.67	60.35	1.39	**31.56**
23 Centennial	" 2	62.31	.44	22.08	61.10	1.23	**30.89**
24 McLean's Advancer	July 30	54.88	1.08	27.30	53.89	.97	**29.97**
25 Scotchman	Aug. 8	64.06	1.37	22.72	62.62	1.83	**29.91**
26 Royal Dwarf Marrowfat	" 1	61.38	1.62	24.48	60.39	1.53	**29.89**
27 Early June	" 1	63.56	1.38	22.30	62.59	1.43	**29.77**
28 Prince Albert	" 5	62.50	1.40	26.57	61.77	1.50	**25.86**
29 Sword	" 2	63.75	1.52	22.82	62.05	1.39	**25.54**
30 Canada Field	" 2	61.88	1.32	26.15	61.03	1.33	**24.65**
31 Potter	" 1	61.94	1.34	27.08	60.98	1.18	**23.49**
32 Oakshott Field Pea	" 9	54.56	1.44	18.65	53.52	1.38	**20.55**
33 Pride of the North	" 4	60.13	.89	20.22	58.58	1.02	**19.94**
34 Striped Wisconsin Blue	" 6	63.56	1.19	16.88	62.52	1.26	**18.43**
Grown for two years :							
35 Egyptian	Aug. 6	57.19	.97	29.48	59.25	1.05	**32.64**
36 Chancellor	July 22	64.13	1.23	29.17	63.32	1.36	**31.54**
37 Common Grey	" 29	58.25	1.49	28.65	58.25	1.27	**30.68**
38 William the First	" 23	58.13	1.00	26.57	59.47	1.00	**29.89**
39 Nine Pod	" 30	58.56	1.36	24.80	58.43	1.34	**28.90**
40 Nimble Taylor	" 30	58.13	1.18	25.63	58.32	1.19	**28.42**
41 D'Auvergne	" 21	62.19	.90	23.33	61.25	1.03	**25.62**
42 Fall Turkish	" 21	61.88	1.56	24.68	60.59	1.26	**24.79**
43 White Imperial	Aug. 2	61.63	.72	15.93	61.47	1.03	**23.12**
Grown for one year :							
44 Crown	July 29	61.25	1.56	26.25	61.25	1.56	**26.25**
45 Improved Grey	" 29	61.25	.95	23.43	61.25	.95	**23.43**
46 Coffee	Aug. 1	61.25	1.23	19.17	61.25	1.23	**19.17**

The Canada Cluster is very similar in every respect to the Mummy. The Egyptian is a pea differing very materially from all of the other varieties grown. The stems are quite upright in growth and branch out in the form of a tree. The seed of this variety was brought from Egypt a few years ago.

It is a very exceptional thing to find more than one pea in a pod, and the grain is large and plump. There are a great many buds on each plant. It is a late maturing variety, and the straw, which does not grow more than about one foot high, is not equal to the straw of the other varieties. The Egyptian pea is worthy of further experiments to determine its true value in connection with agriculture.

Varieties discarded. A number of varieties which had been grown previous to 1894 were not grown during the present year ; the reasons being that some of them were inferior in many respects, and that others were better adapted to garden than to field cultivation. The varieties which were dropped from the list were as follows : Veitch's Perfection, Earliest of all Blue, Champion of England, Early Maple, Sexton's Alpha, Telephone, Sugar, Philadelphia Extra Early, Tom Thumb, Prince of Wales, Cleveland's Rural New Yorker, Cleveland's Alaska, Telegraph, British Queen, McLean's Little Gem, Stratagem, Anticipation, Yorkshire Hero, Blue Peter, American Wonder, Laxton's Supreme, French Canner, Laxton's Prolific Long Pod, Bruce's Early Conqueror, Kentish Invicta, Bliss Everbearing, Ne Plus Ultra, New Giant Podded Marrow, Carter's Lightning, Tall Turkish, Carter's First Crop, Long Island Mammoth, Laxton's Evolution, Carter's Nimble White, Dwarf Sugar Edible Podded, Hair's Dwarf Blue Mammoth and Partridge.

Leading varieties of 1894. The six varieties which gave the largest average yield of grain per acre were as follows: White Wonder (New Zealand) 41.9 bushels, Early Britain (England) 40.0, Mummy (Ontario) 38.4, Sweet Jessie (England) 36.9, Field (New Zealand) 36 5, and Brown (New Zealand) 36 5.

The five varieties which gave the heaviest weight per measured bushel were as follows: Chancellor 64.1, Scotchman 64.1, Mummy 64.0, White Wonder 63.9, and Sword 63.8.

The six varieties which gave the largest yield of straw per acre were: Tall white Marrowfat 1.8 tons, Early Britain 1.7, White-Eyed Marrowfat 1.7, Royal Dwarf Marrowfat 1.6, Tall Turkish 1.6, and Crown 1.6.

The three varieties which were the earliest to reach maturity were: Selected Maple, D'Auvergne, and Tall Turkish ; and the two varieties which were the latest, were the Grass and Oakshott Field Pea.

The two varieties which possessed the longest pods were the Pride of the North and New Zealand Brown, and those which had the shortest pods were the Grass and the Egyptian.

The three varieties which gave the largest average number of peas per pod were the Sword, Golden Vine, and D'Auvergne.

Spring Wheat, Comparative Test of 62 Varieties.

In 1893, 62 varieties of spring wheat were grown side by side on the experimental plots. Besides varieties which were obtained from over Ontario, there were some which were imported by this farm within the last six years from Germany, Russia, France, England Greece, Italy, Sicily, etc Of the 62 varieties which were tested this season, nine were grown for six years in succession, twenty-one for five years, nine for four years, eight for three years, ten for two years, and five were grown upon the experimental plots in 1894 for the first time.

The varieties were all grown on land which was quite similar in quality throughout, being what might be termed a mild clay loam. The soil used for the spring wheat was in close proximity to that used for the barley and the peas. The grain was sown broadcast, and at the rate of 120 lb. per acre. The plots were exactly 1-100 of an acre in size in every instance. The land had been manured in the spring of 1893 with suitable manure at the rate of 15 tons per acre, and a crop of corn was grown on the land during that season. The seeding of all the varieties took place on April 19th. The yields per acre have been estimated from the actual yields given from the plots.

Varieties.	Nature of head.	Results for 1894. Weight per measured bushel.	Results for 1894. Yield of straw per acre.	Results for 1894. Yield of 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. Yield of straw per acre.	Average results for number of years grown on plots. Yield of grain per acre.
		lb.	tons.	bushels.	lb.	tons.	bushels.
Grown for six years:							
1 Herison Bearded	Bearded	64.44	2.21	41.25	63.32	2.04	**29.29**
2 Bart Tremenia	"	63.94	1.94	40.22	62.82	1·74	**27.37**
3 Pringle's Champion	"	61.38	2.13	37.18	60.56	1.94	**26.95**
4 Saxonka	"	61.75	2.28	40.52	60.54	1.80	**25.17**
5 Konisburg	"	61.25	1.94	33.75	61.63	1.66	**24.29**
6 Holben's Improved	Bald ..	60.19	2.23	35.52	58.78	1.87	**24.25**
7 Summer	Bearded	58.00	2.27	30.93	57.83	1.80	**23.16**
8 Ordinary Bearded March	"	57.25	2.50	30.00	57.88	1.83	**22.58**
9 Odessa Ghirka	Bald ..	59.13	2.33	25.73	59.61	1.89	**22.54**
Grown for five years:							
10 Red Fern	Bearded	63.06	2.58	38.97	61.57	2.20	**33.39**
11 Wild Goose	"	60.50	2.18	47.18	60.98	1.96	**31.92**
12 White Russian	Bald ..	60.19	2.32	39.27	59.24	1.98	**31.53**
13 Red Fyfe	"	61.00	2.19	37.08	60.04	1.88	**27.74**
14 White Fyfe	"	61.06	2.27	34.38	61.73	1.65	**26.88**
15 Medeah	Bearded	61.13	2.49	40.42	60.95	1.62	**26.64**
16 Sorentina	"	60.63	2.11	34.68	59.73	1.70	**25.58**
17 Mountain	Bald ..	59.94	2.84	37.08	58.79	1.93	**25.34**
18 Colorado	Bearded	60.75	2.47	30.93	60.15	1.77	**24.91**
19 Algiers	"	60.06	2.27	36 05	58.17	1.81	**24.89**
20 Kubanka	"	62.19	2.48	35.63	....	....	**24.33**
21 Grecian	"	61.50	2.06	31.25	58.22	1.77	**23.61**
22 Triumph	Bald ..	56.63	2.24	25.22	58 53	1.73	**22.64**
23 Atalank	Bearded	58.19	1.94	23.75	57.64	1.59	**20.43**
24 Ladoga	"	54.19	1.80	19.85	56.44	1.40	**20.37**
25 Paros	"	57.06	2.26	22.92	56.69	1.65	**18.98**
26 Neapel	"	49.94	2.39	18.65	52.79	1.76	**17.57**
27 Voto	"	56.50	2.20	21.77	56.58	1.64	**14.91**
28 March White	Bald ..	56.13	1.95	18.23	56.11	......	**12.93**
29 Square Head	"	51.50	2.21	18.02	53 26	1.64	**11.28**
30 African	"	58.63	1.69	11.98	....	1.22	**6.40**
Grown for four years:							
31 McCarlin	Bearded	58.56	2.15	28.38	59.19	2.19	**27.80**
32 Okanagan Valley Velvet Chaff	Bald ..	59.06	2.12	32.82	54.42	1.88	**27.63**
33 Rio Grande	Bearded	58.31	2.07	25.93	59.35	1.94	**27.33**
34 Manitoulin	Bald ..	60.88	2.15	33.28	59.92	1.74	**27.15**
35 Saskatchewan Red Fyfe	"	60.88	1.98	32.40	59.72	1.77	**26.40**
36 Salzer's Assiniboia Fyfe	"	60.50	2.09	31.93	59.15	1.57	**25.46**
37 Washington	Bearded	60.13	2.24	30.42	59.58	1.69	**24.63**
38 Pringle's Defiance	Bald ..	57.94	1.74	23.55	58.51	1.49	**21.04**
39 Anglo-Canadian	Bearded	52.63	2.03	17.50	54.03	1.63	**17.58**
Grown for three years:							
40 Wellman Fyfe	Bald ..	59.63	2.09	35.32	58.94	2.16	**30.77**
41 Lost Nation	"	59.69	2.08	35.52	59.43	2.16	**30.57**
42 Velvet Chaff Blue Stem	"	59.38	2.33	33.85	58.39	1.98	**28.82**
43 Hayne's Blue Stem	"	58.81	2.08	30.52	58.00	1.89	**26.97**
44 New York	Bearded	60.63	2.16	36.35	59.08	1.85	**26.78**
45 Manitoba Red	Bald ..	60.50	2.19	33.55	59.43	1.93	**26.18**
46 Dakota Marvel	"	59.25	2.18	30.73	57.35	1.86	**23.31**
47 Campbell's White Chaff	"	57.19	1.88	25.83	54.20	1.56	**17.08**

SPRING WHEAT, COMPARATIVE TEST OF 62 VARIETIES.—*Continued.*

Varieties.	Nature of head.	Results for 1894.			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.
Grown for two years:		lb.	tons.	bushels.	lb.	tons.	bushels.
48 Blue Democrat	Bearded	60.94	2.46	34.80	59.47	2.08	**25.75**
49 Amythest	Bald	61.38	2.06	31.47	59.09	1.68	**23.84**
50 Champion Bearded	Bearded	61.00	2.35	31.67	58.75	1.98	**23.29**
51 Early Scotch Bearded	"	58.13	2.16	28.02	57.97	1.78	**21.86**
52 French Imperial	Bald	61.19	2.07	32.60	58.85	1.59	**21.80**
53 Ontario	Bearded	59.00	2.10	26.67	57.65	1.65	**20.14**
54 Canadian Club	Bald	58.50	1.97	26.05	56.75	......	**18.13**
55 Scotch Fyfe	"	61.00	1.88	29.17	58.65	1.39	**17.64**
56 Niagara	"	56.19	2.03	22.18	52.70	1.52	**13.79**
57 White Australian	"	51.06	1.93	13.97	49.28	2.62	**9.39**
Grown for one year:							
58 Salzer's Marvel	Bald	59.06	1.99	31.98	59.06	1.99	**31.98**
59 Cubana	"	59.06	2.07	31.05	59.06	2.07	**31.05**
60 Pillsburg	"	59.31	1.66	27.92	59.31	1.66	**27.92**
61 May's Early Wonder	"	60.63	1.93	27.40	60.63	1.93	**27.40**
62 Red North Dakota	"	59.25	1.55	26.67	59.25	1.55	**26.67**

The spring wheat crop of 1894 was even superior to that of 1893, as in the case of the former the average yield was 30.3 bushels of grain per acre, and of the latter 21.1 bushels per acre. This, however, is partly accounted for by our having discarded thirteen poor varieties in 1894, which were grown the year previous. The average weight of grain per measured bushel during the last year was 59.2 pounds, while the average weight per measured bushel for all the varieties during the past six years, was 58.5 pounds. In 1893 it was only 56.5. The straw of the past year was slightly over two tons per acre, which is indeed high.

The Herison Bearded, which was imported from France in 1889, still heads the list in yield of grain per acre among all the varieties which have been grown for the past six years. Not only is this true in regard to the yield of grain, but it is also true in regard to the average weight per measured bushel, which is 63.3 pounds. The Bart Tremenia which was imported from Greece in 1889, comes next to the Herison Bearded in average yield of grain per acre, also in weight per measured bushel. It is however, a much coarser wheat than the Herison Bearded. The Pringle's Champion which was imported from Germany, stands third in average yield of grain, and is a variety which the millers have pronounced as being a first-class milling wheat. The yield of this variety in 1894 was about four bushels per acre less than that of the Herison Bearded. The Red Fern is a variety well known over Ontario, and has taken the lead of all the Ontario varieties in the experimental department. The Wild Goose is at the head of the list of all the varieties of spring wheat during 1893 and 1894. This, however, is a very coarse wheat and will not bring as much on the market as some of the other varieties of a finer quality. The Wellman Fyfe, which was obtained in the United States three years ago is a promising variety; it possesses a velvety chaff, is stiff in the straw, and is very free from rust.

Varieties discarded. After growing twenty-two varieties of spring wheat during the years of 1889, 1890, 1891, 1892 and 1893, the thirteen poorest varieties were discarded and only the nine which had given the best results were sown in the spring of 1894. The thirteen varieties which were discarded are the following: Dantzic, Nenhert, King Bartigen, Bearded Red, April Bearded Red, Red Bearded March, Ordinary March, March Debrie, French Summer, Chidham White, Large Flag, Hickling's March White and Lonzella White.

Prominent varieties in 1894. The five varieties which gave the largest average yield of grain per acre were as follows: Wild Goose (Ontario) 47.2 bushels per acre, Herison Bearded (France) 41.3, Saxonka (Russia) 40.5, Bart Tremenia (Greece) 40.2, Medeah (Africa) 40.4.

The five varieties which gave the heaviest weight per measured bushel were as follows: Herison Bearded 64.4 pounds, Bart Tremenia 63.9, Red Fern (Ontario) 63.1, Kubanka (Russia) 62.2 pounds, and Saxonka 61.8.

The six varieties which gave the longest straw were: Wild Goose (Ontario), Red Fern, Red Fyfe, White Fyfe, Sorentino. Each of which was from 51 to 53 inches in height.

The eight varieties first to mature were: March White, Herison Bearded, Colorado, Ladoga, Square Head, African, Early Scotch and Cubana.

WINTER WHEAT, COMPARATIVE TEST OF 80 CANADIAN AND AMERICAN VARIETIES.

The following report upon 80 varieties of Canadian and American winter wheat was issued in August as Bulletin No. XCVII.:

There were 178 plots used for the winter wheat experiments in 1894, these being divided off as follows: Variety tests, 102 plots; dates of seeding, 36; methods of seeding, 12; selection of seed, 8; quantity of seed per acre, 6; sowing spring grain to act as a mulch for wheat, 4; and harvesting at different stages of maturity, 10. As the variety tests have been conducted for five years in succession and the rest of the experiments for only one or two years, this bulletin treats more particularly of the varieties grown than of the methods of cultivation.

Conditions of soil. The field upon which the grain was grown is a good average clay loam, quite uniform in character, and has a gradual slope towards the northeast. The size of all the plots used was $\frac{1}{100}$ of an acre, with the exception of those for different dates of seeding, in which case it was $\frac{1}{150}$ of an acre. The yields per acre have been calculated from the actual results of the plots. The land was prepared on the bare fallow system, and received a dressing of fifteen tons of farmyard manure per acre in the summer of 1893. No other fertilizer was used. Four crops had been removed from the land since it had received farmyard manure previous to last year.

Conditions of season and growth. Seeding took place early in September, and during that month 1.3 inches of rain fell, which was slightly below the average of the four years previous. The growth of the wheat in the autumn was good, and the amount killed out during the winter and early spring was small. April proved to be a very dry month, and May one of exceptionally wet weather; the growth of the wheat, however, was quite good throughout. The ripening of the grain took place between the 15th and the 23rd of July, which was fully three days earlier than in any of the four previous years. The trouble from both rust and smut was not serious this season.

Soon after the grain headed out, a storm caused the weak-strawed varieties to become considerably lodged, which interfered with the proper filling of the heads. To determine the effect produced by the lodging of the crop, an examination was made of four varieties, which were partly lodged about five weeks before the ripening season. From each of these varieties 1,000 heads were collected out of the standing grain, and also 1,000 heads out of the lodged portion of the crop. The sheaves were threshed separately and the results recorded, the following being the summary:

Condition of crop.	Weight of grain from 4,000 heads.	Weight of 4,000 kernels of grain.
	ozs.	drs.
Standing	121¼	82
Lodged	67	73

Providing the plants which lodged were equal in every respect to those which did not lodge, these results go to show that the loss to the grain through lodging was about 4.5 per cent. in yield and 11 per cent. in quality.

Varieties. This bulletin gives the particulars of 80 varieties of winter wheat grown in 1894 upon plots exactly similar in size and situated side by side. Paths three feet wide were left between the plots. Seeding took place on September 2nd with all the varieties excepting Nos. 56, 58 and 65, which were sown three days later, and No. 54, which was sown seven days later. The grain was sown by hand at the rate of 2 bushels per acre, and the land was then harrowed. The average yield in 1894 was superior to that of 1890, 1892 or 1893, but was not equal to that of 1891.

The following table gives the average results of the winter wheat tests for each of the past five years:

Year.	Number of varieties grown.	Average weight of grain per measured bushel.	Average yield of straw per acre.	Average yield of grain per acre. (bu.=60 lb.)
		lb.	tons.	bush.
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

It will be noticed that the yield of straw per acre in 1894 was double that of 1891, and yet the yield of grain for 1891 was the highest of the five years. The order of the yield per acre for the five years is the same as that of the weight per measured bushel.

The result of the 80 varieties of winter wheat grown in 1894 are placed in tabulated form in such a way that the reader can compare the different kinds very easily. Starting at the left hand side of the table, columns 1 and 2 give the numbers and names of all the varieties; 2 and 3 refer to their characteristics; 5, 6, 7, 8 and 9 give the results for 1894, and 10, 11 aud 12 give average results for the number of years the varieties have been grown in the experimental department. The varieties are arranged in the order of their average yield per acre for the number of years grown, as indicated by the last column in the table, to which the reader's attention is especially directed. The great advantage of having the results of *all* the varieties here recorded is that any farmer may be enabled to compare the varieties with which he is not familiar with those which have been grown by himself or by his neighbors.

Characteristics and yields of eighty varieties of winter wheat:

Varieties.	Nature of head.	Color of grain.	Results for 1894. Date of maturity.	Results for 1894. Per cent. of straw lodged.	Results for 1894. Weight per measured bushel.	Results for 1894. Straw per acre.	Results for 1894. Grain per acre.	Average results for number of years grown. Weight per measured bushel.	Average results for number of years grown. Straw per acre.	Average results for number of years grown. Grain per acre.
			July		lb.	tons.	bush.	lb.	tons.	bush.
Grown for five years:										
1 Early Red Clawson	Bald	Red	18	77	58.9	4.9	55.3	59.0	3.2	**46.5**
2 Surprise	“	White	20	35	59.2	3.7	48.3	59.8	2.9	**46.0**
3 Golden Drop	“	Red	20	72	62.9	4.4	49.3	61.9	3.1	**44.0**
4 Red Velvet Chaff	“	“	22	62	58.0	5.1	49.3	59.5	3.2	**42.8**
5 Bonnell or Landreth	“	White	19	37	59.4	4.5	53.2	59.7	3.1	**42.6**
6 Standard	“	“	18	7	59.9	3.7	58.3	59.2	2.8	**42.3**
7 Golden Cross or Volunteer	Bearded	Red	23	77	59.4	5.2	40.5	60.5	3.1	**41.6**
8 Rogers	Bald	“	23	67	59.4	5.0	43.0	60.4	3.1	**41.5**
9 Seneca or Clawson	“	White	19	55	59.7	4.3	58.0	59.6	3.0	**41.0**
10 Manchester	“	Red	19	57	61.1	4.7	46.5	61.1	2.9	**40.9**
11 Martin Amber	“	White	24	57	60.9	4.4	49.1	60.6	3.0	**40.6**
12 Hybrid Mediterranean	Bearded	Red	21	67	61.1	4.8	39.1	61.2	3.2	**40.3**
13 Lancaster	“	“	19	92	60.7	4.8	42.5	61.7	3.2	**39.1**
14 Red Lion	“	“	16	95	62.0	4.9	42.4	61.4	3.2	**38.8**
15 New Monarch	Bald	“	17	60	61.1	4.1	44.9	60.2	2.8	**35.5**
Grown for four years:										
16 American Bronze	Bald	Red	17	0	61.3	3.7	52.7	59.7	3.1	**48.4**
17 Egyptian	Bearded	“	17	55	61.5	3.6	54.2	61.4	2.9	**48.3**
18 Jones' Winter Fyfe	Bald	“	17	7	61.0	3.9	59.6	60.6	2.6	**47.4**
19 Bulgarian	Bearded	White	17	42	62.0	3.9	53.9	62.3	2.7	**45.6**
20 Canadian Velvet Chaff	Bald	“	19	4	59.1	3.5	57.0	58.4	2.7	**45.4**
21 Garfield or Natural Cross	“	“	21	4	61.6	3.3	57.6	60.0	2.7	**45.3**
22 White Pearl	“	“	21	2	62.1	3.3	52.8	60.8	2.7	**43.7**
23 Democrat	Bearded	“	17	27	62.3	2.7	49.5	62.1	2.7	**41.9**
Grown for three years:										
24 Dawson's Golden Chaff	Bald	White	18	8	61.1	4.1	65.2	59.3	3.3	**51.5**
25 Reliable	Bearded	Red	17	50	62.4	4.2	52.5	61.6	3.1	**44.0**
26 Russian Amber	“	“	17	50	61.5	3.6	53.3	61.2	2.9	**43.0**
27 Walker's Reliable	“	“	18	50	62.3	4.4	53.6	60.8	3.1	**42.6**
28 Valley	“	“	16	32	61.9	4.2	55.6	60.7	2.9	**41.8**
29 Rumsey	“	White	19	45	61.0	4.2	46.0	60.7	3.1	**39.5**
30 Rutherford	“	Red	21	50	61.1	4.9	42.1	59.7	3.5	**39.1**
31 Fultz	Bald	“	18	11	63.8	2.8	48.7	62.4	2.4	**38.7**
32 Genesee	Bearded	White	19	30	60.9	3.8	48.8	60.2	2.9	**38.2**
33 Mediterranean	“	Red	18	50	62.5	4.2	33.1	61.8	3.5	**38.1**
34 Hybrid Diehl	Bald	White	19	16	61.3	3.7	51.1	59.0	2.6	**37.8**
35 Monette	“	Red	19	25	69.2	3.7	46.3	59.1	2.9	**37.0**
36 Manilla	“	White	20	11	59.3	3.6	49.4	57.3	2.9	**36.7**
37 Longberry Red	Bearded	Red	18	92	60.4	4.2	41.0	60.5	3.1	**36.5**
38 Velvet Chaff	“	“	16	0	63.6	3.0	40.5	62.4	2.5	**35.7**
39 Red Wonder	“	“	21	50	61.1	4.8	31.3	61.7	3.6	**35.3**
40 Deitz Longberry	“	“	20	16	62.2	3.2	25.2	61.9	2.8	**34.7**
41 Fulcaster	“	“	19	47	60.8	4.8	29.4	62.2	3.2	**34.4**
42 Scott	Bald	“	19	42	60.1	3.4	44.6	59.6	2.5	**33.3**
43 Red Russian	“	“	21	0	61.9	2.8	40.3	59.8	2.3	**29.9**
Grown for two years:										
44 Early White Leader	Bald	White	22	15	57.9	3.6	57.2	56.2	2.7	**43.6**
45 South Sea	“	“	20	7	60.3	3.4	50.1	60.2	2.3	**40.6**
46 Soules	“	“	17	20	57.8	4.5	52.5	55.9	3.2	**39.4**
47 Eureka	“	“	17	17	58.1	3.6	47.2	57.1	2.7	**37.4**
48 Stewart's Champion	“	Red	18	15	59.1	4.0	47.3	57.5	3.2	**36.6**
49 White Star	Bearded	“	19	20	60.1	4.0	44.5	59.5	2.5	**34.8**
50 Treadwell	“	White	17	20	61.1	3.6	47.9	59.1	2.4	**32.2**
51 British Columbia	Bald	Red	22	0	58.6	3.2	45.8	55.9	2.4	**30.4**

Characteristics and yields of eighty varieties of winter wheat.—*Continued.*

Varieties.	Nature of head.	Color of grain.	Results for 1894.					Average results for number of years grown.		
			Date of maturity.	Per cent. of straw lodged.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for one year:			July		lb.	tons.	bush.	lb.	tons.	bush.
52 Early Genesee Giant	Bearded	White	19	15	60.9	4.0	56.9	60.9	4.0	**56.9**
53 Early Ripe	Bald	Red	21	42	61.5	4.2	55.1	61.5	4.2	**55.1**
54 Pride of Genesee	Bearded	"	19	40	60.5	3.8	51.4	60.5	3.8	**51.4**
55 Poole	Bald	"	16	42	61.6	4.0	50.7	61.6	4.0	**50.7**
56 New Columbia	"	"	16	15	58.2	4.0	50.1	58.2	4.0	**50.1**
57 Siberian	"	"	23	35	62.9	4.1	49.6	62.9	4.1	**49.6**
58 Rudy	Bearded	"	23	77	59.6	3.8	48.9	59.3	3.8	**48.9**
59 Red May	Bald	"	17	20	62.5	4.0	48.4	62.5	4.0	**48.4**
60 Jones' Square Head	"	White	19	0	60.3	3.2	48.3	60.6	3.2	**48.3**
61 Arnold's Hybrid	Bearded	Red	16	22	62.2	3.9	48.2	62.2	3.9	**48.2**
62 Tasmania Red	"	"	19	85	61.9	4.4	47.1	61.9	4.3	**47.1**
63 Turkish Red	"	"	17	40	62.3	3.6	46.6	62.3	3.6	**46.6**
64 McPherson	Bald	"	18	30	61.9	3.9	45.1	61.9	3.9	**45.1**
65 Kentucky Giant	Bearded	"	16	70	58.4	3.9	45.1	58.4	3.9	**45.1**
66 Tuscan Island	"	"	17	65	59.8	3.9	44.8	59.8	3.9	**44.8**
67 Hindostan	"	"	21	45	61.5	4.0	44.5	61.5	4.0	**44.5**
68 Zimmerman	Bald	"	18	2	63.0	2.9	44.3	63.0	2.9	**44.3**
69 Egyptian Amber	Bearded	"	18	65	60.3	4.5	44.0	60.3	4.5	**44.0**
70 Imperial Amber	"	"	21	90	59.0	4.9	43.4	59.0	4.9	**43.4**
71 Andrew's No. 4	"	"	22	47	60.0	4.5	41.4	60.0	4.5	**41.4**
72 Emporium	Bald	"	23	45	58.0	3.9	41.2	58.0	3.9	**41.2**
73 Penquit's Velvet Chaff	Bearded	"	19	2	62.1	3.6	40.4	62.1	3.6	**40.4**
74 Geneva	"	"	17	67	61.6	4.1	40.1	61.6	4.1	**40.1**
75 Bissell	"	"	15	72	60.8	4.0	40.0	60.8	4.0	**40.0**
76 Simcoe Red	"	"	17	69	57.0	4.3	38.3	57.0	4.3	**38.3**
77 Currell	Bald	"	16	40	61.5	4.2	37.2	61.5	4.2	**37.2**
78 Currell's Prolific	"	"	16	50	61.5	4.3	36.7	61.5	4.3	**36.7**
79 Bullard's Velvet Chaff	"	"	23	0	62.9	2.3	31.6	62.9	2.3	**31.6**
80 Golden Tankard	"	"	17	92	59.4	5.2	31.5	59.4	5.2	**31.5**

The following remarks are made upon the varieties which have given the largest yields of grain per acre for the number of years they have been grown on the plots.

Early Red Clawson. This variety gave the largest average yield of grain per acre, and also the lowest average of grain per measured bushel among fifteen varieties grown for five years. The crop is much inclined to lodge in unfavorable seasons, but when it stands well, the bald heads, red chaff and white straw give this variety an attractive appearance when seen standing in the field. It will be remembered that the Early Red Clawson stood third in average yield per acre in the co-operative experiments over Ontario for 1893, at which time eleven varieties were tested.

American Bronze. The special feature of the American Bronze is that the crop usually stands well, while that of many other varieties becomes badly lodged. It is also a good yielder, and the average weight of grain per measured bushel for five years is nearly up to the standard. The chaff and straw are white, the heads bald, and the grains large, fairly long, and of an amber color. Among the 80 varieties of winter wheat grown on plots in 1894, the American Bronze was one of the finest looking at the time of harvest. I may add that this variety is somewhat subject to rust in unfavorable seasons.

Dawson's Golden Chaff. In yield of grain per acre, the Dawson's Golden Chaff takes the lead among all the varieties that have been tested at this station. In 1894 it gave 18.5 bushels per acre more than the average of the eighty varieties grown and 5.6 bushels more than the variety which stood next below it in yield. This wheat has been grown on the plots for three years, and leads in yield of grain among the forty three varieties grown for that length of time. In the co-operative experiments over Ontario in 1893, when eleven varieties of winter wheat were tested, the Dawson's Golden Chaff not only gave the largest average yield of grain in the sixty experiments, but also headed the list in thirty-five out of sixty of the individual experiments. In three years' trials at the experiment station, the Dawson's Golden Chaff stands exactly equal with the American Bronze in strength of straw, these two being the stiffest strawed varieties. The average weight of grain per measured bushel for the Dawson's Golden Chaff during three years is 59.3 lb., which is also exactly the same as the average of the fifteen varieties of white wheat grown for the same length of time. This variety is apt to rust in some seasons; but it has been quite free from smut at this place although some trouble with smut in this variety is reported from one or two of the localities where it is now grown. The Dawson's Golden Chaff is quite distinct from any of the other varieties grown, and when ripe most closely resembles the Standard and the Clawson (white) varieties. The straw is medium in length and the crop has a golden appearance. In 1894 it was grown on eleven plots in the experimental department, and on about four acres in the farm department; and was unanimously pronounced the most attractive variety at this station by five judges who examined the standing grain.

Early White Leader. Although this variety gave the largest average yield of grain for two years, among eight varieties grown on the plots in 1893 for the first time, the weight of the grain per measured bushel was the third lowest, among eighty varieties grown this season. It possesses long straw; long, bald heads; white chaff; and white grain of medium size.

Early Genesee Giant. This variety has been grown on the plots for two years, but owing to the lateness of receiving the seed in 1892 the results were not reported the first year. It stood fourth in general appearance of standing grain, and seventh in yield of threshed grain, among eighty varieties grown this year. The straw is tall and fairly strong, the heads bearded and quite compact, the chaff red and the grain white.

The above mentioned varieties have all been offered by leading seedsmen over Ontario for at least two years, with the exception of the Dawson's Golden Chaff which was not advertised in the seedsmen's catalogues previous to this season. In 1881 Mr. Robert Dawson, of Paris, Ont., had a field of the Seneca, or Clawson in which he found one plant quite distinct and much superior to the rest of the crop. Mr. Dawson sowed the grain from this plant, and has continued to grow this wheat since that time. This variety has been extensively grown in the vicinity of Paris for the past few years; but it was practically unknown over Ontario until tested at the experimental station along with many old and new varieties, and the comparative results published.

The following table gives the average results of white and red wheats grown side by side for five years in succession:

Years.	Average results of white wheats.				Average results of red wheats.			
	Number of varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Number of varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.
		lb.	tons.	bush.		lb.	tons.	bush.
1890	5	60.1	2.3	30.3	10	59.9	2.5	31.2
1891	10	62.7	2.1	55.9	13	63.7	1.9	50.7
1892	15	59.6	3.2	40.0	29	61.1	3.2	44.0
1893	20	57.4	2.0	29.6	32	59.0	2.2	30 2
1894	22	60.3	3.8	52.4	58	60.9	4.1	44.5
Average	....	60.0	2.7	41.6	....	60 9	2.8	40.1

In the above summary no separate classification was made for the amber, bronze and golden shades of color which are sometimes applied to winter wheat. These were included with the red wheats. The white wheats gave an average of $1\frac{1}{2}$ bushels per acre more than the red varieties, but the latter surpassed the former in weight per measured bushel of grain by nearly one pound.

The following table gives the average results of bald and bearded wheats grown side by side for five years in succession :

Years.	Average results of bald wheats.				Average results of bearded wheats.			
	Number of varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Number of varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.
		lb.	tons.	bush.		lb.	tons.	bush.
1890	11	59.9	2.3	30.6	4	60.1	2.7	31.7
1891	16	62.9	2.0	55.9	7	64.3	1.9	46.1
1892	24	59.6	3.3	40.2	20	61.6	3.2	45.5
1893	30	57.4	2.2	30.0	22	59.8	2.0	29.9
1894	42	60.5	3.9	48.7	38	61.0	4.1	44.4
Average	....	60.1	2.7	41.1	....	61.4	2.8	39.5

Varieties possessing very short beards are classified as bald wheats. The bearded varieties gave the heaviest weight of grain per measured bushel for each year, and the poorest yield of grain per acre for three out of the five years. The number of the bald and bearded varieties is about equal, while in the case of the white and the red grained wheats, the latter has more than double the number as compared with the former.

Experiments of Wheat Cultivation.

Concise statements regarding the experiments in wheat cultivation:

Different dates of seeding. The average results for two years in sowing winter wheat on September 2nd, September 9th, and September 17th are slightly in favor of the middle date ; but, as the crop from the first-sown grain was the most lodged in 1894, future experiments may give different results.

Methods of seeding. By sowing winter wheat from all the tubes of a grain drill, the average yield per acre was 44.6 bushels ; from every second tube of a grain drill, 42.2 bushels ; and by broadcasting with the hand, 43.6 bushels.

Selection of seed. Several experiments in the selection of seed grain were conducted, but they are too complicated to report in this bulletin. It might be mentioned, however, that in 1894 plump seed produced heavier grain than shrunken seed ; but the difference in the yield per acre was very small.

Different quantities of seed per acre. Two varieties of winter wheat were each sown on small plots at the rate 1, $1\frac{1}{2}$ and 2 bushels of seed per acre, and the average results show that the largest yield was obtained from the thickest seeding, but the best quality of grain was from the medium amount of seed. The proper quantity of seed to sow can be best determined by the various wheat-growers themselves, as much depends upon variety of grain, fertility of the soil, etc.

Sowing spring barley in the autumn, to form a mulch for wheat in winter. Two varieties of wheat were sown with and without spring barley of September 5th, 1893, and the results go to show that slightly better yields were obtained when the barley was not used.

Cutting grain at different stages of maturity. Two varieties of winter wheat which were considered about right for cutting by the 19th of July, were cut on July 4th, 11th, 19th, and 25th, and August 2nd. The heaviest grain was from the cutting on July 19th, and the largest yield of grain on August 2nd. The lowest results, in both these particulars, were from the first cutting.

CONCLUSIONS.

1. The average results of winter wheat grown on the experimental plots for five years in succession are as follows: Weight of grain per measured bushel, 60.6 lb.; yield of straw per acre, 2.74 tons; and yield of grain per acre, 40.6 bushels.

2. Among eighty varieties of winter wheat tested, the following have made high records: (1) Dawson's Golden Chaff; (2) American Bronze; (3) Early Genesee Giant; (4) Surprise; (5) Early Red Clawson; (6) Golden Drop; (7) Jones' Winter Fyfe; (8) Bulgarian; (9) Early Ripe; and (10) Pride of Genesee.

3. The Dawson's Golden Chaff has made the best record of all the varieties of winter wheat tested in the experimental department.

4. Within certain limits, the amount of straw produced by a winter wheat is a poor indication of the yield of grain.

5. For five years in succession the bearded wheats gave a larger average weight per measured bushel than the bald varieties.

6. The white wheats have given the best results in favorable years, and the red wheats in unfavorable years.

DISTRIBUTION OF SEED FOR TESTING PURPOSES.

In the subjoined table will be found the different sets of varieties of wheats, which will be sent free, by mail, in half-pound lots of each variety, to farmers applying for them, who will be able to test them carefully and report the results after harvest next year. The seed will be sent out in the order of the applications received, as long as the supply lasts.

Two Sets of Winter Wheat for Co-Operative Tests.

I.	II.
Dawson's Golden Chaff.	Dawson's Golden Chaff.
Early Red Clawson.	Early White Leader.
Jones' Winter Fyfe.	Early Genesee Giant.
Surprise.	Early Ripe.
American Bronze.	Pride of Genesee.

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 limited supply becomes exhausted.

SEED WHEAT.

The Dawson's Golden Chaff and American Bronze varieties of winter wheat were grown in the farm department in 1894. A limited quantity of these two varieties has been offered for sale this season at $1.00 per bushel, including bags.

The supply is now completely exhausted, owing to the large demand.

WINTER WHEAT, COMPARATIVE TEST OF 10 FOREIGN VARIETIES.

Ten foreign varieties of winter wheat were grown on the trial grounds in 1894 for the fifth time. The conditions regarding the quality of land, previous cropping, amount of seed per acre, size of plot, etc., used for the foreign varieties were the same as those given for the Canadian and American kinds. The seeding also took place at the same time. These varieties were not included in those which were mentioned in the bulletin issued early in August, as many of them are late in reaching maturity and none take the lead of some of the best Canadian and American varieties.

Varieties.	Country obtained from.	Results for 1894.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for five years:		lb.	tons.	bush.	lb.	tons.	bush.
1 Spalding Red	England.	59.13	4.62	44.27	58.31	2.28	**28.85**
2 Dividend	Germany.	54.50	4.00	34.90	52.34	2.74	**27.38**
3 Square Head Red	England.	58.50	5.10	48.33	......	......	**27.11**
4 White Patanelle	France.	53.88	4.05	38.23	54.14	2.32	**26.21**
5 Regent	Germany.	53.13	4.51	27.92	54.55	......	**25.10**
6 Red Inversible	France.	58.50	3.88	50.63	56.90	2.10	**25.09**
7 Saumur	France.	55.88	3.56	49.58	54.86	2.01	**25.04**
8 Browick Red	England.	57.50	3.72	42.82	55.18	2.09	**24.08**
9 Galizien Summer	Germany.	55.63	3.80	46.67	57.21	1.77	**23.01**
10 Kessingland Red	England.	53.50	2.73	32.18	51.74	......	**20.84**

The foreign varieties of winter wheat did much better during 1894 than they did in previous years. As some of them are comparatively free from rust and have fairly stiff straw and several other desirable qualities, it has been thought advisable to continue growing the best of them in the hope that in time they will become sufficiently hardy to withstand the severe weather of the winter, and thus becoming valuable varieties to be grown over Ontario.

As the yield of these varieties during the past season has been better than during the previous years it is not improbable that these may soon become acclimatized.

Varieties discarded. After growing 17 of the foreign varieties side by side for four years, seven of the poorer ones were discarded and the ten best varieties were again sown in the spring of 1894. The following were those which were discarded. Square Head, Lamed Hybrid, Russian Odessa, Golden Drop Red, Imperial Velvet Chaff, Herfordshire White and Lammas Red.

OATS, COMPARATIVE TEST OF 83 VARIETIES.

The oat crop is one of the most important for the Ontario farmer of the present day. There is more land devoted to the cultivation of oats than of any other variety of grain grown in Ontario. The demand for new and promising varieties is greater than that for any other class of spring grain. The experimental department has been more successful in procuring varieties of oats from foreign lands, which surpass, to a considerable extent, the varieties which are known over Ontario, than in any other class of grain. The number of varieties of oats, which have been tested on the trial grounds in the experimental department, is greater than that of barley, peas, spring wheat or winter wheat.

There were in all 83 varieties of oats tested in 1894; of this number 17 have been grown for six years, 26 for four years, 8 for three years, 18 for two years, and 14 were grown this season for the first time. The plots used for the oats were all exactly the same size, each plot being 10 links wide by one hundred links long, thus making $\frac{1}{100}$ of an acre. The grains were sown broadcast at the rate of 75 lb. per acre, equal quantities of the different varieties being used. Seeding took place on the 20th and 21st of April. The land had received farmyard manure in the spring of 1890, at the rate of 15 tons per acre; and a crop of roots was grown on the land in the same year. The range of plots for the oats was situated between that used for the spring wheat on the one side and those used for the barley and peas on the other. The yields per acre are estimated from the actual yields produced on the plots.

OATS, COMPARATIVE TEST OF 83 VARIETIES.

Varieties.	Seed obtained from—	Color of grain.	Character of head.	Results for 1894.				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.
					lb.	tons.	bush.	lb.	tons.	bush.
Grown for six years:										
1 Joanette Black	France	B	S	Aug. 4	35.12	2.59	76.85	35.85	2.68	**82.81**
2 Siberian (Russia)	Russia	W	S	" 8	36.24	2.71	84.94	35.71	2.62	**78.07**
3 Oderbrucker	Germany	W	S	" 6	32.08	2.45	70.59	31.68	2.49	**74.00**
4 Improved Besthorn ..	"	Y	S	" 6	32.24	2.20	67.82	32.71	2.12	**73.89**
5 Probsteier	"	W	S	" 6	31.76	2.08	68.76	32.38	2.43	**73.46**
6 Danebrog	"	W	S	" 8	32.64	2.39	62.50	32.69	2.40	**72.92**
7 Poland White	France	W	S	" 1	37.64	2.48	74.44	37.52	2.41	**72.91**
8 Waterloo	Germany	W	S	" 7	31.32	2.15	70.77	30.89	2.53	**72.13**
9 Bavarian	Ontario	W	S	" 8	30.80	2.61	63.97	30.80	2.69	**69.83**
10 Egyptian	"	W	M	" 7	34.20	2.45	70.59	34.62	2.74	**68.43**
11 Georgian	Germany	W	S	" 7	31.80	2.63	69.12	32.47	2.69	**68.19**
12 Yellow Gigantic	France	Y	M	" 16	31.52	2.37	48.71	29.25	2.65	**65.37**
13 Black Poland........	Scotland	B	M	" 8	29.32	2.62	60.85	29.39	2.85	**64.48**
14 Rosedale	Ontario	W	M	" 7	34.76	2.29	65.44	33.54	2.88	**63.99**
15 Black Champion	"	B	M	" 8	30.12	2.31	55.15	29.10	2.47	**63.36**
16 Victoria White	Scotland	W	S	" 1	38.36	2.10	61.94	38.98	2.60	**63.24**
17 Black Tartarian	"	B	M	" 8	28.92	2.26	40.62	31.49	2.71	**60.35**
Grown for four years:										
18 White Schonen	Ontario	W	S	Aug. 7	30.36	2.19	62.50	31.59	2.20	**77.28**
19 Vick's American Banner	United States .	W	S	" 7	30.92	2.12	63.62	30.98	2.18	**75.98**
20 Wide Awake	Ontario	W	S	" 6	32.76	2.18	62.88	33.01	2.20	**74.75**
21 Magnet	"	W	S	" 7	30.68	2.45	56.06	30.77	2.41	**74.39**
22 White Mane	"	W	S	" 7	32.80	1.99	56.62	31.83	2.37	**72.66**
23 Danish	New Zealand..	W	S	" 6	32.24	1.54	62.32	25.54	2.11	**71.76**
24 Holstein Prolific	Ontario	W	S	" 6	31.80	1.78	59.94	31.65	2.02	**71.54**
25 Golden Giant	"	Y	M	" 14	30.00	2.15	44.12	28.27	2.26	**71.18**
26 Early Calder	"	W	S	" 4	33.56	1.88	60.29	32.39	2.27	**70.05**
27 Giant Yellow	United States .	Y	S	July 29	36.12	2.04	65.44	33.71	2.09	**67.14**
28 Giant Swedish	Ontario	Y	M	Aug. 2	30.92	2.16	43.38	28.73	2.34	**66.65**
29 Early Gothland......	"	W	M	" 6	37.36	2.02	57.74	35.14	2.31	**64.69**
30 White Belgian	"	W	S	July 30	40.08	1.75	55.88	36.50	2.31	**62.72**
31 Clydesdale	"	W	S	" 30	42.20	1.78	57.35	37.03	2.62	**62.04**
32 White Swiss	United States .	W	M	Aug. 4	38.20	1.72	52.03	34.75	2.23	**61.53**
33 Japan	"	W	S	July 30	42.64	1.59	50.74	38.11	2.42	**58.74**
34 Black Mane	Ontario	B	M	Aug. 7	33.44	1.66	43.56	29.14	2.37	**58.67**
35 Early Archangel	"	W	S	July 30	41.24	1.56	49.26	31.31	2.19	**58.07**
36 Dakota..............	United States .	W	S	" 30	42.44	1.57	51.85	38.74	2.49	**56.69**
37 New Rosedale White	Ontario	W	M	Aug. 6	38.92	1.64	47.44	35.38	2.06	**56.56**
38 Canadian Triumph ..	"	W	S	July 30	42.56	1.57	51.85	39.29	2.04	**56.31**
39 Carter's Royal Cluster	England	W	S	" 30	42.56	1.48	50.91	38.09	2.17	**54.95**
40 Carter's Early Black..	"	B	M	Aug. 7	33.12	1.51	40.44	29.06	....	**54.81**
41 Victoria Prize White.	"	W	S	July 30	42.76	1.47	48.71	39.57	1.94	**52.75**
42 Rennie's Prize White.	Ontario	W	S	" 30	43.00	1.51	49.44	39.03	1.88	**51.81**
43 Black Glen Rothern ..	"	B	S	Aug. 16	34.20	1.83	36.59	31.28	2.63	**49.65**

OATS, COMPARATIVE TEST OF 83 VARIETIES.—*Continued.*

Varieties.	Seed obtained from—	Color of grain.	Character of head.	Results for 1894. Date of maturity.	Results for 1894. Weight per measured bushel.	Results for 1894. Straw per acre.	Results for 1894. 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 three years:					lb.	tons.	bush.	lb.	tons.	bush.
44 Joanette (uew French seed)	Ontario	B	S	Aug. 3	34.00	1.80	58.82	34.13	2.40	**67.94**
45 Baltic White	United States	W	S	" 5	30.92	2.13	51.47	31.37	2.38	**62.62**
46 Abyssinian	Ontario	W	M	" 6	37.80	1.83	51.47	35.47	2.61	**62.09**
47 American Beauty	"	W	M	" 6	37.68	1.76	49.44	35.09	2.45	**59.35**
48 Wilson's White Prolific	United States	W	M	" 5	36.44	1.85	50.00	30.75	2.08	**55.80**
49 Thousand Fold	"	W	M	" 4	38.08	2.21	52.38	34.16	2.40	**54.99**
50 Badger Queen	"	W	S	July 28	44.12	1.74	56.62	38.04	2.58	**54.21**
51 New Wonderful	Ontario	W	S	" 28	43.92	1.80	56.06	37.51	2.27	**51.82**
Grown for two years:										
52 Black Beauty	United States	B	S	July 30	34.32	2.14	62.50	32.81	2.32	**65.10**
53 Lincoln	"	W	S	Aug. 6	34.80	1.88	57.35	33.35	2.19	**63.18**
54 High Bred	"	W	S	July 30	40.64	......	61.76	37.22	....	**63.13**
55 Green Mountain	"	W	S	Aug. 6	32.08	1.95	58.82	30.54	1.93	**61.61**
56 New Zealand	"	W	S	" 6	32.76	1.88	57.35	29.63	2.09	**60.63**
57 Improved American	"	W	S	" 6	32.36	2.00	55.88	31.13	2.05	**58.39**
58 New American	"	W	S	" 7	32.44	2.06	58.47	30.42	2.08	**57.39**
59 Challenge	Ontario	W	S	July 31	42.00	2.11	58.26	38.40	2.41	**56.08**
60 South Carolina Black.	United States	B	S	" 31	33.76	1.67	54.79	32.88	2.44	**53.60**
61 Royal Prize Cluster	England	W	S	" 30	41.68	2.26	63.97	37.59	2.18	**52.99**
62 Rust Proof	United States	W	S	Aug. 5	34.20	2.17	51.85	31.90	2.24	**52.18**
63 Excelsior	"	W	S	" 5	31.76	2.10	52.94	30.53	2.05	**50.32**
64 Jarman's White Monarch	England	W	S	" 3	39.92	2.34	59.38	36.16	2.12	**48.69**
65 White Dutch	United States	W	S	July 30	42.08	1.67	51.65	38.19	1.99	**48.38**
66 Jarman's Black Defiance	England	B	M	Aug. 10	31.12	1.88	42.65	29.51	1.84	**48.18**
67 Pringle's No. 6	United States	W	M	" 12	32.38	2.23	30.88	31.94	2.17	**46.54**
68 North Star	"	W	S	" 3	39.92	2.16	61.03	36.61	2.08	**44.77**
69 Texas Rustproof	"	D	S	" 8	29.13	1.98	30.53	29.87	2.14	**35.17**
Grown for one year:										
70 Surprise	United States	W	S	Aug. 6	32.24	3.26	73.18	32.24	3.26	**73.18**
71 Negro Wonder	"	B	S	July 30	33.76	2.55	70.59	33.76	2.55	**70.59**
72 Peerless	Ontario	W	S	Aug. 9	30.56	2.90	64.53	30.56	2.90	**64.53**
73 Pride of America	United States	W	M	" 6	36.44	2.74	59.56	36.44	2.74	**59.56**
74 Bolton	"	W	S	" 6	31.88	2.05	59.00	31.88	2.05	**59.00**
75 Lousinee	Ontario	W	S	" 5	33.92	1.60	58.65	33.92	1.60	**58.65**
76 Salzer's Great Northern	United States	W	S	" 6	32.52	1.96	58.09	32.52	1.96	**58.09**
77 Bonanza King	"	W	S	" 6	33.20	1.93	57.35	33.20	1.93	**57.35**
78 Improved White Russian	"	W	M	" 10	32.36	3.08	47.97	32.36	3.08	**47.97**
79 Hull	Ontario	W	M	" 10	32.00	2.46	46.71	32.00	2.46	**46.71**
80 Australian Square Head	United States	Y	M	" 11	30.56	2.47	42.82	30.56	2.47	**42.82**
81 White Swede	"	W	M	" 10	33.80	2.74	38.79	33.80	2.74	**38.79**
82 Red Tamworth	Ontario	D	S	" 8	31.00	1.79	35.68	31.00	1.79	**35.68**
83 Mammoth Cluster	United States	B	M	" 11	27.50	2.03	33.82	27.50	2.03	**33.82**

The average yield per acre of grain in 1894 was 55.9 bushels per acre, which was 1.6 bushels per acre greater than that for 1893, and 4.6 bushels per acre less than the average of the past six years. The weight per measured bushel during the past season was 34.9 pounds, the average for the past six years being 33.2 pounds. It is interesting to notice that all the leading varieties of oats were obtained by this experiment station from foreign lands. Some of the leading varieties were procured from Russia, France and Germany.

The *Joanette Black*, which stands at the head of the list among seventeen of the leading varieties selected from among 79 kinds grown in the experimental plots since 1889, was imported from France six years ago. It is an oat which is very short in the straw, only averaging about 40 inches in height in the average of six years' trials; while the Siberian gives an average of about 60 inches in height. In weight per measured bushel it has been quite uniform throughout the different years, the average being 35.9, and the weight in 1894 was 35.1. It is one of the thinnest hulled varieties that has ever been grown on the trial grounds. It has a spreading head of good size. The straw usually stands up well, and is less susceptible to rust than most other varieties. It is medium early in ripening. Upon good strong land this is one of the best yielding oats that we have found in our experience of six years. The *Siberian* variety of oats, which was obtained from Russia, stands next to the Joanette in average yield of grain per acre. It, however, surpassed this variety during the past year by eight bushels per acre. It is a white oat with a spreading head. The straw is long and fairly strong. The average weight per measured bushel for six years has been 35.7 pounds, and in 1894 it was 36.2 pounds. Thus it has given a much larger yield of grain per acre than any Ontario variety which has been grown on this farm, both on the small and large plots. Not only has it surpassed all the other varieties of white oats in the co operative tests on the station plots, but in the average yield of six varieties of oats sent out over Ontario and tested in 125 different localities in 1892, and 105 different localities in 1893. The Siberian took the lead both years. The average yield per acre of this variety in these co-operative tests in 1892 was 58.8 bushels per acre, and in 1893 it was 52.4 bushels per acre. It reaches maturity in about the same length of time as the Joanette. The Siberian might be said to have the best all around record of about 150 varieties which have been tested at the experimental station during the past six years. The *Oderbrucker*, imported from Germany in 1889, stands next to the Siberian in average yield of grain per acre. This variety, however, does not equal the first two mentioned varieties in weight per measured bushel by about four pounds in the average of six years. The *White Schonen* heads the list among twenty-six varieties grown for four years. It also produces a grain which has given an average of only 31.6 pounds per measured bushel in six years' trial. In other respects it is a good oat. The *Black Beauty* heads the list in yield of grain per acre among 18 varieties grown for two years. The seed of this variety was obtained from the United States, and it somewhat resembles the Joanette variety in its habits of growth, although the grain does not weigh so heavy per measured bushel, and the straw grows to a greater length. Among the 14 new varieties grown in 1894 for the first time, the *Surprise* heads the list, and the *Negro Wonder* comes second. The seed of both these varieties was obtained in the United States. The first mentioned is a white oat, and the last a black variety.

Varieties discarded. After growing 79 varieties of oats side by side for five years in succession on our experimental plots, we selected 17 of the leading kinds and continued experimental work with these varieties in the spring of 1894. There were, therefore, 62 varieties discarded from our trial experiments during the past year. Some of these are fairly good varieties, but not the very best for yield of grain, quality of grain, freedom from rust, strength of straw, etc., combined. The varieties which were discarded were as follows: Chenailles Black, Black Etampes, Pringle's Progress, Houdan Black, White Canadian, Siberian (France), Acclimatized Black Tartarian, White Abundance, Improved Waterloo White, Black Hungarian, Nubian Black, California White, Flying Scotchman, American Welcome, Cluster or Triumph, Hopetown (Ontario), August White, Pedigreed Black Tartarian, Early Blossom, Black Tartarian, Flanders White, Prolific Black, Dutch Bren, Yellow August, White (Australia), Podolisher, Victoria Prize White, Carter's Prize White, Carter's Prize Cluster, Black Red Crown, White Tartarian, Thuringen, White Poland, White Hungarian, Welcome, Rennie's Prize White, Racehorse, Yellow Flanders, Colommiers, Potato, Port Adelaide, Early Racehorse, Potato, Round or

Branching Black, Longfellow, Australian White, Brie Black, Angus, Bertram's Prolific, Triumph, Dun, Providence, Hamilton, Hungarian Black, Longfellow, Birlie, Scotch Potato, Dun, Improved Scotch, Hopetown (Germany), Hopetown (Scotland), Selected Winter, and Red Spot.

Comparison between white and black oats. In 1894, there were sixty-two varieties of white and thirteen varieties of black oats grown upon the plots. The white varieties average 57.8 bushels per acre, and 35.9 pounds per measured bushel, and the black varieties gave an average of 52.1 bushels per acre and 32.4 pounds per measured bushel. This shows an average of 5.7 bushels per acre and 3.5 pounds per measured bushel in favor of white oats for the year 1894. The six varieties of yellow oats gave an average of 52.1 bushels per acre, and two varieties of dun oats an average of 33.1 bushels per acre.

Comparison of varieties with mane and spreading heads. Among the eighty-three varieties of oats tested in 1894, fifty-eight possessed heads which were spreading in character, and twenty-five possessed heads with the oats growing along one side, usually termed mane or side oats. The varieties with the spreading head gave an average of 59 bushels per acre, while those with the side head gave an average of only 48.7 bushels per acre. The weight per measured bushel of the former was also two pounds greater than that of the latter. The straw of the mane oats, however, was about one-tenth of a ton per acre greater than in the case of the varieties possessing a spreading head.

Prominent varieties of 1894. The five varieties which gave the largest average yield of grain per acre were as follows: Siberian (Russia), 84.9 bushels; Joanette (France), 76.9; Poland White (France), 74.4; Surprise (United States) 73.2, and Waterloo (Germany), 70.8.

The five varieties of oats which gave the heaviest weight per measured bushel were: Badger Queen (United States), 44.1 pounds; New Wonderful (Ontario), 43.9; Rennie's Prize White (Ontario), 43.0; Victoria Prize White (Scotland), 42.8, and Japan (United States), 42.6.

The five varieties which gave the largest yield of straw per acre were: Surprise, 3.3 tons; Improved White Russian (United States), 3.1 tons; Peerless (Ontario), 2.9 tons; Pride of America (United States), 2.7 tons, and White Swede 2.7 tons.

The three varieties which were the earliest to reach maturity were: Badger Queen, New Wonderful and Giant Yellow; and the two varieties which were latest to reach maturity were: Yellow Gigantic (France) and Black Glen Rothern.

The two varieties which grew the greatest length of straw were the Victoria White and the Siberian.

Beans, Comparative Tests of 13 Varieties.

Thirty-seven plots were devoted to the growing of beans in the summer of 1894. The experiment was principally with different varieties; but in the case of the horse beans, samples were received from five different sources. The land on which the beans were planted did not receive manure for seven years and grew a crop of spring wheat in 1893. Each plot was $\frac{1}{200}$ of an acre in size. The beans were planted on the 30th and 31st of May in rows $2\frac{1}{2}$ links ($19\frac{4}{5}$ inches) apart, there being six rows four rods long of each variety. After reaching maturity they were harvested in the ordinary way and threshed when dry.

The five plots of horse beans all germinated well, and for a time gave promise of a good crop; but when the drouth and hot weather came the vines turned black as in 1893, and the green beans first withered and then dried up. After the fall rains came, however, there was a second growth from the roots, and at the time of the harvesting early in November, the second growth of horse beans was in blossom. The New Bush Lima grew mostly to vines, producing but a very small amount of threshed beans. The Medium or Navy produced the largest amount of threshed beans per acre in 1894, and the Royal Dwarf Kidney came second, followed closely by the California Pea Bean. The latter variety headed the list among those tested in 1893.

Varieties.	Weight per measured bushel.	Yield of straw per acre.	Yield of beans per acre. 1893.	1894.	Average two years, 1893-1894.
	lb.	tons.	bushels.	bushels.	bushels.
1 California Pea	62.38	.70	28.8	16.60	22.70
2 Prolific Dwarf Tree	64.81	.97	27.3	12.64	19.97
3 Small White Field	65.06	.94	24.6	14.17	19.39
4 Medium or Navy	60.38	.64	17.7	19.87	18.79
5 Boston Pea	64.50	.71	22.3	15.21	18.76
6 Yellow Soy	59 13	1.82	20.4	15.56	17.98
7 Giant Dwarf Wax	52.44	.39	15.8	9.10	12.45
8 Yellow Eyed or Boston Favorite	59.50	.28	17.3	4.48	10.89
9 Edamaine	59.00	1.19	7.6	6.94	7.27
10 Marrowfat	62.88	53	5.9	7.78	6.84
11 Yosemite Mammoth Dwarf Wax	58.19	.88	7.2	6.26	6.73
12 Royal Dwarf Kidney	60.06	.97	....	17.71	
13 New Bush Lima	....	.41	....	.64	

Winter Rye, Comparative Test of 2 Varieties.

In the autumn of 1893 two varieties of winter rye were sown on plots 1/100 of an acre in size. The seeding took place on September 9th. The seed was sown broadcast at the rate of two bushels per acre. 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.
	lb.	tons.	bushels.
Pennsylvania rye	55.00	5.11	62.9
Common rye	54.88	5.12	56.0

The crop of rye on each of the plots was very large. The straw was long and the heads well filled. The Pennsylvania rye gave an average of nearly seven bushels per acre more than the common rye.

Winter Barley.

A variety of winter barley was received from Kansas Experiment Station under the name of Winter Six-Rowed Nevada. It was sown on the plots 1/100 of an acre in size, and at the rate of 100 lb. of seed per acre. The soil was similar in every way to that described in the winter wheat experiments. The seeding took place on September 2nd. The following gives the yield of this variety:

Average height, 41½ inches.
Weight of grain per measured bushel, 39 lb.
Yield of grain per acre, 38.2 bushels.
Yield of straw per acre, 1.3 tons.

The winter six-rowed Nevada barley was badly winter-killed, and looked to be nearly a failure in the early spring. That part which did not winter-kill, however, came on very rapidly, and at the time of harvest the ground was nearly covered with a fairly even crop. This variety does not seem to withstand our severe winters any better than the winter barley which we received from Germany a few years ago and tested on our trial plots for three or four years in succession.

Winter Oats, Comparative Test of 2 Varieties.

Two kinds of oats were received from the United States, which were claimed to be winter varieties. They were sown on plots $\frac{1}{100}$ part of an acre in size on September 9th, at the rate of 75 lb. per acre. The remarks regarding the soil are the same as those given for the winter wheats. The oats germinated well and gave a good growth in the autumn, but were so completely killed out during the winter season that not one plant was alive in the spring. We therefore had the same experience with the two varieties of so-called winter oats tested during the last year that we had with the winter variety which was claimed to be a winter oat, and was tested in the year 1892-3.

Grains Sown in Mixture.

In the spring of 1894, oats, spring wheat, peas and barley were sown separately, and also in various combinations. 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, therefore, eleven mixtures in all, and four varieties of grain grown separately. These were all sown from duplicate plots, thus making thirty plots in all. A similar experiment was conducted in 1893. Each plot was exactly $\frac{7}{1000}$ of an acre in size. The grain was sown broadcast on May 11th. Fodder crops were grown on the land in 1893, and farmyard manure at the rate of 20 tons per acre was applied in the spring of 1894.

The following table shows results from sowing grains separately and in mixtures :

Mixtures.	Yield of straw per acre.				Yield of grain per acre.			
	Sown separately.		Sown in mixture.		Sown separately.		Sown in mixture.	
	1894.	Average 1893-4.	1894.	Average 1893-4.	1894.	Average 1893-4.	1894.	Average 1893-4.
	tons.	tons.	tons.	tons.	lb.	lb.	lb.	lb.
Barley and peas	1.18	1.18	1.24	1.43	1,623	1,341	1,594	1,324
Peas and wheat	1.25	1.25	1.36	1.41	1,467	1,216	1,366	1,055
Wheat and oats	1.63	1.70	1.78	1.80	1,531	1,480	1,724	1,735
Barley and oats	1.56	1.63	1.80	1.93	1,688	1,604	2,121	2,168
Wheat and barley	1.29	1.23	1.46	1.36	1,514	1,138	1,719	1,178
Peas and oats	1 52	1.58	1.70	1.93	1,641	1,670	1,683	1,804
Barley, peas and wheat	1.24	1.24	1.47	1.62	1,535	1,235	1,786	1,428
Peas, wheat and oats	1.47	1.51	1.68	1.94	1,546	1,455	1,724	1,689
Barley, wheat and oats	1.49	1.61	1.59	1.89	1,578	1,444	1,902	2,012
Barley, peas and oats	1.42	1.46	1.58	1.83	1,651	1,538	1,920	1,982
Barley, peas, wheat and oats	1.40	1.44	1.60	1.86	1,577	1,410	1,804	1,844

The average results for 1894 show that there was 1,577.4 pounds of grain per acre from the grain sown separately, 1,758.5 pounds per acre from the same kinds of grain grown in combination. This is 181.1 pounds of grain per acre in favor of the grains being sown in mixtures. By examining the results of 1893, along with those of 1894, we find that there is a yield of 244.5 pounds per acre more from the mixture than from the grain when sown separately. In the experiment of 1894 the results show that in nine cases out of eleven the mixed crop gave a larger yield of grain per acre than the same crops when grown separately. In regard to straw, the mixtures gave the largest yield in every instance in 1894 as well as in 1893. The largest yield of grain during the past season was obtained from the mixture of barley and oats, which also gave the largest yield of grain per acre in 1893.

Spring Grains, Different Dates of Seeding.

Barley, peas, spring wheat and oats were sown on different dates in the spring of 1894. The experiments were conducted in duplicate in every case. By referring to the College report of the experimental department for 1891 and also for 1892, the results of similar experiments may be found, in which barley, peas, spring wheat and oats were sown at six different dates. It was the intention to continue this experiment for several years in succession, but owing to the exceedingly wet and cold weather in the early spring of 1893, it was found impossible to get the grains in on their proper dates, and in fact it was not until after the time of the second seeding of 1891 and 1892 that the first seeding could be accomplished in 1893. Therefore, the experiment was not continued during that year. In 1894, however, it was again started, but owing to the exceedingly wet weather during the month of May no seeding took place from the 9th until the end of the month, and the seeding of June 6th was a failure in every instance. We, however, have results of seeding on April 21st, May 1st and May 9th for the present year. The land on which this experiment was conducted in 1894 was a medium clay loam, which had been summer fallowed the previous year.

The following tables give the results of the crop for 1894 and also the average results of the experiment conducted in 1891, 1892 and 1894, for the three dates mentioned.

Barley, Dates of Seeding.

Dates of seeding.	Weight per measured bushel.		Straw per acre.		Grain per acre.	
	1894.	Average 3 years, 1891-2-4.	1894.	Average 3 years, 1891-2-4.	1894.	Average 3 years, 1891-2-4.
	lb.	lb.	tons.	tons.	bush.	bush.
April 21-22	49.78	49.06	1.34	1.14	44.27	32.16
May 1	48.57	47.52	1.28	1.23	41.67	32.49
May 9	44.85	45.62	.83	1.06	12.10	22.17

Barley, which was seeded on April 21st, gave an average of 44.27 bushels per acre, while that which was seeded on May 1st produced nearly three bushels less, and that which was seeded on May 9th nearly 32 bushels less. It is rather surprising to notice that barley sown on May 9th, yielded less than one-third as much as the same kind of barley sown on the same land, and under similar conditions, 19 days earlier. The average results for three years show that the seeding of May 1st gave a slight increase in yield of grain per acre over that sown on the 21st and 22nd. In every instance the weight per measured bushel of the barley was best from the earliest seeding and decreased as the dates of seeding became later.

Peas, Dates of Seeding.

Date of seeding.	Weight per measured bushel.		Straw per acre.		Grain per acre.	
	1894.	Average 2 years, 1892-4.	1894.	Average 2 years, 1892-4.	1894.	Average 2 years, 1892-4.
	lb.	lb.	tons.	tons.	bush.	bush.
April 21-22	60.91	59.41	1.33	1.32	45.10	32.30
May 1	62.41	60.81	1.22	1.31	46.00	33.55
May 9	62.75	61.73	1.03	1.12	35.02	28.41
June 6-7	59.35	60.43	....	....	20.83	13.02

The seeding of peas on May 1st gave better results in weight per measured bushel and in yield of grain per acre during 1894, and also for the average of two years, than the sowing of April 21st and 22nd. The seeding on May 9th, however, gave a considerably less yield per acre, but gave a heavier weight per measured bushel than any of the earlier dates of seeding.

Spring Wheat, Dates of Seeding.

Dates of seeding.	Weight per measured bushel.		Yield of straw per acre.		Yield of grain per acre.	
	1894.	Average, 3 years, 1891-2-4.	1894.	Average, 3 years, 1891-2-4.	1894.	Average, 3 years, 1891-2-4.
	lb.	lb.	tons.	tons.	bush.	bush.
April 21-22	60.29	60.56	1.62	1.33	27.43	18.74
May 1	56.10	57.90	1.12	1.10	17.33	13.91
May 9	54.75	....	.81	.95	11.67	9.62

There is no class of grain which shows greater advantage from very early seeding than spring wheat. We notice from this experiment that the spring wheat which was sown on April 21st in 1894 gave 10 bushels per acre more than that which was sown only eleven days later, and the average of three years shows an advantage of about 5 bushels per acre in favor of the early seeding. The weight per measured bushel of the spring wheat is very much heavier from the early seeding than from those sown later in the season.

Oats, Dates of Seeding.

Dates of seeding.	Weight per measured bushel.		Yield of straw per acre.		Yield of grain per acre.	
	1894.	Average, 3 years, 1891-2-4.	1894.	Average, 3 years, 1891-2-4.	1894.	Average, 3 years, 1891-2-4.
	lb.	lb.	tons.	tons.	bush.	bush.
April 21-22	34.51	33.50	1.64	1.56	56.78	54.06
May 1	33.50	32.43	1.27	1.45	47.06	53.62
May 9	31.35	29.92	1.20	1.29	35.32	47.57

There is an advantage in favor of early sowing of oats in the production of both straw and grain and in the quality of the grain as indicated by the weight per measured bushel. The results are worthy of our very careful study and point to the great advantage in getting oats sown as early in the spring as the soil is in proper condition for cultivation.

Spring Grains, Selection of Seed.

A considerable amount of work was carried on during the past year in the selection of seed of barley, peas, spring wheat and oats. We think this one of the most important branches of work which can be taken up at an experiment station. We have had sufficient experience to show that the quality of seed sown has a marked influence on the ultimate yield of the crops. The work of selection of seeds in connection with the grain experiments was commenced to a limited extent in 1892; in 1893 it was extended, and in 1894 the experiments were again increased. To carry on this work to give the best satisfaction requires a great deal of time and labor, but as each season passes by we become in a much better position to carry on careful and systematic work along this line. It is our rule invariably to handpick the seed sown on the plots for comparison of varieties and also all seed distributed to farmers for testing. This is done after the grain has been first well cleaned. About 6,000 packages of seed grain were very carefully cleaned and handpicked in the winter of 1893-4. By this careful work in the selection of grain according to a fixed type great improvement has been made in the varieties which are now being tested in the experimental department. For instance when the Herison Bearded spring wheat was first imported from France the straw and the heads were both irregular. Some of the heads were long and some were short. By selecting the best seed for the past five years we have made the Herison Bearded produce a very nice even crop. The same treatment which has been given to the seed of the Herison Bearded has also been given to all other varieties under experiment. For the experiments which were conducted in 1894 for the express purpose of observing the influence of different qualities of seed on the crop produced, 26 plots were used. These were situated on the higher part of our experimental field in one single range, which was about 32 rods long. The land was plowed the autumn previous and was thoroughly cultivated in the spring before the seeding took place. The grain was sown broadcast on plots $\frac{1}{100}$ of an acre in size. The barley, spring wheat and peas were sown on May 4th and the oats on May 8th. The yields per acre are estimated from the actual yields from the plot.

Barley, Selection of Seed.

No. of plot.	Selection.	Amount of seed used per acre.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.
			lb.	tons.	bush.
1	Large plump	80 lb	50.56	1.36	46.87
2	Small "	Same weight of seed as for No. 1 plot	49.75	1.38	45.73
3	Shrunken	" " "	50.56	1.22	35.83
4	Small plump	Same number of seeds as for No. 1 plot	48.81	1.58	37.50
5	Shrunken	" " "	49.00	1.37	36.27
6	Cracked..........	Same weight as for No. 1 plot	50.31	1.56	35.00

It will be observed that the same weight of seed was sown on plots numbers 2 and 3 as that sown on number 1. In the case of 4 and 5, however, the weight was much less as the grains were all carefully counted and the same number of grains in each case was sown as on plot number 1. This point will need to be kept in view when considering the results. Large plump seed gave the largest yield per acre which was closely followed by the small plump seed, of which there was an equal weight sown. When the same number of small plump seeds was sown as those in number 1 plot, the yield was about nine bushels per acre less. It will be seen that the large plump grain gave the best results in yield per acre throughout.

Peas, Selection of Seed.

No. of plot.	Selection.	Amount of seed used per acre.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre. 1894.	Yield of grain per acre. Average 2 years 1893-4.
			lb.	tons.	bush.	bush.
1	Large	280 lb	58.31	.64	18.83	19.32
2	Small	The same weight as for No. 1 plot	58.94	.70	20.83	19.32
3	"	The same number of grains as for No. 1 plot.	58.94	·60	17.17	....
4	Cracked	The same weight as for No. 1 plot	....	....	.83	2.62

From the above table it will be seen that, in the average of two years' experiments, small peas which were sound and perfect in every respect gave exactly the same yield of crop per acre as the large peas, when sown in equal weights per acre. It will be understood, however, that there were about twice as many plants in number two plot as in number one. When there was the same number of small peas as there was of large peas sown, the results of 1894 show an advantage of 1.66 bushels per acre in favor of the large peas. There is but a very small percentage of the cracked peas which grew, the germs evidently having been destroyed.

Peas, Sound *vs.* Buggy.

Method of seeding.	Amount of seed used per acre.	Yield of grain per acre.
	lb.	bush.
Sound	130	6.16
Buggy	107	1.17

A little experiment was conducted in 1894 in which two plots of equal size were sown with peas. One plot was sown with sound peas and the other with peas which had been eaten by the pea weevil (Bruchus Risi). An equal number of peas was sown upon the plots in both cases. 130 pounds of the sound peas were sown and 107 pounds per acre of the buggy peas. This goes to show that the pea bug had consumed 18 per cent. of the peas. As a garden variety of peas was used for this experiment, and as the seeding was very light owing to the limited number of buggy peas which could be secured, the yield per acre in 1894 is low, as indicated by the table above. However, as the same number of peas was sown on each plot, it answers for the sake of comparison. It will be seen that the sound peas gave over five times as large a yield per acre as the buggy peas.

SPRING WHEAT, SELECTION OF SEED.

No. of plot.	Selection.	Amount of seed used per acre.	Weight per measured bushel.	Straw per acre.	Yield of grain per acre.
			lb.	tons.	bush.
1	Large plump	80 lb	62.13	1.54	26.16
2	Small "	Same weight of seed as for No. 1 plot.....	62.50	1.54	28 51
3	Shrunken	" " "	62.94	1.40	27.84
4	Small plump	Same number of seeds as for No. 1 plot....	61.94	1.26	24.67
5	Shrunken	" " "	61.81	1.24	22.67

The results of 1894 from sowing different qualities of spring wheat seed seem to point out that a larger yield per acre may be obtained from sowing small or shrunken seed, providing as large a quantity of seed is used as when large, plump grain is sown. There would be about double the number of plants on the land which received the inferior seed, and, as the seeding was light in every instance, there being only $1\frac{1}{3}$ bushels per acre of the large plump seed sown, we might expect different results were there a larger number of plants on the land which received the good grain. This is made manifest by plots four and five as, in this instance, exactly the same number of seeds was sown on each plot as was sown on plot number one; and we find that the yield was somewhat less when the small plump seed was sown, and considerably less in the case of the shrunken seed being used. This experiment goes to show that a plant from a large plump grain of spring wheat will produce a greater weight of grain than one from a small plump seed or shrunken seed of the same variety.

SELECTION OF SEED, POLAND WHITE OATS.

—	Selections.	Weight per measured bushel.	Straw per acre.	Grain per acre.
		lb.	tons.	bush.
1	Large plump	37.12	1.30	50.59
2	Medium..............................	37.25	1.46	41.46
3	Small................................	37.93	1.44	32.38
4	Double (whole)........................	37.62	1.42	39.11
5	Double (outer grain)..................	37.87	1.18	34.40
6	Double (inner grain)........	35.93	.86	20.00

In the above experiment the same number of seeds was sown on every plot, the number required for each plot of $\frac{1}{100}$ of an acre was 8,160 grains. The seed for plots number 1, 2 and 3 were selected by first sifting and then hand-picking the grain. The seed for number 4 plot was all carefully hand-picked from a quantity of oats. They are what we call 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. It would be found upon examination that there were twice as many grains sown on number 4 plot as on any one of the other four plots, although there would appear to be the same number.

For numbers 5 and 6 plots an equal number of double grains, as was used for number 4 plot, was selected and then these were carefully separated, the outer grains being put in one pile and the inner grains in another. These were sown separately. It will be observed from the above table that the large plump grain gave the largest yield per acre. This was followed by the medium sized grain and then by the double grains. The results are certainly very interesting and should be of value, as there is a difference of over nine bushels per acre between the plot which gave the best results and the plot which gave the second best, and there were $2\frac{1}{2}$ times as much grain produced by number one plot as by number six plot.

Selection of Seed, Joanette Oats.

Selections.	Weight per measured bushel.		Straw per acre.		Grain per acre.		
	1893.	1894.	1893.	1894.	1893.	1894.	Average, 2 years, 1893-4.
	lb.	lb.	tons.	tons.	bush.	bush.	bush.
Dark plump	32.3	34.52	1.96	1.82	45.7	67.34	56.52
Light "	30.3	32.81	1.82	1.64	38.0	50.87	44.44
Hulled	33.8	34.87	1.44	1.50	34.4	57.36	45.88

An experiment was carried on in 1893, and again in 1894, by sowing different qualities of seed of the Joanette oats. This is a black variety, and for one plot large, plump, black grains were selected; for another plot, grains which had become considerably faded in color were selected; and for the third plot, grains from which the hull was completely removed were chosen. It appears to be the natural tendency of black oats to become pale in color if grown for several years in succession in this country; hence the reason for selecting the light oats. The Joanette oat is one of the thinnest hulled varieties among 150 kinds which have been tested here during the six past years. It is so thin in the hull that usually in threshing a small percentage have their hulls removed. We were desirous of knowing what influence this would have upon the germination and after-growth of the kernels. In the experiment of 1894, the same number of grains was used on each plot; there being 9,157 grains sown on each plot, which was $\frac{1}{100}$ of an acre in size. The results in 1894 show that the largest yields per acre were obtained from the black, large plump oats; and that the smallest yield per acre was produced from the light colored oats. In 1893, the largest yield was obtained from the same selection as in 1894, but the lightest yield was obtained from the hulled samples. From this experiment it will be seen that the majority of the hulled oats will grow; but, all things considered, the best results will be obtained from sowing the large, plump black oats.

Spring Grain, Drilling *vs.* Broadcasting.

In the spring of 1894, barley, peas, spring wheat, and oats were sown both with a drill and by hand on plots of the same size. This was carried on in duplicate. The grain drill used contained ten tubes, the tubes being about eight inches apart. The seeding took place on April 25th and 26th. The land on which this experiment was conducted produced a crop of roots in 1893, and had received a dressing of 15 tons of farmyard manure per acre before the roots were sown in that season. The average results of the duplicate experiments of all classes of grain above-mentioned will be seen in the following table:

—	Average yield per acre.	
	Straw.	Grain.
Drilled	1.95 tons.	46.3 bushels.
Broadcasted	1.88 "	45.6 "

From these results, it will be seen that there was a slight advantage in favor of drilling the grain, in yield of both straw and grain per acre; but the difference is not very marked. This experiment will likely be continued.

Potatoes and Roots.

The number of potatoes and roots has been increased during the past year by adding some of the newer varieties, which have become prominent in the United States and Canada. During 1894, 178 varieties of potatoes, and 226 varieties of roots were grown on the experimental plots. The land on which these were grown might be termed an average clay loam, with a very gradual slope towards the southwest. The land for the greater number of these experiments produced a crop of spring grain in 1893, and was manured at the rate of 20 tons per acre in the early spring of 1894. The plots for the variety tests were each exactly $\frac{1}{100}$ of an acre in size, with eight or ten exceptions, in which cases smaller plots were used on account of the limited quantity of seed at our disposal. The soil was fairly uniform throughout. Besides the experiments with varieties a large number of tests was made in methods of cultivation of both potatoes and roots. The plots for these varied in size according to circumstances, as will be noted when speaking of the results of the separate experiments.

Potatoes, Comparative Test of 178 Varieties.

In 1894, 178 varieties of potatoes were grown on the trial plots in the experimental department. In some cases two or three samples of the same variety from different localities were grown, and again in some instances potatoes of the same variety with slightly different names were grown upon the plots, and these are included in the 178 mentioned above. The seed of these varieties was obtained during the past five years from the United States, Prince Edward Island, Nova Scotia and Ontario. Twenty-three of the number have been grown on our plots for five years in succession, 16 for four years, 67 for three years, 49 for two years, and 23 were grown in 1894 for the first time in the experimental department. Planting took place on June 1st to 4th in the case of all varieties, with the exception of Silver Dollar and the Great Divide, which were planted on June 7. The plots were $\frac{1}{100}$ of an acre in size, and 15 pounds of potatoes were planted on each plot. This quantity was divided as evenly as could be done into 198 pieces. These were planted in three rows each four rods long. The rows were $3\frac{1}{3}$ links apart and the potatoes were planted one foot apart in the rows. The land was drilled with a double mould-board plow, and the potatoes were placed four inches below the level of the land. Flat cultivation was used throughout, and the application of the 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 potatoes were weighed about a week after being dug. The following table shows the results:

POTATOES, DIFFERENT PREPARATION OF SEED TUBERS.

Varieties.	Results for 1894. Percentage of crop marketable.	Weight of 30 best developed potatoes.	Yield per acre.	Average yield per acre for number of years grown on plots.
		lb.	bushels.	bushels.
Grown for five years:				
1 Empire State	93.48	10	191.67	**184.81**
2 Thorburn	92.50	11	222.08	**166.74**
3 Summit	87.11	8	158.33	**165.67**
4 Early Mane	82.25	6¾	173.75	**150.19**
5 Early Puritan	88.66	7¾	205.83	**144.37**
6 Sweet St. Vernal	83.57	7¾	172.50	**141.46**
7 Early Sunrise	88.43	7¾	201.67	**141.37**
8 Beauty of Hebron	89.67	8	225.83	**141.09**
9 Pootatuck	84.08	7½	185 83	**140.69**
10 Daisy	87.11	6½	187.50	**140.62**
11 Rural New Yorker No. 2	91.96	10	176.25	**139.65**
12 Late Rose	87.91	7	189.58	**139.60**
13 Minister	94.64	11¼	194.17	**128.27**
14 Rural Blush	91.63	9¾	189.17	**125.59**
15 Rose's New Invincible	91.21	9½	203.75	**123.71**
16 White Elephant	88.61	8¾	197.50	**121.42**
17 Green Mountain	89.67	8½	165.42	**119.96**
18 Halton's Seedling	79.04	6⅓	172.92	**117.86**
19 Crown Jewel	79.72	6¼	176.67	**115.65**
20 Dakota Red	86.00	6	116.67	**112.45**
21 Early Ohio	80.99	6½	151.25	**110.73**
22 Rosy Morn	74.12	5	154.58	**105.24**
23 Stray Beauty	76 92	5	130.00	**93.28**
Grown for four years:				
24 Tonhocks	76.03	5¾	191.25	**171.79**
25 Convoy	86.80	7½	202.08	**157.32**
26 Woodbury White	86.06	7	209.17	**148.67**
27 Early Oxford	83.63	7	188.33	**148.41**
28 Advance	78.32	5¼	188.33	**144.28**
29 Thunderbolt	84.15	8⅓	194 58	**144.05**
30 Badger Queen	91.01	9¼	190.00	**141.78**
31 Early Rose	86.48	8½	194.17	**141.24**
32 Hoffman	78.40	7	192 92	**141.08**
33 Early Rochester	87.38	7¾	175.00	**136.60**
34 Kosh Konong	87.30	9¼	183.75	**134.81**
35 Ohio Junior	90.08	10¼	214.17	**131.99**
36 Early Dominion	84.15	8¼	178.75	**131.39**
37 Silver King	83.07	8	182.08	**131.17**
38 Putnam	77.38	7	152.92	**125.53**
39 Queen of the Valley	86.96	9	182.08	**111.60**
Grown for three years:				
40 Burbank's Seedling	87.69	7½	237.08	**180.96**
41 Early Everitt	85.69	9	227.08	**178.76**
42 White Star	94.64	13¾	225.42	**177.34**
43 Early Gem	89.19	9¼	231.25	**177.22**
44 Molly Star	84.02	8	213.75	**174.58**
45 Mammoth Pearl	89.46	9	209 58	**171.26**
46 King of the Roses	79.57	7¼	193.75	**171.12**
47 Thorburn's Extra Early	80.40	7½	206.25	**168.35**
48 New Queen	93.90	11	218.75	**167 65**
49 Polaris	83.47	7	204.17	**167.52**
50 The Dandy	84.15	7	212.92	**165.97**
51 Hotel Favorite	83.06	8	206.67	**165.82**
52 St. Patrick	81.54	8	205.42	**162.47**
53 Paris Rose	76.55	7¼	215.00	**161.40**
54 Burpee's Extra Early	77.20	5¾	199.17	**160.26**
55 May's Imperial	91.23	9½	308.75	**159.72**
56 Ohio Junior	92.72	9¼	217.50	**158.90**

POTATOES, DIFFERENT PREPARATION OF SEED TUBERS.—*Continued.*

Varieties.	Results for 1894. Percentage of crop marketable.	Results for 1894. Weight of 30 best developed potatoes.	Results for 1894. Yield per acre.	Average yield per acre for number of years grown on plots.
		lb.	bushels.	bushels.
Grown for three years: Continued.				
57 Everitt's Seedling	77.11	6¾	192.92	**158.51**
58 Watson's Seedling	81.82	7¼	192.50	**158.37**
59 Island McDonald	90.68	9½	178.75	**156.78**
60 Vick's Perfection	81.18	6½	212.50	**156.37**
61 The Ideal	81.29	6½	213.75	**156.12**
62 Red Australian	90.20	7¼	187.08	**156.09**
63 Munroe Co. Prize	89.67	9¼	177.50	**153.70**
64 Halo of Dakota	79.09	6¾	183.33	**153.58**
65 Eureka	82.67	8¼	187.50	**152.90**
66 N. B. & G. Co's Grand Mogul	93.03	8	185.42	**151.94**
67 Early Market	92.61	9¼	202.92	**151.37**
68 Negro	65.89	5	160.00	**151.27**
69 Early May Flower	76.46	6	192.92	**150.44**
70 Sunlit Star	82.66	8½	206.67	**149.56**
71 Dempsey's Seedling	78.01	6¼	180.00	**149.20**
72 Woodbury White	89.64	8½	245.42	**148.87**
73 Chicago Market	78.77	7	176.67	**147.82**
74 P. E. I. Early Rose	91.82	8½	203.75	**147.52**
75 Mount Carbon	91.55	9¼	212.08	**147.36**
76 State of Maine	90.95	7¾	184.17	**147.26**
77 Vick's Champion	91.93	10½	201.25	**146.42**
78 Edwards	90.18	9	250.42	**146.01**
79 Landreth's State of Maine	89.79	8½	240.83	**144.61**
80 Early Essex	82.50	6	166.67	**144.29**
81 Chautauqua	88.79	8	185.83	**143.61**
82 Morning Star	88.84	6	186.67	**143.49**
83 The Rosedale	85.59	7½	199.58	**143.46**
84 Prince Albert	85.82	7	170.42	**141.41**
85 Alexander's Prolific	90.16	8½	186.25	**141.22**
86 Delaware	85.64	7	162.50	**141.10**
87 Boley's Northern Spy	89.98	8½	199.58	**137.66**
88 White Lily	87.23	9½	228.33	**137.64**
89 Landreth's Farmer's Alliance	90.85	7½	182.08	**137.23**
90 Mammoth Pearl	93.80	11½	201.67	**137.09**
91 Landreth's Garfield	74.44	6¼	166.25	**136.68**
92 Wilson's First Choice	86.75	7½	201.25	**136.42**
93 Extra Early Vermont	84.63	7¾	176.25	**135.42**
94 Vaughan	90.09	10¾	285.83	**134.61**
95 Harbinger	74.89	6½	189.17	**133.99**
96 Belle, A. C	94.56	8½	183.75	**132.38**
97 Rose Seedling	96.34	11¾	193.75	**131.65**
98 Snowflake	48.97	4	161.67	**130.16**
99 Chas. Downing	54.99	3¾	162.92	**129.84**
100 Snow Queen	77.64	5¾	169.58	**128.06**
101 Hopeful	92.84	9¾	197.92	**126.71**
102 Royal Adelaide	90.91	8¾	169.58	**125.06**
103 Lady Finger	56.24	6½	190.42	**124.47**
104 McIntyre	88.52	9¾	174.17	**121.79**
105 Garnets	92.45	8	137.92	**118.04**
106 Pearce's Prize Winner	92.05	11	152.08	**95.63**
Grown for two years:				
107 Pearl of Savoy	95.78	14¾	276.67	**236.04**
108 American Giant	95.15	14	283.75	**227.68**
109 American Wonder	95.75	13¼	362.92	**225.61**
110 Vick's American Wonder	97.01	16	348.75	**222.73**
111 Columbus	92.21	11½	267.50	**217.10**
112 Burpee's Superior	88.92	9¾	259.58	**209.19**
113 Nebula	84.41	7¾	251.25	**208.33**
114 Early Pontiac	86.80	7¾	246.25	**207.33**
115 Woodbury White	93.38	10	251.67	**207.09**
116 Alexander's Prolific	90.29	11	287.50	**206.90**
117 Bill Nye	85.16	10¾	280.83	**206.02**
118 Keiser	94.41	11½	298.33	**204.97**

POTATOES, DIFFERENT PREPARATION OF SEED TUBERS.—*Continued.*

Varieties.	Results for 1894. Percentage of crop marketable.	Results for 1894. Weight of 30 best developed potatoes.	Results for 1894. Yield per acre.	Average yield per acre for number of years grown on plots.
Grown for two years: Continued.		lb.	bushels.	bushels.
119 Arizona	91.33	11	297.92	204.76
120 North Pole	87.07	8¾	232.08	204.59
121 Early Harvest	91.00	10¼	282.50	203.95
122 Improved Rose	92.81	12	278.33	201.42
123 Early Norther	91.94	12¼	279.17	200.84
124 Six Weeks	94.43	12½	276.67	199.99
125 Early June Eating	92.73	14¼	252.08	198.54
126 Rochester Rose	92.98	10½	243.33	193.97
127 Potentate	92.77	11	270.83	192.72
128 Timpe's No. 4	89.84	11	233.75	192.53
129 Early Six Weeks	87.75	10	231.25	192.48
130 Scotch Regent	91.35	9¾	274.58	191.04
131 Steele's Earliest of All	88.27	8¾	245.00	190.65
132 Golden Harvest	91.42	10¾	252.50	188.75
133 Early Yorker	90.48	12	245.00	187.70
134 Bruce's White Beauty	82.92	8¼	234.17	185.84
135 Beauty of Beauties	94.54	13	267.08	185.84
136 World's Fair	89.91	10	268.33	182.52
137 Pride of Ireland	94.06	13½	259.58	181.89
138 Parson's Prolific	94.51	13¼	265.83	181.87
139 Van Orman's Earliest	87.40	8	218.33	180.42
140 Montana Wonder	90.69	9¼	295.42	179.16
141 The Freeman	81.82	8½	224.75	177.93
142 Browell's Seedling	94.03	13½	223.33	175.67
143 Granger	87.73	9½	207.08	173.74
144 Reed's Eighty-Six	89.54	11¼	310.83	172.32
145 General Gordon	95.83	13¼	314.38	171.79
146 The People's	96.14	12¼	269.58	168.09
147 Seneca Beauty	97.96	16	184.17	164.39
148 Ontario	93.93	15	219.58	154.59
149 Howe's Premium	91.43	7	194.58	147.29
150 Manitoba Rose	97.50	14	266.67	145.84
151 Great West	88.46	12¾	195.00	141.05
152 Maggie Murphy	97.48	16	248.13	137.42
153 Columbian Peach Blow	92.21	10¼	240.83	137.32
154 Eyeless	82.58	6¾	184.17	127.09
155 New Satisfaction	90.75	11¼	220.83	126.07
Grown for one year:				
156 Great Divide (Van Orman's Seedling No. 75)	96.40	11	347.50	347.50
157 Vick's American Wonder	98.95	22½	316.67	316.67
158 Troy Seedling	96.18	13¾	316.67	316.67
159 Irish Daisy	94.38	13¾	311.25	311.25
160 Salzer's Prize-taker	91.99	11¼	275.83	275.83
161 Clay Rose	96.85	18½	251.25	251.25
162 Snowdrop	87.01	10¾	243.75	243.75
163 Pride of the Market	96.72	11½	241.67	241.67
164 Adirondack	94.38	8¾	237.08	237.08
165 Hartzel's Seedling	97.88	12	236.25	236.25
166 Vanguard	92.34	11	233.75	233.75
167 Governor Rusk	94.65	11	233.75	233.75
168 Victor Rose	97.10	17¼	230.00	230.00
169 Pride of the Table	96.55	16	229.58	229.58
170 Clark's Nonesuch	98.18	16¾	229.17	229.17
171 Pride of the West	94.48	16	227.92	227.92
172 Russell's Seedling	90.87	9	214.58	214.58
173 Bell's Stray Beauty	93.07	7	192.50	192.50
174 Restaurant	94.77	14¾	191.25	191.25
175 Wilson's Stray Beauty	88.81	8¾	184.38	184.38
176 Silver Dollar	91.74	9¼	181.67	181.67
177 The Hopeful	90.41	9	173.75	173.75
178 Vick's White Gem	88.64	11¾	150.42	150.12

The yield during 1894 was quite large, reaching as high as 362.9 bushels per acre, the lowest yield being 116.7 bushels per acre. There were not more than a dozen rotten potatoes found in nearly four acres of crop grown in the experimental department in 1894. Owing to the dry weather in the middle of the season and the numerous rains later on, the late potatoes gave better results than the early ones.

The largest yield per acre in 1894 was produced by the *American Wonder*, which gave a yield of 362.9 bushels per acre; of this quantity 95.8 per cent. were marketable. Another sample of this same variety, under the name of Vick's American Wonder, gave a yield of 348.8 bushels per acre, and also another sample received of this same variety, the seed of which was obtained in the spring of 1894, gave a yield of 316.7 bushels per acre.

The *Empire State*, which stands at the head of the list in average yield per acre for five years, did not do quite so well in 1894 as previously in comparison with other varieties. It, however, made a fine record in the co-operative experiments in 1894 over Ontario, giving the highest average yield among six leading varieties tested very carefully in 38 different localities reported upon. It is a potato of good quality, and in 1894 required 122 days from planting time until it was ready to be dug.

The *Thorburn* variety stands second in average yield per acre among 23 varieties grown for five years in succession. This variety gave an average of 222 bushels in 1894, and by so doing has made a sufficient average for five years to place it head of the *Summit*, which variety in 1893 stood second among the varieties grown for four years.

The varieties which gave the smallest percentage of small potatoes in 1894 were *Vick's American Wonder*, Clark's Nonesuch, Seneca Beauty, Hartzel's Seedling and Manitoba Rose; and the varieties which gave the largest percentage of small potatoes were Snowflake, Chas. Downing, Lady Finger and Negro.

The largest individual potatoes were produced by the Vick's American Wonder, Clay Rose and Victor Rose.

The varieties which were the earliest to reach maturity were the Stray Beauty, Negro, Chas. Downing, Snowflake and Howe's Premium, and those latest to reach maturity were Columbian Peach Blow, Troy Seedling, Rose's New Invincible, American Giant and Ontario.

Potatoes, Different Depths of Planting Seed Tubers.

An experiment was conducted in 1894 in which potatoes were planted 1, 3, 5 and 7 inches below the surface. A similar test was carried on in each of the following years 1891, 1892 and 1893. During the past year the tests were made with four different varieties of potatoes, Rural New Yorker No. 2, Tonhocks, N. B. & G. Co.'s Grand Mogul, and American Giant. There were, therefore, 16 plots devoted to this experiment in 1894. Each plot consisted of one row, four rods long. Three and one-third links were allowed between each two rows. The nature of soil and the previous cropping were the same as with the variety tests. Planting took place on June 9th. The seeds were placed one foot apart in the row. The results were as follows:

Depths of planting.	Results for 1894.			Average yield per acre for 1891-2-3-4 (10 separate tests).
	Percentage of crop marketable.	Weight of 30 large potatoes.	Yield of whole crop per acre.	
		lb.	bushels.	bushels.
1 inch	96.42	18.00	433.13	214.48
3 inches	97.87	18.31	424.69	223.25
5 "	98.61	20.56	437.50	234.63
7 "	99.05	21.06	379.69	229.55

It will be observed from the above summary that the largest average yield per acre was produced by planting the seed tubers five inches below the level of the surface, and the second largest yield by planting one inch below the surface. Shallow planting, as compared with deep planting in 1894 gave better comparative results than during the three years previous. The largest yield per acre was obtained from planting seven inches deep in 1891, seven inches deep in 1892, three inches deep in 1893, and five inches deep in 1894. The largest average yield of potatoes per acre for the past four years is from planting *five inches deep*. It must be remembered that these are the results from the soil on this farm, which might be termed an average clay loam, which is well underdrained.

In 1894 the potatoes were examined before being removed from the ground, and it was found that on the average the potatoes in the rows in which the tubers had been planted one inch below the surface were 2.3 inches deep; in the rows in which the tubers were placed three inches below the surface, 2 9 inches; in the rows in which the tubers were planted five inches below the surface, 4.1 inches deep; and in the rows in which the tubers were planted seven inches below the surface, 6 inches deep.

It was observed that a good many of the potatoes in the plots which were planted shallow or near the surface became badly sunburned, while in the plots where the tubers were planted deeper there was almost none of the crop which appeared in view of the surface of the ground. By a careful counting it was found that from planting one inch deep 84.6 per cent. of the hills had one or more potatoes exposed; from planting three inches deep, 38.4 per cent.; from planting five inches deep, 9.4 per cent., and from planting seven inches deep, 5.3 per cent.

Potatoes, Different Preparation of Seed Tubers.

This experiment was carried on in duplicate in 1892, in duplicate in 1893, and in triplicate in 1894, for the purpose of ascertaining what influence the different preparations of the seed tubers would have upon the production of the crop of potatoes. There were ten plots in each section of the experiment. The quantity of seed per acre varied with the manner of preparing the seed. The preparation of the soil, including manuring, etc., was precisely the same as used for the comparative tests of the different varieties previously mentioned. Each plot consisted of one row 4 rods long and $3\frac{1}{3}$ links (26.4 inches) between each two rows. Planting in 1894 took place on June 5th. Great care was exercised in the selection of the seed potatoes for each of the component parts of this experiment. Following are the results in tabulated form:

Preparation.	Yield per acre—whole crop.		Yield per acre, less seed used.		Percentage of whole crop marketable.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	bush.	bush.	bush.	bush.		
Large, whole, 1 foot apart	462.92	319.17	241.27	157.29	87.57	81.46
" " 2 feet "	357.08	242.36	247.48	158.16	90.32	86.91
" " 3 " "	322.50	199.90	251.25	147.48	93.62	90.21
Medium " 1 foot "	381.25	265.95	290.00	193.00	88.50	84 97
" " 2 feet "	327.50	202.10	282.50	165.63	93 86	89.75
Small " 1 foot "	352.50	208.37	322.10	180.90	92.65	88.68
Medium, cut in two, 1 foot apart	373.75	191.12	329.50	151.83	94.75	87.18
Medium, two eyes in a piece, 1 foot apart, without seed ends	303.75	158.65	289.85	143.95	97.44	91.75
Medium, one eye in a piece, 1 foot apart, without seed ends	187.08	92.09	179.58	83.93	98.01	90.87
Medium, seed ends, 1 foot apart	261.67	111.89	256 47	105.49	97.46	85.95

The largest yield per acre during each of the three years in which this experiment has been conducted was produced by planting large whole potatoes one foot apart. This, however, required a large amount of seed, and after the seed was subtracted from the produce of the plots, the largest yield per acre then remaining was from medium-sized whole potatoes, one foot apart, in each of the years 1892, 1893 and 1894. The smallest average yield per acre, less the seed used, was from planting medium-sized potatoes cut to one eye in a piece and planted one foot apart. The lowest percentage of small potatoes was produced from the medium sized potatoes cut to two eyes in a piece and planted one foot apart, while the highest percentage of small potatoes was produced by planting large whole potatoes one foot apart. This experiment caused much interest during the summer season, and was witnessed by many hundreds of people who visited the experimental department. The vines of the whole large potatoes were very strong and vigorous, while those of the sets with one and two eyes in a piece were much smaller, and those from the seed ends the smallest of all.

Potatoes, Application of Fertilizers.

In 1894 we carried on an experiment for the third time in applying different fertilizers to the potato ground. The fertilizers were the same in number and quality during each of the three years in which this experiment has been carried on. In 1892 and 1893 the potatoes were grown in the field to the southeast of the College building, and which was rather low in aspect. In 1894 the potatoes were grown in the central part of the experimental field, which lies to the northeast of the College building. The land is more elevated in the latter instances than that used previously. The experiment was conducted in duplicate in 1894, one set on the soil which grew a crop of spring wheat in 1893, and the other on soil which grew fodder crops during that season. No manure had been applied to the land for some years. The plots were $\frac{1}{100}$ of a acre in size. The drills were $3\frac{1}{3}$ links apart, and the potato sets were planted one foot apart in the drills. The tubers were cut to two eyes in a piece and were covered to the depth of about four inches. There were three rows in each plot, and one row was left unfertilized between each two plots. Planting took place on May 31st, and the fertilzers were sown in the drills after the seed had been dropped, but before it was covered. The nitrate of soda and the muriate of potash were each used at the rate of 160 lb. per acre; wood-ashes, unleached, 800 lb. per acre, and all the other fertilizers at the rate of 325 lb. per acre. The table following shows the results:

Fertilizers.	Percentage of crop marketable, 1894.	Weight of 30 best developed potatoes.	Yield of potatoes per acre. 1892.	1893.	1894.	Average for 1892-3-4.
		lb.	bush.	bush.	bush.	bush.
1 Royal Canadian	95 47	17.50	208.7	113.3	193.54	**171.85**
2 Potato manure	95.76	15.50	178.3	109.2	177.29	**154.96**
3 Superphosphate (animal)	95.62	16 50	159.6	104.2	174.17	**145.99**
4 Bone and potash	95 31	17.38	154.2	96 7	174 79	**141.93**
5 Sure Growth	95.02	17.00	123.8	89.6	197.92	**137.11**
6 Superphosphate (mineral)	93.43	16.50	147.1	74.6	186.25	**136.02**
7 Reliance	95.28	17.00	135.0	90.8	179.17	**134.99**
8 Muriate of potash	95.05	15.75	116.3	80.0	205.00	**133.80**
9 Pure bone meal	94.91	17.50	154.6	82 5	161 25	**132.82**
10 Capelton	96.05	17.13	124.6	84.6	172.92	**127.37**
11 Nitrate of soda	95.69	17.13	127.5	82.5	171.67	**127.22**
12 Wood ashes	95.74	17.38	122.1	84.2	166.25	**124.22**
13 Victor	95.81	17.00	111.3	77.5	171.67	**120.16**
14 No fertilizer	95.81	18.00	105.0	72 1	165.42	**114.21**

It will be observed from the table above that the highest yield per acre was produced by the Royal Canadian in 1892 and in 1893, while in 1894 this fertilizer gave the third highest yield per acre, it being surpassed during the past season by the muriate of potash and Sure Growth fertilizers. It will also be observed that the lowest yield per acre in 1892 and 1893 was from the unfertilized plot, while in 1894 the unfertilized produced the second lowest average yield per acre. In percentage of marketable potatoes there is but very little difference in the produce of the various fertilizers used. The crop of potatoes was increased 98.8 per cent. in 1892, 57.1 per cent. in 1893 and 17 per cent. in 1894 by the application of 325 lb. per acre of the Royal Canadian fertilizer. This fertilizer cost us about $38 per ton.

Potatoes, Rural Trench System.

Some very large yields of potatoes have been grown in the United States with the mode of culture known as the Rural Trench System. 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 in the trenches with or without the use of fertilizers or manure until the trenches are one-half to two-thirds full. The potatoes are then planted and the remainder of the soil is placed in the trenches. The test was conducted in 1894 in our experimental department to compare the advantages of using the trench without manure and with manure in comparison with our ordinary method of cultivation. Sixteen trenches were made, each being one foot wide by one foot deep and four rods long. Trenches were three feet from centre to centre. When the potatoes were planted the soil was thrown loosely in the trenches until they were two-thirds full.

The potatoes were then planted and the remaining portion of the soil placed in the trenches. Each plot consisted of two rows. In one plot farmyard manure was used at the rate of 20 tons per acre. This was mixed with soil, one half being below the potatoes and one half above the potatoes. In another plot the same quantity of farmyard manure was used and in addition potato fertilizer at the rate of 1,000 lb. per acre. On another plot, the potato fertilizer alone was used at the rate of 1,000 lb. per acre. This was mixed through the soil as described in the case of the farmyard manure. One plot of trenches was left unfertilized and in the case of another plot drills were made four inches deep by means of a double mould-board plow. In this case no trenches were made or any manure or fertilizers used. This plot is similar to all those used with the variety tests in the experimental department. This whole experiment was conducted in duplicate. The results were as follows :

Fertilizer.	Amount of fertilizer used.	Yield of whole crop per acre.
		bush.
1 Farmyard manure	20 tons per acre	403.34
2 Potato fertilizer and manure	1,000 lb. P.F.+20 tons M.	360.02
3 Ordinary method		335.27
4 Potato fertilizer	1,000 lb.	329.54
5 No fertilzer		312.82

The Trench System with the application of farmyard manure at the rate of 20 tons per acre gave the highest yield of potatoes, which was 68 bushels per acre more than that obtained from our ordinary method of cultivation. This, however, was due to the manure used, as the trenches which received no manure or fertilizers, gave the smallest yield per acre of all the plots in the experiment. Other seasons, however, may change these results to a large extent. The potato fertilizer did not seem to increase the crop to any great extent, but the land upon which the experiment was conducted was in a good state of fertility.

POTATOES, DIFFERENT DISTANCES IN PLANTING POTATO SETS EACH CONTAINING ONE EYE.

An experiment was conducted in 1894 in which potato sets containing one eye in each set and cut from medium-sized potatoes were planted at 4, 8, and 12 inches apart in the drill. The experiment was conducted in triplicate by using the Empire State, Rural New Yorker No. 2, and the N. B. & G. Co.'s Grand Mogul for the separate tests. The conditions regarding the soil were the same as those in the variety experiments with potatoes. Planting took place on June 7th. Following are the results :

Distance between sets.	Percentage of crop marketable.	Weight of 30 large potatoes.	Yield of whole crop per acre.
		lb.	bushels.
4 inches	98.24	16.08	477.50
8 "	98.67	20.50	401.67
12 "	98.70	22.50	351.67

The largest yield per acre was obtained from planting the sets 4 inches apart in the row, the second best from 8 inches apart, and the poorest by allowing 12 inches between the potato sets. By planting the sets 4 inches apart there was an increase of 126 bushels per acre more than was produced by planting one foot apart. It will be observed, however, that there were not so many large-sized potatoes. The 30 best developed potatoes from planting 12 inches apart weighed 32 5 lb , while those planted 4 inches apart weighed only 16.1 lb. The percentage of small potatoes, however, in the whole crop was very similar when the different parts of the experiment are compared. The yield was high throughout.

POTATOES, INFLUENCE OF PLASTER AND LIME WHEN SPRINKLED ON FRESHLY CUT SETS.

It is a custom among some farmers and among a good many seedsmen to sprinkle the potato sets with plaster or sometimes lime immediately after they are cut. To determine the influence of sprinkling this way an experiment was carried on in 1894, in which medium-sized potatoes were cut to one eye in a piece. These sets were carefully divided into nine different lots with an equal number in each lot and in such a way that the lots were all similar in weight. Three of the lots were then sprinkled with plaster, three others were sprinkled with lime and the remaining three were left unsprinkled. The sets were kept in the cellar for three days, and were then planted in rows 3⅓ links apart, the sets being placed 12 inches apart in the row. The three lots in each section of the experiment were planted separately so that the experiment was carried on in triplicate. Planting took place on June 5th, and the same methods of cultivation were used in this experiment as with the potatoes in the variety tests previously mentioned.

Methods of planting.	Weight of thirty large potatoes.	Yield of whole crop per acre.
	lb.	bush.
Potatoes sprinkled with plaster	29.13	398.96
" " lime	28.38	394.38
Potatoes not sprinkled	25.38	312.09

The potatoes sprinkled with plaster gave an average of 399 bushels per acre. Those sprinkled with lime gave about 5 bushels per acre less, and those left unsprinkled gave 86 bushels per acre less. This points to an advantage in sprinkling the potato sets with either plaster or lime if it is intended to send them through the mail or to keep them a few days before planting, after being cut. This experiment will likely be repeated in the future.

Potatoes, Planting Single Eye from Different Parts of the Seed Tuber.

It is often stated that the seed end or small end of the potato should be removed from the potato and thrown away instead of being used for seed. An experiment was carried on in order to try to determine whether each separate eye in the seed end of the potato had as much value for planting as the single eyes from other parts of the same potatoes. 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. In dividing up the seed into about three sets, one eye in each set was taken from each potato, the other eyes being thrown away. They were cut in such a way that a certain number of sets from the seed end of the potato would weigh exactly the same as the same number of sets from the middle or stem end of the potatoes. As great care was exercised in preparing this seed, the results should tend to show the difference in the strength of the individual eyes from the different parts of the potato. The potatoes were planted on the 5th of June in rows 26.4 inches apart, and the sets were planted twelve inches apart in the row. They were covered to a depth of four inches and flat cultivation was used throughout, as in the case of the other potato experiments.

The following table gives the average results of this experiment, which was carried on six times in 1894:

Methods of planting.	Weight of thirty large potatoes.	Yield of whole crop per acre.
	lb.	bush.
Middle of potato	27.08	375.00
Stem end of potato	27.92	371.88
Seed end of potato	27.88	358.55

The eyes from the middle of the potato gave four bushels per acre more than those from the stem end of the potato and sixteen bushels per acre more than those from the seed end of the potato. As the yield per acre was over 350 bushels in every instance, the difference between the yields might be considered quite close, and still they point towards the conclusion that the single eyes in the seed end of the potato were not quite so productive as those from the middle or stem end of the same potato. We have as yet, however, only one year's experience in this from which it is unsafe to draw any conclusion.

Potatoes, Single Eyes with Large and Small Amounts of the Tuber Attached.

In this experiment very large potatoes of as uniform size as possible were selected and all the eyes removed and thrown away but two of the strongest appearing ones on each potato. One of these eyes on each potato was then removed with a piece of the potato attached which would be about the size of a silver fifty cent piece, the remaining part of the potato being left attached to the other eye. It will be observed that the eyes of these two sets are similar in every respect except in the one particular, viz., that there was only a small amount of the fleshy part of the potato attached in one case; while in the other there was large amount of the fleshy part of the potato attached to the eye. Planting took place on June 5th. The soil and methods of cultivation were similar, and the preparation of the soil and method of cultivation were the same as those used for the potatoes in the variety experiments.

Methods of planting.	Yield of whole crop per acre.
	bush.
Single eyes on large potatoes nearly whole	340.0
" small pieces taken from large potatoes	48.1

It will be seen in the average results of the duplicate experiment that the large sets of potatoes gave about seven times as large a yield per acre as was produced by small sets. In the latter case, however, the growth was exceedingly poor, as many of the sets did not grow. Just after planting there was a very dry season and this may account for the wide variation in the results, the small sets not having enough nourishment in themselves to carry them through the trying time until the rains again appeared. They seemed to dry up badly and lose their vitality, while, on the other hand, the large sets did not seem to be influenced to nearly so great an extent by the severity of the season. This, along with other experiments, goes to show that size of the seed tuber planted has a very marked influence upon the crop produced. It seems as if there more depends upon the size of the set planted than upon the number of eyes which the seed contains.

Swede Turnips, Comparative Test of 66 Varieties.

During the past year, sixty-six varieties of Swede turnips were grown side by side in the experimental grounds. The seed of these were obtained from England, United States and Canada. Of this number thirty varieties were grown for four years in succession, eight for three years, thirteen for two years, and fifteen were grown in 1894 for the first time on the experimental plots. The soil on which the seeds were sown was what might be termed an average clay loam, and was quite uniform throughout. It was cropped with oats in 1893, and received farmyard manure at the rate of twenty tons per acre in the spring of 1894, which was the first manure placed on this land for seven years. The land was plowed in the autumn and again before seeding time. Ridges were made three and one-third links apart with a double mould-board plow. Each drill was four rods long, and three of these drills were sown with one variety in every case. Each plot was, therefore, $\frac{1}{100}$ of an acre in size. The seeding took place on June 21st, except numbers 64, 65 and 66, which were sown on June 25th. Great care was exercised in thinning the roots, which were left an average of one foot apart in the row in every instance.

Varieties.	Soundness of roots, 1894.	Results for 1894.			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.
		tons.	lb.	tons.	tons.	lb.	tons.
Grown for four years :							
1 Hartley's Bronze Top	medium	7.50	3 16	28.80	5.85	2.04	23.08
2 Marshall's Purple Top	medium-good	7.25	2.93	28.18	5.75	2.49	21.89
3 White Swede	"	10.15	3.03	28.95	6.38	2.42	21.80
4 P. W. & Co's. Imp'l Prize P. Top	medium	7.05	3.08	28.00	6 68	2.52	21.59
5 Skirving's Swede	medium-good	8.25	2 93	27.25	6.06	2.34	21.50
6 Carter's Prize Winner	"	7.75	2.73	24.55	6.13	2.35	21.45
7 Our Selected Purple Top	"	6.60	2.81	26.10	4.97	2.44	21.38
8 Carter's Imperial Hardy	"	8.13	2.90	26.95	6.14	2.38	21.31
9 Hazard's Improved	medium-poor	7 38	2.74	26.70	5.41	2.49	21.05
10 Bangholm	medium	6.75	2.49	22.65	6.15	2.32	20.60
11 Westbury's Improved	"	6.50	2 42	22.50	6.76	2.29	20.56
12 Sutton's Champion	medium-good	6.45	2.40	22.45	5.24	2.38	20.51
13 Sharpe's Improved	"	6.40	2.59	24 65	4 92	2 20	20.50
14 Green Top	medium	6.25	2 23	20.45	6.99	2 29	20.19
15 Hall's Westbury	medium-poor	4 98	2.63	24.75	4.73	2.20	20.00

SWEDE TURNIPS, COMPARATIVE TEST OF 66 VARIETIES.—*Continued.*

Varieties.	Soundness of roots, 1894.	Results for 1894. Yield of tops per acre.	Results for 1894. Average weight per root.	Results for 1894. 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.
		tons.	lb.	tons.	tons.	lb.	tons.
Grown for four years :							
16 Laing's Improved	medium-poor	6.75	2.28	21.40	5.80	2.15	**19.82**
17 Knowfield	medium-good	6.03	2.47	22.83	4.98	2.28	**19.82**
18 East Lothian	poor	6.50	2.60	24.20	5.54	2.25	**19.69**
19 King of Swedes	medium-poor	5.55	2.35	21.83	5.56	2.24	**19.57**
20 Highland Prize Purple Top	medium	6 70	2.33	21.30	5.94	2.23	**19.42**
21 Drummond's Imperial	medium poor	7.48	2.63	25.25	5.77	2.24	**19.42**
22 Royal Norfolk Purple Top	medium	6.65	2.41	22.15	4.61	2.19	**19.04**
23 Carter's Elephant	"	7.45	2.43	23.30	5.53	2.24	**18.96**
24 Fettecairn Green Top	"	6.45	2 69	24 08	5.31	2.29	**18.58**
25 Marquis of Lorne Purple Top	poor	6 83	2.53	24.13	5.17	2.15	**18.52**
26 Maston's Purple Top	"	5.23	2.11	19.03	5.34	2.03	**18.29**
27 Budlong White Ruta Baga	"	6.33	2.36	23 35	4.21	1.91	**18.19**
28 White Rock	medium	6.70	2 49	28.80	4.59	1.95	**18.03**
29 White Sweet Russian	medium-poor	7.50	2.44	24.08	5.46	1.99	**17.92**
30 Ashcroft's Purple Top	medium	7.93	2.48	23.90	5.00	2.09	**17.63**
Grown for three years :							
31 American Purple Top	medium	6.15	2 78	26.30	4.97	2 31	**23.03**
32 Queen of Swedes	medium-good	6.75	2.70	25 88	5.78	2 27	**22.26**
33 Edina	poor	9.05	2.50	23.10	8.04	2.27	**21.72**
34 Crimson King	medium-good	7.50	3.03	27.90	5.75	2.22	**20.89**
35 Shamrock Swede	medium	8.48	2.61	24.18	6.11	2.16	**20.41**
36 Laidlaw's Improved	"	7.35	2.45	24.18	5 63	2.08	**20.13**
37 Rennie's Prize Purple Top	"	7.90	2.94	26.60	5.95	2.27	**20.13**
38 Aroostock's Ruta Baga	"	6.70	2.14	20.85	5.95	1.95	**19.38**
Grown for two years :							
39 Kangaroo	medium good	7.73	2.94	27.50	6.21	2.55	**24.27**
40 Bloomsdale	"	8.80	2.72	26.20	6.98	2.37	**23.10**
41 N. B. & G. Co's. Prize Winner	medium	8.60	2.95	28.30	6.48	2.44	**22.40**
42 Scottish Champion	medium-good	8.75	2.68	24.90	6.63	2.25	**22.03**
43 Hurst's Monarch	medium	8.00	2.75	25.75	6.19	2.32	**21.98**
44 Improv'd Long Island Ruta Baga	"	5.80	2.65	24.50	5.40	2.22	**21.34**
45 Jumbo or Monarch	medium-good	7.65	2.74	24.90	6.14	2.30	**21.25**
46 Jarman's Improved King of the West Purple Top	medium	9 00	2.75	25.95	6.42	2.30	**21.22**
47 Maule's Heavy Cropping	"	7.95	2.64	24.80	5.84	2.22	**20.14**
48 Sweet German Ruta Baga or Swedish	medium-good	9.08	2.68	24.83	7.67	2 09	**19.73**
49 White French	medium-poor	7.45	2.38	22.45	6.95	2.04	**19.00**
50 Thorp's Improved Shipping	medium	6.73	2.23	20.93	5.49	2.00	**18.89**
51 Premier	"	5.95	2 22	20.95	5.14	1.92	**18.07**
Grown for one year :							
52 Buckbee's Giant	good	9.55	3.16	30.95	9.55	3.16	**30.95**
53 Waite's Improved	medium	6.45	2.76	26.10	6.45	2.76	**26.10**
54 Halewood's Bronze Top	"	6.15	2.60	25.35	6.15	2.60	**25.35**
55 New American Yellow	"	6.38	2 67	24.85	6.38	2 67	**24.85**
56 Keith's Green Top	"	7.55	2.66	24 05	7 55	2.66	**24.05**
57 Dreer's Improved Purple Top	medium-good	5.00	2.35	23.25	5.00	2.35	**23.25**
58 Crosse's Improved	"	7.75	2.32	22 60	7.75	2.32	**22.60**
59 Swirving's Liverpool	medium-poor	5.75	2.42	22.35	5.75	2.42	**22.35**
60 Waite's London	medium	9.20	2.45	20.80	9.20	2 45	**20.80**
61 Improved American Purple Top	"	5.70	2.34	20.25	5.70	2.34	**20.25**
62 Mammoth Russian	"	5.35	2.11	20.05	5.35	2.11	**20.05**
63 Burpee's Breadstone	medium-poor	4.20	1.98	18.00	4.20	1.98	**18.00**
64 American Breadstone	medium	3.60	1.84	16.35	3.60	1.84	**16.35**
65 Sweet German	medium-poor	2.78	1.49	13.35	2.78	1 49	**13.35**
66 Burpee's Improved Purple Top Ruta Baga	medium-good	8.50	.58	5.38	8.50	.58	**5.38**

The Hartley's Bronze Top still heads the list in average yield per acre for four years among the thirty varieties grown for that length of time. Not only does it stand high in its average for the last four years, but it will be observed that in yield of roots per acre in 1894, it was surpassed by only two other varieties, namely, Buckbee's Giant, which gave 30.95 tons per acre, and the White Swede, which gave 28.95 tons per acre. Hartley's Bronze Top also headed the list in the average of nineteen co-operative experiments carried on over Ontario with three varieties of Swedes in 1893, and stood second in the co-operative tests over Ontario in 1894 among three varieties tested in eighteen different localities. The American Purple Top which was mentioned in the 1892 report as Novelty Swede No. 2, heads the list among eight varieties grown for three years. The Kangaroo has not only given the highest average yield among thirteen varieties grown for two years, but it also gave a yield of 27.5 tons per acre in 1894. The Buckbee's Giant which was grown during the past season for the first time surpassed all other varieties in yield of roots per acre. It will be noticed that the White Swede gave the largest yield of tops per acre, and that the Sweet German gave the smallest amount of tops per acre among the sixty-six varieties grown in 1894.

Swedes, Thinning Plants in the Drill.

This experiment was conducted in 1894 for the third year in succession. It was carried on in duplicate each season. The experiment consisted in leaving the plants unthinned and in thinning to four, eight, twelve, sixteen and twenty inches in the drill, the drills being the same distance apart in every instance. The land used for the experiment in 1894 was a clay loam which produced a crop of oats in 1893, and was manured at the rate of twenty tons of farmyard manure per acre in the spring of 1894. The land was plowed in the autumn and again before the roots were sown. Slight ridges were made with double mould-board plow and the seed was sown on June 23rd. The plants were thinned when about two inches high and left to the distance required for the experiment. The results were:

Distance between roots in the drill.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average, 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
Unthinned	9.25	7.24	.46	.33	22.60	13.57
4 inches	9.30	....	1.06	....	27.78	....
8 "	7.95	6.21	2.07	1.66	29.75	21.67
12 "	8.70	5.90	2.79	2.08	27.25	19.20
16 "	7.95	5.54	3.76	2.77	27.10	19.10
20 "	7.60	5.29	4.24	3.05	25.00	17.13

In the above average results for 1894 it will be observed that the roots which were thinned to eight inches apart in the row gave the largest average yield, producing 29.75 tons per acre. The largest yield per acre in 1892 was also produced from thinning to eight inches apart, and in 1893 the roots thinned to eight inches apart were surpassed by those thinned to six inches apart by only $\frac{1}{600}$ of a ton per acre.

It will be observed that these results are very uniform, and all pointing to the high yield produced by thinning the roots to eight inches apart in the row. If we look at the average of the past three years we notice roots thinned to eight inches produced $3\frac{1}{2}$ tons per acre more than those thinned to twenty inches, but, at the same time, it will be observed that the average weight per root of those thinned to twenty inches was nearly double that of those thinned to eight inches. It therefore resolves itself into a question of whether it is more desirable to grow a large yield and have smaller roots or produce a smaller yield and have larger sized roots.

The table is worthy of careful study, and a person can determine which thinning would best suit his conditions, after considering the relative importance of farm help and of cultivated land at his disposal.

Swede Turnips, Different Distance Between Drills.

This experiment was conducted in duplicate in 1892, in 1893, and in 1894, the object being to determine whether drills twenty, twenty-six, or thirty-two inches apart would give the best results with Swede turnips. The roots were all thinned to twelve inches apart in the row. The preparation of the land, including manuring, etc, was the same as mentioned in the experiment with thinning plants in the drills. Seeding took place on June 23. The results are contained in the following table :

Distances between drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
20 inches	7.99	5.88	2.07	1.68	26.66	19.46
26 "	8.00	6.03	2.67	2.10	26.87	18.98
32 "	8.34	5.69	3.06	2.31	24.81	17.48

When studying the results of this experiment it would also be well to study the results of the experiments that follow, which relate to the growing of fall turnips, mangels and carrots on drills different distances apart. It would also be well to observe the results of this experiment with the previous one, in which the roots are thinned to different distances in the drills.

It will be observed that in the average of the three years' experiments the Swede turnips sown on drills twenty inches apart there are two tons of roots per acre more than where the Swede turnips were sown on drills 32 inches apart; but, at the same time, it is important to observe that the roots in the latter case average 2.3 pounds each, while those in the former averaged only 1.7 pounds each.

Fall Turnips, Comparative Test of 43 Varieties.

During the past season forty-three varieties of fall turnips were grown in the experimental department. Of this number thirteen were grown for four years, two for three years, eighteen for two years, and ten were grown for the first time in 1894. Fall turnips are frequently known as the white and yellow-fleshed turnips. The seed was sown on land which was an average clay loam in character, and quite uniform throughout. It had produced a crop of oats in 1893, and received farmyard manure at the rate of twenty tons per acre in the spring of 1894. Plowing had been done in the autumn after the oats had been removed and in the spring before the turnip seed was sown. After plowing the land was well cultivated and slightly ridged with a double mould-board plow into rows $3\frac{1}{3}$ links (26.4 inches) apart. Seeding took place on June 25th, except numbers 35 and 40, which were along with the varieties of Swede turnips, and were sown four days earlier. When the plants were about two inches in height they were thinned to twelve inches apart.

FALL TURNIPS, COMPARATIVE TEST OF 43 VARIETIES.—*Continued.*

Varieties.	Soundness of roots 1894.	Color of roots.	Results for 1894. Yield of tops per acre.	Results for 1894. Average weight per root.	Results for 1894. Yield of roots per acre.	Average results for number of years grown on plots. Yield of tops per acre.	Average results for number of years grown on plots. Average weight per root.	Average results for number of years grown on plots. Yield of roots per acre.
			tons.	oz.	tons.	tons.	oz.	tons.
Grown for four years:								
1 Jersey Navet	Medium	White	13.45	2 86	27.20	6.53	2.69	**24.21**
2 Early American Purple Top	"	"	10.60	2.69	26.20	6.27	2.47	**23.61**
3 Early Purple Top Munick	"	"	8.55	2.57	25.48	4.08	2.38	**22.71**
4 Purple Top Mammoth	Medium-good	"	10.55	2.66	26.30	6.98	2 50	**21.68**
5 Greystone Improved	Good	"	13.20	2.03	19.23	8.06	2 63	**21.08**
6 Red Top Strap Leaf	Medium	"	6.50	2.16	21.28	4.72	2 22	**21.00**
7 Red Globe Norfolk	Good	"	11.25	1.87	18.30	6 97	2.34	**20.82**
8 Pomeranian White Globe	Medium-good	"	12.00	2.60	24 55	8 20	2.27	**20.71**
9 White Stone	Poor	"	8.00	1.85	18.10	4.69	2.11	**17.45**
10 Orange Jelly	Medium	Yellow	8.15	1.57	15.50	4.33	1.90	**15.68**
11 Golden Ball	"	"	8 00	1.57	15.15	5.53	1.77	**14.60**
12 Yellow Aberdeen Purple Top	Good	"	10.35	1.67	16.20	6.10	1.60	**13.13**
13 Yellow Aberdeen Green Top	"	"	9.00	1.57	14.10	5.15	1.60	**13.12**
Grown for three years:								
14 Imperial Green Globe	"	White	8.55	1.65	16.35	5.14	1.66	**15.68**
15 Purple Top Hybrid	"	Yellow	7.75	1.63	14.25	5.31	1.38	**10.57**
Grown for two years:								
16 Cow Horn	Medium-good	White	7.10	2 53	25.00	5.33	2.42	**24.95**
17 Green Barrell	Medium	"	7.80	2.33	22.45	6.85	2.27	**22.28**
18 Jarman's Improved Green Top Yellow Scotch	Good	Yellow	9.40	2.16	20.75	7.33	2.13	**21.14**
19 White Flat Dutch Strap Leaf	Medium	White	8.40	1.62	15.20	6.45	2.04	**20.99**
20 Yellowstone	"	Yellow	6.60	2.33	22.10	4.85	2.10	**20.74**
21 Yellow Montgomery	Good	"	14.70	2.37	23.30	8.72	2.04	**20.58**
22 Jersey Lily	"	White	10.60	2.09	19.90	8.30	2.17	**20.08**
23 Early White Model	Poor	"	5.50	2.11	18.95	4.49	2.02	**19.10**
24 Extra Early Milan	Medium	"	2.58	2.00	20.35	1.97	1.87	**18.80**
25 Jarman's Selected Green Globe	"	"	6 50	1.80	16.70	4.89	1.80	**16.79**
26 Sutton's Imperial Green Globe	Good	"	7.13	2.03	19.80	5.02	1.75	**16.68**
27 White Six Weeks	Medium	"	7.13	1.82	18.05	5.19	1.81	**16.00**
28 Dale's Hybrid	Medium-good	Yellow	10.15	1.61	15.90	7.33	1.49	**14.73**
29 Amber Globe	Medium	"	7.45	1.74	16.70	5.88	1.58	**14.60**
30 Early Maltese	Medium-poor	"	4.43	1.22	11.85	3.79	1.38	**13.83**
31 Fosterton Hybrid	" good	"	6.50	1.16	10.55	6 65	1.32	**12.28**
32 Carter's Champion Green Top Scotch or Aberdeen Hybrid	Good	"	7.65	1.02	9.85	5.75	1.13	**9.33**
33 Seven Top	"	White	8.50	.73	6.10	7 35	.85	**8.08**
Grown for one year.								
34 White Egg	"	"	11.45	3.90	36.25	11.45	3.90	**36.25**
35 Purple Top Mammoth	Medium-good	"	12.50	3.07	29.30	12.50	3.07	**29.30**
36 White Lilly	Good	"	10.05	2.60	25.63	10.05	2.60	**25.63**
37 Milk Globe	"	"	14.25	2.39	23.50	14.25	2.39	**23.50**
38 Orange Sweet	Medium-good	Yellow	9.05	1.98	19.15	9.05	1.98	**19.15**
39 Early LaCrosse	Good	White	13.33	1.71	16.70	13 33	1.71	**16.70**
40 All Gold	Medium-good	Yellow	7.25	1.90	17.60	7.25	1.90	**17.60**
41 Beck's Early Golden Stone	Good	"	3 50	2.72	8.70	3 50	2.72	**8.70**
42 Beck's Improved Early Green Top	Medium-good	"	2.45	2 28	7.40	2.45	2.28	**7.40**
43 Small Berlin	Good	White	.60	.33	2.75	.60	.33	**2.75**

The *Jersey Navet* heads the list in average yield of roots per acre among thirteen varieties grown side by side for four years. Not only did this variety give the largest average yield per acre for the number of years mentioned, but it also stands second in yield per acre, among the forty-three varieties grown in 1894. In 1893, it gave the largest yield per acre among two varieties tested in nineteen different localities over Ontario, and in 1894 it also gave the largest yield per acre of two varieties tested in eighteen different localities over Ontario. The seed of this variety was imported from the United States in the spring of 1890. The *Red Globe Norfolk*, which was at one time considered one of the most productive varieties, now stands seventh in yield per acre among thirteen varieties grown for four years. The *Early American Purple Top* comes next to the Jersey Navet in productiveness; but in keeping quality, it is quite inferior to that variety. The *Imperial Green Globe* which heads the list in yield among two varieties grown for three years, produces roots of excellent quality. They are early, round, uniform, and should be well adapted for shipping purposes to supply the early market.

The *White Egg* variety which was grown in the experimental department in 1894 for the first time, gave the largest yield per acre among forty-three varieties tested. This variety gave nine tons per acre more than the Jersey Navet which stands next in point of yield. The average weight per root was one pound heavier than that of the Jersey Navet.

Fall Turnips, Thinning Plants in the Drill.

A duplicate experiment was carried on in 1894 in growing fall turnips in different parts of the drill. This was a continuation of a similar test conducted in 1893, and also of one conducted in 1892. The land used for the experiment during the past year was a clay loam, which had been cropped with oats the previous year and manured in the spring of 1894 with farmyard manure at the rate of twenty tons per acre. The land was plowed in the autumn and also in the summer before sowing the turnips. Slight ridges were made by a double mould-board plow, and the seed was sown on June 23rd. The plants were thinned when about two inches high to the distance indicated in the table below.

Distance between plants in the drill.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years 1892-3-4.	1894.	Average 3 years 1892-3-4.	1894.	Average 3 years 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
Unthinned	18.75	13.90	.18	.30	20.37	**16.26**
4 inches	13.03	9.23	1.28	1.13	37.50	**27.06**
8 "	12.20	8.56	2.60	2.03	39.15	**26.80**
12 "	12.32	8.07	3.89	2.92	37.88	**25.75**
16 "	11.79	7.94	4.99	3.73	37.27	**25.18**
20 "	10.75	7.26	5.42	4.05	32.40	**22.29**

As in the case with the experiment in thinning Swede turnips at different distances, we find that the largest yield per acre of the fall turnips was produced by *thinning to eight inches* in the drill in 1894. In 1892 and 1893, however, the largest yield was produced by thinning to four inches in the drill and this accounts for there being one-fifth of a ton more per acre in the average of three years from thinning to four inches than from thinning to eight inches in the drill. It is, however, interesting to notice that as the distances increased between the plants left in the rows, the average size per root increased, while the yield per acre gradually decreased.

Fall Turnips, Different Distances Between Drills.

An experiment was carried on in 1894 for the first time by sowing fall turnips in drills twenty, twenty-six and thirty-two inches apart. The land on which this experiment was conducted was a good average clay loam, which produced a crop of oats in 1893, and which received farmyard manure at the rate of twenty tons per acre in the spring of 1894. This was the first manure the land had received for seven years. The soil was plowed in the autumn after the oat crop was removed and in the summer before the fall turnips were sown. The land was slightly ridged with a double mould-board plow; the drills being 26.4 inches apart in every instance. Each plot was $\frac{1}{100}$ of an acre in size and the experiment was conducted in duplicate.

The seeding took on June 23rd. The plants were thinned when about two inches high to the distance of twelve inches apart.

Distance between drills.	Yield of tops per acre, 1894.	Average weight per root.	Yield of roots per acre.
	tons.	lb.	tons.
20 inches	9.74	2.43	31.16
26 "	9.17	3.10	31.23
32 "	9.84	3.66	29.92

As this is the first year that this experiment was carried on with fall turnips, it is not wise to place much stress upon the results. The drills situated 26 inches apart have given a little larger average yield of roots per acre than those 20 or 32 inches apart. It will be observed that the tops of the fall turnips produced nearly one-third as great a weight per acre as the roots themselves.

Mangels, Comparative Test of 57 Varieties.

There were 57 varieties of mangels grown on the plots during 1894; of that number, thirty were grown for four years, seven for three years, twelve for two years, and eight were grown in 1894 for the first time. The mangel seed was obtained from England, United States, Quebec and Ontario. The seed was sown on soil which was a little lighter in character than that used for the Swede turnips. The land had a slight slope towards the southwest, but was quite uniform throughout. It produced a grain crop in 1893, and in the spring of the present year received a dressing of twenty tons of farmyard manure per acre. The land was plowed after the grain crop was removed in the autumn, and again in the spring before the mangels were sown. The double mould-board plow was used to ridge slightly the surface into rows $3\frac{1}{3}$ links apart. Seeding took place on May 8th, except numbers 54 and 56, which were sown on May 9th. When the plants were about two inches high, they were thinned to a distance of 12 inches apart.

The yield of mangels per acre in 1894 was not large, but owing to the very dry weather during the past season for growth, the yield may be considered a fair one. Among 30 varieties grown for four years, the largest average yield of roots was produced by the *Evans' Improved Mammoth Sawlog*, giving 23 tons per acre, the yield for 1894 being two tons per acre less than the average. Not only does this variety stand at the head of the list in the average results, but it also gave the largest average yield of roots among the 57 varieties grown on the plots in 1894. It was followed by the *Norbitan Giant* with a yield of 20.3 tons per acre. The variety which produced the second largest yield for four years was the *Carter's Champion Yellow Intermediate*. It surpasses six varieties of long mangels which come immediately below it in yield per acre. The seed of the Carter's Champion Yellow Intermediate was imported from England, and a fresh supply has been used each season. The flesh of this variety is of a pinkish yellow, and the roots are fairly uniform throughout. Among the Globe varieties, the *Yellow Obendorf* has given the largest yield per acre for four years.

Varieties.	Color of root.	Average length of root, 1893-4.	Results for 1894. Yield of tops per acre.	Results for 1894. Average weight per root.	Results for 1894. 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.
			tons.	lb.	tons.	tons.	lb.	tons.
Grown for four years:								
1 Evans' Improved Mammoth Sawlog	Red	10.9	4.90	2.12	21.00	4.05	2.17	22.89
2 Carter's Champion Yellow Intermediate	Yellow	9.3	2.60	1.63	16.13	3.36	2.16	22.79
3 Improved Mammoth Long Red	Red	12.3	4.10	1.97	19.55	3.99	2.08	22.72
4 Steele Bros.' Long Red Selected	Red	11.4	4.20	1.89	18.15	3.94	2.09	22.16
5 Elvethan Long Red	Red	11.5	4.20	1.90	18.95	4.46	1.85	21.82
6 Norbitan Giant	Red	10.4	4.65	2.03	20.30	3.99	2.05	21.38
7 Carter's Mammoth Long Red	Red	11.4	4.20	1.77	17.55	4.39	1.91	20.77
8 Eiffel Tower	Red	10.2	1.88	1.86	18.38	3.06	1.95	20.55
9 Mammoth Red Intermediate	Red	9.3	2.25	1.65	16.38	3.38	1.82	20.07
10 Yellow Obendorf	Yellow	8.5	4.28	1.65	16.45	3.20	1.73	19.63
11 New Monarch	Yellow	7.5	1.88	1.66	16.55	3.38	1.71	19.33
12 Colossal Long Red	Red	12.5	2.65	1.66	16.63	3.54	1.80	19.32
13 Giant Holstein	Red	11.1	2.70	1.48	14.30	3.67	1.77	18.69
14 Oblong Giant Yellow	Yellow	8.7	2.13	1.69	15.95	2.35	1.80	18.55
15 May's Mammoth Long Red	Red	10.8	2.50	1.56	15.40	4.11	1.68	18.16
16 Chirk Castle	Red	11.3	2.50	1.26	12.45	2.94	1.61	17.90
17 Long Oxhorn	Red	10.8	2.40	1.44	14.40	3.30	1.64	16.79
18 Yellow Oval-shaped Giant	Yellow	7.2	1.50	1.22	12.05	1.83	1.55	16.30
19 Carter's Warden Orange	Yellow	5.1	1.40	1.08	10.83	3.12	1.48	15.74
20 Mammoth Golden Giant	Yellow	8.4	2.65	1.64	16.25	3.01	1.51	15.35
21 Yellow Globe	Yellow	5.0	1.60	1.26	12.50	2.94	1.87	14.89
22 Red Oval-shaped Giant	Oval	8.1	1.33	1.21	12.05	1.97	1.53	14.73
23 Red Globe	Red	6.0	2.20	1.37	13.70	2.43	1.45	14.68
24 Golden Tankard	Yellow	6.1	1.60	1.32	12.58	1.95	1.36	14.27
25 Clark's Devon Orange Globe	Yellow	5.7	1.68	1.27	12.68	1.93	1.33	14.11
26 Fisher Hobbs' " "	Yellow	5.2	1.58	1.26	12.58	1.81	1.37	14.04
27 Kniver Yellow Globe	Yellow	6.2	1.35	1.36	13.50	1.70	1.34	13.88
28 Long Yellow	Yellow	11.2	1.25	1.16	11.50	2.26	1.47	13.77
29 Oblong Giant Red	Red	9.5	1.05	2.58	7.60	1.88	1.79	13.14
30 Red Tankard	Red	8.0	.65	2.01	7.65	1.39	1.49	11.69
Grown for three years:								
31 Sutton's Mammoth Long Red	Red	11.6	2.50	1.37	13.65	3.77	1.56	15.84
32 Canadian Giant	Red	11.1	2.05	1.16	11.45	3.12	1.31	13.21
33 Beck's Champion Globe	Red	8.9	1.83	1.10	11.03	2.24	1.27	12.60
34 Gate Post	Red	10.7	2.15	1.31	12.73	2.67	1.29	12.56
35 Sutton's Golden Tankard	Yellow	6.0	1.50	.99	9.75	2.14	1.22	12.33
36 Berkshire Prize Yellow Globe	Yellow	5.8	1.05	1.31	13.00	1.59	1.23	12.26
37 Sutton's Yellow Intermediate	Yellow	7.6	2.05	1.28	12.75	1.61	1.13	11.14
Grown for two years:								
38 Yellow Leviathan	Yellow	10.1	2.10	1.67	15.88	2.37	1.53	15.44
39 Giant Yellow Intermediate	Yellow	9.9	1.85	1.64	15.15	2.44	1.54	15.24
40 Jarman's Giant Long Red	Red	11.9	2.40	1.30	12.90	3.00	1.38	14.37
41 New Eschendorf	Yellow	6.2	1.45	1.47	13.23	1.82	1.41	13.97
42 Yellow Ovoid	Yellow	8.1	2.05	1.44	13.93	2.47	1.35	13.63
43 Sutton's Yellow Globe	Yellow	5.3	1.40	2.35	12.90	1.78	1.82	13.55
44 English Prize	Red	10.8	2.35	1.44	14.25	2.57	1.32	13.20
45 Jarman's Giant Intermediate	Yellow	6.6	.75	1.23	11.05	1.22	1.28	12.40
46 Olive-shaped Red	Red	6.3	2.03	1.28	12.53	2.01	1.18	12.24
47 Ward's Oval	Yellow	7.8	1.68	1.43	14.05	1.67	1.18	12.08
48 Jarman's Selected Golden Tankard	Golden	8.3	1.30	1.80	9.05	1.80	1.57	11.43
49 Jarman's Model Yellow Globe	Yellow	5.7	1.35	1.43	7.85	1.68	1.36	10.99
Grown for one year:								
50 Jumbo	Red	11.0	2.50	1.78	16.90	2.50	1.78	16.90
51 Carter's Warden Prize Yellow Globe	Red	10.0	2.50	1.48	14.50	2.50	1.48	14.50
52 Webb's New Kniver Yellow Globe	Yellow	7.0	1.15	1.33	13.15	1.15	1.33	13.15
53 Dignity	White	7.0	2.75	1.46	13.10	2.75	1.46	13.10
54 Cornish Yellow Globe	Yellow	5.0	.90	1.97	6.70	.90	1.97	6.70
55 Thorp's Own Yard Long	Red	12.0	1.65	1.91	6.68	1.65	1.91	6.68
56 Brock's Yellow Intermediate	Yellow	6.0	.75	1.86	5.50	.75	1.86	5.50
57 Thorp's Own Champion Yellow Inter	Yellow	7.0	.45	1.50	4.95	.45	1.50	4.95

MANGELS, THINNING PLANTS IN THE DRILL.

For three years in succession an experiment has been conducted in allowing mangels to remain unthinned in the drill, and thinning them to 4, 8, 12, 16 and 20 inches apart; and to make this experiment more complete, it was carried on in duplicate each of the years mentioned. There were none thinned to 4 inches apart in 1892. In 1894, this experiment was conducted on rather low-lying land, which contained a considerable amount of vegetable matter. It produced a crop of roots in 1893, and was manured at the rate of 20 tons per acre in the early spring of 1894, after which it was plowed. The land had also been previously plowed in the autumn. Before the mangel seed was sown, the land was slightly ridged with a double mould-board plow in rows 26.4 inches apart. Seeding took place on May 5th, and the plants were thinned to their proper distances when about two inches high.

Distance between roots in the drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
Unthinned	18.75	10.43	.69	.39	38.79	23.05
4 inches	13.03	....	1.50	....	39.80	....
8 "	10.53	6.03	2.46	1.60	37.85	21.00
12 "	9.76	5.25	3.12	2.03	35.90	22.14
16 "	8.95	4.92	3.73	2.42	33.85	20.39
20 "	7.48	4.37	3.96	2.69	29.10	18.74

The largest yield of mangels per acre was produced by thinning the roots to four inches apart in the drill in 1894, and also from thinning to that distance in 1893. In the corresponding experiment of 1892 there were none of the mangels left at four inches apart in the row, and in that year the largest yield was produced by thinning to eight inches. It will be observed that the largest yield of tops per acre was obtained from the roots that stood the thickest in the row, and as the distance between the roots increases, the yield of tops gradually decreases in yield per acre. The same holds good with the yield of roots per acre, with the exception of the unthinned plot.

MANGELS, DIFFERENT DISTANCES BETWEEN DRILLS.

In this experiment, the mangels were grown upon drills 20, 26 and 32 inches apart. This experiment has been conducted for three years in succession, and it has been carried on in duplicate each year. The mangel seed was sown on the 5th of May, upon ridges made by a double mould-board plow 26.4 inches apart. Each plot was $\frac{1}{100}$ of an acre in size. The land was in good condition, having received a dressing of twenty tons of farmyard manure per acre in the spring of 1894, and having produced a crop of roots in 1893, which were removed from the land, and fed in the stables. The plants were thinned to twelve inches apart in the drill.

Distance between drills.	Yield of tops per acre.		Average weight per root.		Yield of tops per acre,	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
20 inches	6.01	4.31	2.58	1.83	33.46	24.29
26 "	5.87	4.55	3.10	2.15	30.45	22.26
32 "	6.89	4.74	3.56	2.45	28.98	21.12

In examining the average results for the past three years, we find that as the distance between the drills increased, the yield of tops per acre increased, the size of the individual roots increased, and the yield of roots per acre decreased. The weight of the tops of the mangels was about one-fifth of that of the roots.

CARROTS, COMPARATIVE TEST OF 47 VARIETIES.

Varieties.	Color of roots.	Shape of roots.	Length of roots (average).	Results for 1894. Yield of tops per acre.	Results for 1894. Average weight per root.	Results for 1894. 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 three years:			in.	tons.	oz.	tons.	tons.	oz.	tons.
1 Pearce's Improved Half Long White	White..	Cone	9	9.85	20.23	34.78	9.28	16.34	**33.62**
2 Steele Bros.' Improved Short White	White..	Cone	9	9.00	20.68	34.25	8.85	16.49	**32.94**
3 White Green Top Orthe	White..	Cone	10	8.65	19.96	34.75	7.84	15.32	**31.20**
4 Mastodon	White..	Cone	9	8.10	19.96	34.18	7.49	14.45	**29.79**
5 Large White Vosges	White..	Cone	8	7.05	17.58	29.45	6.93	14.06	**28.93**
6 Simmers' Short White Vosges	White..	Cone	7	6.43	16.01	27.53	6.37	13.27	**26.92**
7 Sutton's Yellow, Intermediate	Yellow.	Cone	9	7.48	17.86	31.25	6.65	13.15	**26.08**
8 Large White Beigian	White .	Long	15	6.65	15.09	25.00	7.20	12.50	**25.39**
9 Danver's Orange	Orange.	Cone	7	5.05	11.83	22.00	4.90	11.08	**24.56**
10 P. W. & Co.'s Improved Giant Wiltshire White	White..	Long	12	6.60	14.94	24.28	7.76	13.31	**24.22**
11 Giant Wiltshire	White..	Long	14	7.65	13.11	22.13	8.01	10.84	**23.01**
12 Guerande	Red....	Short	4	3.80	10.23	20.10	3.75	9.01	**21.50**
13 Mitchell's Perfected	Red....	Med. long	8	4.55	12.54	21.95	4.08	10.18	**21.41**
14 Carter's Orange Giant	Orange.	Long	10	6.93	15.09	26.40	4.56	11.90	**20.05**
15 French Intermediate	Red....	Short	8	4.25	10.08	18.65	4.92	8.56	**19.80**
16 Scarlet Intermediate	Red....	Med. long	6	3.60	9.84	16.30	4.16	8.88	**19.04**
17 Half Long Stump-Rooted	Red....	Short	7	2.98	8.72	16.55	2.91	8.17	**18.74**
18 Sutton's Improved Intermediate	Red....	Long	9	3.25	9.83	18.80	3.68	8.34	**18.53**
19 James' Scarlet Intermediatc	Scarlet.	Half long.	8	3.60	10.00	17.35	3.77	7.93	**17.92**
20 Yellow Belgian	Yellow.	Long	12	6.18	10.97	17.83	5.25	8.46	**16.06**
21 Long Red Surrey	Yellow.	Long	12	5.85	10.88	17.00	4.37	7.63	**15.48**
22 Long Orange	Orange.	Long	11	4.83	7.99	13.98	6.39	6.93	**14.81**
23 Improved Large Long Red Altringham	Red....	Long	11	3.50	9.63	15.20	4.91	7.21	**14.49**
Grown for two years:									
24 Nichol's Improved Long Orange	Red....	Long	10	4.40	11.69	22.10	4.19	9.00	**18.87**
25 Rubicon Half Long	Red....	Short	5	5.13	11.02	20.00	4.26	8.51	**18.12**
26 Long Red St. Vallery	Red....	Long	10	4.45	11.15	21.95	3.90	8.63	**17.88**
27 Half Long Scarlet	Red....	Half long.	7	4.28	10.02	19.25	3.81	7.36	**16.75**
28 Nante's Half Long Stump-Rooted	Red....	Half long.	8	5.75	12.07	22.40	3.94	9.19	**16.70**
29 Chantenay	Red....	Half long.	6	3.40	11.79	15.70	3.13	8.60	**15.24**
30 New Long Red Coreless	Red....	Long	9	3.25	9.16	17.38	2.82	6.63	**14.39**
31 Red Parisian Forcing	Red....	Round ..	3	2.50	8.44	16.15	2.24	6.32	**14.20**
32 Small French Forcing	Red....	Short	4	1.65	6.07	11.85	1.30	5.14	**10.47**
33 Jarman's Scarlet Green Top	Red....	Long	9	1.60	16.14	5.70	2.30	11.22	**9.07**
Grown for one year:									
34 Iverson's Champion	White..	Cone	10	6.80	17.24	29.85	6.80	17.24	**29.85**
35 Mammoth Intermediate Smooth White	White..	Long	9	6.50	17.07	29.50	6.50	17.07	**29.50**
36 Simmer's Giant White	White..	Cone	8	5.00	12.43	25.25	5.00	12.43	**25.25**
37 Improved White Belgian	White.	Long	13	5.55	13.74	24.05	5.55	13.74	**24.05**
38 Midsummer	Red....	Short	6	3.20	9.62	19.13	3.20	9.62	**19.13**
39 Yellow Intermediate	Yellow.	Long	8	9.53	16.00	18.75	9.53	16.00	**18.75**
40 Victoria	Red....	Long	9	3.90	9.68	18.45	3.90	9.68	**18.45**
41 Yellow Giant	Yellow.	Long	12	3.80	10.87	16.65	3.80	10.87	**16.65**
42 Half Long Scarlet Carentian	Scarlet.	Half long.	6	1.90	7.26	14.18	1.90	7.26	**14.18**

Nine new varieties of carrots were grown in 1894 for the first time. This has increased the list until the number has now reached forty-seven. Twenty-three of these have been grown on the trial grounds for three years in succession, and ten have been grown during the past two years. The plots upon which the carrots were grown were uniform in shape throughout, and were $\frac{1}{100}$ of an acre in size. There were three rows, four rods long, in each plot, no extra space being allowed between the plots. The land was similar in character, and was prepared in the same way to that for the mangels, as previously described. The seed was sown on May 5th and 7th, except for number thirty-nine, which was sown on the 8th.

The crop of carrots in 1894 was very good indeed, as several of the plots gave upwards of thirty tons of roots per acre. The *Pearce's Improved Half Long White* heads the list in yield per acre, among twenty-three varieties grown for three years in succession. This variety has given an average of 33.6 tons per acre for that length of time, and is followed by the *Steele Bros'., Improved Short White* with an average of 32 9 tons per acre. The yield of the former in 1894 was 34.78 tons, and of the latter, 34.25 tons per acre. It will be observed that the six highest yielding varieties of carrots are all white fleshed. These varieties resemble one another very closely, and are all quite easily removed from the ground. The *Guerande* variety which stands twelfth on the list is a very short carrot and one of the easiest to harvest in the whole list. This was sent out along with some other varieties in 1893 and 1894, and has given very good satisfaction, although the yield is not equal to the *Improved Short White*, as the latter mentioned variety took the lead in yield per acre among the five varieties tested in 1892, in 1893, and also in 1894. Among the new varieties which were grown in 1894 for the first time, the *Iverson's Champion* heads the list with nearly thirty tons per acre. This is followed closely by the *Mammoth Intermediate Smooth White* with 25.9 tons per acre.

Carrots, Thinning Plants in the Drill.

An experiment was carried on in growing carrots at different distances apart in the drill, in 1892, in 1893 and again in 1894. The experiment each year was conducted in duplicate. The land used and the method of cultivation were the same in 1894 as mentioned in a similar experiment with mangels grown in the same year. The seed was sown on May 5th, and when the plants were about two inches high, some were left unthinned and others were thinned to 2, 4, 6, 8, and 10 inches apart as indicated in the following table :

—	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
Unthinned	12.15	8.95	.55	.32	34.73	24.70
2 inches	9.78	7.70	1.07	.64	35.28	26.59
4 "	9.28	6.73	1.27	.86	35.83	24.47
6 "	7.88	5.86	1.62	1.06	32.63	21.50
8 "	7.25	5.17	1.97	1.27	29.83	19.22
10 "	6.08	....	1.99	....	25.93	

In the average of three years the largest yield of carrots was produced by leaving the plants to two inches in the drills, but according to the results of 1894, those thinned to four inches in the drill gave a very high increase in yield of roots per acre over those thinned to two inches. In 1892 there was no plot in the experiment in which carrots were thinned to ten inches apart. It is often claimed that larger yields per acre can be obtained by growing roots to a considerable distance apart than by leaving them remaining quite close in the drill. Each experiment during the three years does not point in this direction, but indicates that as the distance widens between the plants the crop diminishes in yield and the average weight per root increases.

Carrots, Different Distances Between Drills.

This experiment was conducted on land under exactly the same conditions as used for a corresponding experiment with mangels previously described. This experiment was also carried on in duplicate in 1892, 1893 and in 1894. The seed was sown on May 5th. When the plants were about two inches high, they were thinned to an average of four inches in the row. The following table gives the results of the experiment for 1894, and also the average results for the past three years :

Distance between drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
20 inches	8.70	7.00	1.18	.78	43.63	30.25
26 "	8.71	6 76	1.39	.90	41.02	28.07
32 "	8.26	6.15	1.51	.94	36.01	23.53

The results in the carrots throughout are very regular. As the distance between the drills increased, the yield of tops per acre decreased, but the weight per average root increased. The tops of the carrots weigh about one-quarter as much as the roots.

Roots, Selection of Seed.

Up to the year 1894, nothing had been done in comparing the different qualities of seed of turnips, mangels and carrots in relation to root production. During the past year we selected with great care some of the best developed seed, some of the medium seeds, and some of the seeds which were small and of inferior quality, of the following classes of roots : Swede turnips, fall turnips, mangels and carrots. The seed was selected in every case from about one pound of seed obtained from seedsmen in the spring of 1894. The quality of the seed from which the selection was made may be considered about the average of that which is used in general cultivation. The mangels and carrots were sown on May 9th, and the Swede and fall turnips on July 6th. The soil upon which the mangels and carrots were sown was rather low-lying and was manured in the spring of 1894. The seed was sown in rows $3\frac{1}{3}$ links apart. When the plants were about two inches high, the mangels were thinned to 12 inches in the row, and the carrots to four inches in the row.

The Swede and fall turnips were sown on land much more elevated than that used for the mangels and carrots. It had not received manure for several years and had produced a fodder crop in 1893.

The following table gives the average yield per acre from duplicate plots in sowing large, medium and small seed of Swede turnips, fall turnips, mangels and carrots.

Selection.	Yield of roots per acre.				
	Swede turnips.	Fall turnips.	Mangels.	Carrots.	Average of four classes of roots.
	tons.	tons.	tons.	tons.	tons.
Large	20.85	32.85	28.88	34.05	29.16
Medium	20.03	24.00	27.53	33.98	26.39
Small	2.33	10.50	17.03	25.35	13.80

From the above table, it will be seen that the largest yield per acre of Swede turnips, fall turnips, mangels and carrots was obtained from sowing large seed; the second highest yield in every instance was obtained from sowing medium sized seed, and the lowest yield per acre in every instance was from sowing the small seed. The seed used in every instance was all whole, every cracked seed being discarded. Great pains were used to have all conditions regarding this experiment as uniform as possible for each class of roots, with the single exception of the seed used. This table is worthy of careful study and may point to the reasons why we often see a very great variation in the different roots growing in the same field. The selection of the seed was made by sifting and hand-picking. It is really surprising to notice the large amount of small uniform seed that can frequently be sifted from a pound of root seed which has been purchased for sowing. The proper selection of seed is of very great importance, and a large amount of experimental work along this line will likely be conducted at the College in future.

SUGAR BEETS, COMPARATIVE TEST OF 13 VARIETIES.

Three varieties of sugar beets were grown upon the plots in 1894 for the first time. This makes the number of sugar beets now under experiment, thirteen. Ten of these varieties have been grown for three years. The soil on which this experiment was conducted was rather low-lying, and contained a considerable amount of vegetable matter. It also produced a crop of roots in 1893, and was manured in the spring of the present year with twenty tons of well-rotted farmyard manure per acre. The land was plowed both in the autumn and in the spring, and after thorough cultivation was slightly ridged with a double mould-board plow. The rows were three and a third links apart and four rods long. Three rows were used in each plot, with the exception of the New Danish Improved, in which case only one row was used, owing to a very limited quantity of seed. Seeding took place on May 8th, and after the plants were about two inches high they were thinned to twelve inches in the row.

Varieties.	Color of root.	Results for 1894.			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.
		tons	lb.	tons.	tons	lb.	tons.
Grown for three years:							
1 White Silesian	White	7.58	1.68	26.10	5.75	1.61	18.89
2 Red Top	Reddish	5.65	1.60	23.90	4.55	1.53	18.15
3 French White	White	7.55	1.67	25.00	4.79	1.52	18.03
4 Vilmorin's Improved White	White	5.55	1.51	23.35	5.40	1.44	17.17
5 Lane's Improved	Pinkish	3.80	1.55	23.20	3.39	1.41	16.92
6 Champion	White	5.10	1.51	22.30	4.35	1.35	15.98
7 Austria Electorial Wohanka	White	7.05	1.57	23.33	5.68	1.27	15.26
8 Kleinwanzelben	White	7.28	1.53	21.65	5.53	1.24	14.48
9 Red Skinned	Pinkish	4.25	1.41	19.70	3.66	1 08	12.45
10 Improved Imperial	White	3.60	3.26	11.40	3.77	1.97	9.96
Grown for one year:							
11 New Danish Improved	Pink	4.13	1.85	24.45	4.13	1.85	24.45
12 Jersey	White	6.55	1.58	23.13	6.55	1.58	23.13
13 French Yellow	Yellow	3.85	1.29	18.80	3.85	1.29	18.80

The *White Silesian* sugar beet, which was at the head of the list in 1893, occupies the same position in 1894. Not only does the White Silesian give the largest average yield of roots among the ten varieties grown for three years in succession, but it also gives the largest yield of roots among all the varieties tested in 1894. With one exception it also produced the largest yield of tops per acre among the thirteen varieties grown during the past season. Among the new varieties the *New Danish Improved* heads the list in yield of roots, producing 24.45 tons per acre. The *Jersey* variety, however, produced 6.5 tons of tops per acre thus making it the heaviest topped variety among those tested. The *Lane's Improved* produced the smallest yield of tops per acre being only about one-half the weight of those of the Jersey variety.

Silage and Fodder Crops.

The experiments under the heading of silage and fodder crops include those with fodder corn, various mixtures of grain for fodder, millet, rape, sunflowers, clovers, grasses, etc. Fodder crops are becoming more important in Ontario's agriculture year by year. A few years ago, there was but a very limited quantity of corn grown, and that was principally for the production of grain, and confined almost entirely to the Canada Yellow variety. Now a large number of varieties of fodder corn are grown over Ontario since, due in a large measure to the introduction of the silo. The fodder crops of various kinds can be used in several ways; as nearly all of them can be used as green food for the summer and for ensilage or dry food for winter.

Fodder Corn, Comparative Test of 110 Varieties.

In 1894, 110 varieties of fodder corn were grown in the experimental department Of this number 55 were grown side by side for four years in succession, 8 for three years, 16 for two years, and 31 were grown in 1894 for the first time. The seed was mostly obtained from the United States, but some was obtained in Ontario. All the varieties were grown in duplicate; the duplicate plots being about 20 rods apart. The character of the soil, previous cropping, etc., were exactly the same for each sectation of the experiment. The land was rather high-lying, and was what might be termed an average clay loam. A crop of grain was grown on the land in 1893, and an application of 20 tons of farmyard manure was applied in the spring before the corn was planted. The land was plowed in the autumn after the grain crop was removed, and in the spring it was thoroughly cultivated and the manure well worked into the soil. The corn was planted on June 1st, with the exception of numbers 80, 88 and 105, which was planted on June 6th. The seed was put in hills five links (39.6 inches) apart both ways. Eight kernels were dropped in each hill, and after the corn was up nicely it was thinned out to four plants per hill.

It will be observed that among 55 varieties grown side by side for four years in succession, the *Chester County Mammoth* gives the largest total yield per acre, and the *Brazilian Flour* the second largest. These, however, are very late varieties, and are entirely unsuited for Ontario conditions, as the grain, when cut about the middle of September has not even reached the early milk stage in the average of four years' trials. The *Thoro'bred White Flint* stands third in the yield per acre. This is also a late variety and is unsuited to the greater part of the province. It, however, reaches a sufficient stage of maturity in the southern counties. In our experimental plots for four years the grain of this variety has averaged the milk condition when the crop was cut just before the autumn frosts. The *Cloud's Early Yellow* is the earliest to mature among the heavy yielding varieties for four years. It has given a average of a little over 20 tons per acre, and the corn has reached the late milk stage. The ears are, however, large and yield heavily per acre. This is certainly one that has made a good record among the varieties. The *Improved Leaming*, which has given an average of 19 tons per acre for four years, has produced grain which, on the average, reached the dough stage at the time of cutting. This variety can be grown to good advantage in the central to southern part of the province.

Test of 110 Varieties of Fodder Corn.

Varieties.	Kind of corn.	Results for 1894. Condition of grain when harvested.	Results for 1894. Average yield of whole crop per acre.	Average results for number of years. Condition of grain when harvested.	Average results for number of years. Average weight per ear when harvested.	Average results for number of years. Yield of ears per acre.	Average results for number of years. Yield of whole crop per acre.
			tons.		oz.	tons.	tons.
Grown for four years:							
1 Chester Co. Mammoth	White Dent	Early Milk	19.73	Water	3.32	1.19	21.28
2 Brazilian Flour	"	Water	18.10	"	1.42	.41	21.08
3 Thoro'bred White Flint	"	Late Milk	18.23	Milk	4.57	1.79	20.63
4 Mammoth White Surprise	"	Early Milk	14.18	Water	3.36	.85	20.50
5 Blunt's Prolific	"	Late Milk	18.40	Early Milk	3.20	1.23	20.22
6 Cloud's Early Yellow	Yellow Dent	"	15.93	Late Milk	7.14	3.40	20.11
7 Mastodon Dent	"	"	16.95	Milk	6.59	2.95	20.03
8 Virginia Horsetooth	White Dent	Milk	16.63	Water	2.52	.93	19.14
9 Mammoth Sweet Fodder	White Sweet	Dough	13.80	Milk	5.23	2.46	19.10
10 Improved Leaming	Yellow Dent	Firm Dough	16.25	Dough	5.84	3.12	18.95
11 Giant Prolific S. Ensilage	White Dent	Dough	18.53	Milk	5.40	2.20	18.85
12 Golden Beauty	Yellow Dent	"	16.55	"	4.94	2.38	18.70
13 Mammoth W. Cob Ensilage	White Dent	Late Milk	17.20	Early Milk	4.03	1.70	18.66
14 Hickory King	"	Milk	19.30	"	2.64	.98	18.55
15 Mammoth Southern Sweet	White Swee	Early Milk	17.55	"	3.98	1.59	18.53
16 Red Cob Ensilage	White Dent	Late Milk	16.60	"	3.59	1.27	18.49
17 Centennial White	"	Dough	16.75	Late Milk	6.42	3.16	18.10
18 Mammoth Cuban	Yellow Dent	Firm Dough	15.40	Dough	6.85	3.58	17.97
19 Sheep's Tooth	White Dent	Late Milk	20.18	Early Milk	5.58	1.55	17.97
20 Salzer's Sup. Fod. Ensilage	"	"	20.40	"	4.73	1.79	17.85
21 Horsetooth	Yellow Dent	Ripe	13.28	Dough	5.85	3.04	17.51
22 Egyptian Sweet	White Sweet	Dough	18.95	Milk	4.16	1.95	17.17
23 Salzer's North Dakota	White Flint	Ripe	15.70	Firm Dough	5.38	2.98	17.00
24 Evergreen Sweet	White Sweet	Dough	15.95	Milk	5.12	2.35	16.69
25 Hickox Sweet	"	"	15.18	"	5.58	2.63	16.64
26 Salzer's South Dakota	Yellow Flint	Ripe	15.85	Ripe	5.01	2.98	16.47
27 Tuscarora	White Flint	Dough	15.00	Dough	6.19	3.02	16.28
28 Wisconsin Earliest W. Dent	White Dent	Firm Dough	15 75	"	7.73	3.71	15.90
29 Sweet Fodder	White Sweet	"	15.40	Late Milk	4.57	1.34	15.87
30 Queen of the Prairie	Yellow Dent	Ripe	18.30	Ripe	5.17	3.53	15.86
31 Clark's Co. Champion	White Dent	Firm Dough	13.88	Late Milk	5.95	2.72	15.64
32 Large White Flint	White Flint	"	11.75	Ripe	5.26	3.15	15.46
33 Stowell's Evergreen Sweet	White Sweet	"	14.00	Late Milk	4.69	2.11	15.22
34 Old Colony	"	"	14.45	"	4.89	2.64	15.09
35 Compton's Early	Yellow Flint	Ripe	12.95	Ripe	6.30	3.36	14.95
36 Longfellow	"	"	13.65	"	5.28	2.93	14.83
37 Early Butler	Yellow Dent	"	14.30	Dough	6.80	3.10	14.83
38 Angel of Midnight	Yellow Flint	"	14.23	Ripe	5.25	2.85	14.67
39 Late Mammoth Sweet	Yellow Sweet	Dough	16.08	Milk	6.10	2.19	14.56
40 Pride of the North	Yellow Dent	Ripe	15.93	Ripe	5.43	2.96	14.54
41 Wauskakum	Yellow Flint	"	13.28	"	5.42	2.91	13.37
42 100-day Corn	"	"	15.50	"	5.29	2.96	13.36
43 Early White Flint	White Flint	"	14.95	"	5.72	3.00	13.32
44 Golden Dent	Yellow Dent	"	13.70	"	5.54	2.83	13,16
45 Dakota Dent	"	"	12.53	"	6.02	3.15	13.11
46 Queen of the North	"	"	14.93	"	5.54	2.98	13.00
47 Early Adams or Burlington	White Dent	"	9.08	Dough	5.11	2.73	12.96
48 Canada Yellow	Yellow Flint	"	11.08	Ripe	5.74	2.95	12.82
49 Self Husking	Reddish Flint	"	12.80	"	4.47	2.53	12.76
50 Minnesota King	Yellow Dent	"	13.65	"	5.91	3.09	12.44
51 King of the Earlies	"	"	12.38	"	6.10	2.88	11.78
52 Pearce's Prolific	Yellow Flint	"	10.70	"	4.78	2.18	11.62
53 Crosby	White Sweet	Firm Dough	10.05	Late Milk	4.49	2.60	11.36
54 Smutnose	Pinkish Flint	Ripe	10.25	Ripe	5.97	3.05	10.87
55 Rideout or Mercier	Yellow Flint	"	9.55	"	5.83	2.91	10.75
Grown for three years:							
56 Giant Beauty	Yellow Dent	Dough	16.68	Late Milk	7.61	3.31	20.86
57 Dr. Woodhull	"	"	18.70	"	6.62	3.00	20.57

List of 110 Varieties of Fodder Corn.—*Concluded.*

Varieties.	Kind of corn.	Results for 1894. Condition of grain when harvested.	Results for 1894. Average yield of whole crop per acre.	Average results for number of years. Condition of grain when harvested.	Average results for number of years. Average weight per ear when harvested.	Average results for number of years. Yield of ears per acre.	Average results for number of years. Yield of whole crop per acre.
Grown for three years (Con.)							
58 N. B. & G. Co's. Giant Fod.	White Dent ...	Late Milk	17.25	Milk	4.38	1.55	19.72
59 Pride of Kansas............	Yellow Dent ..	"	12.75	"	5.32	1.96	18.54
60 New Leaming	"	Firm Dough	14.90	Dough	6.56	3.11	17.89
61 True Leaming	"	"	16.00	"	7.60	3.49	17.87
62 Wilson's White Prolific....	White Dent....	Dough	12.63	Late Milk	6.63	2.95	16.56
63 Silver Flint.....	White Flint....	Ripe	10.88	Ripe	6.72	3.15	12.59
Grown for two years:							
64 Peach Blossom Mam. Field	Pinkish Dent ..	Dough	16.75	Milk	7.62	2.91	21.10
65 Champion White Pearl	White Dent....	"	16.50	Late Milk	6.79	3.39	20.03
66 Boone Co. White..........	"	"	19 15	Milk	5.83	2.45	19.60
67 Kansas King	"	Milk	18.30	Early Milk	4.29	1.74	19.30
68 Legal Tender.............	Yellow Dent ..	Dough	18.90	Late Milk	5.75	2.69	19 18
69 Giant White Southern	White Dent....	Late Milk	17.95	Milk	5.01	2.27	19.00
70 Big Buckeye	Yellow Dent ..	Dough	18.13	Late Milk	6.31	2.61	18.44
71 Elephant Fodder	"	Ripe	16.15	Dough	6.61	2.99	18.35
72 Mammoth S. for Ensilage..	White Sweet ..	Dough	14.73	Late Milk	6.40	2.60	17.89
73 Queen of the Field.........	Yellow Dent ..	Firm Dough	16.18	Dough	7.88	3.86	17.12
74 Iowa Gold Mine	"	"	16.18	"	6.56	2.90	16.62
75 Red Blazed.....	Reddish Dent ..	Ripe	13.13	Ripe	6.85	3.58	16.42
76 N. B. & G. Co's. Hustler White Dent	White Dent....	Firm Dough	14.55	Dough	8.17	3.87	15.70
77 Dakota Queen	Yellow Dent ..	Ripe	12.45	Ripe	6.75	3.64	13.68
78 Extra Early Huron Dent...	"	"	12.30	"	6.49	3.32	13.30
79 Farmer's Favorite.........	"	Dough	17.90	Milk	8.87	1.84	11.65
Grown for one year:							
80 White Souther...........	White Dent....	Milk	21.73	Milk	......	1.54	21.73
81 Nebraska White Prize....	Yellow Dent ..	"	19.40	"	7.07	2.96	19.40
82 Red Blaze	Reddish Flint..	Ripe	19.13	Ripe	7.36	3.47	19.13
83 Perfect Mammoth Ensilage	White Dent....	Dough	18.70	Dough	6.22	2.99	18.70
84 Riley's Favorite	"	"	18.40	"	6.84	3.38	18.40
85 Paragon White Ensilage..	"	"	17.80	"	6.58	2.90	17.80
86 High Mixed..............	Yellow Dent ..	Firm Dough	17.65	Firm Dough	8.09	3.74	17.65
87 White Prolific	White Dent....	"	17.35	"	6.87	3.22	17.35
88 Canadian Dent	Yellow Dent ..	Ripe	17.30	Ripe	......	3.26	17.30
89 Salzer's Early Giant W. Dent	White Dent....	Firm Dough	17.15	Firm Dough	9.42	4.36	17.15
90 Early White Cap Dent....	"	"	16.85	"	7.86	3.59	16.85
91 Champaign Co. Prolific....	Yellow Dent ..	Dough	16.73	Dough	6.06	2.35	16.73
92 King Philip	Reddish Flint ..	Ripe	16.53	Ripe	7.83	4.08	16.53
93 90-days Leaming..........	Yellow Dent ..	Firm Dough	16.53	Firm Dough	7.24	3.14	16.53
94 Waterloo Extra Early Dent.	"	"	16.50	"	6.29	2.75	16.50
95 Yellow West. Horse-tooth.	"	"	15.30	"	6.95	3.19	16.30
96 Golden Superb	"	"	16.30	"	7.68	3.07	16.30
97 Nebraska Mammoth Red..	Red Dent	"	16.25	"	7.49	3.37	16.25
98 Early California..........	Yellow Dent ..	Dough	16.15	Dough	5.93	2.61	16.15
99 North Star Yellow Dent..	"	Ripe	14.83	Ripe	8.00	3.68	14.83
100 Squaw	Variegated Flint	"	14.20	"	5.87	3.19	14.20
101 Sanford Corn	White Flint....	Firm Dough	14.05	Firm Dough	5.57	2.75	14.05
102 Hutt	Yellow Dent ..	Ripe	14.05	Ripe	7.68	3.82	14.05
103 Wisconsin White Flint....	White Flint....	Firm Dough	13.50	Firm Dough	5.43	2.51	13.50
104 Pride of Canada..........	Yellow Flint ..	Ripe	12.83	Ripe	4.94	2.75	12.83
105 Smoky Dent.............	Reddish Dent ..	"	12.18	"	.....	4.50	12.18
106 Gold Medal Dent	Yellow Dent ..	"	12.05	"	7.95	3.98	12.05
107 Red Glazed	White Flint....	"	11.00	"	6.38	2.95	11.00
108 Dakota Gold Coin	Yellow Dent ..	"	10.60	"	5.34	2.74	10.60
109 Rawling's	"	"	10.18	"	7.36	3.36	10.18
110 Excelsior Yellow Dent ..	Yellow Flint ..	"	6.65	"	5.19	2.04	6.65

The *Mammoth Cuban* has given an average of 18 tons per acre for four years, and has given grain which reached the dough condition at this place. It produces a large ear and a heavy weight of grain per acre. The *Salzer's North Dakota* is the heaviest yielding variety among the 55 varieties grown for four years which produced grain that reached the firm dough stage at the time of harvest. This variety is a safe one to grow in the vicinity of Guelph, and even considerably farther north, for ensilage purposes. It ripens nearly as early as the Compton's Early variety, and produces an average of about two tons per acre more than that variety. The *Wisconsin Earliest White Dent* is a variety which has also given good satisfaction. Its most prominent characteristic is the large well-developed ears which are produced. It is one of the heaviest eared varieties among the 110 kinds tested. The *Compton's Early* is fairly well known over the province, and will mature in nearly every locality. It produces a fair amount of grain; but in nearly all cases larger varieties will reach a sufficient stage of maturity for either production of grain or for use in the silo. The heaviest yield per acre in 1894 was produced by the *White Souther*, which gave an average of 21.73 tons per acre. This variety produced grain which was only in the milk stage at the time of cutting the corn. The table given above is worthy of very close study by every corn grower in Ontario, as all the leading varieties have been grown side by side under similar conditions for one, two, three, or four years.

Fodder Corn, Different Distances Between Drills and Between Plants in the Hill.

For three years in succession an experiment has been conducted with fodder corn, with the object of determining the proper distance between the rows and between the plants in the rows, to give the most satisfactory results. For this experiment an early, a medium and a late variety were selected. Each variety was grown in drills 30, 36 and 42 inches apart, and the corn in each set of the drills planted 4, 8 and 12 inches apart. Two grains of seed were put in where but one plant was desired, and when necessary one plant was removed from each place when about 3 inches high. This experiment throughout was conducted in duplicate. The soil on which the corn was grown was a mild clay loam, which had grown a crop in 1893, and received a dressing of twenty tons per acre of fairly well-rotted farmyard manure in the spring of 1894. The land was plowed in the autumn after the grain was removed; but in the spring the manure was well mixed through the soil by thorough cultivation without the use of the plow. Planting took place on June 6th and 7th. The following table gives the average results from three years in which this experiment has been conducted.

In examining the average results of three years in the above table, we notice that in every instance the largest total yield per acre is produced from thinning to 4 inches in the drill, the second from thinning to 8 inches, and the lowest from thinning to 12 inches. This applies to the early, medium and late varieties of corn, and to the rows which were 30, 36 and 42 inches apart with each variety. In regard to the average weight per ear, the opposite is the case, as the largest ears, in every instance, were produced by thinning to 12 inches in the drill, the second largest by thinning to 8 inches in the drill, and the smallest were produced where the plants were left to 4 inches apart in the drill. This also holds good with the three varieties, and for the different distances apart of each variety.

The largest yield of ears per acre was produced by planting the Mammoth Southern Sweet in drills 42 inches apart and thinning to 8 inches apart in the rows; by planting the Wisconsin Earliest White Dent in drills 36 inches apart and thinning to 8 inches apart in the drill, and by planting the Compton's Early 30 inches apart and thinning to 8 inches apart in the drill. It will be noticed that the thickest seeding of the Compton's Early gave a heavier total yield per acre than the thinnest seeding of the Mammoth Southern Sweet and at the same time produced nearly double the amount of grain per acre. The results in the above table should be of very great value to every person in

Ontario who is growing corn extensively, as it gives some very important information in regard to the best distance to plant early, medium and late varieties of corn for the production of both stalks and ears.

Distance between drills.	Distance between plants in the drill.	Average weight per ear.		Yield of ears per acre.		Yield of whole crop per acre.	
		1894.	Average three years, 1892-3-4.	1894.	Average three years, 1892-3-4.	1894.	Average three years, 1892-3-4.
		oz.	oz.	tons.	tons.	tons.	tons.
Mammoth Southern Sweet:							
30 inches	4 inches.	2.48	2.75	2.19	1.61	23.46	23.18
	8 "	2.46	2.99	1.94	1.59	18.86	19.61
	12 "	3.59	3.72	2.13	1.77	16.48	17 24
36 inches	4 "	2.95	2.86	2.63	1.41	22.81	19.96
	8 "	4.10	3.87	2.20	1.80	17.20	18.01
	12 "	6.11	5.07	2.32	1.87	15.30	15.99
42 inches	4 "	....	....	3.79	1.90	24.89	20.13
	8 "	....	....	3.26	2.06	16.60	17.47
	12 "	....	....	2.86	1.97	16.72	16.30
Wisconsin Earliest White Dent:							
30 inches	4 "	3.21	3.61	3.07	3.53	17.72	19.09
	8 "	4.96	5.52	3.32	3.61	13.86	15.58
	12 "	8.34	8.07	3.22	3.72	12.47	14.43
36 inches	4 "	4.20	3.93	3.49	3.08	16.21	16.28
	8 "	6.85	7.25	3.71	3.78	13.98	15.37
	12 "	7.17	8.24	3.05	3.38	11.59	13.38
42 inches	4 "	5.01	4.58	4.35	3.69	17.82	16.96
	8 "	7.84	7.33	3.65	3.62	13.54	14.93
	12 "	9.04	9.15	3.60	3.49	13.12	13.33
Compton's Early:							
30 inches	4 "	3.26	3.55	2.94	3.41	18.41	18.42
	8 "	5.09	5.21	3.71	3.68	16.14	15.78
	12 "	6.52	6.52	3.08	3.33	14.06	14.41
36 inches	4 "	2.98	3.49	2.44	2.97	13.28	14.87
	8 "	5.60	5.91	3.58	3.61	13.16	14.22
	12 "	6.39	6.92	2.80	3.08	10.02	12.44
42 inches	4 "	3.96	3.87	3.31	3.16	13.82	13.71
	8 "	6.50	6.33	3.17	3.28	12.27	12.94
	12 "	7.78	7.17	2.86	3.01	11.14	12.45
Average of the three varieties:							
30 inches	4 "	2.98	3.30	2.73	2.85	19.86	20.23
	8 "	4.17	4.57	2.99	2.96	16.29	16.99
	12 "	6.15	6.10	2.81	2.94	14.34	15.36
36 inches	4 "	3.38	3.43	2.85	2.49	17.43	17.04
	8 "	5.52	5.68	3.16	3.06	14.78	15.87
	12 "	6.56	6.74	2.72	2.78	12.30	13.94
42 inches	4 "	4.49	4.23	3.82	2.92	18.84	16.93
	8 "	7.17	6.83	3.36	2.99	14.80	15.11
	12 "	8.41	8.16	3.11	2.82	13.66	14.03

Fodder Corn, Seed Selected from Different Parts of the Ear.

In 1894 an experiment was conducted by planting corn from the small end, middle, large end, and also from the whole ear. The corn from which the seed was selected was grown in the experimental department in 1893. Four varieties of corn were used for this experiment. This experiment would not be exactly the same as if the whole field were sown with seed from the small end or from the other parts of the ear, as the different plots were situated side by side and should there be any lack of fertilization from any of the class of kernels sown, the plants could become fertilized from the adjoining plots. This experiment, when repeated a number of times, should go to show whether or not it is advisable to plant the seed from the small end of the ear or to throw that away as is sometimes done. Planting took place on June 6th. The corn was planted in hills 39.6 inches apart both ways and four plants were allowed to grow in each hill. The corn was all cut on the same day and weighed immediately on being cut. The weight per ear was determined after the corn was husked and before it was thoroughly dry. The following table gives the results:

Selections.	Yield of cobs per acre.	Yield of whole crop per acre.
	tons.	tons.
Middle of cob	3.72	13.60
Small end of cob	3.28	12.45
Whole cob	3.21	12.40
Large end of cob	3.33	12.38

The above table gives the average results of the four varieties used for this experiment. In 1894 we notice that the largest yield per acre of whole crop was produced by the grain from the middle part of the ear. All the seed from the small end of the ear, from the average of the whole ear and from the large end of the ear produced practically the same, which was about 1⅕ tons per acre less than the quantity produced from the grain in the middle of the ear. The yield of ears was also the highest from the grain which was taken from the middle of the cob. This experiment will likely be repeated in the future.

Fodder Corn, Planting Large and Small Grain of the Same Variety.

For this experiment two varieties of corn were selected and the test was carried on in duplicate with each variety. The corn which was used was supposed to be choice samples received from seedsmen. From these samples large uniform grains were selected for one part of the experiment and small irregular grains for the other part. This corn was planted on June 7th in hills 39.6 inches apart both ways. Four plants were allowed to remain in each hill. The corn was all cut on the same day. It will be understood that the seed was perfectly sound in both cases and the comparison was simply a matter of size and uniformity of grains. The following table gives the average results for the two varieties of corn used in this experiment and for the duplicate of each variety:

—	Yield of whole crop per acre.	Yield of cobs per acre.
	tons.	tons.
Large seed	16.40	2.74
Small "	15.40	2.33

We notice by the above table that the good seed produced exactly one ton per acre more corn than the small seed. The yield of green ears per acre was ⅖ of a ton per acre more from the large uniform seed than from the smaller and more irregular seed.

Fodder Corn, American and Canadian Seed.

For this experiment four varieties of corn were selected. The seed of the varieties obtained from the United States was planted by the side of the same varieties which had been grown in Ontario. The Ontario seed of one of the varieties was grown in the Niagara peninsula, the seed of another in Lambton county, and the seed of the remaining other two varieties at the Agricultural College. The seed corn of these same varieties were obtained from the Eastern and Middle States. The corn was all planted on June 6th in hills 39.6 inches apart both ways. Eight kernels were planted in each hill and after the plants were about four inches high they were thinned to four plants per hill. The corn was all cut on the same day. The following table gives the results:

Country obtained from.	Yield of whole crop per acre.	Yield of cobs per acre.
	tons.	tons.
Ontario	15.83	4.12
United States	15.64	3.93

It will be observed from the above table that the yield from the seed grown in Ontario and that grown in the United States was not widely different. The yield of the whole crop per acre and also of the ears per acre were slightly in favor of the seed grown in Ontario.

Millet, Comparative Test of 16 Varieties.

Among the 16 varieties of millets which were grown on the experimental plots in 1894, 8 were grown for three years, 2 for two years, and 6 were new varieties grown for the first time during the past season. The land upon which the millets were grown was an average clay loam which received a dressing of 20 tons of farmyard manure per acre in the spring of 1894. The seed was sown on June 8th at the rate of 40 lb. per acre. The crop was not cut until nearly ripe, and it was then shocked up and allowed to remain until partially dried before hauling to the barn. When hauled in the crop was weighed and was then run through the threshing machine. The seed was then cleaned. The yields for 1894 give the amount of seed per acre in bushels and the amount of partially dried whole crop in tons. The whole crop per acre is, on account of its being partially dried, somewhat less than in former years, but the comparison of the different varieties as shown in the following table is valuable:

The *Salzer's Dakota*, which heads the list in yield per acre among 8 varieties grown for three years in succession, did not yield quite as heavily in 1894 as three of the other varieties. The *Pearl Millet* gave the highest yield per acre of those grown during the past season; but as this is a very late variety and one which did not produce any seed, on account of its leaves, the crop was much more succulent than in the case of the other varieties. The largest amount of seed in 1894 was produced by the California millet and the next largest by the Japanese variety. These produced a little over 41 bushels per acre. They were handsome millets when growing in the plots and the plants were well loaded with seed. The seed from the Hog millet and Russian millet weighed 59.25 lb. per measured bushel. In the co-operative tests over Ontario where three varieties were grown in 1892, three in 1893 and four in 1894, the Salzer's Dakota gave the highest average yield of whole crop per acre in each of the years mentioned.

Varieties.	Weight of millet seed per measured bushel.	Yield of millet seed per acre.	Yield of green crop per acre.	
			1894.	Average for number of years grown on plots.
	lb.	bush.	tons.	tons.
Grown for three years:				
1 Salzer's Dakota	48.56	11.47	4.32	6.84
2 German or Golden	......	1.27	5.28	6.69
3 Golden Wonder	......	1.37	5.36	6.26
4 Pearl	......	......	6.96	5.32
5 Common	55.00	28.13	3.20	4.67
6 White French	55.31	15.63	2.56	4.37
7 Red French	59.06	25.43	2.48	3.80
8 Broom Corn	57.38	15.63	2.32	2.31
Grown for two years:				
9 Western Grown	48.88	6.67	4.40	7.5
10 Hungarian Grass	51.38	17.93	2.72	5.06
Grown for one year:				
11 Magic	50.25	13.43	4.40	4.40
12 California	56.63	41.87	3.12	3.12
13 Canadian	56.75	34.37	3.08	3.08
14 Japanese	58.38	41.03	2.84	2.84
15 Hog	59.25	26.47	2.60	2.60
16 Russian	59.25	21.27	2.40	2.40

Mixed Grains Grown for Fodder Purposes.

For three years an experiment has been carried on in which grains have been grown separately, and in various combinations for fodder purposes. Peas, oats, barley and spring wheat were grown separately and combined, by making all the combinations possible with two of the classes of grains, three of the classes of grains, and all four classes of grains together. The experiment was carried on in duplicate. The soil was a clay loam, which had received a dressing of 20 tons per acre of farmyard manure in the spring of 1894. Seeding took place on May 11th. When grown singly the same quantity of seed was used per acre as in the variety tests; when the grains were grown in mixtures, two-thirds the quantity used in the variety tests was sown in every instance.

The following table gives the average results of the grain grown singly and grown in the various combinations as indicated in the table:

Crops.	Yield of green crops from grains sown separately, 1894.	Average yield of green crop from mixed grains.			
		1892.	1893.	1894.	Average three years, 1892-3-4.
	tons.	tons.	tons.	tons.	tons.
1 Peas and oats	8.02	10.95	6.01	8.14	8.37
2 Barley, peas and oats	7.19	9.95	5.30	7.25	7.50
3 Barley and peas	6.77	8.50	5.93	7.25	7.23
4 Peas, wheat and oats	6.73	8.20	6.94	6.46	7.20
5 Barley and oats	6.79	7.08	6.12	7.29	6.83
6 Barley, peas, wheat and oats	6.43	9.85	4.01	6.43	6.76
7 Barley, wheat and oats	5.91	8.60	4.77	6.36	6.58
8 Wheat and oats	6.10	7.58	5.28	6.64	6.50
9 Peas and wheat	6.08	7.95	4.48	5.89	6.11
10 Barley, peas and wheat	5.90	7.45	3.98	6.21	5.88
11 Wheat and barley	4.85	6.15	4.81	5.20	5.39

It will be observed that the largest yield per acre in 1894 was produced from the *mixture of peas and oats*. This mixture also gave the largest yield per acre in the average of the experiments of three years. In the results of the past year, larger yields of green crop were produced from the mixtures than from the same grains when sown separately in 8 out of the 11 separate tests. The results point towards the advantage of sowing a mixture of peas and oats together. Not only does this mixture give the largest average yield per acre of the various combinations used, but it also produces a food which is of excellent quality whether fed in the green state or converted into dry fodder.

Mixed Grains, Peas and Oats Sown in Different Quantities for Fodder Purposes.

In this experiment nine plots were sown with oats and peas in varying proportions and the experiment was conducted in duplicate, making in all eighteen plots. The land had received similar treatment to that described under the heading of "Mixed grains grown for fodder purposes." The seed was sown on May 12th.

Mixtures of grain.	Yield of green crop per acre.			
	1892.	1893.	1894.	Average 1892-3-4.
	tons.	tons.	tons.	tons.
1 Oats 1 bushel and peas 3 bushels per acre	11.35	6.32	7.75	8.47
2 " 2 " 3 "	11.75	6.52	7.00	8.42
3 " 2 " 1 "	11.55	6.28	6.89	8.24
4 " 1½ " 2 "	11.85	5.88	6.54	8.09
5 " 1½ " 1 "	12.10	4.88	7.21	8.06
6 " 1 " 1 "	11.80	4.68	7.61	8.03
7 " 1½ " 3 "	11.40	5.72	6.46	7.86
8 " 1 " 2 "	10.75	4.18	7.79	7.57
9 " 2 " 2 "	10.10	5.36	7.07	7.51

As this experiment has been conducted for three years in succession, we find that in the average of three years' trials *one bushel of oats and three bushels of peas* gave the largest yield per acre, but there is not a very wide variation in the yield per acre of the first six mixtures mentioned in the above table. When three bushels of peas are sown with one or with two bushels of oats, the crop is apt to lodge badly. All things considered we believe the best mixtures for land similar to that upon which this experiment has been conducted are *one bushel and a half of oats and one bushel of peas*, or two bushels of oats and one of peas. With each of these combinations the crop usually stands up well and a fine quality of food is produced.

Sunflower, Comparative Test of 7 Varieties.

In 1894, seven varieties of sunflower seed were obtained from different seedsmen, the most of whom were located in the United States. The seed was planted in rows 25 inches apart on June 9th. The land was cultivated similarly to that on which the corn was planted. The different varieties were all cut on the same day.

Varieties.	Average height.	Yield of heads per acre.	Total yield per acre.
	inches.	tons.	tons.
1 Texas Silver Queen	70	5.20	**12.80**
2 Helianthus Globosus	65	6.72	**8.68**
3 Black Giant	52	4.88	**6.40**
4 Mammoth Russian Giant	58	4.40	**6.32**
5 Common	62	4.80	**5.04**
6 Dwarf, double flowered	31	5.64	**4.60**
7 Double California	54	2.40	**4.00**

The Texas Silver Queen, which was grown on the plots this season for the first time, gave the largest total yield per acre, but the largest weight of heads, from the different varieties, was obtained by one called the *Helianthus Globosus* obtained from the United States. No common name was mentioned for this variety.

Rape, Selection of Seed.

A duplicate experiment was carried on in 1894 in which large, medium, and small sized seeds of the Dwarf Essex Rape were sown. These seeds were all selected from one package, which had been obtained for general sowing. The seed was not a bad looking sample, but when sifted and the seeds put into three different classes a very marked difference was observed between the best, the medium, and the poorest quality. Nothing but sound seeds, however, were sown in any instance. Seeding took place on July 6th. The following table gives the average results of the experiment :

Selection.	Yield of rape per acre.
	tons.
Large	33.98
Medium	22.80
Small	11.78

The results from this experiment are certainly very interesting and show a very wide difference in the produce from the different classes of seed. The large seed produced about three times as much per acre as the small seeds ; and the medium sized seeds about twice as much as the small seed. This experiment will likely be repeated in future years. On examining the results of this experiment it might also be well to refer to the variation from the different qualities of seed in the experiments with roots, grain and corn which have been already mentioned.

Rape, Methods of Cultivation.

Rape was sown in three different ways in the spring of 1893. In one instance the and was ridged with a double mould-board plow in rows 26.4 inches apart ; in another instance the rows were the same distance apart but the land was left unridged, and in the third instance the seed was sown broadcast and harrowed in. Equal amounts of seed were used in every instance. The seeding took place on June 30.

Methods of cultivation.	Yield of whole crop per acre.
	tons.
Flat cultivation	7.71
Ridged "	7.48
Broadcast	7.06

The experiment conducted in 1894 shows that the best results were obtained from seeding in rows 26.4 inches apart, and which were left flat, and the poorest results were obtained from sowing the seed broadcast. There was only about ⅔ of a ton per acre, however, between the best and the poorest yielding plots.

Sugar Cane, Broom Corn, Kaffir Corn, Etc.

During the past year, a number of varieties of sugar cane, millo maize, Kaffir corn etc., were grown upon the trial plots. These were all sown in rows 25 inches apart upon land which had received a dressing of 20 tons per acre of farmyard manure in the spring of 1894. The seeding took place on June 9th. The following table gives the average height, yield of heads per acre, and the whole crop per acre of the different varieties:

Variety	Kind of fodder crop.	Average height.	Yield of heads per acre.	Yield of whole crop per acre.
		inches.	tons	tons.
Early Orange	Sugar Cane	73	....	22.0
Fodder	" "	86	.04	20.3
Early Amber	" "	87	.32	20.2
White African	" "	65	....	17.5
Millo Maize	Millo Maize	75½	....	16.2
California Golden	Broom corn	90	1.60	11.7
Dwarf Broom	" "	76	1.68	9.3
Yellow Millo Maize	Millo Maize	53	1.04	8.6
Improved Evergreen	Broom corn	82	2.28	7.8
Kaffir corn	Kaffir corn	54	....	7.8
Jerusalem corn	Jerusalem corn	56	1.27	5.3

It will be observed in the above table that the *Early Orange sugar cane* gave the largest yield, producing 22 tons per acre. This was followed closely by the fodder cane and the Early Amber sugar cane, all of which gave upwards of 20 tons of green fodder per acre. The Kaffir corn and the Jerusalem corn came at the bottom of the list in amount of crop produced. These latter two varieties have been grown for a number of years, and are found to be too late in reaching maturity for this climate. We have received but poor results from the Kaffir and the Jerusalem corns during all our experience with these varieties.

Clovers, Comparative Test of 16 Varieties.

We have but little to report in regard to the clovers for 1894. Our clover plots in previous years were in the central part of the field which has now been transferred from the experimental to the farm department. In the spring of 1894 we, however, sowed a number of plots with clover in our experimental field in a location where they may remain for some length of time.

The seeding took place on May 12th. Some of the varieties gave a good growth during the summer, while others germinated very poorly; but we hope in another year to have all the varieties well established.

Grasses, Comparative Test of 31 Varieties.

The remarks which were made in regard to the clover will apply equally well to the grasses, as the grass plots were situated in the central part of the field which is now used by the farm department. 31 varieties, however, of the leading grasses from ten years experience in our plots, along with a few of the native grasses from the Northwest, and also some promising varieties from Australia, were sown in plots in the experimental department on May 15th, 1894. We hope to leave these plots undisturbed for a number of years, that the various varieties may be carefully studied in regard to their value for agricultural purposes. Some of the varieties grew well during the past season, while others were failures. We hope, however, in the near future to have all the leading varieties of grasses well established in our experimental plots.

Co-operative Experiments.

About 100 plots were grown in the experimental department in 1894 in conjunction with 7,721 plots, grown by ex-students and other farmers throughout Ontario. The following is a list of experiments conducted during the past year. The results of these will be found in the experimental union report at the end of this volume:

No. of experiments.	Name of experiments.	No. of plots required for each.
I.	Testing nitrate of soda, superphosphate, muriate of potash, mixture and no manure with oats	5
II.	Comparing the advantage of nitrate of soda alone and nitrate of soda with superphosphate over no fertilizer with rape	3
III.	Ascertaining the relative value of four varieties of Millet	4
IV.	Growing Lucerne as a crop for fodder	1
V.	Testing six leading varieties of Fodder Corn	6
VI.	Testing five leading varieties of Turnips	5
VII.	Testing five leading varieties of Mangels	5
VIII.	Testing five leading varieties of Carrots	5
IX.	Testing five leading varieties of Spring Wheat	5
X.	Testing five leading varieties of Barley	5
XI.	Testing six leading varieties of Oats	6
XII.	Testing four leading varieties of Peas	4
XIII.	Testing six leading varieties of Potatoes	6
XIV.	Testing five leading varieties of Winter Wheat	5

Experimental Building.

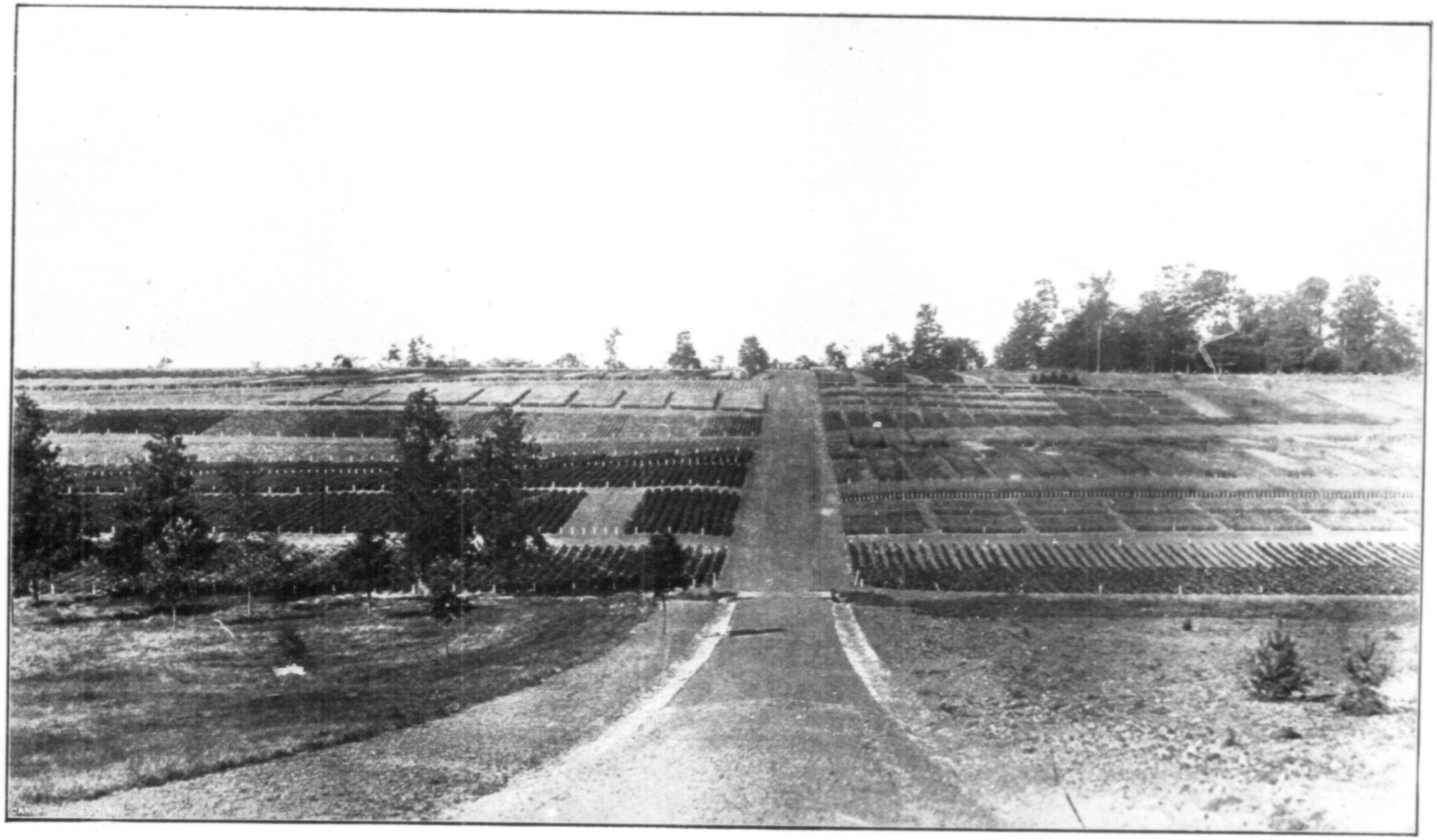
During the year 1894, upwards of 1,700 plots were devoted to the experimental work at the Agricultural College, and 7,721 packages of grains, seeds and fertilizers were distributed among the farmers of Ontario. It is almost impossible to do this work in the most satisfactory manner with the present accommodation; our grains and potatoes are now stored in a number of the buildings on the College grounds. We were unable to keep samples of our different varieties of roots, to determine the keeping qualities of the same, owing to lack of accommodation. We are compelled to use nearly the whole of the basement of the chemical laboratory for the work rooms and an upper compartment for an office. This is far too small for our work, and besides are now greatly needed by the chemical department. Farmers and others visiting the College during the winter season have almost no opportunity of examining the various products which have been grown upon the experimental plots during the past season.

An experimental building is greatly needed in which work could be accomplished during the winter months, in preparing grains, seeds, fertilizers, etc., to be used the following season for sowing upon the station plots, and also for distributing among the farmers of Ontario; where the various products of the experimental plots could be preserved for examination and for testing in different ways; where the reports could be prepared with the products near to hand for reference; where an exhibition of all the varieties of grain, both in straw and sample jars, could be neatly arranged for the benefit of farmers and others visiting the college; where a small conservatory could be built for testing the germination of seeds, etc.; and where a general office, a private office, a dark photographic room, and a storage room for fertilizers, etc., could be provided.

Respectfully submitted,

C. A. ZAVITZ,
Experimentalist.

Ontario Agricultural College,
Guelph, Dec. 31st, 1894.



VIEW OF THE EXPERIMENTAL GROUNDS, FROM NEAR THE COLLEGE BUILDINGS.

VIEW OF DAIRY DEPARTMENT, TAKEN FROM THE COLLEGE.

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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 1894. In doing so, I feel that I am under obligation to yourself for counsel and help at various times. The instructors of the Dairy School did good work during the year, and we are particularly indebted to Mr. A. T. Bell, our cheese instructor, for coming to our assistance in the cheese experiments. He left his work at home, and rendered us good service at no small inconvenience to himself. Messrs. Alex. MacLaren, R. M. Ballantyne, J. S. Pearce and D. Derbyshire gave us good lessons on scoring cheese and butter during the dairy school. We are indebted to these gentlemen. My assistants in the dairy and dairy stable have been faithful, and altogether the year has been one of good results.

You will find my report under the following heads:

I. DAIRY SCHOOL.

II. EXPERIMENTAL WORK: CHEESE, CREAMING, MILK TESTING, FEEDING.

III. DAIRY STOCK.

IV. TRAVELLING DAIRY.

V. MISCELLANEOUS.

I. DAIRY SCHOOL.

The Dairy School opened on January 15th and closed March 16th, making a full two months' course. The attendance was not so large as we expected at first, owing to the fact that many were unable to come, after having made application. No doubt this will always be a hindrance, and a difficulty to overcome in accepting applications. Some apply and make no special effort to attend, while others apply and find there is lack of room. I hope that your efforts to solve this difficulty during the term of 1895 may be successful.

While the school was a success this year, yet we were greatly hampered owing to the fact that the new building was not completed when the students arrived. Then, after a couple of weeks, we found that the boiler in the dairy was not large enough to furnish steam for the new engine and heat both buildings. This necessitated the putting in of a larger boiler during the term, and in the middle of winter, so that our building and appliances were not completed until the term was far spent. However, our students were patient during all these drawbacks, and we were enabled to do fairly good work. It will be better in 1895.

As the boiler and engine are located in the home dairy building, we were obliged to carry steam pipes to the new dairy under the ground This was somewhat expensive, and there is also some loss from the steam being carried so far. The power from the engine is transmitted by means of a rope drive over pulleys, by way of the cheese department. Owing to the distance and the number of pulleys it caused some trouble during the term.

There were more instructors required this year, and two new ones were secured in the place of Messrs. Palmer and Linfield, who had left the College to enter new fields of labor. Messrs. Bell and Millar were retained in the cheese department, Mr. Sprague, the creamery instructor, was put in charge of the butter department, with Messrs. Beckett and MacTavish assistants, and Mr. Zufelt, a dairy student of 1893, and who stood at the head of the class, was given control of the milk testing. On the instructors, to a large extent, depends the welfare and success of the school, and I am personally indebted to them for their hearty co-operation to make the students feel that their time was being well and profitably spent.

The plan of lectures and practical work was similar to that of last year. Lectures were given each morning from 8.30 to 9.30, after roll-call, when the students were distributed to the four departments (cheese-making, separating, butter-making and milk-testing) for practical work under the instructors. Students were changed from one department to the other each day. For instance, if a certain division started at the cheese department, the next day they would be working with the separator, next day making butter, next, testing milk, and next cheese again. This gave variety to their work; but some who had little or no experience found that they were not long enough in any one department to become familiar with the different steps of the process, so that this year we shall try a three day rotation, *i.e.*, instead of changing every day, students will go from one department to the other every third day.

The afternoon discussions were conducted in the cheese room, and they were found to be very popular and profitable. These last for one hour—usually from 2.30 to 3.30. Our new live-stock class-room enables us to illustrate the lectures on the dairy cow and the dairy breeds by living specimens brought into the lecture room. These were given during the afternoon, after most of the work had been completed. At present we have no Guernseys, but the other three leading dairy breeds are found in our stable.

Our students were for the most part cheese-makers, a few butter-makers, and some farmers. The ladies, of whom there were six in attendance most of the term, with a few occasional lady students who stopped but for a short time, were all farmers' daughters. Two of them took the home-dairy course, and the other four the factory course. We were pleased with their behavior and general conduct, and also to see that the men gave them the respect due to them. No lady need be alarmed about going to the Dairy School, "among so many men," as they will assuredly be treated with respect and courtesy. It is to be hoped that more of our young ladies will avail themselves of this opportunity of making an enlarged acquaintance, and of acquiring useful knowledge. If you, sir, and the Honorable Minister of Agriculture, could see the way clear to establish a school of domestic economy, including cooking, laundry, general housekeeping, poultry and dairying, I am satisfied that it would draw many ladies to the College, and be of great benefit to our farmers and the country generally.

The dairy library as yet is not large, chiefly for the reason that there are few books up to date on dairying. There are, however, quite a number being issued at present, and these we hope to have for the benefit of our students. All the leading agricultural journals and dairy papers are kept on file in the dairy during the term. It is hoped that by these means we shall cultivate a desire for good literature that bears more or less directly on the life-work of dairymen.

Thirty-nine students wrote on the final examination, and received certificates. As announced in our circular, special certificates will be awarded to those who pass the examinations during the course, and who comply with certain other conditions named therein. Six are entitled to receive these certificates in cheese-making, having completed the reports for the year, viz.: A. D. Perry, Harrowsmith, Frontenac Co.; R. W. Stratton, Griffins' Corners, Elgin Co.; C. H. Brayley, Marston, Norfolk Co.; G. B. Brodie, Brantford, Brant Co.; R. R. Milne, Newton, Perth Co.; A. G. Calder, Clarksburg, Grey Co. All these were visited by me during the latter part of September and the beginning of October. I found their factories for the most part clean and tidy. One or two might have been improved slightly in this respect. All had good cheese in their curing rooms. Some of the factories were very poor, and the appliances were not up to date. Owners might make an improvement in these respects, and it would be an encouragement to the makers.

In two of the factories dividends were made according to the percentage of fat as determined by the Babcock test. Composite tests were made for a week, two weeks, and a month. Some of the factories have no tester. I would strongly urge the management of every factory to have a tester and use it occasionally, at least, though payment by test is not adopted. It will be found to exert a wholesome influence on the patrons and will show wide variations in the quality of milk sent by them.

Dairy Students' Reports.

For the monthly reports of dairy students, blank forms as follows were sent to each; from these we learn a few interesting facts about the cheese industry from the point of view of the cheese-makers:

ONTARIO AGRICULTURAL COLLEGE.

Dairy School.

Cheese Work.

Report by............................for the month of ....18.....
Name of factory in which you work..
P. O........................County......................Province ....
What position do you hold? Head maker or helper..
Is factory joint stock or private? .... Number of patrons ....
Number of cows.................. Pounds of milk received daily ....
Distance from factory to farthest patrons..
Do patrons aerate and properly care for the milk at home?..
What is the condition of milk when received? ....
Are dividends made according to the per cent. of fat in the milk? ....
What test is used?.......... How often is each patron's milk tested?............................
What is the highest per cent. of fat found in any patron's milk during this month?..............
What is the lowest per cent. of fat found in any patron's milk during this month? ....
Average per cent of fat in mixed milk from all patrons?..
Is any butter made in the factory? ....
How long is cheese held before shipping? ....
How much milk is required for one pound of cured cheese? ....
State highest and lowest temperature in curing room...
State highest, lowest and average price for month..
What per cent. of fat do you find in whey?...
Is whey scalded at the factory? ....
How much is charged per pound for making?..
Remarks:

In two of the factories where payment to patrons according to test was adopted we are able to see the variation in patrons' milk from month to month:

Month.	Mr. Brodie's factory.			Mr. Calder's factory.		
	Highest per cent. fat in any patron's milk.	Lowest per cent. fat.	Average per cent. fat in vats.	Highest per cent. fat.	Lowest per cent. fat.	Average per cent. fat for month.
May	4.2	3.0	3.7	....	....	....
June	4.4	3.1	3.6	....	....	....
July	4.4	3.2	3.6	4.1	3.1	3.52
August	5.6	3.1	3.8	4.0	3.1	3.63
September	4.7	3.0	4.1	4.2	3.0	3.63
October	4.8	3.1	4.1	5.0	3.1	3.90

The average pounds of milk received daily and also pounds of milk required to make a pound of cheese during the season, at the six factories is seen in the table:

Month.	Mr. Brodie's.		Mr. Calder's.		Mr. Stratton's.		Mr. Brayley's.		Mr. Perry's.		Mr. Milne's.	
	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.
		lb.		lb.		lb.		lb.		lb.		lb.
May	10,000	10.38	....	......	3,582	10 82	1,467	10.63	9,000	10.25	4,050	10.30
June	11,400	11.00	8,000	10.67	6,467	11.06	2,038	10.88	14,000	10.35	9,144	10.60
July	9,000	11.45	7,600	10.58	6,126	11.53	1,974	11.47	13,000	10.80	10,246	10.90
August	7,000	11.06	6,000	10.13	4,950	11.07	1,804	11.05	10,000	10.42	8,900	11.50
Sept	5,700	10.57	5,000	9.40	3,950	10.46	1,402	10.55	9,000	9.80	8,500	
October	5,000	9.87	4,000	9.40	3,788	9.56	1,470	9.54	5,500	9.00	6,200	
Av. for season.	8,016	10.72	6,120	10.04	4,811	10.75	1,693	10.69	10,083	10.10	7,840	

Three of the factories are joint stock and three are managed by private individuals. The number of cows, the milk of which was sent to each factory varied from 100 to 600; and the number was greatest at each factory during June and July. These are the months when most milk was received. Patrons should endeavor to supply a more regular amount throughout the year, as it would be better for them and for the makers. The distance travelled for milk ranged from four to nine miles from the factories. Some reported that patrons took good care of the milk and some that they did not. There is evidently room for improvement in the quality of milk supplied to makers. Early in the season the cheese was shipped in ten days' or two weeks' time, but later the cheese were held for a month or more. One factory reports shipping fall cheese at the end of two weeks. The cost for hauling the milk and making the cheese varied from 1¾c. to 2½c. per pound of cheese. The number of patrons varied from 22 to 100. The average price per pound of cheese obtained at the five factories was for May 9.29c., June 8.89c., July 9.19c., August 10c., September. 10.14c., October 10.11c.

It was with pleasure that I noticed a number of dairy students taking prizes for butter and cheese at the leading fairs. The Guelph Exhibition Society offered special prizes to the students of the Dairy School. At this exhibition most of the prizes in butter were carried off by our students of '93 and '94. This reflects credit on the students and also upon the work done by our instructors. It shows that improved methods will tell on the manufacture of butter, and in this way we hope to raise the standard of Canadian butter.

We had little difficulty in securing in the vicinity of Guelph the amount of milk required for the class to work with this year, while the previous year we were compelled to ship long distances by rail. We were compelled to pay a very high price the first year, but succeeded in reducing it somewhat in 1894, and we expect to be able to secure it at almost its commercial value in 1895. The chief expense has been in hauling, as drivers are compelled to go long distances for small quantities of milk. More farmers are now prepared to supply us, and I judge we shall have little difficulty in getting all the milk needed at a reasonable rate. Should we decide to continue our dairy school throughout the whole year, I think milk could be obtained at a much lower price, whereas at present on account of buying the milk for such a short time, farmers complain that it does not pay them to prepare for it unless they receive an extra price. There was also a difficulty in marketing our produce, as most of the dealers had already made their contracts for the season before ours were ready. The responsibility of the marketing fell on me, of which I should prefer to be relieved, especially when complaints were made as to the butter being "turnipy," "off flavor," etc. There is always more chance for the product being spoiled where there are so many doing the work, still on the whole the complaints were not so much as to the making as to the flavor, and the flavor is largely determined by the character of the milk. To secure an improved quality of milk for 1895, I called a meeting of the patrons and others interested on April 7th at the dairy, and laid before them some of our difficulties, and stated wherein we would like improvement.

I pointed out to them the fact that where the milk was sold it relieved the wife and daughters of much hard work during the winter, and that they would realize more by selling the milk than by keeping it at home in the majority of cases. I further pointed out the fact that our object was to teach, not to make money out of the milk bought from them, yet we should be able to purchase it at a price so that we would be at no loss. We would like them to be interested in the Dairy School and try to furnish us with the very best milk capable of being produced on their farms. For the success of our school, from a commercial standpoint, we need three things: good milk, skill in manufacturing, and judgment in marketing. We did not consider ourselves perfect, in fact we had much to learn, but if they would attend to the first requisite, we would do our best to secure the other two.

In milk of good quality two things are implied: First, that it be pure, sweet and of clean flavor; and secondly, that it contain at least 3.5 per cent. of fat. While there was a decided improvement in the quality of the milk during 1894 as compared with 1893 yet it was not all so good as it might have been. To secure the first qualities spoken of it was necessary to have clean stables, clean cows, clean feed and clean men and women. Milk should also be properly aërated in a place where the air is pure, and be cooled for butter-making. Owing to the fact that most of the milk was cold when it arrived at the dairy it was difficult to detect bad flavors until it was heated. We were compelled to send several lots home which were of bad flavor, and in one case a can was thick when it was brought in.

Some wished to send the Saturday night's milk, but I pointed out that it would suit us much better if it were used at home, chiefly for the reason that we required a regular amount each day, while the Saturday night's milk gave us an extra amount to handle on Monday and Tuesday. Then, again, it was too old in most cases, as it would not be all used before Tuesday. There were also complaints about the skim-milk being sour when it reached the farms. This is not to be wondered at, when in many cases the milk was sour or nearly so when brought in, and then it did not reach the farm again until the day after being skimmed. I intimated that we should pay for milk according to the percentage of fat next year, and that we could not accept milk from anyone who would persist in feeding turnips.

After some friendly discussion, the meeting adjourned. I am satisfied that it was productive of much good, and will result in an improved milk supply during the coming session. I attended a similar meeting at Arkell, some four miles from the College, as there were a number of patrons living in that vicinity who were unable to come to the dairy.

Home Dairy School.

There were some 8 or 10 students in this department during the term. Some stayed for a short time, while others were here most of the two months. There is still room for improvement in farm butter-making. The use of the separator in a dairy of 10 or more cows is becoming quite general, and to know how to regulate and care for these machines properly is very important, as with a person who does not understand how to use them they may be even more wasteful than the setting methods. Then, again, every farmer should be able to test samples of milk from the cows in his herd, and also to test the skim and buttermilk. These things are fully taught in the Home Dairy, and it is to be hoped more will avail themselves of this branch. The instructor, Mr. Rogers, is very painstaking and careful, and no one can spend two weeks or a month under his instruction without being greatly benefited.

There are four separators belonging to the Home Dairy, including the Alexandra, Nos. 3 and 8, the Baby Laval and the United States, with extractor attachment. About 800 pounds of milk were daily made into butter with such utensils as should be used in a farm dairy. This, together with milk-testing and some instruction in the cheese department and practice at the vats, comprised the practical work. The methods of setting milk were also explained, and some practice given. We have in the basement the Cooley creamer, Brampton creamer, shot-gun can method and shallow pans, so that students may become acquainted with these also if they wish.

At the close of the special class the regular College students came to the dairy for two weeks' practical work. Some were interested and did their work well, while others the instructors reported as being careless and indifferent Unless the College classes take more interest it is a question as to the advisability of continuing this work.

II.—EXPERIMENTAL WORK.

Experiments in Cheese-Making.

The question, which is better, to pay patrons of cheese factories according to the percentage of fat in their milk, or to pay them according to weight of milk? having been very much discussed at dairy conventions, farmers' institutes and in the press, it was decided to conduct, at the dairy department of the College, during the present year a series of experiments bearing on the point at issue. Besides this, we have asked about 75 cheese-makers in different parts of the province to co-operate with us in the work. The plan of the experiment is to make cheese at the dairy here for one week of each month throughout the season, beginning with May. The cheese-makers have been asked to make one experiment each month and send in the report on blank forms furnished by the Experimental Union in connection with the College.

We select normal milk with as wide a variation in the percentage of fat as we can get. Most of the milk used here has been supplied by our dairy and farm herds. In addition, we bought about 150 pounds per day from neighboring farmers. In all, five herds have contributed the milk used in the May and June experiments, which are here reported. Most of our cows give milk of good quality. We test each cow weekly by composite tests, and put the milk from all the cows testing over 3.6 per cent. into one can, and the milk testing under this into another can. To supplement this, a quantity sufficient to make up 600 pounds per day has been bought—chiefly poor milk. The chemical analyses of milk, whey, green cheese and cured cheese are made from month to month in the chemical laboratory.

The quantity of milk in each vat was 300 pounds. Two such vats of milk were made into cheese each day, under the same conditions as far as possible. The percentage of fat in milk and whey was determined by the Babcock method at the dairy. One ounce of rennet, diluted in 4 ounces of water, was used for each 300 pounds of milk in both May and June. No coloring was used in the milk. A rennet test was made of each vat every day. In making the test we added 1 dram of Hansen's Rennet Extract to 8 ounces of milk at a temperature of 86° F., and noted the time required for coagulation. During the month of May the rennet test varied from 9 to 18 seconds, with an average of 14 when set. In June the tests varied from 14 to 18 seconds—average 16.

The temperature at which the milk was set varied from 85° to 90°, but nearly all the vats were set in both months at 86°. The time required for coagulation varied from 11 to 28 minutes—average, 19 minutes in May; in June the variation was from 20 to 30 minutes, with an average of 23 minutes. All the curds were heated to 98° for cooking. They were dipped on showing about one-eighth of an inch of acid on the hot iron. All curds were milled with the Harris mill, and at a time about half-way between dipping and salting. In May the salting was done at the rate of 2 lb. per 1,000 lb. of milk. During June all curds were weighed when ready, and salted at the rate of 2½ lb. per 100 lb. of curd. They were put to press in 15 or 20 minutes after salting. Pressure was applied lightly at first in a "gang" press, having a "spring head;" and after 40 to 60 minutes the cheese were bandaged and put back to press for about 20 hours. All cheese were weighed green with one press cloth on, and then put into the curing room. The May cheese were weighed again on June 2nd, and the June cheese on July 2nd.

In spite of extra care taken of our own milk some of the curds developed a peculiar flavor, and some were slightly gassy. A "starter" was used in some cases to hasten the ripening of the milk.

The table shows the difference in yield of cheese from milk with different percentages of fat for the two months. Three hundred pounds of milk were used in each case.

Date.	Per cent. fat in whole milk.	Lb. cheese.		Loss in curing.	Lb. milk for 1 lb. green cheese.	Lb. green cheese for 1 lb. fat in milk.
		Green.	Cured.			
April 30th	3.90 3.35	30.00 27.50	28.25 25.50	1.75 2.00	10.00 10.91	2.56 2.74
May 1st	3.90 3.60	29.50 27.00	27.50 24.50	2.00 2.50	10.17 11.11	2.52 2.59
" 2nd	3.60 3.50	29.75 27.75	27.50 25.75	2.25 2.00	10.08 10.81	2.76 2.64
" 3rd	3.85 3.40	29.00 28.00	27.50 26.50	1.50 1.50	10.34 10.71	2.51 2.75
" 4th	3.70 3.70	29.00 29.00	27.50 27.50	1.50 1.50	10.34 10.34	2.61 2.61
" 5th	4.00 3.50	30.00 28.00	28.75 27.50	1.25 0.50	10.00 10.71	2.50 2.67
" 7th	3.65 3.30	29.25 27.50	27.75 26.00	1.50 1.50	10.26 10.91	2.67 2.75
June 4th	4.50 3.20	33.75 28.25	31.25 26.25	2.50 2.00	8.88 10.62	2.50 2.94
" 5th	3.80 3.40	31.25 30.00	29.50 28.25	1.75 1.75	9.60 10.00	2.74 2.92
" 6th	4.10 3.60	32.75 29.75	31.00 28.00	1.75 1.75	9.16 10.08	2.66 2.75
" 7th	4.20 3.80	32.75 32.50	30.75 30.50	2.00 2.00	9.16 9.23	2.59 2.85
" 8th	4.10 3.70	32.50 31.00	30.75 28.75	1.75 2.25	9.23 9.67	2.64 2.79
" 9th	4.40 3.90	32.50 29.75	30.50 28.25	2.00 1.50	9.23 10.09	2.46 2.55

The average percentage of fat for the seven days, April 30th to May 7th, was for one vat 3.80 and for the other 3.48. There were 2,100 lb. of milk used altogether in each vat. This amount of milk, testing 3.80 per cent. fat, made 206.5 lb. green cheese and 194.75 lb. cured cheese. The loss in curing was 11.75 pound. The average number of lb. green cheese made from 300 lb. milk was 29.5. The lb. of milk for 1 lb. of green cheese was 10.03—cured cheese 10.77. The lb. of green cheese made for 1 lb. of fat in the milk were 2.59. The average loss of fat in the whey as determined by the Babcock method was 0.26 per cent.

The other vat (2,100 lb.), averaging 3.48 per cent. fat, made 194.75 lb. green cheese—183.25 cured—loss in curing 11.5 lb. The average number of lb. of green cheese made from 300 lb. of milk was 27.82. The lb. of milk for 1 lb. of green cheese were 10.78—cured cheese 11.46. The lb. green cheese for 1 lb. fat in the milk were 2.68. The average percentage of fat in the whey was 0.25.

During the June experiments the vat of "rich" milk averaged 4.18 per cent. fat. 1,800 pounds of milk were used, which made 195.5 lb. green cheese—183.75 cured—loss in curing 11.75 lb. The average lb. cheese from 300 lb. milk were 32.58 green, 30.62 cured. The average lb. milk required to make 1 lb. cheese were 9.21 green, 9.79 cured. The average amount of cheese produced for 1 lb. fat in the milk was 2.60 lb. green and 2.44 lb. cured. Per cent. of fat in whey 0.19.

The vat of "poor" milk averaged 3.60 per cent. fat. 1,800 lb. milk made 181.25 lb. green cheese—170 cured; loss 11.25 lb. 300 lb. milk made 30.21 lb. green cheese—28.33 cured. Pounds of milk to make 1 lb. cheese, 9.95 green—10.59 cured. One pound of fat made 2.80 lb. green cheese—2.62 cured. Fat in whey, 0.19 per cent.

The cheese made from the "rich" and "poor" milk was scored by two competent judges. The following is the scale of points used by them:

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

All cheese were scored full points for finish. The average score of the two judges of the cheese made from "rich" milk (3.80 per cent. fat) in May was 83 points. Cheese from "poor" milk (3.48 per cent. fat) scored 84 points. The cheese of June experiments were judged on July 6th by the same men. The average score of "rich" milk cheese (4.18 per cent. fat) was 91; that made from milk averaging 3.60 per cent. fat scored 93 points. The two cheese which scored the highest number of points in May and June were made out of milk testing 3.2 and 3.4 per cent. fat.

It is yet too soon to draw definite conclusions from our work, but so far it would indicate:

1. An increased percentage of fat in the milk gives an increased yield of cheese, though not in the same proportion.

2. That a pound of butter-fat in milk ranging from 3.2 to 3.7 per cent. will make more cheese than a pound of fat in milk ranging from 3.6 to 4.5 per cent. of fat.

3. That there need not necessarily be more loss of fat in whey from rich milk up to 4.5 per cent. fat than from poor milk, though we did notice a little more "grease" on the hoops, press and shelves from the rich milk cheese (4.5 per cent. fat.

4. That the milk containing the same per cent. of fat does not always give the same yield of cheese, especially when comparing one day with another or one month with another. April 30th, 300 lb. of 3.9 per cent. milk made $28\frac{1}{4}$ lb. cured cheese; May 1st, same quantity and quality of milk made $27\frac{1}{2}$ lb.; June 9th it made $28\frac{1}{4}$ lb. May 1st, 300 lb. of 3.60 per cent. milk made $24\frac{1}{2}$ lb. cured cheese; May 2nd, $27\frac{1}{2}$ lb.; June 6th, 28 lb. May 4th both vats tested 3.7 per cent. and each made $27\frac{1}{2}$ lb. cured cheese. June 8th, 3.7 per cent. made $28\frac{3}{4}$ lb. cheese.

This question has been a vexing one in factories, where payment by test has been adopted. It has been found that the yield of cheese does not always increase with the fat, and the discrepancy it doubtless due to differences in conditions of milk, methods of making, and state of the weather.

As some of our factories are still in doubt as to the advisability of distributing proceeds among patrons according to the percentage of fat in the milk, perhaps the following table will throw some light on the question.

Patron.	lb. milk.	Per cent. fat in milk.	Wt. cheese. lb.	Amount of money each would receive if cheese sold for 10c. per lb. Paying by wt. of milk.	By per cent. fat	By reading + 1 per cent.	By reading + 2 per cent.	By wt. of cheese made.
May :				\$ c.	\$ c.	\$ c.	\$ c.	\$ c.
H	2,100	3.80	194.75	18.90	19.73	19.54	19.44	19.475
L	2,100	3.48	183.25	18.90	18.06	18.25	18.37	18.325
June :								
H	1,800	4.18	183.75	17.685	19.01	18.73	18.56	18.37
L	1,800	3.60	170.00	17.685	16.36	16.64	16.81	17.00
July :								
H	1,800	3.84	184.00 (green)	17.41	18.91	18.58	18.37	18.40
L	1,800	3.23	164.25 (green)	17.41	15.91	16.24	16.45	16.42

In the table we have assumed that H and L are patrons, and during the months of May, June and July they furnished milk with the percentages of fat given. This milk was made up separately, so that we know how much cheese was made in each vat, or was furnished by each patron. Assuming that all the cheese netted the patrons ten cents a pound, if we divided the money between them according to the amount of milk sent, both of them would receive exactly the same amount of money, because the same quantity of milk was used in each vat. As the milk was made up separately (which would be the correct way in a factory if it were practicable, as every patron would have just the quantity and quality of cheese his milk entitled him to) we know the money value of the milk used in the vats. This is seen in the last column. If we compare the amounts of money in the first and second columns with those in the last, we find that neither of them gives justice, though the second (that according to the per cent. of fat in the milk) is much nearer than the first.

It has been felt by practical men that paying according to the fat alone gives the patron who furnishes rich milk more than his just share of the proceeds, and the patron sending the poor milk less than he is entitled to. This table would seem to indicate that this view is correct.

To overcome this difficulty it has been suggested by one of our prominent young dairymen of western Ontario to add one per cent. to each man's butter-fat reading. For instance, a patron who sends an average of 4 per cent. milk, call his test 5 per cent.; and one who sends 3 per cent. milk call it 4 ; and so on with all the tests. When this was first suggested, I was not favorably inclined towards the plan ; but the results as seen in the table would seem to indicate that adding one or even two per cent. to the fat readings in these tests is more nearly correct than paying by weight of milk or by the fat alone.

We shall have further data on this point, and in the meantime we ask the co-operation of all cheese-makers and factories who are paying by test, to help to settle the question, as it is one that affects all patrons. Every factory that has a tester should select the patron's milk and put the poor milk in one vat and the rich in another. Note the per cent. fat, weight of milk used, yield and quality of cheese made from each, and send the results to the Dairy Department of the Ontario Agricultural College, Guelph. From the data thus secured we can more nearly arrive at the just method for all. Let every factory be a small experiment station until this point is settled.

The Cheese Experiments Continued.

The experiments reported in Bulletin No. 95, for the months of May and June, were continued through July, August, September, October and November. The same general plan was followed throughout these five months, as is given in detail in the bulletin. As the season advanced we were obliged to secure milk from a few herds in the vicinity to make up the quantity required. The milk was also ripened a little more, the curd was allowed a little more acid in the whey (not over ¼ inch on hot iron), and a little more salt was used (not over 3 lb. per 100 lb. curd).

The experiments for July were made from the 2nd to the 7th inclusive. As in the previous months, the quantity of milk in each vat was 300 lb. This was the amount used in all experiments. The rennet test varied from 8 to 18 seconds, with an average of about 16. The setting temperature was 86° Fr., rennet 1 oz. for each vat. The curds were dipped in about 2½ hours from setting, though some "fast workers" were dipped in less time. Curds were ground with Harris' mill about half way between dipping and salting. Salt was used at the rate of 2½ lb. per 100 lb. curd. One or two curds were "gassy."

In August the conditions were very similar to those in July, except that the curds were salted 3 lb. to the 100, instead of 2½.

Table showing yield of cheese from different percentages of fat during July and August:

Date.	Per cent. fat in whole milk.	Lb. fat in milk.	Lb. cheese from 300 lb. milk. Green.	Lb. cheese from 300 lb. milk. Cured.	Per cent. fat in whey (Babcock tester.)
July 2nd	4.00 3.25	12.00 9.75	28.75 25.75	27.25 24.25	0.2 0.2
" 3rd	3.55 3.20	10.65 9.60	30.75 26.75	27.50 25.25	0.3 0.25
" 4th	3.80 3.20	11.40 9.60	31.00 27.75	29.25 26.00	0.5 0.4
" 5th	4.00 3.30	12.00 9.90	31.25 28.25	29.25 26.50	0.25 0.2
" 6th	3.90 3.40	11.70 10.20	31.50 28.75	29.75 27.00	0.2 0.15
" 7th	3.80 3.00	11.40 9.00	30.75 27.00	29.25 25.50	0.2 0.2
" 30th	3.90 3.20	11.70 9.60	27.75 26.75	26.00 25.00	0.4 0.15
" 31st	4.10 3.50	12.30 10.50	29.50 26.00	27.75 24.75	0.4 0.35
August 1st	3.90 3.20	11.70 9.60	29.50 26.50	28.25 25.00	0.25 0.20
" 2nd	4.10 3.35	12.30 10.05	31.50 27.50	30.00 25.75	0.25 0.25
" 3rd	3.80 3.05	11.40 9.15	30.00 26.75	28.25 25.25	0.15 0.15
" 4th	3.80 3.20	11.40 9.60	30.25 28.00	28.75 26.50	0.15 0.10

One vat averaged during July, 3.84 per cent. of fat, which yielded (from 1,800 lb. of milk) 184 lb. of green cheese and 172.25 lb. cured, when weighed on July 31st. The average of the other vat was 3.23 per cent. fat, which produced 164.25 lb. green and 154.5 lb. cured cheese. The average lb. of cured cheese from 300 lb. of milk was in the first case 28.7, and in the other 25.75—a difference of 2.95 lb. The loss in curing from the rich milk cheese was 11.75 lb, and from the other 9.75. The average pounds of milk for a pound of cured cheese where the per cent. of fat was 3.84, was 10.46; and where the per cent. of fat averaged 3.23, it took 11.66. The pounds of cured cheese to 1 lb. of fat in the milk, averaged for the richer milk 2.49 and the other 2.67. The per cent. of fat in whey was 0.275 and 0.27 for the two lots respectively.

During August the vats of richer milk averaged 3.93 per cent. fat, which produced 178.5 lb. green cheese—169 lb. cured. The vats of poorer milk, testing 3.25 per cent. fat, made 161.5 lb. green and 152.25 lb. cured cheese. The average pounds of cured cheese from 300 lb. milk was in the one case 28.16, and in the other 25.37. The loss in curing was 9.5 lb. from the 3.93 per cent. milk, and 9.25 lb. from the 3.25 per cent. milk. The average pounds of milk for 1 lb. of cured cheese in the first lot was 10.68, in the other 11.83. The pounds of cured cheese to 1 lb. fat was 2.39 and 2.56 respectively. The average per cent. of fat in whey was .26 from the richer milk and .20 from the poorer.

During the months of September, October and November there is nothing special to note regarding the method of manufacture. More "starter" was used, and the milk was usually in better condition. The following table shows the yields on the different dates:

Date.	Per cent. fat in whole milk.	Lb. fat in whole milk.	Lb. cheese from 300 lb. milk.		Per cent. fat in whey.
			Green.	Cured.	
September 3rd	4.00	12.00	32.50	30.5	0.10
	3.00	9.00	27.75	26.5	0.05
" 4th	4.00	12.00	31.25	29.25	0.10
	3.20	9.60	27.00	25.25	0.30
" 5th	4.00	12.00	30.50	29.00	0.10
	3.00	9.00	27.00	25.50	0.10
" 6th	3.80	11.40	31.25	29.75	0.10
	3.00	9.00	26.75	25.25	0.10
" 7th	4.10	12.30	32.25	31.75	0.10
	3.10	9.30	26.50	25.25	0.05
" 8th	3.90	11.70	30.50	29.50	0.05
	2.90	8.70	26.25	25.00	0.05
October 1st	4.00	12.00	32.75	31.00	0.15
	3.30	9.90	29.00	27.25	0.15
" 2nd	4.05	12.15	32.50	30.75	0.15
	3.60	10.80	30.50	28.50	0.10
" 3rd	3.90	11.70	32.75	31.00	0.10
	3.80	11.40	30.50	29.00	0.10
" 4th	3.80	11.40	81.25	29.75	0.15
	3.40	10.20	29.75	28.25	0.15
" 6th	4.00	12.00	32.50	31.00	0.15
	3.70	11.10	31.00	29.50	0.20
November 5th	4.00	12.00	32.00	31.00	0.15
	3.60	10.80	29.25	28.00	0.10
" 6th	3.65	10.95	32.25	31.00	0.20
	3.25	9.75	29.75	28.00	0.15
" 7th	3.75	11.25	30.25	29.25	0.10
	3.75	11.25	30.50	29.50	0.10
" 8th	3.95	11.85	31.25	30.00	0.15
	3.40	10.20	28.25	27.00	0.10
" 9th	4.05	12.15	31.75	30.75	0.10
	3.60	10.80	29.00	28.00	0.10
" 10th	3.90	11.70	32.50	31.25	0.15
	3.20	9.60	29.00	27.75	0.10

The averages for the three months are seen in the table:

Month.	Average per cent. fat.	Average lb. fat in vats.	Lb. cheese from 300 lb. milk.		Loss in curing lb.	Lb. milk for 1 lb. cheese.		Lb. cheese for 1 lb. fat.		Average per cent. fat in whey.
			Green.	Cured.		Green.	Cured.	Green.	Cured.	
September ...	3.97	11.90	31.38	29.96	8.50	9.56	10.01	2.63	2.52	0.09
	3.03	9.10	26.88	25.46	8.50	11.16	11.80	2.95	2.79	0.15
October	3.95	11.85	32.35	30.70	8.25	9.27	9.77	2.81	2.59	0.14
	3.56	10.68	30.15	28.50	8.25	9.95	10.52	2.82	2.68	0.14
November....	3.88	11.65	31.66	30.54	6.75	9.47	9.82	2.72	2.62	0.14
	3.47	10.40	29.29	28.04	7.50	10.24	10.69	2.82	2.70	0.11

The average quality of the cheese was much superior during these three months. Though the per cent. of fat was about the same during July and August, yet the cheese was much inferior. This indicates that it is not alone the higher per cent. of fat which gives the fall cheese its superior quality, but we must look for the full explanation of the fact in other quarters—probably in the more favorable conditions of weather, which result in a better quality of milk supplied to the factories, and more favorable conditions for making and curing the cheese.

Table showing the results of the experiments for seven months:

Month.	Average per cent. fat in whole milk.	Total lb. milk.	Total lb. fat.	Lb. Cheese.		Lb. milk for 1 lb. cheese.		Lb. cheese for 1 lb. fat.		Average per cent. fat in whey.
				Green.	Cured.	Green.	Cured.	Green.	Cured.	
May	3.80	2,100	79.80	206 50	194.75	10.03	10.77	2.59	2.44	0.26
	3.48	2,100	73.08	194.75	183.25	10.78	11.46	2.68	2.51	0.25
June.........	4.18	1,800	75.24	195.50	183.75	9.21	9.79	2.60	2.44	0.19
	3.60	1,800	64.80	181.25	170.00	9.95	10.59	2.80	2.62	0.19
July	3.84	1,800	69.15	184.00	172.25	9.79	10.46	2.67	2.49	0.28
	3.23	1,800	58.05	164.25	154.50	10.97	11.66	2.83	2.67	0.27
August.......	3.93	1,800	70.80	178.50	169.00	10.10	10.68	2.53	2.39	0.26
	3.25	1,800	59.50	161.50	152.25	11.15	11.83	2.76	2.56	0.20
September ...	3.97	1,800	71.40	188.25	179.75	9.56	10.01	2.63	2.52	0.09
	3.03	1,800	54.60	161.25	152.75	11.16	11.80	2.95	2.79	0.15
October......	3.95	1,500	59.25	161.75	153.50	9.27	9.77	2.81	2.59	0.14
	3.56	1,500	53.40	150.75	142.50	9.95	10.52	2.82	2.68	0.14
November....	3.88	1,800	69.90	190.00	183.25	9.47	9.82	2.72	2.62	0.14
	3.47	1,800	62.40	175.75	168.25	10.24	10.69	2.82	2.70	0.11

Being summed up, the seven months results show:

1. 12,600 lb. milk with an average of 3.94 per cent. fat yielded 1,236¼ lb. cured cheese, while the same quantity of milk testing 3.37 per cent. fat produced 1,123 lb. cheese—a difference of 112¾ lb. cheese in favor of the richer milk. The difference in the average per cent. of fat is .57.

2. The average pounds of milk required to produce a pound of cured cheese from 3.94 per cent. milk was 10.19 ; from 3.37 per cent. milk the average was 11.22—a difference of 1.3 lb. milk in favor of the richer milk.

3. The average pounds of cheese produced from one pound of fat in the richer milk (3.94 per cent. fat) was 2.50, and from the poorer milk (3.37 per cent. fat) there was produced 2.65 lb cheese—a difference in favor of the poorer milk of 0.15 lb. cheese for each lb. of fat.

4. The loss of fat in whey, as determined by the Babcock tester, was 0.19 per cent. for the richer milk, and 0.18 per cent. for the poorer.

5. The cheese made from the richer milk shrank 5.2 per cent. when weighed at the end of a month, while the cheese made from poorer milk shrank 5.5 per cent. in the same time. The was little difference in the per cent. of shrinkage of the cheese made from the two lots of milk. The greatest shrinkage was during the months of May and June (and the richer milk cheese in July), and the least during November, but these latter cheese were not so well cured as the others.

The indications from the seven months' experiment confirm what was stated on page 137. "The results indicate that adding one or even two per cent. to the fat readings in these tests is more nearly correct than paying by weight of milk or by the fat alone."

It will be remembered that these experiments refer to normal milk, and cannot be compared with skimmed or watered milk. On the seven months' transactions, the patron sending the richer milk (3.94 per cent. fat) would receive six cents more than he should receive according to yield of cheese, and the other patron sending 3.37 per cent. milk would receive two cents. less than he ought, if the basis of adding on two per cent. to fat readings were adopted.

Table showing the amounts of money patrons would receive according to different methods of pooling, assuming that one patron furnished the high per cent. and another the low per cent. milk :

Month.		Av. per cent. fat in whole milk.	Lb. of cured cheese.	Amount of money each lot would receive if paid according to: Weight of milk, (cheese at 10 cents per lb.)	Per cent. fat.	Per cent. of fat +1 to fat readings.	Per cent. of fat +2 to fat readings.	According to weight of cheese made.
				$ c.	$ c.	$ c.	$ c.	$ c.
May		3.80	194.75	18 90	19 73	19 54	19 44	19 47
		3.48	183.25	18 90	18 06	18 25	18 37	18 32
June		4.18	183.75	17 68	19 01	18 73	18 56	18 37
		3.60	170.00	17 68	16 36	16 64	16 81	17 0C
July		3.84	172.25	16 33	17 74	17 43	17 24	17 22
		3.23	154.50	16 33	14 92	15 23	15 43	15 45
August		3.93	169.00	16 06	17 58	17 25	17 04	16 90
		3.25	152.25	16 06	14 54	14 87	15 08	15 22
September		3.97	179.75	16 62	18 86	18 36	17 87	17 97
		3.03	152.75	16 62	14 39	14 89	15 38	15 27
October		3.95	153 50	14 80	15 57	15 41	15 30	15 35
		3.56	142 50	14 80	14 03	14 19	14 30	14 25
November		3.88	183.25	17 57	18 57	18 34	18 21	18 32
		3.47	168.25	17 57	16 57	16 80	16 94	16 82
	lb. milk.							
Totals for 7 mos.	12,600	3.94	1,236.25	117 96	127 06	125 06	123 66	123 60
	12,600	3.37	1,123.50	117 96	108 87	110 87	112 31	112 33
Difference	....	0.57	112.75	....	18 19	14 19	11 35	11 27

THE CREAM SEPARATOR, DEEP SETTING AND SHALLOW PANS COMPARED.

The experiment of 1893, comparing results obtained by creaming with the separator, deep cans or creamers, and shallow pans was continued through the months from April to November of 1894. The herd milk was all mixed together and then divided into three portions—one part was run through a hand separator (three kinds were used at various times—the Alexandra No. 8, Baby No. 2, and the United States hand size); another part was set in deep cans in ice water under the best conditions, and the remainder set in small shallow pans.

The results were:

Method of creaming.	Month.	Lb. milk creamed by each method.	Temp. set or separated.	Lb. cream.	Per cent. fat. Whole milk.	Per cent. fat. Skim milk.	Total lb. fat in each lot of milk.	Hours set.
			deg. F.					
Separator	April	180	90	32.00	3.3	0.17	5.94	....
Deep setting		180	90	33.50	3.3	0.20	5.94	12
Shallow pan		180	90	28.50	3.3	0.27	5.94	30
Separator	May	184	82	33.50	3.97	0.18	7.30	....
Deep setting		184	85	34.00	3.97	0.33	7.30	18
Shallow pan		184	85	30.00	3.97	0.40	7.30	29
Separator	June	180	92	30.00	3.72	0.18	6.69	....
Deep setting		180	92	33.50	3.72	0.20	6.69	13
Shallow pan		180	92	34.50	3.72	0.25	6.69	26
Separator	July	180	93	31.00	3.56	0.30	6.40	....
Deep setting		180	93	30.75	3.56	0.27	6.40	13
Shallow pan		180	93	23.50	3.56	0.40	6 40	28
Separator	August	175	90	26.00	3.73	0.23	6.52	....
Deep setting		175	90	31.00	3.73	0.30	6.52	24
Shallow pan		175	90	27.00	3.73	0.30	6.52	36
Separator	September	160	89	28.00	3.93	0.05	6.29	....
Deep setting		160	89	29.00	3.93	0.28	6.29	20
Shallow pan		160	89	25.00	3.93	0.33	6.29	36
Separator	October	180	94	28.75	3.40	....	6.12	....
Deep setting		180	94	29.50	3.40	0.20	6.12	16
Shallow pan		180	94	25.00	3.40	0.36	6.12	33
Separator	November	180	90	26.00	3.93	0.03	7.07	....
Deep setting		180	90	35.00	3.93	0.40	7.07	24
Shallow pan		180	90	40.00	3.93	0.23	7.07	36
Totals and averages— Separator	8 months	1,419	90	235.25	3.69	0.11	52.33	....
Deep setting		1,419	90	256.25	3.69	0.27	52.33	20
Shallow pan		1,419	90	233.50	3.69	0.32	52.33	32

It will be noticed that in November the quantity of cream was large, due to the fact that there was a great deal of skim milk in it. Practical dairymen know that the quality of cream obtained from a given amount of milk depends largely upon the percentage of the skim milk taken off with the cream, and no one can tell how much cream should be obtained from 100 pounds of milk unless he knows the degree of richness that is required. Yet this question is frequently asked.

The milk set in deep cans was set for an average of 20 hours and skimmed at an average temperature of 42° F., while the shallow pans were set for 32 hours and were skimmed at an average temperature of 54° F.

On 1,419 lb. milk, containing 52⅓ lb. fat, the loss in skim milk was 1.50 lb. of fat by the separator method—3.83 lb. by deep setting, and 4.54 by shallow pan.

During the tests of 1893 the loss of fat in skim and buttermilk from May to October (1,027 lb. milk in each method) was 0.47 lb. fat by the separator, 1.67 lb. by deep setting, and 3.29 lb. by the shallow pan method.

The per cent. of total fat lost in skim and buttermilk by the three methods for two years is—

	1893.	1894.
Separator	1.2	3.5
Deep setting	4.3	7.9
Shallow pan	8.5	9.6

The per cent. of fat lost is greater in all three methods during this year, although they hold the same relative positions as last year.

The cream from each lot of milk was churned separately and samples kept for testing as to keeping quality. In nearly every case the butter made from the separator cream was best at the end of two to four weeks. Just after churning there was not much difference in the three lots of butter.

The average time required to churn the separator cream was 26 minutes, deep setting 31 minutes, and shallow pan 35 minutes. The per cent. of fat in buttermilk was 0.175 from separator, 0.16 from deep setting, and 0.30 from shallow pan. In the actual yield of butter from the churn there does not seem to be the same differences as we might expect from losses of fat in skim and buttermilk, due no doubt to manipulation, as it is almost imposible to make several lots of butter containing the same percentage of moisture, salt, etc. The yield by the churn was 59½ lb. worked butter from 1,419 lb. milk by separator method, 59 lb. by deep setting, and 58 lb. 2½ oz. from shallow pan.

The difference would be greater than this, according to the manner of using setting methods, as commonly practised on the farm.

How Long Does it Take All the Cream to Rise on Milk Set in a Deep Pail?

This question was sent in to the dairy early in the year. As we had made no experiments in this direction, we carried on a series to determine, if possible, the length of time required for the cream to rise on deep pails set in ice water.

In August (from 9th to 15th) six trials were made. The milk was first mixed and then divided into cans which were skimmed at the end of 4, 8, and 12 hours. The average per cent. of fat in skim milk when skimmed at the end of 4 hours was .66; at 8 hours, .36, and at 12 hours, .275. In every trial, better results were obtained by allowing the milk to set 8 hours than 4, and 12 hours gave better results than 8 in each case but one, when they were equal. The gain was more marked at the end of 8 hours, as compared with 4 hours, than at the end of 12 hours, compared with 8.

From August 16th to 20th, four more trials were made, skimming at the end of 7, 9, and 11 hours, and in November, from 15th to 22nd, five trials were made, skimming at the same times. The average results were: .61 per cent. fat in skim milk at the end of 7 hours, .45 at the end of 9 hours, and .43 at 11 hours. The temperature at which the milk was skimmed ranged from 41° to 43° in all the experiments.

From December 4th to 13th, when we had a greater proportion of stripper cows, some further trials were made by skimming at the end of 12, 24, and 36 hours. The per cent. of fat in skim milk at 12 hours was .43; 24 hours, .32, and 36 hours, .28. Where milk from a large proportion of stripper cows is set in deep cans, it should be allowed to stand for 24 hours.

Similar experiments were made with shallow pans, skimmed at the end of 24 and 36 hours. During August (seven trials) the average per cent. fat in skim milk at 24 hours was .35, and at 36 hours, .22. In December (six trials), 24-hour setting, left an average of .42 per cent. of fat in skim milk, and 36-hour settings, an average of .24 per cent. of fat. The character of winter milk seems to be such that a longer time is required for the cream to rise perfectly, and we would advise 24-hour settings for deep pails, and 36 hours for shallow pan. We have also found a great difference in the "creaming quality" of different lots of milk. Some lots give up the cream quite readily at the end of 4 or 8 hours, while other lots contain .6, .7, .8 and .9 of 1 per cent. of fat in the skim milk at the end of the same period of time. The cream separator overcomes this difficulty.

Milk Set in Shallow Pans in Warm *vs.* Cool Temperature.

This is a continuation of the experiment of last year, in which we endeavored to secure data as to whether it was best to set milk in shallow pans in a warm place or whether a cool temperature would give equally good or better results.

In 1893, we reported that in 13 trials where the average temperature of the milk when skimmed was 56°, the per cent. of fat in the skim milk was .38, and in 12 trials, where the average temperature was 46° when skimmed the average per cent. fat in skim milk was .28.

The experiments were conducted similarly during 1894 in the months of May and November. The quantity of milk set in each temperature was 351 pounds. In each trial all the milk was mixed, then divided, and one lot set in a somewhat warm temperature, and one lot in a cooler place. The average temperature of one lot (12 tests) when skimmed was 54°, and the per cent. of fat in skim milk was .41. The other lot (12 tests) contained .36 per cent. fat in skim milk when skimmed at a temperature of 45°. There was not much difference in the 12 trials, but, in nearly every case, the lower temperature gave slightly better results.

Composite Testing.

As the labor in connection with testing milk at a cheese factory or creamery is considerable, we have been endeavoring for the past two years to arrive at a method which will insure accuracy, and at the same time entail as little labor as possible. Taking out from one-half to one fluid ounce with a small dipper from each patron's milk every time it is delivered, we think is about the most practicable way of sampling. Pint or quart jars properly labelled, and having quickly removable covers, are about the best things to keep the samples in. Potassium bi-chromate, costing from 15 to 25 cents a pound, is a good preservative. Last year, from a somewhat limited number of experiments, we stated that samples might be kept for one, two, three or four weeks, and yet give accurate tests. These experiments have been continued through the months from April to November during 1894, with satisfactory results, as the following figures show:

Month.	1st week.				2nd week.				3rd week.				4th week.			
	Average per cent. of fat, daily tests.		Per cent. of fat in jar.		Average per cent. of fat, daily tests.		Per cent. of fat in jar.		Average per cent. of fat, daily tests.		Per cent. of fat in jar.		Average per cent. of fat, daily tests.		Per cent. of fat in jar.	
	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2
April	3.49	3.30	3.40	3.15	3.19	2.76	3.10	2.75	....	....	....	....	....	....	....	....
May	3.77	2.94	3.95	3.00	3.45	2.47	3.30	2.45	3.02	2.51	2.75	2.45	2.80	3.00	2.60	3.30
June	5.70	5.11	5.65	5.20	4.25	3.69	4.20	3.55	3.75	3.36	3.80	3.25	....	....	....	....
July	3.73	3.47	3.60	3.40	3.71	3.47	3.60	3.50	3.52	3.35	3.60	3.30	3.51	3.27	3.45	3.25
August	3.09	2.57	3.20	2.60	3.10	2.53	3.00	2.60	3.06	2.66	3.01	2.70	3.12	2.76	3.15	2.80
September	2.99	3.47	2.80	3.70	3.37	3.31	3.35	3.40	3.36	3.39	3.40	3.50	....	....	....	....
October	3.75	3.07	3.80	3.05	3.76	3.17	3.80	3.20	3.52	3.19	3.50	3.15	3.63	3.36	3.65	3.40
November	3.01	3.60	3.00	3.50	3.36	3.50	3.40	3.50	3.10	2.87	3.11	3.30	2.87	3.09	2.85	3.10
Average	3.69	3.44	3.67	3.45	3.52	3.21	3.47	3.12	3.33	3.10	3.30	3.09	3.18	3.09	3.14	3.17

It will thus be seen that the widest variation in the average of daily tests for one, two, three or four weeks is not over two-tenths of one per cent., when compared with the test of the composite sample for the same time, and in most cases they compare very closely. When we compare the averages for the eight months the results are quite close. The average daily tests for one week in No. 1 experiment was 3.69, the composite test for one week was 3.67. In No. 2 experiment the average of daily tests was 3.44; the jar tested at the end of a week 3.45 per cent. fat. For two weeks the average of No. 1 was 3.52, the composite test 3.47; in No. 2 the tests were 3.21 and 3.12 respectively. For three weeks the tests were 3.33 and 3.30 in No. 1, and 3.10 and 3.09 for No. 2. At the end of one month or four weeks, the average of the daily tests was 3.18 in No. 1, and 3.09 for No. 2. The jars tested 3.14 and 3.17 per cent. fat.

These were two distinct experiments. In some cases the jars tested nearly alike, though the same kind of milk was not always put into both jars. We may conclude that composite testing for four weeks may be practiced with accurate results, though in factory or creamery work it may not be advisable to continue them longer than two weeks.

Though the composite test has proven itself to be correct, it occurred to us that where the amount of milk varies from day to day, as it usually does from a herd, it might make a difference in the total quantity of fat credited to a patron, if we tested the milk every day and multiplied the pounds of milk by the test, or took the total amount of milk delivered during any given period, say one week, two weeks or a month, and multiplied this by the test for the same period. Where both quantity and quality vary from day to day and we do not take out an aliquot part, the total pounds of fat would be quite different by the two plans, so some have said. To get some data on this point we arranged a pair of scales in the separator room at the farm, on which we placed the receiving vat of the separator containing the milk of our herd night and morning. The milk was weighed, and samples taken before being allowed to run into the separator, and at the same time a composite sample was taken.

During the month of June, 18 milkings were tested in this way. The pounds of milk at each milking varied from 2.15 to 2.95 (June 12th to 21st), and the per cent. of fat in the milk varied from 3.15 to 4.30. The total pounds of milk tested during this period was 4,472, which contained an average of 3.7 per cent. fat. The composite test was also 3.7. The total pounds of fat obtained by multiplying each day's milk by the per cent. of fat was 163.55 and by the composite test 165.46. The difference is 1.91 lbs. fat on 4,472 lb. milk for 18 milkings in June. To illustrate how this difference may occur, we give the pounds of milk and daily tests for June:

—	Pounds of milk.	Percentage of fat.	Pound of fat.
June 12, p.m	274	3.40	9.31
" 13, a.m	281	3.30	9.27
" 13, p.m	270	3.80	10.26
" 14, a.m	270	3.20	8.64
" 14, p.m	254	3.50	8.89
" 15, a.m	274	3.90	10.68
" 15, p.m	266	4.30	11.44
" 16, a.m	225	4.00	9.00
" 16, p.m	242	3.60	8.71
" 17, a.m	295	3.70	10 91
" 17, p.m	194	3.90	7.56
" 18, a.m	261	3.15	8.22
" 18, p.m	221	3.85	8.50
" 19, a.m	243	3.35	8.14
" 19, p.m	215	3.90	8.38
" 20, a.m	234	3.70	7.66
" 20, p.m	222	4.20	9.32
" 21, a.m	231	3.75	8:66
Total	4,472	3.70	163.55

In July, 29 milkings (from July 9th to 27th) were tested in a similar manner. The total pounds of milk were 6,141, which tested on an average of 3.65 per cent. of fat by the daily tests. The composite test was 3.60. The pounds of milk varied from 158 to 252; the per cent. of fat varied in the different milkings from 3.0 to 4.45. The total pounds of fat as determined by daily tests was 223.54, and 221.07 by the composite test—a difference of 2.47 pounds fat on 6,161 pounds milk.

During August the tests continued from the 6th to the 30th—40 milkings in all. The pounds of milk varied from 119 to 235 and the daily test from 2.90 to 4.00 per cent. of fat. The lowest number of pounds of fat given at one milking was 4.28, and the highest 8.09. The average per cent. of fat for all the milkings was 3.51, and the composite test was 3.55. The total pounds of fat credited by testing each milking was 255.39 and by the composite test 258.90—a difference of 3.51 pounds on 7,293 pounds milk.

For September the average of daily tests was 3.75—composite test 3.80. The total pounds fat credited by testing each milking (29) was 185.36, and by composite test 188.59—difference, 3.23 pounds fat on 4,963 pounds milk.

The October experiments continued from the 6th to the 27th (39 milkings.) The pounds of fat credited by daily tests (3.55) was 342.09—composite test (3.55) 343.71—difference 1.62 on 9,682 pounds milk.

In November the tests continued from the 2nd to December 1st—(34 milkings). The pounds of milk varied from 180 to 301—The per cent. of fat from 3.4 to 4.60. The average of the tests of the separate milkings was 3.76, while the composite test was 3.75, The fat credited by testing each milking was 318.13, and by the composite test 318.82—a difference of but .69 pound fat on 8,502 pounds of milk.

Several valuable lessons may be learned from this experiment:

1. We have added proof of the correctness of the composite test, if that were necessary.

2. The pounds of fat credited to different patrons is nearly correct by adopting the composite test and multiplying this on the total pounds of milk delivered. The greatest variation from the correct amount was during August, when the difference was about 3½ pounds of fat on 7,300 pounds of milk. In October the difference was but 1.62 pound of fat in 9,582 pounds milk, and in November there was less than 1 pound difference on 8,502 pounds milk. In all the months, except July, the composite test plan gave slightly higher results in total fat than the tests made from each milking.

3. Although not one of the objects of the experiment, we may also learn the amounts of milk given morning and evening, and the percentage of fat in the milk of our herd from June to December 1st. Not all the milkings are included, nor are they all the same cows. Some cows were drying up and some were fresh, similar to what occurs in any large herd where a regular supply of milk during the year is aimed at. The results of morning and evening milkings for each month are comparable if we make allowance for the fact that about 1½ gallons of milk is sold to customers each evening. The table will best show the results:

Month.	Average pounds of milk given by the herd. a.m.	p.m.	Difference.	Average per cent. of fat in herd milk. a.m.	p.m.	Difference.
June	257	240	17	3.56	3.83	0.27
July	223	198	25	3.51	3.83	0.31
August	199	164	35	3.89	3.62	0.27
September	184	154	30	3.61	3.96	0.35
October	269	227	42	3.45	3.66	0.21
November	273	221	52	3.70	3.86	0.16

It is thus seen that the cows invariably gave most milk in the morning, which is accounted for to some extent (1) by the fact that there is a slightly longer time between the night and morning milking than between morning and night—a difference of from half to three quarters of an hour; (2) for the reason that customers get milk in the evenings. The milk, however, averaged a higher percentage of fat in the evening for the six months. In some cases, the morning milk was higher in fat percentage. That the fat varies considerably from one milking to another, is seen in the following instances:

		Percentage of fat.
July 9th......	a.m.	3.5
	p.m.	4.4
July 10th......	a.m.	3.5
	p.m.	3.9
July 13th......	a.m.	3.0
	p.m.	4.0
July 27th......	a.m.	3.35
	p.m.	4.45
August 15th ..	a.m.	3.20
	p.m.	3.90
September 11th.	a.m.	3.50
	p.m.	4.30
November 18th.	a.m.	3.70
	p.m.	4.60

We may, therefore, expect considerable variation in herd milk from day to day in both quantity and quality.

Composite Cream Tests with Oil Test Churn.

A correspondent early in the creamery season asked us if we had ever tried the composite test with cream which was to be tested with the oil test churn. As we had not done so a series of experiments were undertaken to see if this were practicable. Samples of cream were put in a jar and potassium bichromate added, to keep it from souring too much. Tests were made at the end of a week; but they were not satisfactory. Some of them gave good separation and clear readings, while others did not; but the chief difficulty was in the wide difference between the reading of the composite sample and the average of the single tests. So far this plan has not proved a success with us, and we should like some further trials before pronouncing definitely on the feasibility or failure of this method. If practicable, it would save considerable labor at the creamery.

Experiments on the Effect of Food on Milk.

On May 14th our cows were turned out to pasture. There were 19 milking at that time, and we divided them into two groups. Group I received a meal ration of 4 lb. bran, 3 lb. wheat and 1 lb. cottonseed meal, in addition to pasture, while each cow in Group II received but 1 lb. bran per day, just enough to entice them to their stalls.

For the week ending May 13th, while the cows were in the stable and receiving their regular winter ration, Group I (10 cows), gave 1,863 lb. milk, with an average of 3.84 per cent. fat. During the next three weeks, they gave a weekly average of 1,820 lb. milk and 4.21 per cent. fat. This by itself looks like an increase in per cent. of fat, which might be attributed to the meal fed; but Group II (9 cows), for the week previous to the experiment, gave 1,821 lb. milk and 3.4 of an average percentage of fat, and for the three succeeding weeks when on pasture and no meal (except 1 lb. bran each daily), their weekly average was 1,754 lb. milk and 3.85 per cent. fat. Group I gained .37 per cent. fat and Group II .45. Group I failed to the extent of 43 lb. milk and Group II, 67 lb. milk. We evidently were not paid for the meal on good pasture. As the pasture was excellent at the close of this period (June 3rd), allowing one intervening week, on June 10th all the cows were put upon a ration consisting of pasture alone, except a little bran to assist in tying the cows in the stables for milking.

The weekly record for three weeks without meal, from June 10th to July 1st, of Group I, was 1,707 lb. milk and 3.77 per cent. fat. Group II gave an average weekly record of 1,742 lb. milk and 3.54 per cent. fat. Both groups decreased in quantity and per cent. of fat in milk during this period as compared with the previous period. Group I decreased on an average for one week 113 lb. milk and .44 per cent. fat. Group II decreased 12 lb. milk and .31 per cent. fat.

From July 1st, when the pastures began to fail, to July 22nd, both groups were fed 2 lb. bran and 2 lb. wheat to each cow daily, and July 10th one pound of cottonseed meal was added to the daily ration on account of the pastures drying up. The weekly average for Group I in this period was 1,498 lb. milk and 2.82 per cent. fat. Group II gave 1,601 lb. milk and 3.56 as a weekly average. The milk from each cow was weighed night and morning and samples were also taken and tested weekly by composite test plan.

If we compare the last period where all the cows received meal, with the previous period where practically no meal was fed in addition to the pasture, we find that Group I decreased in milk flow by 209 lb. per week and there was but .05 per cent. difference in the average of the fat. Group II decreased 141 lb. milk, while the per cent. of fat remained practically the same—a difference of but .02 per cent. in the weekly average.

The data for all the experiments is conveniently summed up in the following table:

Group I.				Group II.			
Week ending	Weekly average. Pounds milk.	Weekly average. Per cent. fat.	Ration.	Week ending	Weekly average. Pounds milk.	Weekly average. Per cent. fat.	Ration.
May 13th	1,863	3.84	Ensilage, hay and meal (in stable on winter ration.)	May 13th	1,821	3.4	Winter.
June 3rd (3 weeks)...	1,820	4.21	Pasture and 4 lb. bran, 3 lb. wheat and 1 lb. cottonseed meal.	June 3rd (3 weeks ...	1,754	3.85	Pasture without meal.
July 1st (3 weeks)...	1,707	3.77	Pasture without meal.	July 1st (3 weeks)...	1,742	3.54	Pasture without meal.
July 22nd (3 weeks)...	1,498	3.82	Pasture and 2 lb. bran, 2 lb. wheat and 1 lb. cottonseed meal.	July 22nd (3 weeks)...	1,601	3.56	Pasture and 2 lb. bran, 2 lb. wheat and 1 lb. cottonseed meal.

SLOPPING COWS.

Further experiments were made in November and December to see the effect that "slopping" cows would have on quantity and quality of milk. Nine cows were used in this trial. Their record for two weeks previous to "slopping," for two weeks in which they were "slopped" once a day, and for two weeks in which "slopping" twice a day was practised, is seen below.

The meal ration at this time consisted of 2 lbs. ground wheat and 4 lbs. bran. While the cows were slopped once a day, half of this amount of meal was given dry and the other half in the form of warm slop. When slopping twice a day was followed, this quantity of meal was given at two feeds. Besides the meal, they were getting some silage and pasture during the day for a part of the time, when the weather was favorable.

Some of the cows increased in the quantity of milk and in the percentage of fat, while others decreased during the period of slopping once a day. The difference in the percentage of fat was .14 for the group in the first period and .1 in the second when compared with the dry feed period.

Name of cows.	Record for 2 weeks previous to experiment. Oct. 8 to 21.		Record for 2 weeks when "slopped" once a day.		Record for 2 weeks when "slopped" twice a day.	
	Pounds milk.	Per cent. fat.	Pounds milk.	Per cent. fat.	Pounds milk.	Per cent. fat.
Bella	389	3.50	403	3.60	327	3.55
Violet	457	3.45	444	3.50	410	3.35
Bessie	420	3.45	466	3.30	429	3.45
Pansy	451	3.20	465	3.15	448	3.10
Annie	368	4.00	427	3.90	420	3.75
Clara	468	3.55	444	3.30	401	3.20
B. Temple	249	5.75	273	5.20	283	5.65
L. Rose	260	4.75	235	4.60	222	4.80
Totals and averages	3,062	3.96	3,157	3.82	2,940	3.86

After an intervening period of one week, six of these cows—Bella, Violet, Bessie, Pansy, Annie and Clara, were given nearly all their drink in the form of slop. For the first few days the covers of the water boxes were not properly fastened down, but after this they were given all the warm slop they would drink and no water. The average of the six cows for the week beginning Nov. 19th previous to slopping was 1,110 lb. milk and 3.60 per cent. of fat. The weekly average for the two weeks on warm slop feed was 1,085 lb. milk and 3.63 per cent. of fat—a decrease in the quantity of milk by 25 pounds, while the per cent. of fat remained about the same.

In 1893, we said in the report on slopping cows—"This experiment would indicate that slopping is an expensive way to feed cows." We would say again that there does not appear to be any advantage in feeding cows wet meal, nor is there evidence to prove that this method of feeding will make the milk poorer in fat to any extent.

Experiments in the Piggery.

Two experiments were made in the piggery, one to determine the relative value of wet and dry meal fed to pigs, and the other comparing sweet milk with sour milk.

The first was with seven Berkshire grade pigs that had been bought to consume the milk from the dairy. The meal fed was middlings wet with milk (during part of one week whey was used) into a form of slop as is customary with feeders of pigs, and a few dry, whole peas were also fed. The experiment commenced on April 16th and continued three weeks. At the beginning of the experiment, the lot of seven pigs weighed 1,039 lb.—average 148 lb. each—and at the close they weighed 1,181 lb.—a gain of 142 lb. they consumed in this time 2,188 lb. skim milk, 675 lb. whey, 433 lb. middlings and 15 lb. peas.

In the second period from May 7th to May 28th the increase was 171 lb. when fed dry middlings. The drink was given separately. They ate 508 lb. dry middlings, 25 lb. peas, and drank 2,313 lb. skim milk.

Assuming that the whey is worth one quarter as much as the skim milk, the amount of liquid food in the two periods is nearly the same. During the first period 448 lb. meal (chiefly wet) produced a gain of 142 lb., while in the second (dry) it took 533 lb. meal to produce a gain of 171 lb. Wet meal produced a gain of one pound of flesh for 3.2 lb. meal and dry meal a gain of 1 lb. flesh for 3.1 lb. meal. This is practically the same amount of meal to produce a pound of gain, whether fed wet or dry. The pigs seemed to waste more meal when fed dry.

Experiment No. 2 in which sweet and sour milk were fed at the same time to grade Tamworth hogs, commenced on April 16th also. We had 11 of these pigs, which were divided into two pens, one lot fed on sweet milk and the other on sour. In the first period, from April 16th to May 7th, some whey was also fed. Pen No. 4 (6 pigs) weighed 846 lb. at beginning of experiment and 1,013 lb. at the end of 3 weeks—a gain of 167 lb. During this time they ate 400 lb. middlings, and 15 lb. peas, and drank 2,475 lb. sweet skim milk and 890 lb. whey. The other pen (No. 5, with 5 pigs) weighed 726 lb. at beginning, 917 lb. at close—a gain of 191 lb.—and consumed 370 lb. middlings, 15 lbs. peas, 2,410 lb. sour, skim and buttermilk, and 875 lb. whey.

On May 7th the pen which had been fed on sour milk, was fed on sweet milk and meal. During three weeks they gained 212 lb. They consumed 2,710 lb. sweet skim milk, 550 lb. middlings, and 35 lb. peas. The other lot, which had been getting sweet milk, were changed to sour milk during the same time, and made a gain of 247 lb. on 2,775 lb. sour skim milk and buttermilk, 580 lb. middlings, and 30 lb. peas.

Summing up the averages of both lots when fed on practically the same amount of feed for the six weeks, we have a gain of 379 lb. for the sweet milk periods and a gain of 438 lb. for the sour milk periods—a gain of 59 lb. in favor of the sour milk. This experiment would indicate that sour milk is equal to or better than sweet milk for pigs, weighing from 140 to 200 lb., as an economical producer of gain.

III. DAIRY STOCK.

We have at present 28 dairy cows, including one pure-bred Ayrshire, one Holstein, and three Jerseys. The others are grade animals, bought during the spring and fall at prices ranging from $35 to $50. We have also four Jersey calves (one bull and three heifers), and one yearling Jersey heifer, one Ayrshire bull calf, one Holstein and three grade heifer calves, eighteen pigs, and one horse.

To have some cows fresh during all seasons of the year, with the greater number calving spring and fall, is our aim at present.

Several of those bought in the spring have been sold for beef or exchanged for fresh milkers during the autumn. As stated in previous years, we do not wish to keep any cow that will not attain to our standard of 6,000 lb. milk or 250 lb. butter in a year. As has been our custom in the past, we have kept a record of the lb. milk given by each cow, together with a weekly test of butter-fat throughout the whole year.

As indicated in my last report, the greater part of our herd was lost during the winter by tuberculosis. On December 27th, 1893, most of the animals were slaughtered. All of the cattle were removed from the stable and the whole inside thoroughly white-washed twice with hot lime, and all the mangers and stalls washed first with carbolic acid water, so as to disinfect the stable.

Nine head were isolated for experimental purposes by the veterinary surgeon, on which he will no doubt report.

The loss which I felt greatest was a number of grade heifers due to calve in the spring, which had been raised from our best cows and from the dairy stock bulls. I hoped to have soon had a herd of our own rearing, but all were sacrificed and we are compelled to start again.

Record of Dairy Herd for 1894.

Owing to the fact that there have been so many changes in our herd during the past year, it is very difficult to give a satisfactory record. Of the 29 cows whose record is given, but 4 of them have been in our herd for the entire year. Some were bought late in the fall, and consequently we have their record for but a limited period. It is interesting to note that nearly all the cows average over a pound of butter per day for the record given. The cow Spot is a grade cow, showing some Ayrshire blood. Her record is nearly 9,000 lb. of milk and 370 lb. butter. The cow Bella is also a grade, showing Shorthorn blood. Her record is over 8,000 lb. of milk and over 300 lbs. butter.

The milk of each cow is weighed night and morning, and weekly composite tests made of night's and morning's milk. The highest per cent. of fat is the highest *weekly* test, and the lowest the lowest weekly test. The average is the average of all the weekly tests during the time reported.

YEARLY RECORD OF DAIRY COWS ENDING DEC. 2ND, 1894.

Name of cow.	Weight.	Calved.	Bred.	No. days milking.	Total lb. milk.	Per cent. fat. Highest.	Per cent. fat. Lowest.	Per cent. fat. Average.	Total lb. fat.	Lb. milk to 1 lb. fat.	* Total lb. butter.
Lisgar's Rose	1,078	April 12..	October 29	214	5,150	6.2	3.55	4.7	242.8	21.28	266.24
Bashful.....	1,265	May 19...	....	182	3,774	4.0	2.90	3.58	135.1	28.0	148.6
Belle Temple	900	July 18...	Dec. 24..	164	3,200	6.6	4.6	5.61	179.5	17.8	197.47
Blossom	1,220	August 23	Nov. 12..	95	2,537	3.7	3.0	3.46	87.80	28.9	96.58
Fanny......	1,190	June 29..	....	70	1,894	3.8	2.7	3.39	64.2	29.5	70.62
Violet	1,020	Sept. 8...	October 29	90	2,791	3.8	3.1	3.47	96.84	28.8	106.5
Maria	1,115	October 3.	Nov. 3 ...	59	1,486	3.8	3.2	3.49	51.86	28.6	57.04
Bessie	1,030	Sept. 30..	October 15	61	1,904	3.8	3.1	3.42	65.11	29.2	71.72
Clara.......	1,255	October 1.	Nov. 4 ...	60	1,866	3.8	3.0	3.41	63.63	29.3	70.00
Pansy	1,030	Sept. 29..	Nov. 5 ...	61	1,963	3.6	3.1	3.24	64.58	30.4	71.03
Annie	920	October 10	Nov. 2 ...	53	1,507	4.2	3.5	3.95	59.5	25.3	65.47
Birdie	1,100	October 15	....	49	1,366	4.2	3.6	3.92	53.54	25.5	58.89
Alice 1st....	....	....	....	219	5,497	3.82	3.0	3.27	189.5	28.9	208.61
Alice 2nd ...	1,105	Nov. 1 ...	....	32	811	4.9	4.3	4.75	38.52	21.05	42.37
Starlight....	1,315	October 9.	....	18	647	3.9	3.4	3.65	23 61	27.4	25.97
Lisgara......	1,171	Sept 18, '93	July 21 .	217	3,680	6.45	4.2	5.19	191.0	19.26	210.0
Margaret ...	1,484	October 26	....	217	6,249	4.2	2.95	3.61	225.59	27.7	248.14
Spot........	1,185	Feb. 1...	April 12..	312	8,849	4.4	3.3	3.80	336.2	26.3	369.88
Rebecca	1,150	March 9..	April 9...	270	7,068	6.1	3.0	3.62	255.86	27.6	281.4
Queen	1,240	March 7..	April 9...	270	6,741	4.1	2.9	3.5	235.9	28.5	259.5
Lilly	1,275	Feb. 12...	March 12.	259	5,425	4.6	3.3	3.7	200.7	27.0	220.7
Jessie.......	1,315	March 27.	May 28...	254	6,164	4.7	2.6	3.63	223.75	27.5	246.12
Bella	1,465	March 9..	April 22..	251	8,167	4.25	2.9	3.53	287.6	28.3	316 33
Carrie	1,295	October 7.	....	252	6,295	4.4	3.2	3.97	249.9	25.2	274.9
Patience	1,275	March 27.	April 27..	238	6,861	4.6	3.2	3.9	267.6	25.6	294.33
Fancy	1,080	Nov. 25..	....	154	2,728	4.72	3.5	4.0	109.1	25.0	120.0
Nancy ...	1,085	Nov. 31..	....	140	2,030	4.6	3.5	4.14	84.04	24.15	92.44
Jennie	1,140	April 1..	June 16..	245	6,733	3.7	2.7	3.14	211.41	31 8	232.55
Filpail	1,240	March 23.	April 23..	227	6,708	3.6	2.7	3.38	226.7	29.5	249.4

*Calculated by adding one-tenth to the butter-fat.

On June 7th, according to the arrangement made by you with our veterinary surgeon, Dr. Reed, about 18 cows were dehorned. Some of the animals appeared to suffer considerable pain and quite a loss of blood while others did not appear to mind it a great deal. There was little, if any, less milk on the days after dehorning, though the percentage of fat fell off to some extent. The average percentage of fat in the milk of 22 cows, most of which were dehorned, for the three days previous to dehorning was 3.9 while for the four days after dehorning it was 3.36. The average per cent. of fat of the four cows not dehorned was 4.0 for 3 days before and 4.3 for the 4 days after dehorning.

The chief feed for our cows during the winter is corn silage. We are indebted to the farm department for filling our silo, for a quantity of mangels, hay and straw, and help at various times during the year. During the summer, while the pasture was good, our cows got no meal except for experimental work. When pasture became poor we fed some corn silage and 2 lb. bran, 2 lb. ground wheat and 1 lb. cottonseed meal.

The cows are turned out to pasture May 14th.

From our limited experience with corn silage, and from the reports of dairymen who have used it during the summer, I am satisfied that this food will play an important part in the rations of cows during the summer when pasture is scarce. During August and a part of September three cows were kept in the stable and fed on soiling or green crops. Owing largely no doubt to the fact that they fretted considerably in the stable we did not find the flow of milk increase to any extent; in fact, it scarcely kept up to the normal. Animals appear to like some freedom, and we must humor the cow in some ways if we are to get the most from her.

The horn-fly pest caused a good deal of annoyance during the summer. We tried various plans, but found that a mixture of train oil and carbolic acid rubbed well into the hair once or twice a week was the most effectual remedy, in the proportion of one tablespoonful of the crude acid to a quart of the oil, rubbed lightly all over the animal with a sponge.

The Alexandra cream separator No. 3, run by tread power in the annex to the dairy stable, has been entirely satisfactory during the year. Some similar plan to this is perhaps the best method of creaming milk on a farm where ten or more good cows are kept. For full particulars of our buidling, power, etc., I would refer readers to the report of last year. We used a horse on the power most of the time, but on some occasions when the horse was not in the Ayrshire bull was put on and gave entire satisfaction. Dairymen have by this method an excellent plan of exercising the bull, and it will do him no harm—in fact, it will be good for him.

The manure shed in connection with the dairy stable has leaked more or less during the year. We have recently banked it up on the inside with dirt, and hope it may be remedied. The yard needs a coat of gravel and the buildings need eave troughs. I hope this may be done during next year.

During the month of January I bought 47 hogs to consume the skim milk from the dairy school. To accomodate these it was necessary to make temporary pens. If we can otherwise dispose of the skim milk I think it would be better, as we have not sufficient pen-room for the number of hogs needed to use all the milk. The whey from the cheese department I sold in bulk to a farmer who drew it away each day from the dairy.

We keep sufficient hogs to use the skim milk, buttermilk and whey from our own cows. In the past we have bought these, but at present we are aiming to raise them.

IV. TRAVELLING DAIRY.

It was decided this year to continue the work done by the travelling dairy, but to send only one team and one set of instructors instead of two as in former years.

As there was no available man at the beginning of the season, you decided that it would be best for me to take charge until a suitable person could be obtained. Accordingly I, with Mr. Hume, the butter-maker, proceeded on May 12th to the first meeting in Halton county, at the village of Brookville. Meetings were also held at the following places in this county: Georgetown, Milton, Nelson, Palermo, and Postulle. At all of these places great interest was manifested; especially at the Milton meeting the attendance was large and the interest good. The farmers had recently erected a cheese factory near the town, and were fully alive to the importance of the dairy question. Previously they had been engaged in private dairying and shipping milk to Toronto. I am pleased to note that several factories are likely to start in the county, no doubt, largely the result of the work done by the dairy. This is the invariable result where there are no cheese factories or creameries previous to the visit of the travelling dairy. The president, secretary and members of the Farmers' Institute did good service in advertising the meetings and in assisting to make the tour a success. I am personally indebted to them for their kind hospitality and favors shown.

In the county of Peel I was in charge at Streetsville, Huttonville, Edmonton, Cheltenham, Belfountain, Alton, Charleston, Caledon East, and Tullamore. After this, Mr. Sleightholm, a graduate of 1894, assumed the responsibility. I am pleased that he has succeeded so well. Favorable reports have been received of his good work.

During my stay in Peel it rained nearly every day, and any one who knows the character of the roads in this county can imagine that we did not have a very pleasant time travelling about. The weather, no doubt, tended to make the attendance small in some places. In spite of bad weather the gatherings were nearly all good and the discussions brisk and to the point. We found a good many Jerseys and their grades in this section. There are few factories, and most of the dairying is private or shipping milk to the city. We found a great many excellent butter makers, and we learned lessons from their experience that will be helpful to us.

The report of Mr. Sleightholm will show the extent of the work for the remainder of the season.

Whether this work will be continued or not will doubtless remain with the Honorable Minister of Agriculture to decide. On a recent visit to the county of Victoria the secretary of the institute there said that the people were anxious for the dairy another year. There are perhaps others who would wish another visit; so it seems to me that the work should be continued, with perhaps a longer stop in each place.

REPORT OF THE TRAVELLING DAIRY.

To Prof. H. H. Dean, B. S. A.

SIR,—I beg leave to present the report of the work done by the travelling dairy while it has been under my management, which time dates from June 1st to December 17th, 1894.

After a brief tutorship under yourself, I assumed full charge at Nortonville,

County of Peel,

from which place we proceeded to Hanlan, Malton, Ebenezer and Bolton, closing at the latter place the tour of that county. The meetings at these places were fairly well attended, and considerable interest was manifested in dairying throughout. At each place of meeting a lecture was given upon those topics pertaining to the making of butter on the farm, the rearing of calves, the selection and management of a dairy herd, foods, feeding of milch cows, milking, care of milk, creaming of milk, care of cream, churning of cream; washing, salting, working and packing of butter, being the chief topics discussed.

The same interest was not manifested in the work here as in some other counties we visited; due in large measure to the fact that Peel county has always been essentially a grain-producing county, the growth and sale of barley and wheat being the prime industry. Even when these commodities ceased to be so profitable as formerly, attention was directed to the raising of beef cattle for shipment to England, rather than to the dairy industry. Even yet dairying is confined chiefly to the making of butter in the private dairy, where, perhaps, six or seven cows are kept and the product sold either in the towns or villages, or taken to Toronto. In the southern part of the county, the daily delivery of milk to Toronto has reached considerable proportions. The

County of York

was next visited, and meetings were held in the following places: West Riding—Woodbridge, Weston, Islington, Thornhill and Richmond Hill; North Riding—King City, Nobleton, Schomberg, Kettleby, Yonge Street, Grange Hall, Sharon, Keswick, Sutton West, Pefferlaw, Mt. Albert, Pine Orchard, Ballantrae, Bethesda and Stouffville; East Riding—Victoria Square, Unionville, Cedar Grove, Highland Creek, Agincourt, Wexford and L'Amaroux. In all, twenty-six lectures were delivered, and twenty-six lots of cream were churned and prepared for market.

The attendance was variable throughout this county, but as a rule was not large; the average being not more than forty. One cause of the low average attendance here was, doubtless, the extreme wet weather of the month of May, which put farmers very much back with their work, and they then needed all their time to get prepared for the harvest.

It may be said of York county as of Peel, as regards the general interest taken in dairying. In the north riding, however, we had greater numbers, in some cases as many as a hundred being present. It was cause of remark that the cereal crops, the pea crop and the hay crop of this riding of York were most excellent for the season.

In the south riding we continued our meetings up to the 19th of July, after which time the work was laid aside for the harvest. Indeed, during the latter meetings the initial part of the harvest lowered the attendance considerably.

When the harvest was about housed, acting under directions from Dr. Mills, I arranged for a series of meetings in the north riding of the

County of Wentworth

as follows: Freelton, Mountsberg, Carlisle, Waterdown, Millgrove, Bullock's Corners, Rockton, Troy, Sheffield, Kirkwall and Clyde. We thus covered this section pretty well, and all who desired could attend at least one meeting and not be obliged to travel more than three or four miles.

The extreme drouth of the past summer was felt nowhere, perhaps, in Ontario more forcibly than in Wentworth county. Many of the crops were almost *nil*. The summer feeding of milch cows thus became a subject of pressing importance, and very much interest was manifested by farmers in such discussions. The

County of Brant

was our next field of work, distributed among the following places: St. George, Glenmorris, S. S. No. 11, South Dumfries, S. S. No. 13, Cainsville, S. S. No. 17, Onondaga, Newport, Mt. Pleasant, Scotland, Burford, Parley's Schoolhouse and McNaught's Schoolhouse. Owing to a failure in the appearance of the cream, and practically an empty house, no meeting was held at the last-mentioned place. At nearly all the other places the farmers turned out well, and seemed very well pleased to have a chance of discussing dairy work. As the travelling dairy had been through these counties (Wentworth and Brant) before, the people were able to speak of its usefulness as an educator on dairying, and it was a pleasing thing to hear the expressions favorable to this itinerant institution. At almost every meeting one or more voiced the thought expressed by a lady: "The character of the butter in this section has wonderfully improved since the travelling dairy was around before."

The County of Kent

was our next field of labor. In this county we visited the Town Hall (Gore), Croton, Highgate, Botany, English's Schoolhouse, Bridge End Hall, Ebert's, Richmond's Schoolhouse, Dover Centre, Mitchell's Bay, Paincourt, Crowe's Schoolhouse, Chatham Exhibition, Union Hall (Raleigh), Town Hall (Raleigh), Pardo's Schoolhouse, Merlin, Valetta, Quinn's Schoolhouse, Tilbury Centre, and Romney Town Hall. Dairying has not received very much attention in any form in this and the sister county, Essex. Nevertheless we had fairly well attended meetings as a rule. Credit is due the president and secretary of the Farmers' Institute of the two ridings of Kent for the energetic way in which they furthered the work of the travelling dairy. Here and there we met those who manifested an intense interest in the work, driving eight or ten miles or more to attend meetings.

County of Essex.

Meetings were advertised in Essex County as follows: Comber Fall Fair, Wheatley, Harrow Fall Fair, Patron Hall (Anderdon), North Ridge, Ruthven, Canard, Shuel Settlement, Hurst Settlement, Tecumseh, Ruscom and Belle River. A meeting was also advertised for Pelee Island, but as the boat did not leave the mainland until the afternoon, it was not possible for us to fill this engagement. As no preparation was made at Comber for our work on the fair ground, this also was a vacancy. With these exceptions the meetings in Essex may be considered as very successful. Much discussion was raised in these two counties upon the raising of cream by deep can setting, in comparison with the shallow pan system. The trouble experienced lies in the water of these sections, which is generally quite warm during the summer, and therefore unfit to give a good separation of cream from deep cans, and from the fact that the cellars are, in many cases, quite unsuitable for separating the cream in good condition by the shallow pan method.

The conclusion generally arrived at was that a liberal supply of ice was the only satisfactory solution of the difficulty. Strange as it may seem, while these are essentially corn-growing counties, there is very little green corn or silage used to feed dairy stock. In many sections of these counties the prevalence of weeds, we think, effectually hinders the production of high-class milk, cream or butter.

Leaving Essex, we crossed Kent and commenced a very satisfactory tour of

Elgin and Norfolk.

Mahon's Schoolhouse, West Lorne, Wallacetown, Campbellton, Cowal, Iona Station, Fingal and Lawrence Station were visited in the West Riding, and the Grange Hall (Yarmouth), Mapleton, Lyons, Springfield, Summer's Corners, Orwell, Sparta, Copenhagen, Calton and Straffordville, in the east riding. From Straffordville, where one of the most successful meetings of the season was held, we entered Norfolk county, lecturing at Courtland, Delhi, Teeterville, Waterford, Bealton, Rockford, and School Section No. 4 (Townsend) in the north riding, and at the Grange Hall (Woodhouse township), Port Dover, Vittoria, Walsh, St. Williams, Clear Creek, Fair Ground, Langton and Silver Hill in the south riding, the meeting at the latter place being the closing one for the year, after a travel of over twelve hundred miles.

The farmers of Elgin and Norfolk turned out *en masse* to the meetings of the travelling dairy, and the most intense interest was manifested. The feeding of turnips to milch cows was a much debated question at many of the meetings, and strenuous differences of opinion prevailed. The usefulness or otherwise of turnip tops was also discussed. I think it correct to state that the prevailing opinion among the best farmers and dairymen was, that these foods were better left out of milch cow rations, and that green corn and ensilage, mangels, carrots and sugar beets were quite as good and without the objectionable flavor. The advisability of using the Babcock milk tester as a basis for the payment of milk delivered at cheese factories was frequently and very vigorously discussed. Generally speaking the farmers were not in favor of it, but a desire for a clearer understanding of the question was evidenced.

I find, on making a résumè of the summer's work, that there are many things to cause satisfaction to the promoters of the travelling dairy. Attention has been directed, forcefully, to the need of the closer selection of dairy stock, and to the necessity of having a standard for milk and butter production; to the need of a better system of summer feeding and management; to the basic principles underlying the handling of milk and the care of cream, that will result, as they have already resulted, in much benefit to the industry. A great many people have admired the system of working butter as practised by the travelling dairy. Many have taken the measure of the lever worker, and intend to make or buy one. The testing of several hundred samples of milk, skimmilk and buttermilk, and a consideration of the uses of the Babcock milk tester have created a keener interest in these matters. We have met with several farmers who use cream separators, and all speak well of them. But space forbids further comment. There can, however, be no room for doubt that Ontario's Minister of Agriculture has just right to feel proud of this itinerant child of his brain, the travelling dairy.

My assistant, Mr. N. J. Hume, has attended to his work in a creditable manner.

I desire, in closing this report, to recognize, with thanks, the valuable advice and assistance which I have received both from Dr. Mills and from yourself in connection with my work as lecturer and manager of the travelling dairy.

Very obediently yours,

F. J. SLEIGHTHOLM.

V. MISCELLANEOUS.

IMPROVEMENTS. In the spring, under your direction, the drives, yards and lawn about the dairy buildings were improved a great deal. Considerable grading was done so as to make the yards and drives level, while the plots in front of the buildings were seeded. New walks were laid where needed, and in the autumn a nice, wide, gravel road was made leading to and around the dairy. The yards of the piggery which had become unfit for use owing to the mire, were laid with cement and gravel. I hope that the experiment may prove successful. A neat wire fence enclosing a yard for the cows was a much needed improvement. Our improvements have kept pace with the rapid advances and needs of the dairy industry. Visitors to the south side of the Brock road will be agreeably surprised to see the change from the old piggery, ricketty sheds, and small barn, to the modern buildings and neat drives and walks of the present day. Nearly all of this has been due to your efforts and to the liberal grants of the Legislature through the efforts of the Honorable Minister of Agriculture for this purpose.

EXCURSIONS. During the summer we have had rather more than the usual number of visitors. On each day of an excursion we prepared a churning, tested milk, ran the cream separator by hand and tread power, sometimes made cheese, and endeavored by lectures and practical work to entertain and instruct visitors. All seemed well pleased with our efforts, and I trust that some good was accomplished.

SPECIAL DAIRY MEETINGS. In addition to my regular work of the College, I attended meetings and gave addresses on dairy topics at the following places, besides taking charge of the travelling dairy from May 12th to June 1st as per the report under that heading: Hornby, Streetsville, Peterboro' (Eastern Dairymen's Association), Belleville (Creameries' Association), Ingersoll (Western Dairymen's Associatien), Noval, Huttonville, Dunnville, Wingham, Dungannon, Freelton, Pinedale, Greenbank, Uxbridge, Huntingdon, P. Q., (Huntingdon Dairy Association), Innerkip, Arkell, Bloomingdale, Ancaster, Brampton, Bond Head, Gormley, Listowel, Bridge End, Brantford, Peterboro', Fraserville, and Bobcaygeon.

For reports of addresses given at the dairy associations, I would refer you to their report published by the Department of Agriculture. There have been numerous requests to attend meetings in various other places, which I was unable to comply with owing to other work.

DAIRY TEST AT TORONTO. At the request of the Holstein Breeders' Association and the exhibition authorities, I took charge of the two day dairy test at the Industrial Exhibition, at Toronto, September 10th and 11th. Eleven cows entered, all Holsteins except one (a Jersey), which dropped out owing to sickness after the first day. The prizes were for the cows giving the largest number of pounds of solids in two days, to be determined by the Bobcock tester and lactometer. The first prize cow gave 130 lb. milk in two days, which tested 2.45 per cent. fat and contained 14.42 lb. solids in the two days. She was owned by Messrs. A. & G. Rice, Currie's Crossing, near Woodstock, Oxford County. The second cow was also owned by this firm and gave 98.25 lb. milk, containing 2.2 per cent. fat and 10.9 lb total solids in two days.

The third prize cow, owned by G. W. Clemons, St. George, Ont., gave 64.5 lb. milk, 3.6 per cent. fat, and 7.94 lb. total solids in the two days.

Though no fourth prize was given, yet a cow owned by the Ellis Bros., Toronto, was so near third place, I give her test—68.75 lb. milk, 2.4 per cent. fat, 7.84 lb. total solids in the two days.

The first two cows were milked three times a day—5 a.m., 12.30 p.m., and 8.30 p.m. All the cows were milked out clean the evening previous to the test; and daily composite tests were made.

TESTING APPARATUS AND DAIRY SUPPLIES. We receive a great many requests from manufacturers, agents, etc., to try various new things which are being brought before the public from time to time. So far as our time and means will permit we are willing to make these tests and give the parties the results. We have never made a practice of publishing the results, unless they are a fraud on the public, (and these seldom ask us for a test), for reasons which I need not mention. To give an idea of the things sent us on trial, I submit a partial list:

Pneumatic churn, several aerators, brands of rennet, cheese and butter color, brands of salt, milk testers, preservers of milk, foods, cow ties, udder protectors, etc.

CORRESPONDENCE. This has become quite heavy, having increased a great deal during the past two years. Letters come to the Department making inquiries about the various phases of dairy work, some of which take considerable time to answer. The writing of these together with the copying, etc., takes a considerable part of the time at my disposal while at the college.

THURSTON'S PURE MILK BUTTER PROCESS.

We have had an opportunity to see this so-called process tried recently, and have no hesitation in saying that it is a fraud on the public, unless there is something else besides the directions for manufacturing sent out with the "license."

A prominent farmer and dairyman near Guelph who tried it, also pronounces it a "fake." I repeat what was said to the farmers and dairymen of last year: "*Do not invest your money in anything of this nature, unless the parties are able to produce satisfactory evidence that what is being sold has been tried and proved successful by either the Dominion Experimental Farm, or by our own farm at Guelph, which have better opportunities to test these things than the ordinary dairyman.*"

REPORT OF SPECIAL DAIRY SCHOOL COMMITTEES.

These reports have been prepared by Committees of the Special Dairy School, 1894, at the Ontario Agricultural College. They were issued as Bulletin XCIII. The committees are:

MILK-TESTING.—L. A. Zufelt, Chesterville, Ont., Instructor in Milk-Testing; T. B. Millar, London, Ont., Assistant Instructor in Cheese-Making; Wm. Campbell, Cannamore, Ont.; Miss G. E. Peacock, Mt. Salem, Ont.

SEPARATOR CREAMERIES.—M. Sprague, Ameliasburg, Ont., Instructor in Butter-Making; H. L. Beckett, B.S.A., Hamilton, Ont., Assistant Instructor Separators; J. McTavish, Seaforth, Ont., Assistant Instructor Butter-Making.

CREAM GATHERING CREAMERIES.—M. Sprague, Ameliasburg, Ont.; T. C. Rogers, O. A. C., Guelph, Instructor in Home Dairy; L. McCallum, O. A. C., Guelph.

SPRING CHEESE.—A. T. Bell, Tavistock, Ont., Instructor in Cheese-Making; J. F. Millar, Burgoyne, Ont.; S. R. Lee, Hickson, Ont.

SUMMER CHEESE.—T. B. Millar, London, Ont.; James Poole, Waba, Ont.; E. A. Bell, Crown Hill, Ont.

FALL CHEESE.—A. T. Bell, Tavistock, Ont.; W. A. Edgar, Brussels, Ont.; J. T. Hill, Napanee, Ont.

MILK-TESTING.

The term milk-testing, up to a few years ago, simply meant the detection of adulterations in milk. Now, however, it means a little more, viz., the comparative valuing of the different milks delivered, either to a cheese factory or creamery. We may, therefore, divide the work into two parts—first, the detection of adulterations in milk and second, paying for milk according to quality, or, as it is commonly called, the test plan.

Detection of Adulterations in Milk.

The most usual adulterations of milk are the addition of water and removal of cream Those factorymen who pay for milk according to quality need have no fear of either of these, as the system makes it the interest of every man to supply as rich milk as possible. but as there are many factories that still do business on the pooling system, it is thought, advisable to describe the methods by which said frauds may be detected.

The first step to be taken is to find out the specific gravity of the milk. This is done by means of the Quevenne lactometer, which has a scale corresponding to the Sp. G. (specific gravity) of milk. The graduated scale from 15 to 40 being equivalent to Sp. G. of 1.015 to 1.040; thus a milk which has a Sp. G. of 1.032 would show on the lactometer a reading of 32. These lactometers are made to give the Sp. G. at a temperature of 60° F., and as it is not always convenient to have the temperature of the milk at 60° when the reading is taken, corrections may be made for slight variations (not more than 10°) by adding to the L. (lactometer) reading .1 ($\frac{1}{10}$) for each degree of temperature above 60°, or subtracting .1 for each degree below 60°. For example, the L. reading is 29, and the temperature 68°; then the correct reading or Sp. G. for 60° would be $29 + .8 = 29.8$. Had the temperature been 56°, the correct reading would be $29 - .4 = 28.6$.

The average composition of milk is as follows:

Water, 87 to 88 per cent.

Fat (F.), 3.0 per cent. and upwards.

Solids not fat (S. N. F.), 8.5 to 9.5 per cent.

The Sp. G. or L. reading of pure milk ranges from 28 to 34, skimmed milk 33 to 36.

The next step to be taken is to find out the per cent. of fat. This we do by means of the Babcock tester. Then having obtained the per cent. of fat and the Sp. G., the per cent. of S. N. F. (solids not fat) may be obtained by the following formula:

$$\frac{L + F.}{4} = \text{per cent. of solids not fat.}$$

L = Lactometer reading or specific gravity at 60°.

F = Per cent. of fat.

To find the extent to which a known sample of milk has been watered, multiply the per cent. S. N. F. in the adulterated sample by 100 and divide by the per cent. S. N. F. in the pure sample. The result will be the number of pounds of pure milk in 100 pounds of the sample examined, and the remainder will be the number of pounds of water. Pure milk contains not less than 8.5 per cent. S. N. F., and often as high as 9 and $9\frac{1}{2}$ per cent., and where it is not possible to get a sample of the pure milk for testing, use 8.5 as a standard for the first half of the season and gradually increase to 9 as the season advances, say beginning to use 9 the 1st of September. To make the foregoing more plain, take the following example:

L. reading 28, tem. 54°, per cent. fat 2.6, and, suppose the pure milk to test 9 per cent. S. N. F. Required to find the per cent. of water added. The correct L. reading is $28 - .6 = 27.6$, then substituting for formula we get:

$$\frac{27.4 + 2.6}{4} = \frac{30.0}{4} = 7.5 \text{ per cent. S. N. F.}$$

$$\text{then } \frac{7.5 \times 100}{9 \text{ (per cent. S. N. F. in pure milk)}} = \frac{750}{9} = 83.\dot{3} \left.\begin{matrix}\text{per cent.}\\ \text{pure milk.}\end{matrix}\right\}$$

Then $100 - 83.\dot{3} = 16.6$ per cent. water in the adulterated sample.

Points to be Observed.

1. Always mix milk well before taking the lact. reading. Do this in such a manner as not to make it froth or foam.

2. If it is desired to change the temperature of the milk, do so in such a way that it will be uniform throughout.

3. Always let milk stand an hour after being drawn from the cow before testing with the lactometer, as it is saturated with air and has not reached its maximum density.

4. When the L. reading is high (33 and upwards) and the per cent. of fat low (below 3 per cent.) it is an indication of skimming.

5. When the L. reading is low (below 28) and the per cent. of fat low, it indicates watering.

6. When the L. reading is normal and the per cent. of fat *very* low, it indicates both skimming and watering.

Notes on Handling the Babcock Tester.

1. See that bottles are properly graduated. This may be done by filling up to the 0 mark with water of the same temperature as the room, after which carefully wipe out the neck with filter paper. Then put in 2 c.c. of water with a 2 c.c. pipette, which should fill the neck up to the 10 per cent. mark. If the variation is more than .2 per cent. the bottle is not incorrect and should be discarded. Another very good way, and perhaps the most practical, is to test one quality of milk with all the bottles, and compare the readings, keeping only those bottles which give the same results.

2. Have bottles numbered.

3. Determine strength of acid. This may be done by using different quantities and thus find out which gives the best result.

4. Be sure and get a representative sample of milk in the bottle, by thoroughly mixing before measuring with the pipette.

5. Be sure and get the correct amount (17.6 c.c.) in the bottle by blowing all the milk out of the pipette into the bottle.

6. Pour in the acid so that it will run down the side of the bottle under the milk, and not directly through it, otherwise you will be likely to have charred portions of casein and milk-sugar mixed with the fat.

7. Thoroughly mix acid and milk by giving the bottles a rotary motion, seeing that no portion of the milk enters the neck of the bottle.

8. Place immediately in the machine and revolve for four minutes at the rate of from seven to twelve hundred revolutions per minute, according to the size of the machine.

9. Then add water at a temperature of not less than 130°, being careful not to fill above the 10 per cent. mark.

10. Revolve again for one or two minutes.

11. Place bottles at once in a hot water bath, after which read carefully from highest to lowest limits of fat, holding the bottle in a perpendicular position and the fat on a level with the eye.

12. Empty bottles directly after reading and rinse out twice thoroughly with hot water, using when necessary a little sal soda in the first water.

13. Always keep bottles *clean*.

14. The warmer the milk the less acid is required, and *vice versa*; consequently in the fall of the year it is advisable to warm the milk to about 70° by placing test bottles in a pan of hot water, or else use more acid.

15. Always keep bottles warm.

16. Dark, cloudy readings are caused either by using too much acid, milk at too high a temperature or acid not being properly added. If butter-fat is of a light color with particles of a curdy matter mixed with it, it indicates either not enough acid has been used, or milk has been too cold, or milk and acid have not been thoroughly mixed.

17. Be careful and exact from beginning to end if you wish to be successful.

Paying for Milk According to Quality.

This system assumes that the relative values of all milks that are pooled together for either butter or cheese, are in direct proportion to the amount of fat which each contains. The method is applied by dividing the net proceeds among the patrons in proportion to the total amount of fat which the milk supplied by each contains. To illustrate take the following example:—A., B., C., D., represent the patrons of a factory. The amount of milk which each supplied and also the quality being as follows:

A. 1,000 lb. testing..........................3.7 per cent. fat.
B. 2,000 " ....3.5 "
C. 3,000 " ....3.8 "
D. 4,000 " ....4.0 "

From this milk was manufactured 1,000 lb. cheese which sold for 10c. per lb., and the cost of manufacturing being 1½c. lb. Required to find the amount of money each should receive, the butter-fat as explained below, being worth 22.31c. per lb.

The total lb. of fat in each patron's milk is found by multiplying the number of lb. of milk by the per cent. of fat and dividing by 100, as per cent. simply means, so much in 100. The total amount of cheese made was 1,000 lb. which sold for 10c. and cost of manufacture was 1½c.; this would leave 1,000x(10—1½) or 1,000x8½=$85.00 to be divided. Now divide this amount by the total number of pounds of fat, which is 381, and we will get the price for one pound which is $\$\frac{85.00}{381}$=22.31 cts. Then by multiplying the number of lb. of fat which each patron supplied by 22.31 cts. we will get the amount of money which each should receive.

Name of patron.	Lb. of milk.	Per cent. fat.	Total lb. fat.	Price per lb.	Amount which each should receive.
				cts.	$ c.
A	1,000	3.7	37	22.31	8 25
B	2,000	3.5	70	22.31	15 62
C	3,000	3.8	114	22.31	25 43
D	4,000	4.0	160	22.31	35 70
Total..........	....	....	381	....	85 00

Again, supposing the milk had been made into butter and the yield was 425 lb., which sold for 24c. and cost of manufacturing was 4c. lb. we would then have 425x20c. =$85.00 to be divided among the patrons or the price per lb. of fat would be 22.31 cts., the same as in the previous example, and the amount which each would receive would be the same as before.

The Composite Test.

As it is impossible in large factories to make a test of each patron's milk every day without a great deal of extra expense and labor, the best method to pursue is that of composite sampling. This is done by taking a sample of each patron's milk each morning, say 1 ounce, and put in a glass jar or sealer along with about 5 or 10 grains (or about what will lie on a 10-cent piece) of bichromate of potash. This quantity is sufficient to keep the milk in a perfectly liquid condition for one or two weeks, at the end of which time the test can be made in the usual way, care being taken however, to have the cream and milk thoroughly mixed before taking the sample with the pipette. The result will be the average per cent. of fat in all the milk supplied by each patron up to the time of making the test. Then to find the amount of fat which each delivered, multiply the total amount of milk sent, by the per cent. of fat and proceed as in the example given above.

In this way tests can be made once every one, two, three or four weeks with equally good results, as samples have been kept for two months and longer, which tested as well as when kept only one week, but where convenient, testing every two weeks would perhaps give better satisfaction to the patrons.

Observe Carefully the Following Points.

1. Get a fair representative sample of milk each morning.
2. Shake the sealer or jar with a rotary motion each time a new sample is put in, being careful not to churn the milk.
3. If samples are kept for three or four weeks, use a correspondingly larger quantity of the bichromate.
4. If cream should gather on the samples and become thick so as not to readily mix with the milk, before testing, stand the jars in warm water for a few minutes, shaking frequently, when the cream will quickly dissolve again.

THE SEPARATOR CREAMERY.

In the creamery, as in the private dairy, the first and most important requisite to success is cleanliness.

As it is impossible to turn out a good finished article without good material to work upon, no milk should be accepted but that of good quality and free from any objectionable odor or taint. It is important that milk should be aerated as soon as drawn from the cow, care being taken to see that the air is pure. It should also be protected from rain; rain water in milk makes it impossible to secure a good quality of butter. Milk from healthy cows only, fed on wholesome food and having access to pure water, should be accepted by the butter-maker. The pastures, yards and lanes should at all times be kept free from carrion and all decaying matter.

The milking should always be done with dry hands and in a cleanly manner, the udder being well brushed or wiped with a damp cloth. All vessels, pails, etc., should be of tin, and should be thoroughly scalded each day. Wooden pails should never be used. The butter-maker should at once reject any milk that is found to contain any bad odor, or any that is delivered in cans not properly cleaned and scalded. It is well to accompany the rejected milk with a notice as to its defect, and also, if possible, with the remedy.

After strictly enforcing the foregoing, the butter-maker should keep the factory in the best possible condition, as an example to those of his patrons who may visit him.

In order to keep the separator in good running condition, all oil must be kept wiped off, and the bearings kept free from any water, dirt or grit. Keep all parts with which the milk comes in contact thoroughly clean and well scalded every day.

The temperature of the milk to be separated should be from 80° to 85°, not allowing it to go higher, as the cost in time and ice in cooling is increased, and the quality of the product is likely to be injured.

The cream should be cooled as soon as possible after separation to about 45° or 50°, and held at that temperature until about eighteen hours before churning, then warmed to about 60°, or churning temperature. If the cream should not ripen sufficiently, add enough starter to give the cream a sharp, acid taste, and glassy appearance on the surface. About two per cent. of starter will usually be sufficient.

To prepare the starter, take fresh skim milk that is known to be free from any odor or taint and warm it to 90°, keeping it at that temperature for twenty-four hours, when it will be ready for use. It should be kept excluded from the air as much as possible, more especially if the air be at all impure. Use a small amount—about one per cent.—of the starter already made to stimulate the development of the next day's starter. This may be omitted on Saturdays, as the length of time over Sunday will give sufficient development of lactic acid, and the starter will be entirely fresh each week.

We favor cooling the cream to a low temperature immediately after separation, and ripening it in a few hours, using starter when the season and condition of the milk requires it, for the following reasons :

1. The solids in cream other than fat are subject to rapid decomposition.
2. This decomposition is not favorable to the keeping quality of whatever it affects.
3. Butter always contains a proportion of solid matter that is not fat, and the less this has advanced towards decomposition the better the flavor of the butter, and the longer will this flavor be retained.
4. This decomposition in cream is very rapid at a high temperature, while at a low temperature it is retarded.

Churning.

See that the churn is well cleaned inside, with a brush, at least once a week in cold and twice a week in hot weather, and scalded each day before and after using. Cool it before putting in the cream, which should always be strained into the churn.

Thick cream churns easier than that which is thinner; but to get the best results it should contain from 25 to 30 per cent. butter-fat. If for any reason it should be thicker than this, it should be diluted with pure water or skim milk of the proper temperature. Churn at as low a temperature as is possible to get butter in from thirty-five to seventy minutes. To warm or cool cream, do so by putting warm or cold water or ice around the vat or vessel containing it, and stir it frequently. Never put hot water, steam or ice directly into the cream, as this tends to injure the grain of the butter, and causes in too many instances white streaks and poor flavor.

When necessary to use color, add sufficient to make the butter as nearly as possible the color of that made in June. Always add the color before starting the churn. About one-half ounce per thousand pounds of milk in winter will usually be found sufficient, gradually increasing to that amount in the fall, and lessening towards spring.

As soon as the cream breaks, or at the first signs of butter, add enough cold water to lower the contents of the churn 2° or 3°, and continue to churn until the butter granules are the size of wheat grains. Allow the churn to rest in a position to draw off the buttermilk for four or five minutes, that the particles may all arise to the top. Then draw off the buttermilk, straining it to prevent any loss of butter. Add at least as much water as there was buttermilk, at a temperature of 50° or 52° in winter, and 45°, as nearly as possible, in summer. Revolve the churn as fast as possible for about two minutes, then draw off the water, straining as in the case of the buttermilk. Then add the second water—about the same quantity as for the first water—at 56° to 58° in winter and 52° to 58° in summer, and repeat as before. If for any reason the second water does not come off clear, or nearly so, repeat the washing until it does.

Allow the contents of the churn to drain well; then take the butter out carefully, using a wooden spade, care being taken to keep it in a granular form. Weigh, and place the butter on the worker, adding salt sufficient to suit the taste of the customer. From three-fourths to one ounce of salt to one pound of butter will usually be found sufficient.

Work carefully and evenly, avoiding any rubbing or friction, until the salt is evenly distributed and excessive moisture is expelled. From seven to eight times over will usually be sufficient. Turning inwards and outwards, then doubling, is meant to be once over on the power worker. Then pack in tub. If for prints, about five or six times over will be sufficient working.

To prepare ash or spruce tubs for use, they should be pickled in hot brine for twenty-four hours or steamed over a steam jet for thirty minutes. Tin-lined tubs should be thoroughly scalded and cooled before using. Remove any resin or specks on the tin. Put the butter in the tub in small quantities, pounding it thoroughly around the edges with a suitable pounder, keeping the surface of the butter level. The tubs should be filled to within one-half an inch from the top, leaving the surface slightly crowning. Cover with parchment paper or butter cloth, or, what is better, with both. This should be covered with a salt paste, made by putting salt in cold water. The tubs should be filled until the salt is level with the top of the tub. Lining the tub with parchment paper before putting in the butter will be found to give good results.

The temperature of the storage room should not be higher than 56°, and as much lower as it can be kept uniform.

THE CREAM GATHERING CREAMERIES.

In order to attain a good reputation for our butter made in cream gathering creameries, the patrons who supply the cream should take a lively interest in supplying it sweet, clean and of pure flavor. To do this, cleanliness must be the watchword. All pails and other utensils should be thoroughly washed and then scalded, after which they should be placed outside in a pure atmosphere to become well aired. Never use a cloth for drying any of the tinware after scalding them.

The milk rooms should be kept cool, clean and with no bad odors.

Strain and set the milk immediately after milking, in water at a temperature of not more than 45 degrees in the summer and 38 to 40 degrees in the fall and winter for at least 12 hours in summer and 24 hours in winter. Every farmer who handles milk should use a thermometer, so that he may know that the milk has been cooled to the temperatures named above, as the loss of cream or butter-fat is very great when the milk has been cooled to but 50 degrees. To have profitable returns from the handling of milk for a creamery, the patrons should provide plenty of ice and have it stored in a convenient place near the milk room. The water in the tank should be changed frequently, and care should be taken to prevent any milk getting with it and allowing it to become tainted from this or any other cause. If care and good judgment is exercised much unnecessary trouble and labor can be avoided. It is not necessary to change the water more than once every second day where good, clean ice is used. Where the skim milk is not drawn off from the can at the bottom, a skimmer made $4\frac{1}{2}$ inches in diameter at the top, without any wire around the edge and tapering to a point 7 inches deep, with a handle 10 to 12 inches long, will be found very convenient for skimming the cream from the top of the can. If the skim milk is drawn from the bottom of the can, a strip of glass should be soldered from the bottom upwards, so that the cream can be seen when it reaches the bottom. Tip the can a little so as to allow all the skim milk to run out without taking any of the cream. We would suggest having a bottom with three inches slant to carry off all sediment that may be at the bottom along with the first skim milk. But for general use we would recommend skimming from the top, as there will be less sediment in the cream. Where the cream has been forced up in twelve hours there will be more inches of cream than if the same milk was allowed to set for twenty-four hours, but the yield of butter will be about the same per hundred pounds of milk. Where the temperature of the milk cannot be lowered to 45 degrees, we would recommend setting the milk for 25 hours. The per cent. of butter-fat in the cream depends on the amount of skim milk in the cream. The depth or inches of cream on the top of the can depends on the per cent. of fat in the milk and the temperature to which the milk has been cooled. There will be more cream on milk containing 4 per cent. butter-fat than on milk containing 3 per cent. There will be more on milk cooled to 42 degrees than on the same milk cooled to 50 degrees.

As an educator for dairy farmers we know of nothing equal to the Babcock milk tester, which is simple and easy to operate, and would strongly recommend all dairy farmers to have, in some way, their individual cow's milk tested also the skim milk) as we know there are a large number of unprofitable cows fed and kept which should be disposed of. Each cow should give at least 6,000 lb. milk, which should make about 250 lb. butter per year. The skim milk should be tested that the farmer may know whether he is getting all the cream out of the milk. We have frequently tested skim milk from farmers, showing from 1 to over $1\frac{1}{2}$ per cent of butter-fat, which means a loss of about 25 per cent. of all the butter-fat in the milk, or in other words a loss of from 20 to 25 cents per hundred pounds of milk. No expensive creamer is necessary to get all the cream out of the milk, so long as you can maintain the proper temperature, as it is the temperature of the water about the milk which does the work, and not the creamer into which the cans or pails of milk are placed. Any ordinary box or barrel which is clean and will hold water, will do the work as efficiently as the most expensive creamer made.

Where shallow pan cream is taken to a creamery the milk should be set in a clean cool room at a temperature of 60 degrees and lower, for 24 hours, but no longer, as all the cream will be up in that time and of a better quality than if allowed to remain longer—as the cream being exposed to the air in warm weather becomes thick and tough and will not run through the strainer at the creamery, which means a loss to the other patrons who supply good cream. Such cream should be rejected, as it is better to lose one patron than ruin the reputation of the creamery, as it is difficult to make good flavored butter from shallow pan cream because there are very few milk rooms throughout the country which are fit to set milk in. Good flavor is the most important point about butter. Buyers look for flavor first. If the flavor is bad, down goes the price. We would recommend for creameries that all milk should be submerged in the water to protect it from any foul odors that may be about the dairy.

(Some of our best creameries refuse to take shallow pan cream at all. This, no doubt, is the safest plan.)

Where cold water or ice cannot be got we would recommend for a herd of from 15 to 20 cows a cream separator. These separators usually leave about one-tenth of one per cent. of butter-fat in the skim milk, while milk from the deep setting when cooled to only 50° usually has about one per cent. But if the same milk had been cooled to 42° or 45° the loss of fat would be but from one to three-tenths of one per cent.

Care of Cream.

After the milk has been carefully skimmed the cream should be submerged in water in a can specially made for the purpose, keeping the temperature somewhat below 50°, stirring well each time fresh cream is added. If the cream is cared for in this way there will be no complaints about sour cream, and the patron will have done his duty in supplying the butter-maker with the raw material in prime condition to make gilt edge butter. Cream should not be set in open crocks or pails in cellars, pantries or any other place where the air is not perfectly pure, nor where the temperature is above 60°, as it is sure to sour and may be in churning condition before taken to the creamery. When the cream vessel is emptied, it should be well washed and scalded, and placed where it will get plenty of fresh air. All cream vessels should have an air-tight cover, and we would recommend having the seams in all milk vessels well filled with solder, which, if not filled, an accumulation of dirt having a yellow color which will taint the milk will be seen.

The Cream Gatherer.

He should be clean, courteous, obliging and honest. He should keep the cream cans or tank thoroughly clean and in the best possible condition for the reception of the cream, and should allow the cans or tank to get all the fresh air at night possible. The wagon should be kept clean. The managers of the creamery should see that this as well as many other things of like importance are attended to.

The collector should be very careful about the measurement and mixing of the cream before the samples are taken, as carelessness on his part may cause a shortage of butter and an unjust division of the proceeds. The cream should be stirred carefully after it is poured into the measuring pail, so as to make it uniform before the sample is taken for testing. Measure carefully and give the patron credit for the full number of inches. Give a statement of all cream received from each patron and the date to the person in charge of the creamery.

The manager of the creamery should take steps to have the cream delivered at a temperature not above 60°. To do this tanks or cans should be provided with dead air spaces around the cream so as to protect it from the heat, and the wagon should be covered to protect the tank or cans from the sun. If the patrons will do as directed in the care of the cream it can be delivered much cooler than is usually done, and a superior quality of butter can be made. The cream should be strained through a perforated tin bottom strainer into the vat, also from the vat into the churn. After the cream is in the vat, take the temperature and also ascertain if it is turning sour. If the cream is sour cool at once to 56° or 58°. Sweet cream should be set at 60° to 61° over night in warm weather and from 62° to 63° in cold weather. As a rule cream is delivered through the summer at too high a temperature, and generally it is soured more or less, and it is always safe to cool down to about 56° within an hour after it is delivered into the vat and held at that temperature over night. These temperatures are given only as a guide, and the butter-maker should bear in mind that the lower the temperature the cream is ripened at, so long as the desired amount of acidity is attained, the firmer will be the texture of the butter, if the churning temperature is right. Ripening cream and churning cream at a high temperature should be avoided, as the butter will have a soft texture or body. A good supply of ice should be stored for use in warm weather to cool the cream by breaking it up fine and putting in the water around the vat. Never put ice directly into the cream in the vat or churn.

(For churning see "Separator" portion of Bulletin.)

Oil Test Churn.

1. See that representative samples are taken and that test tubes are not over half full.
2. Place in water at a temperature of 70° over night to ensure a perfect ripening of the cream.
3. Churn at a temperature of from 75° to 80°.
4. After a thorough separation of the butter, place in water at a temperature of not less than 170° for at least 20 minutes.
5. Cool again to 70° or 75°, churn and reheat, after which the readings may be taken. Readings should be made carefully and the test recorded for each patron.
6. If the separation of butter oil is not perfect, cool, churn and reheat again.

SPRING CHEESE.

The cheese-maker who is desirous that his cheese shall be of the finest quality will accept nothing but good, pure milk. All tainted or sour milk and the first milkings (colostrum) should be refused.

Heat the milk to 86° Fahr. The rennet test should then be used to ascertain the degree of ripeness. To make this test take 8 oz. milk from the vat, add to it one drachm of rennet, stir rapidly ten seconds, and if coagulation takes place in from 17 to 20 seconds the milk is sufficiently matured for the addition of the rennet. A slight variation from this may be necessary to suit different localities, but a few trials will enable the maker to tell when the milk is properly ripened. A very simple way to tell the exact moment when coagulation takes place is to drop a bit of burnt match into the milk. It assumes a rotary motion when the milk is stirred. Then count the number of seconds from the addition of the rennet until the stick ceases to move. This gives you the exact time required for the milk to coagulate.

Ripen the milk to that condition that all the whey may be run off in $2\frac{1}{2}$ hours after setting, and the curd showing $\frac{1}{8}$ inch acid after dipping. Great care and watchfulness should be exercised at this season, as acid develops very rapidly during the early period of lactation.

Use sufficient rennet (from 6 to 5 oz. per 1,000 lb.) to coagulate the milk fit for cutting in from 15 to 20 minutes. In cutting use the horizontal knife first, and begin when the curd is somewhat tender. Cut slowly, with a firm, steady motion and continuously, until the cutting is completed.

Let the curd settle a few minutes to allow the surfaces to heal slightly, then stir with the hands—very gently and slowly at first—for about ten minutes. Rough handling at this period sets free a great number of small particles of curd, which go off in the whey and very materially lessen the yield. Then the agitators may be put in and the steam gradually turned on. Take about 30 or 35 minutes in heating up to 98°. Continue stirring about ten minutes after the steam has been turned off, when the curd may be allowed to settle. Draw off a portion of the whey at this time that you may not be caught by a rapid development of acid. Then stir the curd occasionally (a common hay rake is best suited for the purpose) to prevent matting and to secure a thorough cooking of each particle of curd.

When the curd is thoroughly cooked and shows about $\frac{1}{8}$ inch of acid on the hot iron, the whey should be removed. After dipping, the curd should be well stirred with the hands to effectually drain off the whey before allowing to mat. When it has become sufficiently matted, cut into convenient strips (about 8 inches wide) and turn. In about ten minutes they may be turned again and piled two deep. Turn frequently (four or five times an hour) to prevent any whey collecting on or about the curd and to ensure uniform ripening. The temperature should be maintained at about 94° while the breaking-down process is going on, and when the curd presents a flaky appearance on being pulled apart and shows acid to about $\frac{3}{4}$ inch, it may be milled and then aired by stirring occasionally. When it becomes soft and velvety, smells like newly-made butter and shows some fat on being pressed in the hand, it may be salted at the rate of from $1\frac{1}{2}$ to 2 lb. of salt per 1,000 lb. milk.

The temperature when salting should not be higher than 86°. Put to press in about 15 or 20 minutes, or when the salt is thoroughly dissolved. Have the temperature at this time between 80° and 85°.

Apply pressure gently at first, until the whey begins to run clear, then gradually increase. After the cheese have been in press about 45 minutes, they may be taken out and neatly bandaged ; only pure water should be used. They should be turned again in the morning. See that no rims or shoulders are left on the cheese, but have them neat and stylish in appearance and of uniform size. They should be pressed for at least 20 hours before being removed to the curing room.

The curing room should be kept at an even temperature of about 65° or 70°, and should be well ventilated.

SUMMER CHEESE.

The same treatment is required in handling and caring for the milk as for spring cheese. Aeration and cleanliness should have the same careful attention. When the milk arrives at the factory each can should be subjected to strict examination by the cheese-maker (don't leave this to the poorest helper) to detect, if possible, and reject all bad flavored or tainted milk. There is no excuse for having milk of this kind. What one patron can do all can do—care for it properly and have it arrive at the factory in the very best possible condition.

When the milk has been received, heat up gradually to 86°. When this has been done, try it with the rennet test to ascertain the degree of ripeness. It is advisable to do this even in handling very ripe milk, for it enables the cheese-maker to know just about how fast the curd is going to work. If possible, have the milk in that condition that all the whey will be drawn in from $2\frac{1}{2}$ to 3 hours from the time the rennet is added, with $\frac{1}{4}$ inch acid on the curd by the hot iron test. Use enough rennet to coagulate the milk sufficiently for cutting in 30 minutes. Start to cut a little early. Take plenty of time and don't hash or slash the curd. Use the horizontal knife first, finishing with the perpendicular. When the cutting is finished, start to stir very gently at first or until the curd is somewhat firm. Do not apply heat for 10 or 15 minutes after stirring has commenced. Heat gradually up to 96° or 98°, taking fully one-half hour to do so. Continue stirring for some time after the desired temperature has been reached to prevent matting and to ensure a more uniform cooking of the curd.

Draw off part of the whey soon after the heating has been finished, and if there are any bad odors or taints, draw the whey down quite close to the curd. By keeping it stirred and well aired, the flavor will be very much improved. Draw off all the whey when the curd shows $\frac{1}{4}$ inch acid by the hot iron test, and continue hand stirring until it is sufficiently dry before allowing it to mat, and, when matted, break or cut into convenient strips and turn it over at short intervals (about every fifteen minutes), piling a little deeper each time it is turned and never allow any whey to gather on or around it.

Grind early, or when the curd strings 1 to $1\frac{1}{4}$ in. on the hot iron. Keep it apart and well stirred and aired after grinding until ready for salting.

In handling over-ripe milk, set at a lower temperature; use more rennet, cut finer, cook quickly, draw off part of the whey as soon as possible, dip curd with less acid, stir well before allowing to mat, grind early and mature well before salting.

In the case of gassy curd, try to retain more moisture in it when the whey is drawn off by stirring less. Grind in about the usual time, and when it is partly ripe pile deep, and if the whey begins to lodge around it, open the pile to allow the whey to drain off, then pile again. Continue in this way until the curd becomes velvety and buttery, when it is ready for salting. Use at the rate of $2\frac{1}{2}$ to $2\frac{3}{4}$ lb. of salt per 1,000 lb. milk. Hoop in from 15 to 20 minutes after the salt has been well stirred in.

Apply pressure very gently at first. After the whey begins to run clear, it may be safely increased. In from 45 to 60 minutes the pressure may be removed, the hoops taken off, the cheese dressed neatly, and put back to press again. Apply full pressure before leaving them for the night.

Turn in the hoops in the morning, pare off any corners or shoulders which may arise from imperfect fitting followers, putting back to press for five or six hours longer, when the cheese will be ready to take to the curing room, which should be kept as cool as possible during the summer.

We would strongly advise cheese-makers to keep a record of each vat, the condition of the milk and how it works each day. Stencil each cheese with the date when made, the number of the vat it was made in, and by so doing a great many difficulties may be overcome.

FALL CHEESE.

Milk in the fall is usually sweeter and in better condition than in summer, so that the heat may be applied sooner or when it is being received into the vat; care being taken to have it stirred carefully all the while the steam is going on. Heat to 86° then apply the rennet test to ascertain the condition of milk, and if found too sweet for the application of rennet, use some clean-flavored starter. Set vats at that stage of ripeness which will ensure thorough cooking of the curd before the removal of the whey, which takes ordinarily three hours from the time the rennet is added until it is all removed and curd showing $\frac{1}{4}$ inch acid. Enough rennet should be used to cause perfect coagulation in from 40 to 45 minutes.

When ready for cutting, start by using the horizontal knife first and cut continuously until completed.

After the cutting is completed the curd should be stirred very carefully for 10 or 15 minutes before any heat is applied, then raise the temperature gradually to 98°, taking about 45 minutes to do so.

Stir the curd carefully all the while the steam is going on and for some time after the desired temperature has been reached, to prevent matting and to ensure a more uniform and thorough cooking.

Remove the whey when the curd shows $\frac{1}{4}$ inch acid. Drain well by hand, stirring before allowing to mat, and when matted sufficiently cut or break into convenient strips, and turn them over occasionally, reversing the position of the curd each time. Piling may be allowed at this stage two or three deep, but never allow any whey to gather in pools on or around the curd. If this is noticed at any time, the curd should be opened out at once and whey allowed to escape. Keep up the temperature to not less than 94° until grinding. When curd feels mellow and will pull apart in flakes or show $1\frac{1}{4}$ to $1\frac{1}{2}$ inches of acid, it should be put through the curd mill. Stir and air well immediately after milling and at intervals to keep it from matting until ready for the salt.

When the curd is well matured and has a velvety feel and a buttery appearance, the salt may be applied. Use at the rate of $2\frac{3}{4}$ to $3\frac{1}{4}$ lb. per 1,000 lb. milk, varying the quantity to the amount of moisture in the curd. The temperature at this stage should be about 86°. The curd may be hooped and put to press in from 15 to 20 minutes after the salting is done. Apply the pressure very slowly at first, or until the whey begins to run somewhat clear, when all the pressure can be safely applied.

Allow the cheese to remain in the press not less than 45 minutes before taking out to dress.

See that the dressing is done neatly. Do not allow any wrinkles to remain in the bandage, but have it drawn up smoothly and laid over each end about $\frac{3}{4}$ inch. Use clean sweet cap-cloths, one on each end of the cheese, and have them laid on smoothly. Only pure, warm water should be used in bandaging.

Turn the cheese in the hoops every morning and never allow a cheese to be placed in the curing room without a perfect finish. The temperature of the curing room should be maintained as near as possible at from 60° to 65°. Cheese when taken to the curing room should be placed on the top shelves and removed to the lower ones when room is required, as by doing so there will be more uniformity in curing.

When coloring, pour the coloring into a dipper of warm milk from the vat, then draw the dipper quickly along under the surface of the milk from one end of the vat to to the other, then stir well and there will be no danger of streaks in the curd. Have a dipper with a long handle for the purpose.

Rennet should be diluted to one gallon of pure water for each vat, and the milk should be well stirred for at least five minutes after the rennet has been added. In case the milk is very ripe two minutes will be ample time to stir after adding the rennet.

Everything in and about the factory should be kept scrupulously clean. The cheese-maker who fails to do this need not grumble if his patrons follow his example.

All strainers, sink-cloths, etc., should be well-washed, then scalded and thoroughly aired each time they have been used.

The vats, pails, curd-sinks, etc., should be scalded with boiling water after washing, and if the water can run out readily they will dry off in a few minutes without wiping. Do not use a dish-cloth, as it usually leaves an unpleasant flavor.

A STARTER.

By A. T. Bell, Instructor in Cheese-Making, Tavistock.

A starter is some milk in which the lactic acid has been allowed to develop. In using a starter, first provide a suitable can or vessel for holding it in. A can similar to the ordinary cream gathering can will do, having double walls with hollow space between. It should have two lids, one fitting closely inside the can with a flange to keep it from going below the shoulder, and the other covering over all and fitting close to the outside.

In preparing the starter use the best cared for milk that comes to the factory—milk that has been well aired and free from any foreign flavors (it is best to use the same patron's milk). Save out say 20 lb. for each vat at a temperature of 75°, then take about one pound of the previous day's starter for every 25 or 30 lb. fresh milk saved, mix all thoroughly and allow to stand for say one hour, then add about as much water as there is milk. Stir well, cover up close and set it where it will not be disturbed until required for use.

To use, first break it up fine by stirring in the can, then take out what is required, pouring from one pail to another a few times when it will have a creamy consistency and be ready for use.

When to Use a Starter.

Be sure of the condition of the milk before adding the starter, which may be ascertained by applying the rennet test. It may be used with advantage at all times with gassy milk, and in cold weather when milk is being delivered at the factory very sweet. If it is known for a certainty that all the milk being delivered into the vat is perfectly sweet, a little may be added on the start, but the bulk should always be kept until the application of the rennet test to ascertain the condition of the milk. Do not run the rennet test so low by 3 or 4 seconds when using a starter.

While a good clean flavored starter is an advantage, a poor flavored one should never be used under any conditions, for it will spoil the flavor of the whole vat.

THE CARE OF MILK FOR CHEESE FACTORIES AND CREAMERIES.

That the cheese and butter-makers may be able to make an A1 article of cheese and butter, it is essential that they be supplied with first-class raw material. It is just as impossible for a furniture dealer to make excellent furniture out of decayed, worm-eaten lumber, or the manufacturer of "all wool" goods to make them out of shoddy, as it is for a maker to produce fancy cheese or butter from bad milk.

A cheese-maker of several years' experience said to me recently that the chief faults he found with the milk supplied in his locality were:

I. Want of Aeration.

II. Lack of Straining.

In the older cheese and butter sections these two are doubtless the points chiefly neglected.

Aeration of Milk.

Meaning. To aerate milk is to put *air into it*, hence the importance of pure air where this is done. Not only this, but aeration implies the driving off of gases that may be already in the milk. These are most easily driven off while the milk is fresh and warm, and for this reason aeration should be done *at once* after milking and *before* the milk is cooled.

Importance. The flavor of the cheese and butter largely determines the price. The flavor of these depends, with a competent maker, upon the flavor of the milk; therefore, the price depends, to a great extent, upon the flavor of the milk. This something which governs price depends upon proper management of milk at the farm. Proper aeration will get rid of any objectionable odors that may have come from the cow or food. Where paying by test is practised, aeration and stirring will prevent the cream from rising, and consequently the milk will give a higher average test and one more uniform.

How to Aerate. It may be done by dipping, pouring or stirring, or by the use of an aerator. An aerator properly used is a help, but abused it is a hindrance. Simply running milk through an aerator once after milking without any further stirring is not sufficient. It should be stirred two or three times at intervals of 10 or 15 minutes after being put through one of these aerators and again before going to bed. Not only to improve flavor should this be done, but also to prevent loss of cream in the vats, especially in the fall, when milk frequently stands some time before being set.

Some keep their milk over night in pails hanging on hooks. These hooks are fastened to a strong pole or scantling supported by means of a couple of posts in the ground.

The morning's milk needs aerating as well as the evening's.

(Note.—Attention is directed to the spelling and pronunciation of this word. In nine cases out of ten it is pronounced as if spelt erry-ation or air-y-ation, whereas it should be pronounced a-ur-ation.)

Aerators Should be Kept Clean. Look out for grease and dirt in nooks and crevices. Do not buy an aerator that is not easily cleaned. One good maker in Western Ontario does not advise the use of aerators at all, for the reason that patrons do not keep them clean.

A good thing for purifying milk may be made by taking an ordinary shallow milk pan made of strong tin. On the outside bottom of this, fasten a handle about 2½ feet long. Punch 8 or 10 small holes in the bottom of the pan. In using, put the inverted pan squarely down into the milk and allow this pan of air to bubble through the milk. When it ceases bubbling, draw out and then insert again. Do this a dozen times each evening and morning. The evening milk should be treated about three times in the foregoing manner, once immediately after milking, then in 15 minutes, and again in about half an hour. Stir before retiring for the night.

Straining.

When to Commence. Straining *should begin before commencing to milk*, by brushing off all dirt, hairs, straw, etc., from the udder, teats and body of the cow. Let it be the duty of some one person to go over all the cows with a soft brush, or a damp cloth, before the cows are milked.

How to Strain. An ordinary wire sieve strainer does very well, but we add to this by doubling cheese cloth or thin cotton so as to have four thicknesses. Lay the cloth across the bottom of the strainer and then fasten it on by means of a tin ring which slips over the cloth and bottom part of the strainer. For quickness we use a strainer that a pail of milk may be put into at once. This sits in a wooden frame over the can. Some use a woollen cloth to strain with. Cloth of some kind is necessary to catch hairs and fine dirt. This cloth must be kept clean. Scald it thoroughly each time after using.

Why Strain? Cheese and butter are articles of food to be eaten by men and women. A great many forget this. They seem to think that it does not make any difference what kind of milk is sent to the factory, judging from what may be seen on the strainers of factories. It all goes—well, goes somewhere, and they do not eat it.

Other Points to be Observed.

1. Keep none but cows that will give at least 6,000 pounds of milk or 250 pounds of butter a year. Weed out the poor ones and replenish the herd by raising calves from the best. Send milk to the factory from none but healthy animals. When a cow shows symptoms of not doing well, she should be separated from the rest of the herd and her milk not used for food.

2. Colostrum, or the first milk after calving, should not be sent to make either cheese or butter. Not until the fifth day does the milk become normal. Previous to this it contains a high percentage of albumen, which is of no use to either the cheese or the butter-maker, but is a decided hindrance.

3. In the spring and fall, while the cows are in the stable, it should be kept clean. To keep a stable clean, the following are necessary: Two brooms—a stable and a house broom; tight floors; land plaster for the gutter; lime for sprinkling around the passages; whitewash for ceilings and walls. Let the men borrow a little whitewash and a brush for an hour from the women this spring, go down to the cow stable, sweep off the cobwebs and dust that have accumulated there ever since the stable was built; whitewash ten square feet, and then if it is thought to be a waste of lime and labor, don't do any more this spring, but observe the contrast with the rest of the stable. A cow stable is a place for a cow to *live* in, not to exist in. The health of men and women depend, to a large extent, upon the cow: the health of the cow depends largely on her house being properly aired and cleaned; therefore the health of children and men depends in a great measure on how the cow stable is looked after. Aim to keep it as clean and pure as the house. In addition there is need of some handy method of cleaning the stable *twice* a day when the cows are in all the time, and somebody to make use of the things mentioned.

4. While in the stable, cows need currying and brushing once a day. If more time is spent in brushing the cows and less, if necessary, in brushing horses, it will pay better at present.

5. Feed nothing but pure, sweet, clean, wholesome food. Anything which gives a taint or bad flavor to milk should not be given to cows. If a taint or flavor in the milk is caused by the food, it will be at its worst when drawn from the cow; if caused by some fermentation, it will grow worse as the milk is kept. The remedy for the latter is cleanliness. Use scalding water in washing the utensils and strainers. The following foods are prohibited in the dairy: Sour brewers' grains, distillery slops, Swede turnips and tops, rape, sour mouldy silage, musty meal, cleanings from the horse stable, and hay or grass having bad smelling weeds, such as leeks or rag-weed. Allow cows access to plenty of pure water and salt at all times.

6 Milking needs to be done by clean persons. Hands should be washed before commencing to milk. Have a wash basin, some soap, water and a towel in the stable and use them. Clean aprons to put on while milking will be useful. Milk each cow regularly and milk out clean. It will pay to "strip" the cow a minute longer than usual, if you are being paid by test.

7. After straining and aerating, the milk may be cooled for the creamery. For the cheese factory it is not necessary, except during very hot weather. The milk may as well be ripening while the maker is sleeping, as to have him sitting around waiting for it to ripen during the day.

8. Set the milk can in a place where the air is pure, and in winter where it will not freeze. Milk should be protected from sun and rain. These are good in their place, but poor things to make cheese and butter out of.

9. The milk stand should be 100 feet from the barnyard and from where pigs are fed. It should have a cover allowing a free circulation of air, at the same time preventing the milk from being heated, or allowing rain water to get into it. Rain water is said to spoil the flavor.

10. Milk wagons should be kept clean. The boxes or racks for holding the cans need scrubbing with hot water once a week to remove spilled milk, etc. This is especially necessary where whey is hauled on the same wagon as the milk. The odor of some milk wagons is sufficient to taint the milk. The horses need proper grooming that no odors from them reach the milk. The driver and his clothing should be clean and tidy. Cans of milk protected from sun and dust while on the road will reach the factory in better condition than those without cover.

11. If the can is ten years old and rusty, leaks badly, has a dinged cover, and spills one-half a gallon or more milk every day it is sent to the factory, should you continue to use it? Will it not pay to buy a new one?

12. Where possible, insist on the whey being returned in the milk cans. (Sour whey, alone, is an excellent article to keep pigs in good squealing condition). Let it stand in the can until just before commencing to milk, then empty, rinse very slightly with warm —not hot—water. Put the evening's milk at once into this can without straining and aerating. If it gets to the factory before it sours, step into the factory about noon and hear the cheese-maker give an exhortation on gassy curds and whey ("bucky," some call it) flavors. Observe the look on his face which says, "If I get through by 8 or 9 o'clock to-night, I'll do pretty well." Come round again in about a month and see the buyer look at the cheese made from the vat into which but *one* can of such milk was emptied, and notice him set this cheese aside for further inspection or a lower price. He may refuse it altogether for export. It will do for the home market, and will have a great tendency to develop home consumption.

If the patron who sends milk like the foregoing suffered alone, it would not be so bad; but if it is taken in by the maker out of pity, every patron of the factory has to bear the consequences. This is bearing one another's (useless) burdens.

13. To wash milk pails, milk cans, strainers, etc., they should be first rinsed in luke-warm water, next washed with hot water, and then be scalded, after which, put them in a nice place to air and dry. Do not wipe dairy tinware with a dish-cloth. Make a

bonfire of all the old dishcloths that are used for wiping dairy utensils and the flavor of the milk will go up 10 per cent.

14. Milk should be sent to the factory of the same quality as given by the cows. Nothing should be added to the milk and nothing taken from it (except bad odors). Removal of cream, keeping back "strippings" or skim milk, or "first milk," should be prohibited. It is as great a crime to keep home skim-milk, or the "first milk" from a cheese factory as it is to keep home cream or "strippings." Adulterated milk is milk to which anything has been added, or from which anything has been taken. Persons offering such milk for sale should be prosecuted.

15. The patrons having done everything to supply the makers with good, pure milk, it is the duty of the factoryman to make first-class goods. Patrons! step into your factory occasionally and see that everything is neat and clean in and around it, and that there is good cheese or butter on the shelves or in the store-room. If it is not so, ask why, and if the defect is not remedied, insist on a change of maker next year.

Needs of the Dairy Department.

1. A man to carry on experimental work throughout the year in the cheese department. We have made a commencement in this work, but its importance is such that we ought to have a man permanently employed. He could also give instruction to students who come here from time to time to learn something about cheese making.

2. A man in the dairy stable and piggery to do experimental work in feeding and to assist in milking and other work as far as his time will permit. There is need for numerous experiments in the dairy stable, but as we have only one man permanently employed, he has not the time to devote to accurate experimenting.

3. A continuation of the dairy school on a smaller scale throughout the year, that students may come here at any time and receive instruction in butter and cheese-making, milk-testing, etc., while we would still continue the extra session during the winter with a full staff of instructors.

All of which is respectfully submitted.

H. H. DEAN,
Professor of Dairying.

Ontario Agricultural College,
Guelph, Dec. 31st, 1894.

PART X.

REPORT OF THE

MANAGER OF THE POULTRY DEPARTMENT.

To the President of the Ontario Agricultural College:

SIR,—By appointment of the Ontario Government, I entered upon my duties in connection with the College on the 1st October and have since been more or less engaged in assisting to get the building ready, purchasing stock, and looking after the birds now in our pens.

BUILDINGS.

I have to express my gratification at the character of the buildings provided for the poultry department. At comparatively small cost, most excellent buildings have been constructed by the College carpenter under the direction of the President of the institution. The buildings seem to meet every requirement and are admirably adapted to our work. The ceiling of building No. 1 is seven feet high and that of No. 2 is six feet six inches.

STOCK.

In compliance with your instructions, I have purchased mothing but first-class stock. At the present time we have 155 birds representing the following breeds and varieties:

1. Barred Plymouth Rocks. / White Plymouth Rocks.
2. Silver-Laced Wyandottes. / White Wyandottes. / Golden Wyandottes.
3. Light Brahmas.
4. White Cochins. / Partridge Cochins.
5. Black Langshans.
6. Black Minorcas.
7. White Dorkings.
8. Black Javas. / White Javas.
9. Black Spanish.
10. Indian Game.
11. White Leghorns.
12. Silver-Spangled Hamburgs.
13. Houdans.
14. White-Crested Black Polands.
15. Andalusians.

We propose to keep fourteen varieties in breeding pens and the additional ones in the large pen for different breeds.

The illustrations of fowls accompanying this report are photo-engraved from life.

Having got nicely started, we hope to do good work for the College and the Province.

Your obedient servant,

L. G. JARVIS,
Manager of Poultry Department.

ONTARIO AGRICULTURAL COLLEGE,
Guelph, Dec. 31st, 1894.

REPORT OF A VISIT TO THE POULTRY DEPARTMENT.

Ontario Agricultural College.

By Thomas A. Duff, Ontario Poultry Association, Toronto.

Pursuant to many invitations, I paid a visit to Guelph on the 13th of the present month, and, of course, went out to the Agricultural College. This institution is about two miles from the centre of the city and is beautifully situated. The road leading to it was pretty well blocked with snow which made the walking very unpleasant. Although personally fond of a walk, I do not envy the superintendent of the poultry Department (Mr. L. G. Jarvis) his morning constitutional during such weather. However, he looks none the worse for it. During the summer the walk would be more pleasant. I am informed that electric cars will, in the spring, commence to run between the city and a point west of the College, so that in the near future visitors will not be required to hire a carriage or travel on foot.

I first directed my steps to the main poultry house. For some time previous to my visit I had been endeavoring to form an idea of what the place was like, but my most sanguine expectations were more than realized.

The main building (No. 1) is situated about one hundred and fifty feet from the travelled road, and is one hundred and forty feet long by fifteen feet in width, divided, however, by a storey and a half erection 20x32. The building faces the south-east, this being rendered necessary in order to conform to the road, which does not run due east and west. The house is seven feet in height at the eaves, with a third pitch roof. It is constructed as follows: After the framework was up it was boarded on the outside of the uprights with inch boards. Upon this was put tarred paper; upon this again inch boards (dressed) were placed, and then the whole was battened and nicely painted. Then on the inside of the uprights the whole building, ceiling included, was lined with tongued and grooved lumber, leaving an air space between the walls of four inches, which certainly adds to the comfort of the building. The roof is shingled, and on the inside instead of running the match boards up to the centre of the roof on the rafters, the boards run straight across making a very nice ceiling, giving the building a much better appearance and adding to the warmth. The whole sits upon a substantial stone foundation which runs quite a depth into the ground. Across the building, where each pen is divided, a stone wall runs to the level of the floor, the space between being filled in with sharp gravelly sand. This, therefore, is a sure preventative against vermin of any kind getting into the building and destroying the stock.

Upon entering, you find yourself in precisely the centre of the main building in the storey and a half erection before referred to, which is 20x30. The front part, 16x20, forms the office. This is well-lighted and fitted up with all conveniences to make work a pleasure. The back part, 14x20, is the incubator and brooder room, the intention being to run the incubators and brooder the chicks here during the extreme cold weather, and until old enough to place outside in the outdoor machines. A grass run 30 x 80 is provided immediately outside of this compartment. At the time of my visit Mr. Jarvis had in this room a Pineland incubator and brooder, the former being heated by hot air and the latter by hot water. I understand, however, that a hot water incubator will also be purchased as well as several other brooders.

Under this whole section is a splendid stone cellar, with concrete floor, in which to store fuel, vegetables, etc., the entrance to the cellar being from the incubator room.

From the office a flight of stairs leads to the upper portion of the building, which, at the time of my visit, was being fitted up as a granary and workshop.

Off the office, to the right, is a room known as the "boiler room," which is 8x10½. Here is a large caldron for boiling feed. To the left of the office is a room of the same size known as the "hospital," but at the time of my visit it was occupied by a pen of White Javas, there not being a single sick bird about the place.

Proceeding from the office in either direction I found myself in a well-lighted passage three feet six inches wide, from which a splendid view of the birds can be obtained. At each end of this house (No. 1) is a storeroom which may be used for feed and the many necessaries which should always be found about a well-regulated poultry establishment. At both ends of the building a loft has been constructed, and here may be stored coops, tools, etc. At the north-east end it is much wider than at any other part, and contains a pen for a number of birds of different breeds. The sleeping compartment is 12x13, and the scratching pen $12\frac{1}{2}$x16. At the south-west end the building for male birds commences and runs parallel to the road a distance of something slightly over eighty feet. This house is about seven feet six inches high in front and slopes to about four feet at the back. It is divided into some twenty different compartments, each about 3x4, the object being that each compartment should contain an individual male bird. Duplicate male birds of all varieties will be kept in case of an accident to the bird used in the breeding pen In front along its whole length is a passageway three feet wide, thus giving the visitor ample means of viewing the stock. The building is well lighted. Each pen opens, by means of a slide, into a nice wire run, 4x6.

Between the "hospital" and the "storeroom" in building No. 1 are three pens for the fowl, each being divided into two compartments. The compartment in which they sleep is $6\frac{1}{2}$x$10\frac{1}{2}$, with a board floor well littered with straw. The second compartment is $5\frac{1}{2}$x$10\frac{1}{2}$ and is the fowls' "scratching pen." In this the floor is composed of sharp sand and gravel, filled in between the stone foundation hereinbefore referred to, to a depth of about eighteen inches, and here all whole grain is thrown so as to give the birds exercise by scratching for it. The sleeping compartment is separated from the "scratching pen" by a solid partition three feet in height, and above this to the roof is wire netting. A hole is cut in this partition to permit of the birds going from one pen to the other. In front, between the passageway and the pen, is a solid partition three feet high, and then wire netting to the roof which gives visitors a perfect view of the birds. Leading into each compartment from the passageway is a door similarly constructed—one door opening into the sleeping compartment and another into the "scratching pen." These doors are kept locked, which is a first-class idea as it prevents anyone not having a key going into the pens. In each sleeping compartment is a double window containing sixteen panes of glass 8x10. In each of the "scratching pens" is a door leading out into a grass run twelve feet wide and eighty feet long. The upper portion of this door has double glass windows also. It is nice to open these doors on fine sunny days as the fowls enjoy it, and it gives the building a good airing without creating a draught. When it is not desirable to open them the fowl can be let out into the yards by means of a hole cut in the building, and operated by a slide to which is attached a rope which works on pulleys, so that the person in charge can open or shut this slide from the passageway. It is very convenient. In each sleeping compartment is a box about 2x2 and nine inches deep, filled with road dust. This is placed under the window where the sun strikes it. The fowl wallow in it every day, which keeps them healthy and clean. Each pen is also provided with small boxes containing oyster shells and other gritty substances. When cabbage is fed it is hung up by the root to a height sufficient to enable the birds to reach it by jumping, thus affording them plenty of exercise. They are also provided with mangels and turnips by way of variety.

The drinking fountain used here is one which will commend itself not only to fanciers but to farmers as well. It is made of galvanized iron, square, with a place left in the top to pour the water in. It holds about three quarts. At the bottom a two-inch trough is constructed on three sides ; hole are made in these three sides of the fountain proper, out of which the water gushes into the trough, and the fountain having an air-tube inside the water can only rise to the height of these holes, so that as the fowl drink the water comes out fresh and clean. The fountain is hung on pegs just high enough for the birds to reach it conveniently. This prevents dirt getting into the water, and also keeps their combs and wattels dry, which is of great advantage during the winter months.

The nests are made as follows : Two feet four inches long, 12 inches wide, 14 inches high at lowest part and sloping up to a height at the back of about two feet. This prevents the birds from roosting upon them. Each nest is divided into two compartments, and round holes cut into each to permit of the bird going in and out. At the back it is only boarded up to a height of about six inches—just sufficient to keep the straw in. This is all that is necessary as it is placed against the wall. It is movable and easily cleaned. This makes a complete and comparatively inexpensive nest.

Feed troughs are also used for soft food. These are about three inches wide and three deep, and are hung upon nails against the partition, so that the fowl cannot get their feet into them. When they are through eating these can be placed out of the way.

One feature of the equipment of the buildings is the roosts. At the time of my visit two roosts were in use.

No. 1 was made the whole length of the pen ($10\frac{1}{2}$ feet). It is of 2x4 scantling (flat side up), placed on wooden sockets nailed to the wall and partition. Under this is a drop board, which, when down, is only three inches from the floor. In the day time, when not required for use, the roost is taken out of the sockets and the drop board turned up against the wall by means of hinges fastened to the partition. It is kept in place by hooks. On the bottom of the board are two iron brackets upon which is placed the roost. These also act as a support for the board when down.

No. 2 is known as the "Robertson roost," and, to my mind, is the most complete article I have yet seen. It is constructed as follows: Two iron uprights are screwed to the floor; about nine inches up two iron sockets are constructed. The drop board has two iron arms in the centre which fit into these sockets, and by means of a thumb-screw on one of the uprights, this drop board can be lowered for use at night or raised during the day. The roost proper is 2x4 scantling (flat side up), and in the ends are placed two iron rings. These rings slip into the uprights and hold the roost in place. President Mills asked my opinion as to the two roosts, and, without any hesitation, I cast my vote in favor of No. 2, for the following reasons:

1. Roost No. 1 is too heavy and cumbersome, and is altogether too large for the number of fowl in the pen. The dropping board sits too close to the ground, making it very difficult to clean.

2. The drop board is too long, making unnecessary work. It is too cumbersome to be often taken outside and washed. Every time it was desired to do this the hinges would have to be removed.

3. A careless attendant might easily put the roost through a window while handling it night and morning.

4. Fitting, as it does, close up to the partition, the chances are lice might become secreted in the space between drop-board and partition.

5. Roost No. 2 is neat appearing, and being almost entirely constructed of iron, is insect proof. In addition, it will last a lifetime and costs but little more than No. 1.

6. It can be made any desired size.

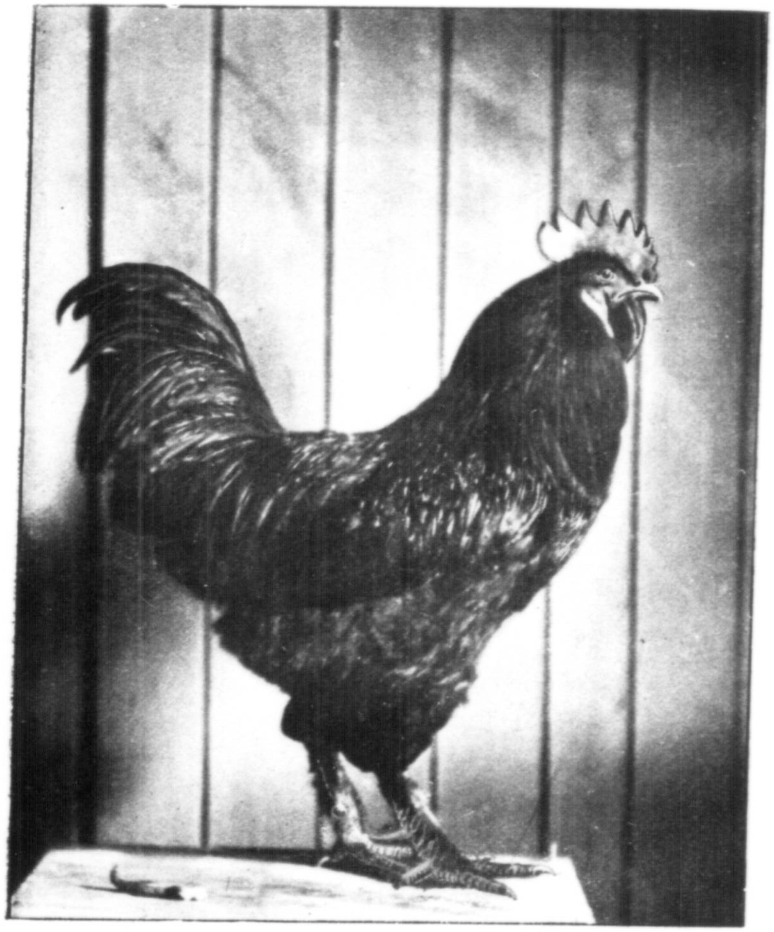
7. The drop-board is easily cleaned, being considerably above the floor, and if it is desired to take it outside and wash it, this can readily be done by simply lifting it out of the sockets.

8. It is only necessary to turn a thumb-screw in order to turn the dropping board up under the roost and thus keep it out of the way during the day. When required for use at night you simply have to give the screw the reverse turn.

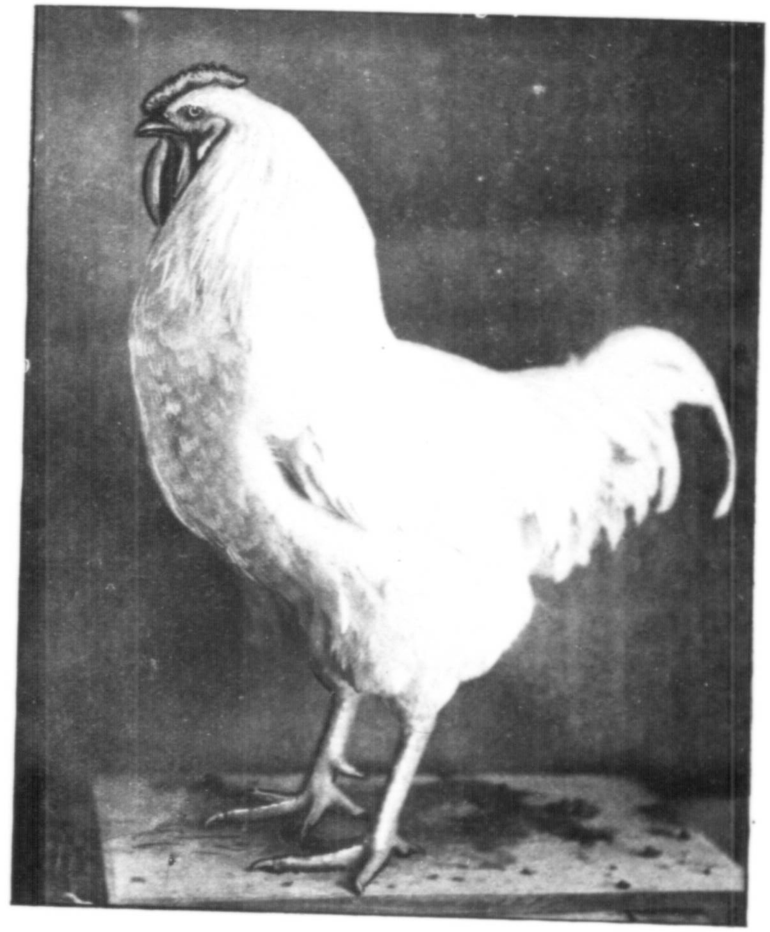
In my opinion it is the best and most complete roost yet placed upon the market, and, I believe, will come into general use.

Water taps are placed at convenient places in both buildings.

A departure, new to the writer at any rate, has been made in the construction of the runs. Usually a solid board partition, running from the ground to a height of about two feet six inches or three feet, has been used to prevent the male birds fighting. Here, however, no boards are used, but instead, very fine wire netting has been run to a height of three feet and through this, it is thought, the birds cannot fight. It certainly makes the yards more pleasing to the eye, but whether it will answer the purpose for which it is intended remains to be seen. Gates open from each yard into the other. At the rear of these runs is a passageway or walk for visitors, from which to view the stock. This walk divides these runs from three large grass yards, 49x94, 32x94 and 36x94 respectively, it being the intention to utilize these should the smaller runs become bare of grass. The fowls could be turned into these alternately, which would give the



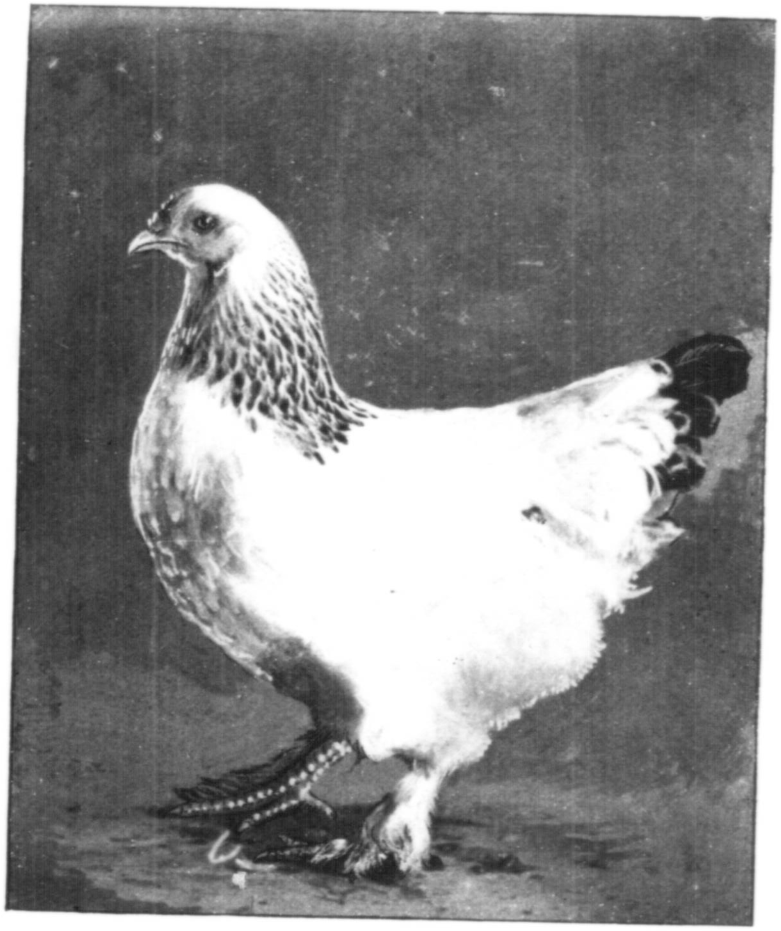
BLACK LANGSHAN COCKEREL

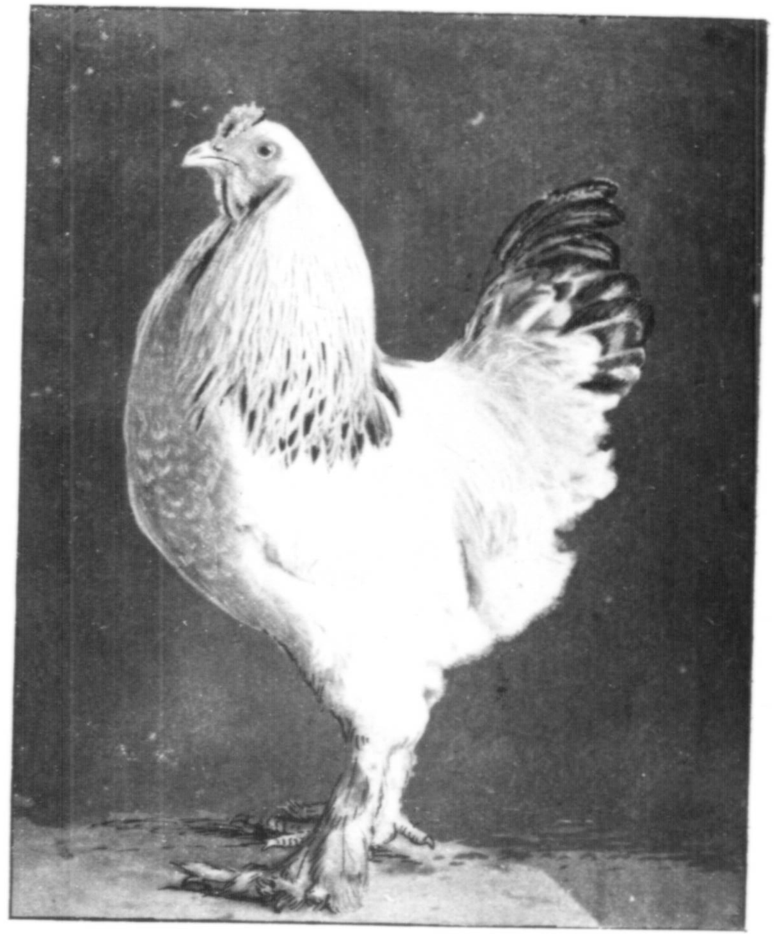


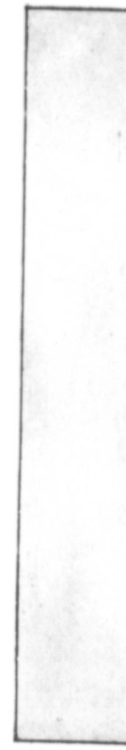
WHITE WYANDOTTE COCKEREL.

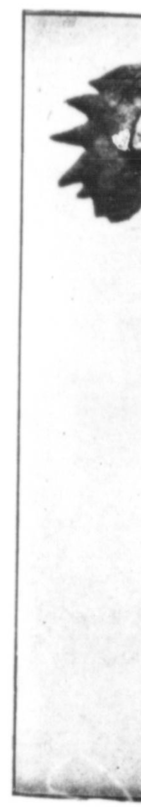
BLACK MINORCA COCKEREL.

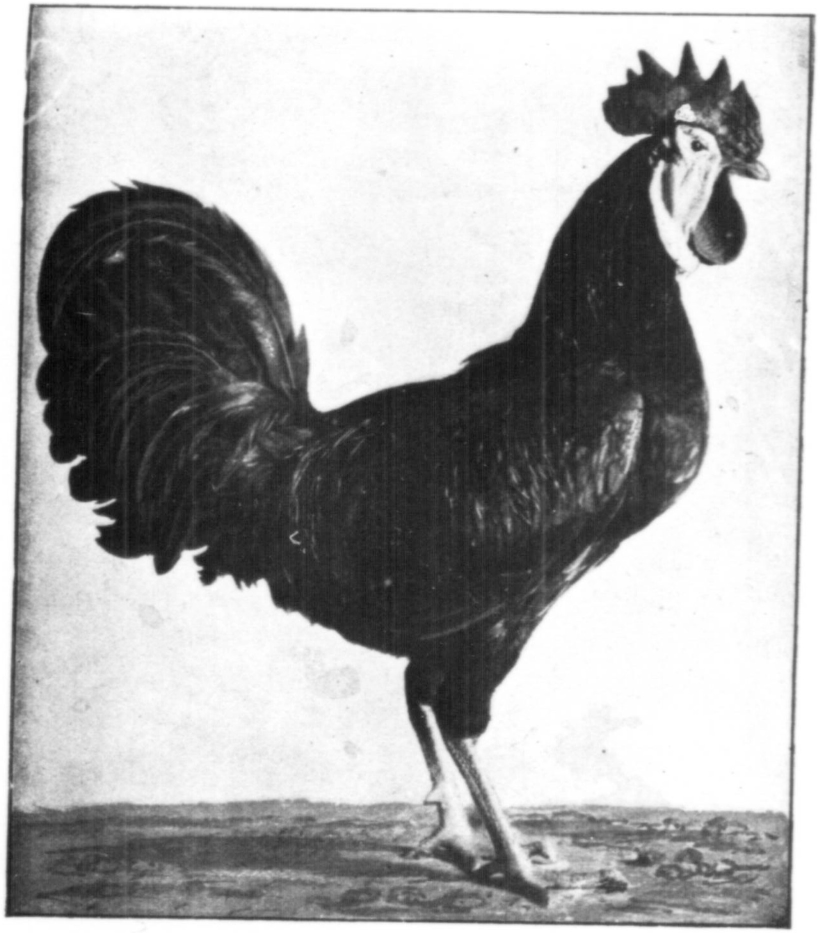
BLACK MINORCA PULLET.


LIGHT BRAHMA PULLET.


LIGHT BRAHMA COCKEREL.







BLACK SPANISH COCKEREL.

GOLDEN WYANDOTTE COCKEREL

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No. 1. *India*
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smaller runs a chance to improve. Fruit trees are growing in the large yards and these will provide shade. It is the intention to plant plum trees in the small runs, and I shall be interested to know the result of the experiment, as it is loudly proclaimed that plum trees do better in poultry runs than anywhere else. The yard for miscellaneous breeds is much larger than the others, being 16x154. In order to view the birds in this pen the visitor has to look through a glass window, which is not by any means as pleasant as looking through the wire. The glass gets dirty and the birds are not seen at their best.

All of the passageways and gates in the runs are wide enough to admit a wheelbarrow, so that by little labor all may be kept clean.

In line with house No. 1 is house No. 2, separated only by a carriage road. This building is constructed in precisely the same manner as No. 1, being 15x108, and six feet six inches at the eaves. In the centre is a feed room 8x10, for the storing of grain, etc., for use in this building. Beside this is a place built for a stove, which gives enough heat to warm the entire building. The balance of the house is divided into eight pens with yards—four on each side of the feed room—the same as in No. 1.

One special feature (which must be of service to the visitor, is that over each different compartment is a sign designating what the particular room is used for; also designating the variety of fowl inhabiting each pen.

The above is as accurate a description of the buildings and yards as I can prepare without the use of a plan, and, I trust, will give some little idea of what I consider, from a utility point of view, the best and most complete poultry house I have yet visited. When you bear in mind the fact that these buildings had to be constructed not only for utility, but in such a manner as to afford the public every opportunity of viewing the stock, you can realize, in part, what has been accomplished. Upon inquiring the cost of these buildings, together with the fitting up thereof, I was astonished at the small sum expended. The Government have certainly given the province good value for the amount of money expended, and have erected buildings of which the country at large may well be proud. I am satisfied the students will find this department one of the most interesting of the College course.

The erection of these buildings was looked after by President Mills personally, and too much credit cannot be given this gentleman for the part which he took in their construction. He always listened to advice, but before any changes were adopted you always had to give the why and the wherefore.

I understand it is the intention to heat house No. 1 and the cock house by steam, placing the heater in the cellar. It is not intended, however, to ever have the temperature above forty-five degrees.

Two or three small houses are to be constructed, some considerable distance from the main building, for the purpose of housing young chicks. Brooders can be placed in these, and when the chicks are old enough, these brooders can be taken out and roosts placed in the houses. They will thus answer the double purpose of brooder houses and houses for young stock after the use of the brooder becomes unnecessary.

Mr. Jarvis is a great believer in the merits of green bone, and it is the intention of the Government to procure a power machine so that large quantities of this grand food may be used.

At present the superintendent is somewhat handicapped by being obliged to live in the city. In order to properly look after poultry, and to obtain the best results therefrom, the person in charge should constantly be on hand. This is especially so during the hatching season and while the chicks are growing. I understand that it is the intention of the Government to erect a dwelling upon the farm for the use or Mr. Jarvis and his family.

I will now shortly endeavor to describe the stock, merely giving a short paragraph upon each variety kept. For the sake of convenience I will number the pens, commencing at the pen nearest the travelled road and going on through both houses, the birds being penned in the order of numbers.

No. 1. *Indian Games.* This pen is composed of one cockerel and six pullets. The cockerel is a fine big bird of good color. The pullets are all very good, the first prize bird at the last "Ontario" being among the number. I noticed two very good pullets, which are just now getting their final feathers. They were late hatched, but have nice double lacing, grand shape, and should make a pair hard to beat.

No. 2. *White Dorkings.* One cockerel and six pullets. The cockerel, to my mind, is rather small; he falls away in breast and has a very bad tail. He has, however, a very small comb, this being his chief virtue. The pullets are all very good in color, but to my mind they lack that depth of breast usually looked for in this grand variety.

No. 3. *Black Minorcas.* This yard is made up of one cockerel, four hens and five pullets. The cockerel is a very nice bird indeed, and would win at many shows; he has grand lustre and a nice comb, but a little too deeply serrated; his lobes are a little small but are nice shape and good color. The females have all good color and are of great size. Mr. Jarvis has evidently in his selection of stock, borne in mind that size is of importance in Minorcas. They are being bred too small. This is an excellent pen and should produce good stock.

No. 4. *Light Brahmas.* One cockerel and eight pullets, and a grand lot they are. The cockerel heading this pen was in the third prize breeding yard at New York show. He is of immense size, with good comb and hackle, and a nice colored tail. He has good leg and toe feather; and a beautiful bird to look at. The females are all good, Mr. Jarvis being particular to get size as well as markings. One of the pullets is inclined to be a little Cochiny in shape. Good results should come from this pen.

No. 5. *Black Javas.* Here is a grand cock bird; in fact, I do not think a better has been seen this year. His comb has been slightly frozen, but, of course, this does not hurt him. He has mated to him six excellent pullets of good size and color. One or two are a little scaly on legs.

No. 6. *White Wyandottes.* One cockerel and five pullets. The cockerel is a very large bird of good color, good comb and wattles. The females are all large, with good Wyandotte shape and exceedingly good combs.

No. 7. *Pen of Miscellaneous Breeds.* This is composed of females of breeds not kept at the College. I understand the main object is to have a few females of the different breeds, with the view to being able to give the students an object lesson during Mr. Jarvis' lectures. At the present time there are 24 birds in this pen.

No. 8. *Black Langshans.* This is a pen that any fancier might well be proud of. I question if there is a better pen in Canada at the present time. The cockerel is a typical Langshan of grand color and good comb. The eight females are all winners. Certainly Mr. Jarvis has got together a grand lot of Langshans, and he should produce some excellent stock from this mating.

No. 9. *Barred Plymouth Rocks.* One cockerel and eight females. The cockerel, to my mind, is too light in color; he has a good comb, with good colored legs and beak. The females are very good indeed. One of them is especially fine. She is well-known to fanciers, having won at the Industrial, Hamilton and the "Ontario" in 1893-94 as a pullet, and this year, first at the "Ontario" and third at New York as a hen. She is magnificently barred, and good all over. Another good bird is the first prize pullet at the last "Ontario." She is well barred all over but a little on the small side.

No. 10. *White Cochins.* One cockerel and eight females. The cockerel is a splendid bird, with good leg and toe feather. He has good Cochin shape. The females are all good, one of them being full feathered.

No. 11. *Silver Wyandottes.* This yard is made up of one cockerel and eight females. The cockerel is the best I have seen out this year. Nothing at any of our shows nor at New York could approach him. He is beautifully laced on the saddle and hackle, and has good Wyandotte shape. His comb is excellent, the spike following the neck nicely. The females are also good, two of the pullets being especially fine. They were, I understand, purchased at New Hamburg, from Mr. J. Dorst, Toronto. Some of Mr. J. E. Meyer's (Kossuth) stock is also seen here. In this pen is one very open-laced female, but she is very poor in color of tail.

No. 12. *Silver Spangled Hamburgs.* These, with the Polands, are the ladies' pets. The pen is composed of one cockerel and ten pullets of excellent quality, being made up of stock from the yards of Messrs. McNeil and Oke.

No. 13. *Black Spanish.* One cockerel, one hen and six pullets. The cockerel has a good comb, good smooth face and good color, but to my mind he lacks size. I consider he is altogether too light in body. The females are all very good indeed, with nice smooth faces. The hen is very large and good all over.

No. 14. *White Leghorns.* One cockerel and ten pullets, and all very nice indeed, with good size. The cockerel has a fair comb, nice shaped lobes, but a little too creamy in color. The pullets have nice combs and good color.

No. 15. *Houdans.* One cockerel and six pullets, and all made up of different strains. These are only a fair lot.

The above completes the number of varieties kept in No. 1 and No. 2 houses, with the exception of the White Javas, but the following are at present located elsewhere.

White Crested Black Polands. These are essentially the ladies' favorites. Mr. Jarvis took special case in selecting his birds, and it is sufficient to say in regard to their quality that they are from the best stock that Messrs. McNeil and Bogue possess.

White Javas. These were located in the hospital. All are very good indeed, with nice colored legs. This should prove a very useful variety, especially as a table fowl, they being without the black pin feathers so much objected to.

Blue Andalusians. One cockerel and four hens. The cockerel is a little small, but has good color. He won 1st at Port Hope. Three of the hens are the 1st, 2nd and 3rd prize winners at Port Hope, and are as good as I have seen.

Golden Wyandottes. Mr. Jarvis has the first prize cockerel at Port Hope and three nice pullets.

At the time of my visit there were in the cock pens the following males:

Black Java cockerel, the best I have seen this year. Houdan cock, Forsyth strain, good color but very small. White Cochin cock, good bird, winner at "Ontario" last year. Black Spanish cockerel, 1st at "Ontario," good size, grand color, a little rough in face. Silver Spangled Hamburg cockerel, small, but fine comb and lobes, nice shaped spangles. Light Brahma cockerel, good all round bird, splendid comb, good color, fine tail, hackel might be a little longer, over standard weight, will make a grand cock. White Leghorn cock grand, color, good comb, nice legs. Black Langshan cockerel, 1st "Ontario," a grand bird in every way, but a little too purplish in tail.

All of the stock was purchased by Mr. Jarvis personally, and had to be first-class in every way. It certainly surprised me to know that such excellent specimens had been bought at an average of about $3 per bird. It speaks well for Mr. Jarvis' business ability.

I have visited every department of the College, and was much struck by the neatness shown everywhere. The students are a fine body of young men, and apply themselves assiduously to their studies. They are taking a lively interest in the poultry department, and no doubt this will prove one of the greatest attractions at the College. Poultry can certainly be made one of the most profitable branches of a well regulated farm, and I sincerely trust that the information obtained here will be practised at home.

TORONTO, February 25th, 1895.

To the Presider

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GUELPH, Dec. 3

PART XI.

REPORT OF THE PHYSICIAN.

To the President of the Ontario Agricultural College :

SIR,--I beg to present to you my first report. My appointment as College physician was made on August 10th last.

During the present term 116 students were enrolled on the College register. They were all on admission carefully examined as required by the by-laws defining the duties of the College physician. All were found in good health and free from suspicion of contagious disease. Speaking generally, all are robust-looking young men. I found on examination, however, that a large number had never been vaccinated. This fact, in view of the occurrence of smallpox at various parts of the province, I reported to you and you required all the unvaccinated to be immediately vaccinated. This was done.

I have made the regular half-weekly, and in cases of illness, more frequent, visits required by the by-laws, as well as by the nature of the cases I have been called upon to attend. I am pleased to say that in most instances the cases of illness requiring my attention were of a mild character. The exceptions, I am happy to inform you, were few. In one of these we were obliged to remove the patient to the general hospital in the city, where I continued to attend and where he quickly recovered, and on his discharge returned to the College to resume his studies. In another instance the young man's illness was of such a nature as to compel him to return home, and for the present, at least, to give up his course in the College.

The hospital wards provided for the care of the ill are very comfortable, and the careful ministrations of the matron to the sick are worthy of praise.

Upon the good sanitary condition of the College and the general health of the institution, you are to be congratulated.

Respectfully submitted,

WM. O. STEWART,
College Physician.

GUELPH, Dec. 31st, 1894.

BACI

1893—Beckett
1893—Bell, L
1890—Brodie,
1894—Brown,
1891—Fuchan

1892—Carlyle,
1891—Cowan,
1888—Craig, J
1893—Crealy,
1888—Creelma

1893—Day, G.
1890—Dean, H
1893—Dyer, W

1893—Eaton, I

1888—Fee, J. J
1894—Ferguson
1891—Field, H

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1888—Austin, A
1880—Anderson
1880—Ash, W.
1893—*Atkinso
1892—Aylesworth

1881—Ballantyn
1879—Bannard,
1888—Bayne, S.

* Gold Medal

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.
1891—Cowan, J. H.
1888—Craig, J. A.
1893—Crealy, J. E.
1888—Creelman, G. C.

1893—Day, G. E
1890—Dean, H. H.
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.

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.

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.

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.

1891—Whitley, C. F.

1888—Zavitz, C. A.

2. Associates.

The total number of Associates up to the present time is 285, 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.
1992—Burns, J. A. S.

* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.

ASSOCIATES—*Continued.*

1893—Burns, J. H.

1886—Calvert, S.
1890—Campbell, C. S.
1877—Campbell, J. A.
1880—Campbell, D. P. L.
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.
1886—Cobb, C.
1880—Chapman, R. K.
1882—Charlton, G. H.
1882—Chase, O.
1894—Christian, A. H.
1879—Clark, J.
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.
1892—Dyer, W. D.

1892—Eaton, L. W.
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.
1888—Knowlton, S. M.

1894—Lailey, F. T.
1894—Laird, J. G.
1882—Landsborough, J.
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.
1887—McCallum, E. G.
1893—‡McCallum, W.
1889—McCallum, W.
1893—McCrimmon, W. D.
1889—McEvoy, T. A.
1885—McIntyre, D. N.
1885—McKay, J. B.
1886—McKay, J. G.
1893—McKenzie, W. G.
1891—McKenzie, A. G.
1889—McLaren, P. S.

* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.

ASSOCIATES—*Continued.*

1893—McMordie, R.
1893—McNaughton, K.
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.
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.
1887—†Scrugham, J. G.
1888—Shantz, A.
1887—Sharman, H. B.
1877—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.
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.

1891—Thompson, R. A.
1889—‡Tinney, T. H.
1892—Tolton, J. E.
1879—Toole, L.
1883—Torrance, W. J.
1884—Tucker, H. V.
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.
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—Wilmot, A. B.
1890—Wilson, F. G.
1894—Wilson, E. E.
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 1894.

Third Year Students.

Name.	P. O. Address.	County, etc.
Burns, J. H	Kirkton	Huron, Ont.
Brown, W. J.	Dunboyne	Elgin, Ont.
Christian, A. H.	Guelph	Wellington, Ont.
Doherty, M. W.	Eglinton	York, Ont.
Ferguson, J. J	Smith's Falls	Leeds, Ont.
Graham, W. R	Belleville	Hastings, Ont.
Kennedy, W. A.	Apple Hill	Glengarry, Ont.
Kennedy, P. B.	Sarnia	Lambton, Ont.
King, A. A	Johnson's Crossing	Colchester Co., N. S.
Kidd, D. F	Cookstown	Simcoe, Ont.
Lailey, F. T	Toronto	York, Ont.
McCallum, Wm.	Guelph	Wellington, Ont.
Robertson, G. A	Kingston	Frontenac, Ont.
Rowe, G. F	London	England.
Sleightholm, F. J.	Brampton	Peel, Ont.
Spencer, J. B.	Brooklin	Ontario, Ont.
White, E. F	Clarksburg	Grey, Ont.
Widdifield, J. W	Siloam	Ontario, Ont.
Wiancko, A. T.	Sparrow Lake	Muskoka, Ont.

Second Year Students.

Buchanan, John	Hensall	Huron, Ont.
Butler, W. E.	Dereham Centre	Oxford, Ont.
Caldecott, F.	Toronto	York, Ont.
Campbell, W. G.	Brantford	Brant, Ont.
Carrick, C. S.	Kincardine	Bruce, Ont.
Cass, L. H.	L'Orignal	Prescott, Ont.
Chadsey, G. E	Sumas	British Columbia.
Clark, J. F.	Bay View	Prince Edward Island.
Cook, J. H.	Gordonville	Wellington, Ont.
Duffett, G. P.	Adolphustown	Lennox, Ont.
Dunn, E.	Plover Mills	Middlesex, Ont.
Edelsten, E. J. M.	London	England.
Elford, F. C	Holmesville	Huron, Ont.
Elliott, Wm.	Galt	Waterloo, Ont.
Farrer, J. W.	Parry Sound	Parry Sound District, Ont.
Fitzgerald, J. P.	Mount St. Louis	Simcoe, Ont.
Graesser, F. A.	Llangollen	North Wales.
Henderson, R. H.	Rockton	Wentworth, Ont.
High, A. M	Beamsville	Lincoln, Ont.
James, D. A.	Nilestown	Middlesex, Ont.
King, R. B.	Johnson's Crossing	Colchester Co., N. S.
Kipp, A.	Chilliwack	British Columbia.
Knight, J. W.	Elginburg	Frontenac, Ont.
Laird, J. G	Sarnia	Lambton, Ont.
Lang, L. W	St. Marys	Perth, Ont.
Loghrin, S. M	Stratford	Perth, Ont

3. College Roll for 1894.

Second Year Students.—Continued.

Name.	P. O. Address.	County, etc.
McCallan, E. A.	St. David's	Bermuda.
Maconachie, G. R. B.	Gurdaspur	Punjab, India.
McCullough, H. A	Nantye	Simcoe, Ont.
McDougall, D. H.	Martintown	Glengarry, Ont.
McGillivray, J. W	Sumas	British Columbia.
McKay, W. E	Prince Albert	N. W. T.
Maclennan, J. F	Hoath Head	Grey, Ont.
McPhail, J. D	Vernon	Carleton, Ont.
Macpherson, D. J.	Lancaster	Glengarry, Ont.
Paterson, T. F.	Lucknow	Bruce, Ont.
Payne, G. Y.	Peterboro'	Peterboro', Ont.
Ponting, E. A	Moweaqua	Illinois, U. S. A.
Reinke, C. E.	Ancaster	Wentworth, Ont.
Rogers, C. H.	Grafton	Northumberland, Ont.
Shorey, S. C.	Harrowsmith	Addington, Ont.
Simpson, A. E.	Hamilton	Prince Edward Island.
Smith, G. A.	Morrisburg	Dundas, Ont.
Smith, P. B	Hamilton	Bermuda.
Smythe, F. L.	Tormore	York, Ont.
Taylor, W. H	Peterboro'	Peterboro', Ont.
Thom, W. E.	Morrisburg	Dundas, Ont.
Thompson, W. J	Barrie	Simcoe, Ont.
Traviss, C. H.	Holt	York, Ont.
Tye, C. W.	Haysville	Waterloo, Ont.
Vipond, J. M.	Donegal	Perth, Ont.
Wheatley, Jno.	Blackwell	Lambton, Ont.
Whetter, J. R	Lorneville	Victoria, Ont.
Wilson, E. E.	Brampton	Peel, Ont.
Wilson, N. F.	Rockland	Russell, Ont.
Wilson, A. C.	Greenway	Huron, Ont.
Wood, R. S	Walton-on-Thames	England.

First Year Students.

Allison, D. H	Adolphustown	Lennox, Ont.
Arkell, H. C.	Teeswater	Bruce, Ont.
Arms, W. L.	Randolph	Wisconsin, U. S. A.
Aylen, C. S. F.	Southsea	England.
Balfour, W. D.	Amherstburg	Essex, Ont.
Bard, A. L.	Bardsville	Muskoka, Ont.
Bell, T. C.	Cataract	Peel, Ont.
Benning, J.	Williamstown	Glengarry, Ont.
Black, G. W.	Winchester	Dundas, Ont.
Bourassa, H.	St. Hubert	Chambly Co., P. Q.
Bowker, C. G.	Bedford	England.
Brickwell, J. R.	Paris	France.
Bruneau, A. E.	Montreal	Quebec.

3. College Roll for 1894.

First Year Students—Continued.

Name.	P. O. Address.	County, etc.
Burk, H. W.	Amherstburg	Essex, Ont.
Campbell, A.	Dalmeny	Russell, Ont.
Carlyle, S. G.	Chesterville	Dundas, Ont.
Carter, W. E. C	Toronto	York, Ont.
Charlton, E. S	St. George	Brant, Ont.
Christy, E. V	Bloomfield	Prince Edward, Ont.
Clunn, H. E.	Prestwick	England.
Clunn, W. P.	Prestwick	England.
Cousins, R. J	Enterprise	Addington, Ont.
Cowieson, W. R	Queensville	York, Ont.
Cunningham, J.	Ardtrea	imcoe, Ont.
DeHart, R. A	Creighton	Simcoe, Ont.
Devitt, I. I	Floradale	Waterloo, Ont.
Evans, A. R.	Newmarket	York, Ont.
Fee, F. W.	Toronto	York, Ont.
Fierheller, E.	Mt. Elgin	Oxford, Ont.
Findlay, J.	Toronto	York, Ont.
Fyfe, R.	Laurel	Dufferin, Ont.
Gadd, T.	Varney	Grey, Ont.
Gamble, Wm	Cumberland	Russell, Ont.
Gibson, T. E.	Toronto	York, Ont.
Gilbert, S	Rathgar, Dublin	Ireland.
Gillespie, C. A.	Toronto	York, Ont.
Gonin, B	Ilderton	Middlesex, Ont.
Gooch, G. E.	Toronto	York, Ont.
Guy, J. T	Columbus	Ontario, Ont.
Harkness, R. E.	Irena	Dundas, Ont.
Harris, M. E.	Brantford	Brant, Ont.
Harvard, H. F.	Parkdale	York, Ont.
Higginson, O. G	Hawkesbury	Prescott, Ont.
Hodgetts, P. W.	St. Catharines	Lincoln, Ont.
Humphrey, G. F	Sussex	England.
Hutton, H.	Shanly	Grenville, Ont.
Irving, J. C	Vernon River Bridge	Prince Edward Island.
Kennedy, A.	Limehouse	Halton, Ont.
Kennedy, W. D.	Vernon	Dundas, Ont.
Kewley, H. D	Sarnia	Lambton, Ont.
Kippen, N.	Underwood	Bruce, Ont.
Leavitt, A. S.	Vankleek Hill	Prescott, Ont.
Leggatt, J.	Mitchell	Perth, Ont.
Leishman, J. E. B	New Lowell	Simcoe, Ont.
Leonard, S. E	Woodford	Grey, Ont.
Lewis, Geo.	Ballymote	Middlesex, Ont.
Livingstone, J. M.	Sarnia	Lambton, Ont.
Logie, A. W	Montreal	Quebec.
Merritt, L. A.	St. Catharines	Lincoln, Ont.
Millichamp, R. W.	Toronto	York, Ont.
Moffatt	Morewood	Dundas, Ont.
Morgan, G. W.	Kerwood	Middlesex, Ont.

3. College Roll for 1894.

First Year Students—Continued.

Name.	P. O. Address.	County, etc.
Macdonald, A. N.	Toronto	York, Ont.
Macdonald, A.	W.Oakville	Halton, Ont.
McDonald, J. D	Lancaster	Glengarry, Ont.
McDiarmid, D. A.	Maxville	Glengarry, Ont.
McIntyre, A. W.	Newington	Stormont, Ont.
Mackay, Robt	Braemar	Oxford, Ont.
McKenzie, M. A	Thornton	Simcoe, Ont.
McKinley, W. W.	Seeley's Bay	Leeds, Omt.
McLaughlin, P. J. S.	Stroud	England.
McLaughlin, F. G.	Stroud	England.
McMillan, G. D.	Greenbank	Ontario, Ont.
Nasmith, J.	Toronto	York, Ont.
Oastler, J. R	Featherstone	Parry Sound District, Ont.
Parker, F. A	Bowmanville	Durham, Ont.
Pollard, J.	Orono	Ontario, Ont.
Ratcliffe, A. G.	Anderson	Perth, Ont.
Reinke, B. F.	Ancaster	Wentworth, Ont.
Rive, E.	Guelph	Wellington, Ont.
Robertson, T. H	Kingston	Frontenac, Ont.
Robertson, Geo	Ottawa	Carleton, Ont.
Robinson, H. J.	Delgany	Ireland.
Roblin, D	Adolphustown	Lennox, Ont.
Ross, M. N	Stirling	Scotland.
Ross, N. M	Stirling	Scotland.
Scott, W. F	Milton	Halton.
Shields, W. M.	Glasgow	Scotland.
Shotwell, W. M.	Poplar Hill	Middlesex.
Silcox, C. P	Embro	Oxford, Ont.
Smith, C. F	Shirley	England.
Steele, W. D.	Toronto	York, Ont.
Stewart, A. R.	Felton	Russell, Ont.
Stoddart, R. L	Bedford	England.
Struthers, J. B.	Underwood	Bruce, Ont.
Summerby, W. L.	Russell	Russell, Ont.
Thompson, E. D	Barrie	Simcoe, Ont.
Turnbull, W. J. E	Attwood	Perth, Ont.
Waddy, P. H	Rosseau	Parry Sound District, Ont.
Wallbridge —	Belleville	Prince Edward, Ont.
Wilken, A. G	Alford	Scotland.
Wilson, A. F.	McGarry	Lanark, Ont.
Yuill, J. J.	Carleton Place	Lanark, Ont.

Total number in general course 180

4. Dairy Students.

Name.	P. O. Address.	County, etc.
Barr, G. H.	Culloden	Oxford, Ont.
Ballantyne, John	St. Marys	Perth, Ont.
Bell, E. A.	Crown Hill	Simcoe, Ont.
Bell, E. J.	Glanford Station	Wentworth, Ont.
Bell, J. W.	Newmarket	York, Ont.
Black, Miss M.	Scotch Block	Halton, Ont.
Bogart, Jno	Chesterville	Dundas, Ont.
Borland, Jno.	Villiers	Peterboro', Ont.
Brayley, C. H	Marston	Norfolk, Ont.
Briggs, Jas.	Luton	Elgin, Ont.
Brodie, G. B.	Gladstone	Middlesex, Ont.
Brown, B. C.	McLean	Addington, Ont.
Brown, S. P.	Whitby	Ontario, Ont.
Burkholder, H.	Brussels	Huron, Ont.
Calder, A. G.	Winthrop	Huron, Ont.
Campbell, Wm.	Cannamore	Stormont, Ont.
Campbell, A.	King Creek	York, Ont.
Carlyle, W. J	Dunbar	Dundas, Ont.
Chalmers, A.	Monkton	Perth, Ont.
Clark, C. A.	Brooksdale	Oxford, Ont.
Clarke, Wm.	Haliburton	Haliburton, Ont.
Coben, H.	Kinmount	Victoria, Ont.
Connelly, E	Newbury	Middlesex, Ont.
Cowie, J. G	Caledonia	Haldimand, Ont.
Crosby, J. T.	Marden	Wellington, Ont.
Crothers, H	Northrop	Prince Edward, Ont.
Cummings, J. W.	Stirling	Hastings, Ont.
Cunningham, Jno.	Ardtrea	Simcoe, Ont.
Curzon, A. R.	Guelph	Wellington, Ont.
Cuthbertson, J. J.	Bright	Oxford, Ont.
Dean, Miss E.	Harley	Brant, Ont.
Dunn, E. H.	Evelyn	Middlesex, Ont.
Dwyer, Wm.	Chesterville	Dundas, Ont.
Edgar, W. A.	Brussels	Huron, Ont.
Elliott, W. J	Remington	Hastings, Ont.
Findlay, J. H	Barrie	Simcoe, Ont.
Flack, S.	Lavender	Dufferin, Ont.
Fuller, F. L.	Truro	Nova Scotia.
Gillespie, H. W	Ida	Victoria, Ont.
Haines, H.	Arkell	Wellington, Ont.
Hamilton, C. A. W.	Guelph	Wellington, Ont.
Harris, C. C.	Tyneside	Haldimand, Ont.
Henderson, T. A.	Pitt's Ferry	Frontenac, Ont.
Herrington, A.	Russell	Russell, Ont.
Hill, J. T.	Napanee	Lennox, Ont.
Holmes, W. M.	Shanly	Grenville, Ont.
Hunter, Samuel	Rockton	Wentworth, Ont.
Hunter —	Rockton	Wentworth, Ont.
Hurstfield, Wm.	Glenallan	Wellington, Ont.
Hutchinson, Miss M.	Guelph	Wellington, Ont.
Ireland, Robt.	Beachville	Oxford, Ont.
Langstaff, S.	Bishop's Mills	Grenville, Ont.

4. Dairy Students—*Continued.*

Name.	P. O. Address.	County, etc.
Lee, S. R.	Hickson	Oxford, Ont.
Lingford, H	Pickering	Ontario, Ont.
Luton, C. O	Belmont	Middlesex, Ont.
Makinson, T.	Brigus	Newfoundland.
Malcolm, John	Sheffield	Wentworth, Ont.
Michael, G. P	Hoath Head	Simcoe, Ont.
Miller, R. C.	Burlington	Halton, Ont.
Miller, John	North Bruce	Bruce, Ont.
Millichamp, R. W.	Toronto	York, Ont.
Milne, R. R.	Paisley	Bruce, Ont.
Moore, John D.	Eden Mills	Wellington, Ont.
Morrison, James T	Winthrop	Huron, Ont.
Morrow, H. C	Hannon	Wentworth, Ont.
McCallum, L. C.	Guelph	Wellington, Ont.
McCullough, Miss A.	Eramosa	Wellington, Ont.
McKenzie, D. A	Donegal	Perth, Ont.
Newman, James	Princeton	Oxford, Ont.
Olmstead, W. H	Vars	Russell, Ont.
Park, A. A	Watson's Corners	Lanark, Ont.
Parr, F	Hampton	Durham, Ont.
Pashley, Miss M. S.	Tweed	Hastings, Ont.
Peacock, Miss G. E	Mount Salem	Elgin, Ont.
Perry, A. D.	Wilton	Lennox, Ont.
Phelps, L. L.	Mount Elgin	Oxford, Ont.
Philp, D. R	Sparta	Elgin, Ont.
Pierson, W. J	St. Marys	Perth, Ont.
Poole, James	Waba	Renfrew, Ont.
Potter, R. J.	Mono Mills	Peel, Ont.
Price, W. W.	Butternut Ridge	New Brunswick.
Richardson, J. W.	Caledonia	Haldimand, Ont.
Robertson, L.	Guelph	Wellington, Ont.
Robeson, James	Athens	Leeds, Ont.
Rood, E. A	Hulbert	Dundas, Ont.
Rosenbargo, Jos	St. Marys	Perth, Ont.
Row, W. H	Brockville	Leeds, Ont.
Saul, I. T.	Crumlin	Middlesex, Ont.
Scott, D. F.	Carleton Place	Lanark, Ont.
Smith, A	Beachville	Oxford, Ont.
Steyn, J. G. L.	Riebeek West	Cape Colony, South Africa.
Story, J. E.	Guelph	Wellington, Ont.
Story, T. B.	Smith's Falls	Lanark, Ont.
Stratton, R. W.	Straffordville	Elgin, Ont.
Sutherland, Thomas	Grantley	Dundas, Ont.
Talbot, J. T	Wyton	Middlesex, Ont.
Thompson, W. E	Eldorado	Hastings, Ont.
Vanatter, P. O.	Ballinafad	Wellington, Ont.
Wallace, S. F.	Mount Forest	Wellington, Ont.
Webb, Miss F. I	Ospringe	Wellington, Ont.
Wilford, John	Brownsville	Oxford, Ont.
Wilson, A. H.	Athens	Leeds, Ont.
Young, W. T.	Lakefield	Peterboro', Ont.

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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 Byron and Addison.

MATHEMATICS.

Arithmetic. Review of subject, with special reference to methods, decimals, interest, piscount, 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 long 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 land 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 Longfellow.

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 brough into the lecture-room and analyzed before the class, so as to render students familiar with the different organs and their use in the plant 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 Addison and Longfellow.

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 artificial 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 imple machines.

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 principa 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 benefical 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 hot beds 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; propagation 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.

Statics. Theory of equilibrium; composition and resolution of forces; parallelogram of forces; centre of gravity, etc.

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; adulterations 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 Milton's "L'Allegro" and "Il Penseroso."

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 overings, 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, ·ganic 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 75 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, Bk. 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.

Macaulay—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 farmhouses, barns, stables, etc.—ground plans, elevations, sections, and construction.

APPENDIX III.

EXAMINATION PAPERS.

I. Papers Set at Easter Examinations, 1894.

FIRST YEAR.

Agriculture.

I. Explain how a dairy cow differs from a cow of a beef breed.

II. What is meant by capillary power of the soil?
Explain its importance and the conditions which influence it.

III. What is accomplished by the following operations:
(*a*) Deep plowing in autumn,
(*b*) Frequent shallow cultivation,
(*c*) Rolling?

IV. Under what conditions might the operations mentioned in question III. prove injurious? Give reasons.

V. Give the principal points to be observed in the care of farmyard manure.

VI. Discuss the following methods of applying farmyard manure:
(*a*) Top dressing,
(*b*) Shallow covering,
(*c*) Deep covering.

VII. In deciding the distance between laterals in draining, what things must be considered?
Show clearly what would be the result if placed too far apart.

VIII. Under the following heads write brief notes on clover culture:
(*a*) General characteristics and importance of the crop,
(*b*) Varieties, their importance, soils to which suited,
(*c*) Cultivation, time of sowing, seed per acre, precautions to ensure crop.

IX. Discuss the following points in connection with fodder corn:
(*a*) Suitable soils,
(*b*) Place in rotation,
(*c*) Choice of varieties,
(*d*) Time and method of sowing,
(*e*) Time of cutting.

X. Suppose that on your farm there is a swampy piece of land posssessing a deep humus soil. Explain how you would proceed to reclaim it, and state what kind of crops might be grown during the first few years.

Inorganic Chemistry.

I. Distinguish between physical and chemical changes. Give examples.

II. What proportion by volume of the atmosphere is nitrogen? Briefly describe any method to illustrate this.

III. Define combustion in its broadest sense. CO_2 is incombustible, and CO is combustible. Why?

IV. Define the law of definite proportions. Lime mixed with a nitrogenous manure liberates seven grams of ammonia. Calculate the loss of nitrogen.

V. How are the following collected: Chlorine, hydrogen, carbonic acid (CO_2), carbon monoxide, nitric oxide, and sulphur dioxide?

VI. Sketch an apparatus for obtaining ammonia from ammonium chloride, giving the uses of the several parts.

VII. How may common salt be made and obtained in the solid form? Give chemical equation.

VIII. Define the following: Acid salt, neutral or normal salt, metal, and base. Explain how salts are named.

IX. Name two reducing agents. What is meant by a molecular weight? Determine the molecular weight of calcium phosphate.
$Ca=40$, $P=31$, $O=16$.

X. HCl is called hydrochloric acid. Why not call KCl potassium hydrochlorate? Calculate the weight of P_2O_5 in 100 lb. of monocalcic phosphate.

Geology.

I. Name the deposits wanting in Ontario and account for their absence.

II. Describe the condition of life at the close of Archaean times and draw a sketch map of North America at that time.

III. What are the striking characters of the Cretaceous system? the economic products, and where are the deposits found?

IV. Give proofs of an Ice Age in Ontario and describe briefly how it influenced the nature of our soils.

V. Name six of the most important minerals found in rocks and the constituents they supply in the formation of soil.

VI. Describe the fossils *lingula*, *trilobite*, *ammonite* and *sigillaria*, and name the deposits in which they are common.

VII. In what deposits of Ontario are the chief sources of salt, fuel and gypsum found?

VIII. Name some of the chief changes that rocks undergo after they are deposited and give diagrams showing the different kinds of valleys which sometimes result.

IX. Explain the action of the air in rock disintegration.

Zoology.

I. Give the chief characteristics of living bodies and describe briefly protoplasm and its relation to living bodies.

II. Name some of the most important forms of tapeworm, and state which is most injurious to sheep, and in what way.

III. Classify the following animals: Hawk, dog, bee, starfish, mink, sloth, trichina and whale.

IV. Compare the circulatory system in the sea urchin, tapeworm and fish.

V. State what forms the basis of classification in birds, and give a list of Canadian wild ducks and ten insectivorous birds.

VI. Explain the terms symbiosis, hybernation, metamorphosis and cryst as applied in Zoology.

VII. Compare the characters of the ungulata with those of the carnivora, and state how the animals in these orders are of economic value.

VIII. What conditions are likely to modify the distribution of animals in space?

IX. Show in what way earth worms become important in the formation of soil.

Veterinary Anatomy.

I. Describe the ligamentum nychea.

II. Name the bones of the hind extremity and describe the os calcis.

III. Describe the penniculus carnosus muscle. Give its attachments and action.

IV. What is epithelium? Name the different varieties and mention which variety is found in the air passages.

V. State the number and arrangement of temporary molar teeth a colt has at birth, and also the order and age at which he gets his permanent molars.

VI. Name the organs of respiration and describe the larynx.

VII. Name the genital organs of the male, and trace the semen from its point of secretion until it is ejected from the body.
VIII. Trace the blood through the pulmonary circulation.
IX. Give a general description of the cerebro-spinal and the sympathetic system of nerves.
X. Name the tunics of the eye and describe the lachrymal apparatus.

Literature.—Longfellow and Byron.

Ten marks will be given for *neatness, spelling* and *correctness of expression.*
Those trying for *honors* must attempt question X.

I. Discuss the metre of Evangeline.
Scan the following lines and mark the Cæsural pause:

"Ye who believe in affection that hopes and endures and is patient,
Ye who believe in the beauty and strength of woman's devotion,
List to the mournful tradition still sung by the pines of the forest;
List to a tale of love in Arcadie, home of the happy."

II. Describe (1) the appearance and (2) the character of Evangeline, quoting where you can to illustrate your answer.
III. Give in your own words or quote any of the *outdoor* scenes in Evangeline, and state in detail, with reasons, whether you consider the description true to nature.
IV. Give a synopsis of the poem "Robert of Sicily." What is the purpose of the poem?
Select any *four* of the following *six* questions:
V. Describe the death of Benedict Bellefountaine and the burning of the village. Quote where you can.
VI. Which do you consider the prettiest of the minor poems of Longfellow you have studied? *Give reasons*, and quote four consecutive stanzas from the one you select.
VII. Write out the stanza commencing

"The flying Mede, his shaftless broken bow."
or "And Ardennes waves above them her green leaves."

and point out in *detail* how the diction differs from that of prose.
VIII. Write notes on: St. John's Eve, St. Augustine, Ardennes, Lochiel, Chillon.
IX. How does Byron's "Prisoner of Chillon" differ from the historical personage? Why is this poem said to be the most un-Byronic of any he has written?
X. "This canto paints the revolt of Byron's tortured spirit against the world's opinion, to which, while he scorned it, he was to the last a slave."
Show by reference to *Byron's Life* and the III. Canto the truth of this extract, giving quotations to illustrate your answer.

Grammar and Composition.

I. Define: Relative pronoun; inflection; subordinating conjunction; co-ordinating conjunction; subjunctive mood.
II. State the different methods of forming the plural of nouns, illustrating each by an example.
III. (*a*) Give the possessive singular and plural of the following nouns: Brother, lady, hero, brother-in-law, wife.
(*b*) Decline the pronous *I* and *who.*
IV. Name and classify the inflections of the pronoun and verb. (For classification see definition).
V. Analyze the following sentence and parse the underlined words:
Seeing that there was no boat, he *tried to cross* the river on a raft *made* by *fastening* together a few pieces of board.

VI. Punctuate the following sentences, giving reasons:

(a) Children imitate the language the tone the pronounciation the looks the gestures the gait of those with whom they live and if the imitation be continued sufficiently long no efforts in after life can overcome it.

(b) Nelson was in need of frigates the eyes of the fleet as he called them.

(c) Quick quick cried he let us run away or he will catch us
Who will catch us asked the stranger
Mr. Toil the old schoolmaster answered Daffy Dont you see him.

VII. Improve the following sentences, giving reasons for any changes:

(a) A letter received some time ago from a North-West correspondent, and which was unfortunately mislaid, appears in to-day's issue under the caption of "A settler's trials."

(b) Man, though he has a great variety of thoughts, yet they are all within his own breast.

(c) Let me awake the king of Morven, he that smiles in danger, he that is like the sun of Heaven rising in a storm.

(d) They who opulence has made proud, and who luxury has corrupted, cannot relish the simple pleasures of nature.

(e) The ends of a divine and human legislator are vastly different.

VIII. Change into prose:

All things that love the sun are out of doors;
The sky rejoices in the morning's birth;
The grass is bright with rain-drops; on the moors
The hare is running races in her mirth;
And with her feet she from the plashy earth
Raises a mist; which, glittering in the sun
Runs with her all the way, wherever she doth run.

IX. Write a short composition on one of the following:

(a) Your favorite books. (b) A description of your home.

Arithmetic and Mensuration.

I. Define trapezium, hypotenuse.
A rectangular field A B C D, whose length A B is 80 rods, and width B C 25 rods, has a straight, narrow ditch running from the corner A to the opposite side C D, ending 20 rods from the corner C. Find the length of the ditch and the area of the trapezium formed.

II. Find the value of a pile of lumber consisting of: 50 inch boards, 12 feet long and 10 inches wide at $11 a thousand; 30 2 inch planks, 10 feet long and eight inches wide at $12 a thousand; 25 pieces of scantling, three inches square and 14 feet long at $15 a thousand.

III. How many days from December 26th, 1893, to March 8th, 1894, inclusive.
Find interest on a note for $65 at six per cent for that time.

IV. (a) On April 2nd, 1894, a merchant buys $1,500 worth of goods on four months' credit, and $900 worth on two months' credit. Find the equated time for payment of the whole debt.

(b) 12 lb. of water at 40° is mixed with 3 lb. at 150°. Find the temperature of the mixture.

V. A mixture of oats and barley, 28 bushels, weighs 43 lb. per bushel. How many bushels of oats in the mixture?

VI. Define (a) cylinder, (b) cone, (c) sphere.
How many gallons of water would a cylindrical cistern hold, whose diameter is 7 feet and depth 6 feet? (1 cubic foot = $6\frac{1}{4}$ gallons.)

VII. If the rainfall during 24 hours is $\frac{1}{2}$ inch, how many tons of rain would fall on a 10-acre field? (1 cubic foot of water weighs 1,000 ounces).

VIII. Multiply 3786942 by 7083005, and check your result by casting out the nines.
Prove that (1) $.72 \div .9 = .8$.
(2) $\frac{3}{4} \times 4\cdot5 = 3\cdot5$.

IX. Prove that the area of a regular polygon is equal to the length of the perpendicular from the centre of the polygon upon a side of the polygon multiplied by half of the perimeter.
From this deduce the area of a circle, giving fully each step in the reasoning.

X. A ladder whose foot rests in a given position just reaches a window on one side of a street, and when turned about its foot, it just reaches a window on the other side. If the two positions of the ladder be at right angles to each other, and the height of the windows be 36 and 27 feet respectively, find the width of the street and the length of the ladder.

Book-Keeping.

I. Define negotiable paper.
Name and define clearly three kinds of negotiable paper.

II. Give day book entries for the following:

(*a*) Merchandise, Dr	$1,000	
To pay bills		$ 700
To cash		300
(*b*) Bills, pay Dr	$1,000	
Interest, Dr	18	
To cash		1,018
(*c*) Loss and gain, Dr	150	
Cash	100	
To bills received		250

III. (*a*) Make out a list of accounts that would be opened for general business on a farm, and under these accounts classify the items of outlay and returns that would occur in general farming.
(*b*) Make out a list of, and classify, the items that you would take account of in bookkeeping for a fruit farm.

IV. I commenced business with a capital of $1,200. At the end of six months my books exhibit as follows: Cash on hand, $527.34; Henry Hicks, Dr. $495, Cr. $213; John Sims, Cr. $43; George Hope, Dr. $250, Cr. $375; goods on hand worth $755. Make out in proper form a statement showing my present worth and my net gain or loss.

V. Guelph, Ontario, April 11th, 1894.

—11—

Gave Jas. Smith, on account, my draft at ten days on L. Mason for $40.

—12—

Discounted at the bank M. Taylor's note, due 3 months hence, at six per cent. Face of note $80. Proceeds deposited.

—13—

Bought from J. Richardson goods valued at $400. Gave in payment my note at 60 days for $200, an order on H. Calder for $60, and my cheque on Merchants' Bank for balance.

(*a*) Journalize the above entries.
(*b*) Write the draft in No. 1, the note in No. 2, and the order and the cheque in No. 3.

VI. "Wanted, a foreman for a large stock farm. Applicants state experience and qualifications, with salary expected. Give references.
Answer this advertisement.

SECOND YEAR.

Live Stock.

I. In judging sheep for wool production, to what points would you pay particular attention?

II. Explain briefly in what respects the Lincoln, Leicester, and Cotswold sheep differ from each other?

III. Point out the main points of difference between Galloway and Polled Angus cattle, and between Devon and Sussex cattle.

IV. Describe the type of animal you would approve of as a beef bull, and point out the principal points in which he would differ from a dairy bull.

V. In what respects may some knowledge of the history of a breed aid us in handling it successfully? Illustrate your answer by reference to Jersey cattle.

VI. Give the leading characteristics of Holstein-Friesian and Ayrshire cattle.

VII. Describe a typical Jersey cow, and state how she differs from a Guernsey.

VIII. What is meant by an "Advanced Registry," and what is its value?

IX. State which is your favorite breed of dairy cattle, and give as many arguments as possible in its favor.

Judging Cattle.

I. Of the two steers, state which you think is the better butcher's animal, and give reasons.

II. Criticize the cow as a dairy animal, pointing out her chief good and bad habits.

III. Point out the chief defects in the Sussex bull as a beef sire.

N.B.—Marks will be allowed for the manner in which the judgment is performed.

Do not wait to be asked any questions but proceed at once to work.

Speak distinctly, least you may be misunderstood.

Judging Sheep.

I. Select which you think is the better Oxford ram, and give reasons.

II. Name the breed to which the ewe belongs, and criticize as a representative of the breed.

III. Name the breed of the ram and point out his defects.

Dairying.

I. What things are necessary to make a success of supplying milk to towns and cities? How might a better and more healthful milk supply be obtained? Mention any city where the milk is said to be very pure, and some of the measures that have been adopted to secure this.

II. How may we know whether a taint or bad flavor in milk is caused by the food eaten, or by some abnormal fermentation?

III. Why is the cream separated from milk before churning? How may it be done? Which system of creaming do you prefer? Give reasons.

IV. Name the chief points to be observed in setting and starting a cream separator.

V. What is probably wrong when the following occur: (*a*) Cream is too thick; (*b*) Separation incomplete; (*c*) Machine shakes?

VI. Give the chief points of difference between the Alpha and the Danish Weston separators. In what way does the Russian differ from all the other separators in the dairy building?

VII. Define a "starter." How can it be made? Is it any advantage? If so, what?

VIII. L. reading 30; temp. 67°; fat 1.7 per cent. Give the Sp. Gr. per cent. of solids not fat, total solids, and water in the sample of milk.

IX. What is the value of 50 inches of cream testing 120 per cent. at 20 cents per standard inch.

X. Describe the "hot iron test." What "length of string" should curd have when dipped, and when milled in making spring, summer and fall cheese.

Horticulture.

I. Describe the making of a hot-bed. For what is it used?
II. About what size would you make the vegetable garden to supply the wants of an ordinary family? What crops would you grow in it? What implements would you consider necessary in cultivating these?
III. Describe what is known as "the new onion culture." What are the advantages claimed for it?
IV. To what botanical order does the potato belong? Mention other plants belonging to the same order.
V. Tell what you know about growing asparagus.
VI. State briefly the main points to be observed in growing strawberries.
VII. How and when would you prune the raspberry?
VIII. In what way might the general appearance of country homes be greatly improved.
IX. State briefly some of the general principles to be observed in growing house plants.
X. Give the names of some of the best books in the library on fruit growing, vegetable gardening and floriculture. Name the horticultural journals in the reading-room and give a short account of any article you have read in them.

Agricultural Chemistry.

I. Name (1) the ultimate, and (2) the proximate constituents of the animal body; and briefly discuss the composition of animals in various stages of growth and fattening.
II. Express by numbers the relative heat-producing power of the following: Cellulose, fat, starch, albuminoids, fibre and amides.
III. What is characteristic in composition of the following foods: Linseed cake, peas, oats, barley, bean straw, pasture grass, over-ripe hay and turnips?
IV. A food contains 2.064 per cent. nitrogen and 11.9 per cent. albuminoids; calculate the per cent. of amides.
V. Define "digestion co-efficient." How are digestion co-efficients determined; and what practical value have they in feeding?
VI. What is meant by "albuminoid ratio?" Composition being Nit. substance 22.4, fat 2, S. carbohydrates 52.5, fibre 6.4, albuminoids 19.7, and digestion co-efficients respectively 77, 100, 87 and 30, determine the albuminoid ratio of the food.
VII. What is characteristic of a maintenance diet for a horse at rest? Briefly discuss the relative amount and distribution of the manurial constituents in the excrements of the animal.

Veterinary Pathology.

I. Give symptoms and treatment of open joint, and state what symptoms and conditions indicate an unfavorable termination.
II. Name the diseases of the hock and give treatment for a case of capped hock.
III. Give symptoms and treatment for sprain of back tendons (fore leg).
IV. Name the diseases of the feet and give causes and symptoms of navicular disease.
V. Name the different kinds of tumors to which the horse is subject, and give the probable cause and treatment for melanotic tumors and the effect they have on the animal in case treatment is not resorted to.
VI. Explain the difference in the symptoms of periodic and simple ophthalmia, and give causes and treatment for the latter.
VII. Give symptoms and treatment for tetanus.
VIII. Causes, symptoms and treatment for cracked heels (scratches).
IX. Give difference in the symptoms of spasmodic colic and enteritis, and give treatment for and probable termination of the latter.
X. Causes, symptoms and treatment for laryngitis.

Literature—Richard II.

I. Explain accurately the meaning of the words underlined in the following:

(*a*) thy wretched brother. . .
Who was the *model* of thy father's life.
(*b*) And fright our native peace with *self-born* arms.
(*c*) Or I'll be buried in the King's highway,
Some way of common *trade*.
(*d*) You make a *leg*, and Bolingbroke says aye.
(*e*) The *chopping* French we do not understand.
(*f*) O, how it *yearn'd* my heart when I beheld. . .
(*g*) *Depose* him in the justice of his cause.

II. By whom and under what circumstances were any *five* of the following passages uttered:

(*a*) How sour sweet music is
When time is broke, and no proportion kept!
So is it in the music of men's lives.
(*b*) I count myself in nothing else so happy
As in a soul remembering my good friends.
(*c*) They well deserve to have
That know the strong'st and surest way to get.
(*d*) The purest treasure mortal times afford
Is spotless reputation.
(*e*) Who are the violets now
That show the green lap of the new-come spring?
(*f*) O, but they say the tongues of dying men
Enforce attention like deep harmony.
(*g*) I am sworn brother, sweet,
To grim necessity.
(*h*) Within the hollow crown
That rounds the mortal temples of a king
Keeps Death his court.

III. Give an account of the 1st scene of Act I. Why does Shakespeare begin the play with this scene?

IV. Explain fully what purposes in the play are served by the introduction of Gaunt.

V. What aspects of Richard's character are brought out respectively in the earlier scenes of the play (up to his departure for Ireland); in the middle scenes of the play (up to his yielding to Bolingbroke); and in the latter scenes? What artistic purpose is served in bringing out the aspects of the King's character in this order?

VI. Quote any two of the finer passages, each of about eight lines in length.

Hydrostatics.

I. What is meant by saying that matter is non-continuous?
A block of wood is fixed to the floor, and a heavy ball is suspended so as to touch the block at one end. If the farther end is tapped with a hammer, explain what happens, and what it goes to prove.

II. Name the distinctive properties of a solid and of a gas.
One arm of a U-shaped tube passes through the stopper of a flask partly filled with water. The other arm passes into an open vessel also partly filled with water. Both ends are immersed in water. The whole set is now placed under the receiver of an air pump, and the air exhausted from the receiver, and afterwards let in again. State and explain fully the results of the experiment.

III. Define pressure, pressure at a point, and transmission of pressure.
Describe an experiment (1) to show that the pressure increases with the depth in a liquid, (2) to show the magnitude of air-pressure.

IV. Define (a) buoyancy of a liquid, (b) specific gravity.
A three inch cubic block of iron is suspended in water by a string so that the top surface of the block is 1 foot beneath the surface of the water. Draw a diagram representing the forces acting upon the block, state their magnitudes, and the conclusions to be drawn.

V. Draw a diagram of Nicholson's hydrometer and explain *in detail* its use, stating the hydrostatic principle on which it depends.
State, and explain by means of a diagram, how the specific gravity of mercury can be determined by using a U shaped glass tube.

VI. Define (*a*) cohesion, (*b*) capillarity.
Describe, by means of a diagram, the capillary tubes, and explain their action (1) when water is poured into them, (2) when mercury is poured in.
Explain what is meant by saying that mercury will not wet a body which touches it.
A small quantity of water is poured in with some mercury. Explain how the water may be removed.

VII. State the different sources from which plants may obtain moisture.
Explain, *in detail*, the method of cultivation which will bring moisture to plants, and at the same time prevent wasteful evaporation.

VIII. Draw a diagram, and explain in detail the action, of each of the following: Air-pump, siphon, Bunsen's filterer, force pump.

Political Economy.

I. Are there two kinds of Political Economy—Practical and Theoretical? If so, define and illustrate each.

II. Distinguish: Wealth, Capital, Property, Interest.
Explain: Credit, Inconvertible paper money, Bill of Exchange, Clearing House, Suspension of the Bank Act.

III. State the advantages of direct and indirect taxation, respectively.

IV. "Value always depends on supply and demand." *Explain fully.*

V. What are the functions of a bank?

VI. State the law of "Diminishing returns," and the law of "Increasing returns." In what way are these laws important in considering the following subjects: The State Management of Railways; The Nationalization of Land?

VII. The doctrine of "Laissez Faire" assumes:

(1) That all people are the best judges of their interests.

(2) That the interests of the state are always identical with those of the members.

Refute or substantiate these assumptions.

VIII. State the difficulties which arise in attempting to get a solution for what is known as "the labor problem."

IX. In Canada during the last fifteen years very many of the smaller manufactories of machinery, waggons, carriages, boots and shoes, and harness, have ceased to operate, and these articles are now made by a few large establishments.
How do you account for this change?
State and explain the economic laws which are illustrated by it.

X. Would it be advantageous for the City of Guelph through its Council to own and operate the Street Railways, Telephone System, Waterworks System, and Lighting of the City?

Drawing.

I. Draw the following plans of the Farm Piggery:

(*a*) Plan of building 100 ft. by 32 ft.
Alley through centre, from end to end, 8 ft. wide.
Doors, at each end, in the middle, 7 ft. 6 in. wide.
12 pens, each 7 ft. 2 in. wide, and 12 ft. long, on each side of the alley. Represent only partitions.
Compartment at west end, 14 ft. by 32, for feed.
Scale.—16 feet to the inch.

(*b*) Two of the pens, 12 ft. long, 7 ft. 2 in. wide.
Partition between pens, 10 ft. 9 in. long.
Small doors leading from alley, hinged at the end of partition, 1 ft. 10½ in. wide.
Doors leading outside, 2 ft. 3 in., diagonally opposite the doors from the alley.
Pens outside, same size as inside pens.
Window 3 ft. 10 in. wide. A vertical plane through partition bisects the window.
Scale.—8 feet to the inch.

(*c*) Represent the section of the building made by the above mentioned.
Partition 3 ft. 9 in. high.
Bottom of window 4 ft. 6 in. from the floor.
Window 2 ft. 6 in. high.
Ceiling 9 ft. 4 in, from floor.
Eaves 10 ft. high. Peak of roof 21 ft.
Scale —8 feet to the inch.

II. (*a*) Draw a line parallel to a given line AB. at a given distance from it.
(*b*) Erect a perpendicular to a given line AB. from a point C. within it.
(*c*) Divide a line 4 in. long into two parts, whose ratio shall be 2 to 5.

II. Papers Set at Midsummer Examinations, 1894.

FIRST YEAR.

Agriculture.

I. Desccribe a typical mutton sheep.
II. Write brief notes on the cultivation and utility of *millet* and *rape*.
III. Give a suitable seed mixture for land that is intended for pasture.
IV. (*a*) What advantages are to be derived from following a systematic rotation?
(*b*) Give a good rotation for a clay loam farm devoted to mixed farming.
V. What general principles should be observed in keeping a farm free from weeds?
VI. Give a good method of destroying the following weeds: Canada thistles, wild mustard, and wild flax.
VII. On what soils may lime be used to advantage? Explain its action and state precautions to be observed in its use.
VIII. "But it is none the less true, that gypsum is a fit manure neither for poor land nor for regions where high farming is practised It has found place only in districts where the methods of farming were simple, and so to say backward, and is really a fertilizer of times that are past."—Storer.
Discuss the above statement.

Dairying.

I. Write a short description of a cow's udder, and tell how the milk is secreted therein. 20.
II. What points in a dairy cow indicate large milking powers and the ability to make milk of good quality? 10.
III. What characteristics are needed in a bull for dairy purposes? 10.
IV. Define the following terms: Prepotency, atavism, cross-breeding, grading, heredity, ration, and nutritive ratio. 10.
V. State how you would proceed to establish a dairy herd. 10.
VI. Given the following foods, how would you feed them and in what quantity would you feed them to a cow per day: Corn silage, clover hay, wheat bran, peas, and cottonseed meal? 15.
VII. What are the two requisites in making good silage? 10.
VIII. Give a list of soiling crops suitable for summer use, stating when and how each should be sown and the time of year it will be ready for feeding.

Bee-keeping.

I. What can you say of Canada as a field for honey production?
II. How would you begin bee-keeping?
III. Describe swarming, both natural and artificial.
IV. State methods of producing extracted and comb honey.
V. Explain process of queen-rearing.
VI. Describe approved methods of wintering bees in this climate.

Materia Medica.

I. Define Veterinary Materia Medica and state what is meant by (*a*) The Physiological and (*b*) The Therapeutic action of medicines.
II. Define and give an example of (*a*) a dieuretic, (*b*) a caustic, (*c*) an antiperiodic, (*d*) an anæsthetic.
III. Give the actions and uses of Liquor Ammoniæ Acetatis.
IV. Give actions, uses, and doses of Belladonna.
V. What is understood by a cardiac sedative? Give an example and state in what cases you would use it.
VI. Give the properties, actions, and uses of Gentian.
VII. In what cases, and why, should opium not be given?
VIII. What is (*a*) Calomel? (*b*) Corrosive Sublimate? and why is it important that these two substances should not be confounded?
IX. Give the properties, actions, uses, and doses of Chlorate of Potash.
X. Give properties and actions of the Biniodide of Mercury.

Botany.

I. Define and state how these terms are respectively applied: Napiform, epiphyte, stolen, peltate, pinnate, corymb, caducous, versatile, nectaries, fibro-vascular.
II. Distinguish between: Hybridization, Self fertilization, and Cross-fertilization.
III. Draw diagrams illustrating (1) Hypogynous, (2) Perigynous, (3) Epigynous.
IV. Give the characters of the Cruciferæ and mention weeds that occur in this order.
V. State the economic importance of the following, give scientific name, and allot to their respective orders: Watercress, flax, poppy, red clover, strawberry, sunflower, tobacco, lilac.
VI. Describe the organs of reproduction in a plant.
VII. Write a note on the collecting, preserving, and storing of plants.
VIII. Describe a cell, its forms and contents, illustrating your description by diagrams.
IX. Write a description of the Liliaceæ, naming the more important species, their habitats and times of flowering. *Tabulate your answer.*

Literature—Addison and Longfellow.

I. Explain what is meant by periodic sentence, loose sentence; and illustrate by making use of the following sentence:

Once as they sat by their evening fire, there silently entered into the little camp an Indian woman.

II. Change the following into good *prose*, giving the meaning as fully as possible:

Such in the soul of man is faith. The blossoms of passion, gay and luxuriant flowers, are brighter and fuller of fragrance; but they beguile us, and lead us astray, and their odour is deadly. Only this humble plant can guide us here, and hereafter crown us with asphodel flowers, that are wet with the dews of nepenthe.

Arrange the above in verse form, and scan the two last lines.

III. Relate briefly that part of the narrative which immediately precedes, and succeeds, the following:

Suddenly, as if arrested by fear or a feeling of wonder,
Still she stood, with her colourless lips apart.

IV. State the poetic elements that characterize the poem "Evangeline," illustrating from the following, or from quotations:

"Like a phantom she came, and passed away unremembered.
Fair was she and young, when in hope began the long journey;
Faded was she and old, when in disappointment it ended.
Each succeeding year stole something away from her beauty,
Leaving behind it, broader and deeper, the gloom and the shadow.
Then there appeared and spread faint streaks of gray o'er her forehead;
Dawn of another life, that broke o'er her earthly horizon,
As in the eastern sky the first faint streaks of the morning."

V. Quote any four consecutive lines of the conclusion of "Evangeline."

VI. Write, in your best style, the substance of Addison's Essay on Discretion, or Essay on Inconstancy.

VII. Discuss the probable *purpose* and *effect* of Addison's essays, basing your remarks upon the essays you have read.

Grammar and Composition.

I. Conjugate the verbs *be* and *shall* in the present indicative and past subjunctive.

II. Show clearly, using examples, how to distinguish the imperfect participle from the infinitive in *-ing*.

III. Explain how perfect tenses are formed, and give the different uses of the verb *be*.

IV. Classify pronouns, giving an example of each.

V. Give the principal parts of the following verbs: Bleed, cast, flee, sleep, climb, beat, drink, freeze, swing, can.

VI. Analyze the following sentence and parse the underlined words: "A little room *adjoining* the *hall* is a *kind* of arsenal *filled* with guns of several sizes and inventions, *with which* the knight *has made* great havoc in the woods, *and* destroyed many *thousands* of pheasants, partridges, and *woodcocks*.

VII. Reconstruct the following, giving reasons for any changes which you make:

(*a*) I sink into the bosom of the grave, it opens to receive me, my race is run, my lamp of life is nearly extinguished.

(*b*) The annual anniversary of the landing of the pilgrims, celebrated yearly, took place a few days since.

(*c*) The following treatise, together with those that accompany it, were written many years ago.

(*d*) Alarmed by so unusual an occurrence, it was resolved to postpone their departure.

(*e*) Let you and I go together.

(*f*) Whom do men say that I am?

VIII. Write an essay of at least two paragraphs on *one* of the following topics:
(*a*) Your favorite subject of study.
(*b*) The value of science in agriculture.
(*c*) A day's outing.

Arithmetic.

I. How many cords of wood in a cylindrical piece of timber 11 ft. in circumference and 40 ft. long? (128 cubic feet = 1 cord.)

II. Find total value of the following: 50 pieces of 3-inch scantling, 14 ft. long, at $13 per thousand; 60 2-inch planks, 10 in. wide and 12 ft. long, at $15 per thousand; 100 1-inch boards, 15 in. wide and 18 ft. long, at $16 per thousand.

III. How many bushels of oats must be mixed with 9 bushels of peas, in order that the mixture may average 46 lb. per bushel?

IV. Find the interest on $730 from January 10th to March 19th, 1894, inclusive, at 6 per cent. per annum.

V. How many shingles 8 in. wide, laid 4 in. to the weather, would be required for the roof of a building 30 ft. long, rafters 16 ft. long?

VI. On January 10th, Jones buys from Brown: 1 mower for $55, to be paid in 3 months; 1 rake for $32, to be paid in 2 months; find the equated time for the payment of the whole debt.

VII. Find the result, correct to four decimal places, of $4.62875 + 3.54983$.
A reaper can be bought on either of the following conditions: $110 cash or by making four equal annual payments. If money is worth 6 per cent., and the first payment is made at the time of purchase, find what should be the amount of each payment. Test the accuracy of your result.

VIII. A dealer sold an article at a gain of 35 per cent. If it had cost him $16 more, the same selling price would have yielded a gain of $12\frac{1}{2}$ per cent. Find the cost of the article.

IX. A farmer sold two loads of wheat, in all 110 bushels, for $94.95; one load realized 97c. a bushel and the other 72c. How many bushels were there in each load?

X. Divide 710 by 26 in the scale of 9.

SECOND YEAR.

Agriculture.

I. Explain the importance of heredity in stock breeding.

II. Write notes on in-breeding, discussing its utility, and pointing out its advantages and dangers.

III. What constitutes a good pedigree? Of what importance is a pedigree?

IV. Describe the type of sow which you think might be most successfully mated with the Tamworth boar used on this farm.

V. Write notes on the history and general characters of Berkshire and Poland China swine.

VI. State the main points of difference between improved Yorkshire and Chester White hogs.

VII. Outline your plan regarding the following:
(*a*) Summer management of cows that are milking.
(*b*) Management of brood sow from time of service until young pigs are one week old.
(*c*) Management of lambs from the time they are dropped until one week after they are weaned.
(*d*) Management of stock bull from the time he is one year old.

Dairying.

I. "Rennet action as to time depends upon four things." What are they? 10

II. Hansen's Rennet Extract coagulated 8 ounces of milk in 20 seconds at a temperature of 86°, while a sample sent to the Dairy for testing coagulated the same quantity of milk at the same temperature in 24 seconds. Which is the stronger rennet? How much stronger is one than the other? 10.

III. Give the leading features of the Cheddar system of cheese-making. 10.

IV. Why is the curd cut into cubes? How is it done? What points need to be observed in cutting? 20.

V. When is a curd ready to salt? How much salt should be used? What are the general effects of salt, and the effects of using too much? Under what conditions may an extra amount of salt be used and why? 20.

VI. Give a scale of points for judging cheese. What is the most important point in a good Cheddar cheese? How may it be spoiled? 20.

VII. What two plans of conducting the factory business are usually adopted in Ontario? Name the advantages and disadvantages of each.

Agricultural Chemistry.

I. Enumerate the bad effects of excessive water in soil.

II. Name the essential elements found in the ash of plants.

III. Discuss the use of common salt on land.

IV. Determine the pounds of nitrogen applied in sowing per acre 200 lb. of ammonium sulphate, 94 per cent. pure.

V. Define the following: Albuminoid ratio, proteids, amides, digestion, co-efficients, and non-albuminoids.

VI. Name the most suitable manures for the following crops: Turnips, mangels, spring wheat, barley and clover.

VII. What observations have you made as to the effects of four fertilizers and in fertilizer with oats growing in experimental plots?

Analytical Chemistrry.

I. Is iron present in substance A?

II. Three salts are marked respectively I, II and III. Determine which is potassium sulphate and which sodium nitrate.

III. Does substance D contain phosphoric acid?

IV. Determine the groups present in mixture E.

Botany.

I. Give the characters of the *Borraginaceæ* and *Umbelliferæ*, mentioning some of the common plants in each.

II. Describe a seed, and state how it differs from a spore.

III. Name some orders in which the plants are monœcious or diœcious.

IV. Give a list of weeds with creeping perennial roots, and name the orders to which they belong.

V. Represent a typical cell and mention some of the modifications which cells undergo during development.

VI. Compare the downy mildew and the powdery mildew of the grape, and describe carefully the preparation of the Bordeaux mixture.

VII. Distinguish between Angiospermous and Gymnospermous plants.

VIII. Indicate the *plan* and *formula* of the flower before you. To what order does it belong?

Horticulture.

I. Tell what you know about the nature and functions of roots.
II. Give briefly the management of a young orchard.
III. Describe what you consider the best plan of laying out an orchard,
IV. How would you distinguish a leaf bud from a fruit-bud?
V. What is meant by thinning fruit? Why is it practised?
VI. At what stage of maturity would you pick apples, pears, plums, and grapes? How is the proper stage of maturity in these fruits indicated?
VII. What are the main points to be observed in storing fruits for winter use?
VIII. How are new varieties of fruits originated? By what means may they be perpetuated?
IX. State the objects of top grafting and tell how it is done.
X. Describe the Kniffen system of pruning grapes.

Veterinary Obstetrics.

I. State what is understood by the term Veterinary Obstetrics, and name the four great functions of the generative system.
II. Give the symptoms of threatened abortion, and the treatment to prevent the accident.
III. In case of difficult parturition due to non-dilation of the os uteri, how would you proceed to deliver?
IV. Give symptoms and treatment (in detail) of inversion of the uterus in the cow.
V. Give the advisable general treatment of mare and offspring after a normal parturition.
VI. Give symptoms and treatment (both preventive and curative) of parturient appoplexy in the cow.
VII. Give causes, symptoms, and treatment of parturient laminitis in the mare.
VIII. Give symptoms and treatment of indigestion in calves.
IX. State what is understood (*a*) by the law of Similarity, (*b*) by the law of Atavism, and give an illustration of the latter.
X. In what way is the future progeny of a female influenced by the first impregnation?

Literature—L'Allegro and Il Penseroso.

I. Quote and compare L'Allegro's life set to music.
and Il Penseroso's life set to music.
II. Show by reference to the poems that
(*a*) L'Allegro is a reflection of the Cavalier character
and (*b*) Il Penseroso is a reflection of the Puritan character.
Which more truly reflects Milton's own disposition? Give reasons.
III. What is alliteration? Quote examples from these poems.
IV. Explain the force of the following epithets:
Momumental oak, *heart-easing* mirth, *vain deluding* joys, *ivy-crowned* Bacchus.
Give the derivation of cynosure, twilight, junket.
V. "Half-regained Eurydice." Relate the story, and write brief notes on Prince Memnon, Euphrosyne, Cambuscan.
VI. Justify the following criticisms:
i. "Never was voice given more sweetly to the echo which the loveliness of inanimate nature awakens in the poetic heart."
ii. "Milton is not a man of fields, but of books."
iii. "Milton's defective sight and studious habits have made his pictures in some instances untrue to nature."

VII. Any one of the following three:

(a) Quote the introductions of the two poems; which do you consider the better? Give *reasons* for your preference

(b) Write out your favorite passage (about 20 lines.) Give *reasons* for your selection.

(c) State fully in chronological order, with dates, the principal events of Milton's life.

English Grammar.

I. Analyze and parse the following sentence:
Whatever is worth doing at all is worth doing well.

II. Explain and illustrate what is meant by a *predicate adjective*, an *adverbial predicate adjective*, and an *objective predicate adjective.*

III. Give and explain by an example the rule regarding the case of a *predicate pronoun.*

IV. Under what circumstances may an intransitive verb be used transitively? Illustrate by examples, using the verb *run.*

V. How is the passive voice of verbs formed, and what is gained by the use of it in English?

VI. Write out the *simple* or *predictive* future of the verb *strike*; also the *promissive* future and the interrogative form.

VII. State the different ways of indicating possession in English. Give one example of each, and point out restrictions or limitations in the use of the Saxon possessive.

VIII. Give conditions as to the use of participles.

IX. Make such changes as you think necessary in the following sentences, and give reasons for what you do:

(1) He should reserve the honor for you or I.
(2) Whom do you think it was?
(3) I rely on you coming.
(4) What is this cheese's weight?
(5) Every man, woman, and child were put to the sword.
(6) I wish them boys would be quiet.
(7) I fear I will be under the necessity of reporting him.
(8) Will I put Hill in room No. 4.
(9) Hoping to hear from you soon, believe me yours truly.

Hydrostatics and Road-Making.

I. Define *Heat*, and state the various effects of applying heat to water.
Describe an experiment showing the effect of heat on a gas.

II. Define caloric, latent heat of evaporation. Describe fully an experiment whereby the latent heat of evaporation of water may be determined, using the following data: 1,000 grams water at 20° C., raised to 55° C. by 52 grams steam.
Point out the bearing of this question of latent heat on that of draining.

III. Explain fully the meaning of "The Latent Heat of Fusion of Ice is 79."
If 100 grams at 60° is poured upon 100 grams melting ice in a room at 0° C., determine the condition of the mixture after equilibrium is established.

IV. How many grams of steam at 100° C. must be passed into 100 grams melting ice in order to melt the ice and raise its temperature to 10° C.?

V. "Were it not for the peculiar action of water at 4° C. our rivers and lakes would freeze to the bottom." Explain fully.

VI. Describe and explain what takes place when a mixture is made of snow and salt,

Or

Explain the construction of the centigrade thermometer.

VII. Give a brief review of the work that you have taken in physics in the past year, stating the most important laws and principles that have been discussed.

VIII. State what you think are the essentials of a good road, and discuss methods for obtaining these essentials in the case of (*a*) a sandy bottom, (*b*) a springy bottom, (*c*) a heavy clay bottom.

IX. Compare the relative merits of gravel and broken stones for a road surface.

Mechanical Department.

I. The system of driving the separators at the creamery is the following:
The pulley A on steam engine is 72 inches in diameter and makes 75 revolutions per minute. This is connected by belt to driven pulley B, 36 inch diameter. The driving pulley C on same shaft as B is 44 inches in diameter, and is connected by belt to rope pulley D, 33 inches in diameter. The driving pulley E, on same shaft as D, is $35\frac{1}{4}$ inches in diameter and is connected by belt to pulley F, 6 inch in diameter. Explain how you would determine the motions of each shaft respectively, by making use of logarithm scale.

II. Shew how to determine the angles 60 degrees and 45 degrees respectively by the square.

III. Give the rule for determining on the square:

(1) An octagon, cut from a 10-inch square.

(2) The length required for a brace.

(3) The measurement of a board.

IV. What are some of the essential points of a well trimmed saw?

V. Give a statement of the shape of the teeth of a cross-cut saw; also the shape of the teeth of one for ripping.

VI. What should be the grinding angle of the bench plane irons? Give the names of each plane respectively in the regular order of working them.

VII. State what difference is meant by merely planing and by trying up; and what should be the position of the plane iron cover for smoothing up?

Steam Engine.

I. Which are the better, gauge cocks, or glass gauges; and which would you be governed by?

II. What should you do when a glass breaks?

III. If the throttle valve should become loose from the stem and prevent the steam from entering the valve-chest, what would you do?

IV. What is a steam engine?

V. What is an engine composed of?

VI. If water should accumulate in the cylinder, what would be the consequence?

III. Papers set at the Final Examinations in the Dairy School, 1894.

Dairy Lectures.

I. Define colostrum, period of lactation, lactochrome, milk serum, dry matter of milk, solids not fat, olein, stearin, soiling, silo, silage, alfalfa.

II. How does the albumen differ from the casein in milk ?

III. Give the arguments for and against paying for milk at cheese factories according to butter-fat.

IV. What amounts of money should A, B, C, and D receive, paying by test, when each sent milk as follows :

A, 2,000 lb. of 3 per cent. milk.
B, 1,500 " 3 " "
C, 1,000 " 3.5 " "
D, 1,500 " 4 " "

Pounds of cheese = 600, price = 10 cents per pound.

Cost of manufacturing :
For shareholders 1.5 cents per lb.; for non-shareholders 2 cents per lb.

A and C are shareholders ; B and D non-shareholders.

V. Give an average percentage composition of (1) butter ; (2) cheese. Also give a scale of points for judging both.

VI. What objections may be urged against the transudation theory of the secretion of milk ?

VII. In deciding the method of creaming to adopt, what points should be taken into consideration ?

VIII. How do bacteria get into milk ?

IX. Name some advantages of (1) the silo and silage ; (2) soiling and soiling crops.

X. Write short notes on Jersey, Holstein-Friesian, Ayrshire, American Holderness, Kerry, and Brown Swiss cattle.

Outside Lectures.

I. (*a*) 1.03 being the specific gravity of normal milk, state in grams the weight of one litre.

(*b*) Reduce 16 degrees C. to F.

II. Enumerate the advantages that have been derived from a study of fertilization in plants.

III. Name six of the most important minerals that enter into the composition of the soil, and the chief agents which aid in rock disintegration.

IV. The percentage of butter-fat in a sample of pure milk is 3.6. If to every ten gallons of this milk two gallons of water is added, find the percentage of butter fat in the diluted milk. If 4,000 lb. of the pure milk is furnished during one week, and 7,200 lb. of the diluted milk furnished the second week, find the average percentage of butter-fat for the two weeks.

V. Give the principal points of difference between Berkshire and improved Yorkshire hogs, and explain the importance of a well balanced ration for dairy cows, showing wherein the German feeding standard differs from the American.

VI. Give symptoms and treatment for impaction of the rumen (1st stomach).

Milk-Testing.

I. Indicate the steps necessary for the detection of adulterated milk, and tell to what extent the following sample has been adulterated, supposing the pure milk to contain 9 per cent. S.N.F: L. reading 30, temp. 67 degrees fat 1.7 per cent. 15.

II. Give the Sp. G. and per cent. of solids not fat, total solids and water in the above sample. 10.

III. Explain why skim milk shows a high L. reading, and watered milk a low reading. 10.

IV. Explain the graduated scale on the stem of the Quevenne lactometer. 10.

V. Describe the mode of performing a test by the "Babcock," so as to get accurate results, supposing bottles, etc., to be correct. 15.

VI. Give all the causes which produce dark, cloudy readings, also light, curdy readings. 10.

VII. How much milk by weight is supposed to be placed in the "Babcock" bottle, and why do we use a 17.6 c.c. pipette? 10.

VIII. In taking samples each morning for the composite test, what is the principal thing to be aimed at? 10.

IX. If cream should gather on the samples so as not to mix readily with the milk before testing, how would you proceed to get accurate results? 10.

Cream Separators.

I. Describe the principle of the separation of cream from milk by the separator. 20.

II. (*a*) What would be the loss in pounds of fat on 5,000 lb. of milk, if the separator were to leave .2 per cent. in milk? 5.

(*b*) What would be the value of the fat, butter being worth 24c. per lb.? 5.

III. (*a*) What per cent. of cream is most desirable for making good butter and to churn exhaustively? 5.

(*b*) If the cream from Russian and Alexandra separators be too thin, how could they be made to give off thicker cream? 10.

(*c*) If too thick from United States and Alpha separators, how could they be made to give off thinner? 10.

(*d*) Describe method of thinning cream of Danish separator. 5.

Speed and feed considered perfect in all the above separators.

IV. If separator should vibrate when at full speed, what would likely be the cause How could it be remedied? 5.

V. If bowl should sway when at full speed or when starting, (*a*) What would cause it? (*b*) How could it be remedied? The separators in each case to be level and properly set up. 5.

VI. What size pulley in diameter would be required to drive separator at proper speed, shafting to run 200 revolutions per minute, intermediate to run 950, pulley of intermediate 4½ inches? 10.

VII. Name five important points to be observed in setting up and starting a belt separator. 15.

VIII. Describe a proper oil to be used on separator. 5.

Butter-Making.

I. Give the advantages and disadvantages of the separator and cream gathering creamery. 20.

II. (*a*) What is meant by "A creamery inch" 5.
  (*b*) What would be the value of 48 inches of cream testing by oil test 120 per cent. at 16c. per inch? 5.
  (*c*) If the actual yield was 65 pounds of butter, what per cent. would the manufacturer gain? 5.

III. What is meant by the term "Ripening cream" in butter-making? Describe the best method of ripening separator cream. 15.

IV. Describe the steps necessary for converting the cream into first-class butter, packed for export. 30.

V. What would probably cause cream to froth and refuse to churn? How could it be remedied. 10.

VI. Give the proper method for heating or cooling cream to prepare it for the churn. 10.

Cheese-Making.

I. Name the chief factors and principal agents which are utilized in the manufacture of cheese.

II. Describe the rennet test and its advantages or disadvantages, if any, to cheese-makers.

III. Should milk be ripened to the same degree of ripeness by the rennet test at all seasons and under all conditions; if not, state reasons and probable results?

IV. Does it ever become necessary and advisable to draw off a portion of the whey from the curd soon after heating up? If so, give reasons for it.

V. Describe the hot iron test and its advantages to cheese-makers. If at any stage in the process of cheese-making it fails to be a guide, state when and why.

VI. What length of string on hot iron should curd have for the removal of all the whey for spring, summer, and fall cheese, also at grinding for same?

VII. At about what temperature should milk and curd be at the following stages: (*a*) Milk at setting? (*b*) curd when cooked, and up to the time of milling? (*c*) when put to press?

VIII. State length of time required to make cheese from good milk from the time of adding the rennet until salting for summer and fall cheese, and how best to attain that time.

IX. Give best method of handling over-ripe milk and manufacturing same into cheese.

X. Describe method of preparing a starter. Also state the advantages in using it and how its use may be abused.

CLASS L

Agricultur

CLASS I.

1 Clark, J. F.
2 Paterson, T. F
3 Lang, L. W.
4 { Carlyle, S. C.
Lewis, Geo.
6 Campbell, W.
7 Ponting, E. A.
8 Dunn, E.
9 McCallan, E.
10 { Loghrin, S.
Summerby, W.
Wallbridge, J.
13 Kipp, A.
14 { Chadsey, G. E.
Knight, J. W.

CLASS II.

1 { Cass, L. H.
Gouin, B.
McKinley, W.
Tye, C. W.
5 Taylor, W. H.
6 Wilson, A. C.
7 Cowieson, W. R
8 McPhail, J. D.
9 Kippen, N.
10 McDougall, D.
11 Smith, G. A.
12 { Edelsten, E. J.
Maconachie, G.
McGillivray, J.

CLASS III.

1 Struthers, J. B.
2 DeHart, R. A.
3 Shotwell, W. M
4 { Harvard, H. F.
Robinson, H. J.
Rogers, C. H.
Thompson, W. J
Wilson, N. F.
Whetter, J. R.
10 Thom, W. E.
11 { Maclennan, J. F
Macpherson, D.
Merritt, L. A.
Smith, P. B.
15 Evans, A. R.
16 Silcox, C. P.
17 Bard, A. L.
18 { Balfour, T. B.
Clunn, H. E.
20 Macdonald, A. N.
21 { Bowker, C. G.
Bruneau, A. E.

FAILED.

Smith, C. F.
Gillespie, C. A.
Aylen, C. S. F.

APPENDIX IV.

CLASS LISTS—EASTER EXAMINATIONS, 1894—FIRST YEAR.*

Agriculture.

Class I.

1 Clark, J. F.
2 Paterson, T. F.
3 Lang, L. W.
4 Carlyle, S. C.
  Lewis, Geo.
6 Campbell, W. G.
7 Ponting, E. A.
8 Dunn, E.
9 McCallan, E. A.
10 Loghrin, S.
  Summerby, W. L.
  Wallbridge, J. S.
13 Kipp, A.
14 Chadsey, G. E.
  Knight, J. W.

Class II.

1 Cass, L. H.
  Gouin, B.
  McKinley, W. W.
  Tye, C. W.
5 Taylor, W. H.
6 Wilson, A. C.
7 Cowieson, W. R.
8 McPhail, J. D.
9 Kippen, N.
10 McDougall, D. H.
11 Smith, G. A.
12 Edelsten, E. J. M.
  Maconachie, G. R.
  McGillivray, J. W.

Class III.

1 Struthers, J. B.
2 DeHart, R. A.
3 Shotwell, W. M.
4 Harvard, H. F.
  Robinson, H. J.
  Rogers, C. H.
  Thompson, W. J.
  Wilson, N. F.
  Whetter, J. R.
10 Thom, W. E.
11 Maclennan, J. F.
  Macpherson, D. J.
  Merritt, L. A.
  Smith, P. B.
15 Evans, A. R.
16 Silcox, C. P.
17 Bard, A. L.
18 Balfour, T. B.
  Clunn, H. E.
20 Macdonald, A. N.
21 Bowker, C. G.
  Bruneau, A. E.

Failed.

Smith, C. F.
Gillespie, C. A.
Aylen, C. S. F.

Chemistry.

Class I.

1 Clark.
2 Carlyle.
3 Lang.
  Summerby.
5 Paterson.
6 Thompson.

Class II.

1 Kipp.
2 Lewis.
3 Chadsey.
  Rogers.

Class III.

1 Loghrin.
2 McDougall.
  McCallan.
4 Wilson, N. F.
5 Thom.
6 Dunn.
  Maclennan.
  Maconachie.
9 Edelsten.
10 Knight.
  Taylor.
12 Gouin.
13 Campbell.
14 Tye.
15 Wallbridge.
16 Macpherson.
17 Wilson, A. C.
18 McPhail.
  Smith, P. B.
20 Smith, G. A.
21 McKinley.
22 Merritt.
  Struthers.
24 McGillivray.
  Ponting.
26 Robinson.
27 Cass.
  Whetter.
  Kippen.

Failed.

Harvard.
Bowker.
Silcox.
DeHart.
Bruneau.
Evans.
Shotwell.
Clunn, H. E.
Balfour.
Bard.
Smith, C. F.
Cowieson.
Gillespie.
Aylen.
Macdonald.

Geology.

Class I.

1 Summerby.
2 Clark.
3 Paterson.
4 McCallan.
5 Lang.
6 Chadsey.
7 Carlyle.

Class II.

1 Smith, P. B.
2 Maconachie.
  Lewis.
4 Smith, G. A.
5 Campbell.
6 Loghrin.
  Gouin.
8 Robinson.
9 Taylor.
10 Knight.
11 Edelsten.
12 McDougall.

Class III.

1 Dunn.
2 McGillivray.
  Tye.
4 Cass.
5 Wilson, A. C.
  Maclennan.
7 Silcox.
8 Thom.
9 Kipp.
10 Merritt.
11 Wilson, N. F.
12 McPhail.
13 Macpherson.
14 Rogers.
  Thompson.
16 McKinley.
17 Struthers.
  Ponting.
19 Kippen.
20 Bowker.
21 Clunn, H. E.
22 Balfour.
  Wallbridge.
24 Clunn, W. P.
25 DeHart.
26 Whetter.
27 Cowieson.
27 Bruneau.

Failed.

Harvard.
Shotwell.
Macdonald.
Gillespie.
Bard.
Evans.
Smith, C. F.
Aylen.

Zoology.

Class I.

1 Clark.
2 Summerby.
3 Campbell.
4 Paterson.
  Smith, G. A.
6 McCallan.
7 Lewis.

Class II.

1 Lang.
2 Carlyle.
3 Chadsey.
4 Knight.
5 Smith, P. B.
6 Edelsten.
7 Wilson, A. C.
8 Macpherson.
9 Cass.
10 Gouin.

Class III.

1 McKinley.
2 Clunn, W. P.
3 Kipp.
4 Tye.
  Dunn.
6 Loghrin.
7 McDougall.
8 Silcox.
9 DeHart.
  Kippen.
11 Maconachie.
  Wallbridge.
13 McGillivray.
14 Wilson, N. F.
15 Cowieson.
  Taylor.
17 Ponting.
18 Rogers.
19 Struthers.
20 Thom.
  Balfour.
22 Maclennan.
23 Merritt.
24 Thompson.
25 Smith, C. F.
26 Clunn, H. E.
  Macdonald.
28 McPhail.
29 Robinson.
  Whetter.
31 Bowker.
  Harvard.

Failed.

Bard.
Gillespie.
Evans.
Shotwell.
Bruneau.
Aylen.

Veterinary Anatomy.

Class I.

1 Carlyle.
2 Lang.
  Clark.
4 Paterson.
  Summerby.
6 Kipp.

Class II.

1 Wilson, A. C.
2 Chadsey.
3 McCallan.
4 Loghrin.
5 Lewis.
  Campbell.
7 McDougall.
8 Knight.

Class III.

1 Edelsten.
2 Smith, P. B.
3 Smith, G. A.
4 Maconachie.
  Taylor.
6 Thom.
7 Thompson, W. J.
  Dunn.
  Evans.
10 Wallbridge.
  Kippen.
12 Shotwell.
  Tye.
14 Wilson, N. F.
  Ponting.
16 Macpherson.
  Maclennan.
18 Cass.
19 Gouin.
  McKinley.
21 DeHart.
  McGillivray.
  Struthers.
24 Rogers.
25 Silcox.
  Cowieson.
27 Clunn.
  Bruneau.
  Harvard.
30 Robinson.
  McPhail.
  Balfour.

Failed.

Bard.
Macdonald.
Smith, C. F.
Bowker.
Whetter.
Merritt.
Aylen.
Gillespie.

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* For general proficiency see page 229.

CLASS LISTS—EASTER EXAMINATIONS, 1894 (*Continued*)—FIRST YEAR

Literature.

Class I.

1 Clark.
2 Summerby.
3 Gouin.

Class II.

1 McCallan. Edelsten.
3 Cass. Paterson.
5 Lang. Maconachie.

Class III.

1 Kipp.
2 Carlyle.
3 Bowker.
4 Lewis. Smith, P. B.
6 Smith, G. A.
7 Taylor.
8 Dunn. DeHart. Wilson, A. C.
11 Robinson.
12 Campbell. Knight. Thompson, W. J. Wilson, N. F.
16 Chadsey. Loghrin. Silcox. Tye.
20 McKinley.
21 McPhail. McDougall.
23 McGillivray. Ponting. Smith, C. F.
26 Merritt. Rogers. Wallbridge.
29 Cowieson. Thom.
31 Harvard. Macpherson.

Failed.

Maclennan.
Balfour.
Bard.
Struthers.
Kippen.
Shotwell.
Evans.
Clunn.
Whetter.
Aylen.
Gillespie.
Bruneau.
Macdonald.

Grammar and Composition.

Class I.

1 Lang.
2 Clark.

Class II.

1 Gouin.
2 Summerby.
3 Maconachie.
4 Dunn.
5 McCallan.

Class III.

1 Paterson.
2 Carlyle. Chadsey. Thom.
5 Edelsten.
6 Campbell. Knight. McKinley. Smith, G. A.
10 McDougall.
11 Rogers.
12 Wilson, A. C.
13 Bowker. Cass.
15 Lewis. Roblin.
17 Merritt.
18 Smith, P. B. Taylor. Tye.
21 Kipp.
22 Loghrin. Wallbridge.
24 Wilson, N. F.
25 Struthers.
26 Thompson.
27 Evans. McPhail. Gillespie. Ponting. Macdonald. Macpherson.

Failed.

Cowieson. DeHart. Harvard. Silcox. Smith, C. F.
Bruneau.
Maclennan. McGillivray.
Kippen.
Clunn.
Balfour. Bard. Whetter.
Shotwell.
Aylen.

Arithmetic.

Class I.

1 Clark.
2 Summerby.
3 Paterson.

Class II.

1 Wilson, A. C.
2 Lang.
3 Smith, G. A.
4 Campbell.
5 Maconachie. McKinley.
7 Lewis.

Class III.

1 Carlyle.
2 Chadsey. Edelsten.
4 DeHart. Taylor.
6 Kipp.
7 Gouin. Maclennan. Macpherson. Thom. Tye.
12 McCallan.
13 Knight. Wallbridge. Wilson, N. F.
16 Smith, P. B.
17 Bruneau.
18 Rogers.
19 Thompson.
20 Whetter.
21 Loghrin.
22 Bowker. Evans. McDougall. Merritt. Ponting.
27 Cass. Dunn. McPhail.

Failed.

Gillespie.
Robinson.
Bard.
Kippen.
McGillivray.
Macdonald.
Struthers.
Cowieson.
Shotwell.
Clunn.
Smith, C. F.
Harvard.
Silcox.
Balfour.
Aylen.

Bookkeeping.

Class I.

1 Clark.
2 Paterson.
3 Summerby.
4 Campbell. M'Callan.
6 Lang.
7 Kipp. Rogers.
9 Maconachie.
10 Ponting. Tye.
12 Chadsey.

Class II.

1 Smith, P. B.
2 Lewis.
3 Thompson.
4 Edelsten. Taylor.
6 Loghrin.
7 DeHart.
8 Knight. Gouin. McKinley. Thom.
12 McPhail. Smith, G. A.
14 Wilson, N. F.
15 Macpherson. Wilson, A. C.
17 Merritt. Carlyle.
19 Wallbridge.
20 Cass.

Class III.

1 Maclennan. Struthers.
3 Bruneau.
4 Bard. McDougall.
6 McGillivray.
7 Whetter.
8 Bowker.
9 Cowieson. Dunn. Kippen. Macdonald. Shotwell.
14 Evans.
15 Silcox. Harvard.
17 Balfour.

Failed.

Gillespie.
Smith, C. F.
Robinson.
Clunn.
Aylen.

* CLASS LISTS—EASTER EXAMINATIONS, 1894—SECOND YEAR.

Agriculture.

Class I.

1 King, A. A.
2 Wheatley, Jno.
3 Simpson, A. E.
4 Reinke, C. E.
5 Robertson, G. A.
6 Widdifield, J. W.

Class II.

1 Elliott, Wm.
2 Fitzgerald, J. P.
Kennedy, W. A.
4 Kidd, D. F.
5 Henderson, R. H.
6 Christian, A. H.
Cook, J. H.
8 Lailey, F. T.
Laird, J. G.
Vipond, J. M.
11 Smyth, F. L.
12 Thompson, W. J.

Class III.

1 Wilson, E. E.
2 Buchanan, Jno.
3 Doherty, M. W.
4 High, A. M.
5 Wood, R. S.
6 Caldecott, F.
7 Rowe, F.
8 Duffett, G. P.
9 Shorley, S. C.
Traviss, C. H.
11 Carrick, C. S.
12 McKay, W. E.
13 Graesser, F. A.

Judging Cattle.

Class I.

1 King.
2 Simpson.
3 Kennedy.
4 Elliott.
5 Laird.
Thompson.
Wheatley.
8 Robertson.
9 Kidd.
Widdifield.
11 Traviss.
Vipond.

Class II.

1 Caldecott.
2 Doherty.
High.
Reinke.
Wilson.
6 Christian.
7 Cook.
8 Buchanan.
9 Carrick.
Henderson.
McKay.
12 Lailey.
Rowe.
14 Duffett.
15 Wood.
16 Smyth.

Class III.

1 Fitzgerald.
2 Shorey.
3 Graesser.
4 Clunn, W. P.

Judging Sheep.

Class I.

1 Elliott.
2 Simpson.
3 Buchanan.
Thompson,
5 Carrick.
6 King.
Widdifield
8 Cook.
Kennedy.
High.
11 Laird.
12 Smyth.
13 Christian.
Traviss.
Wheatley.

Class II.

1 Reinke.
Vipond.
Wilson.
4 Caldecott.
Lailey.
6 Doherty.
Robertson.
8 Duffett.
Fitzgerald.
10 Shorey.
11 McKay.
12 Henderson.

Class III.

1 Wood.
2 Kidd.
3 Clunn, W. P.
4 Graesser.
5 Rowe.

Dairying.

Class I.

1 Robertson.
2 Kennedy.
3 Christian.
4 Kidd.
5 Cook.

Class II.

1 Wheatley.
2 Laird.
Buchanan.
4 High.
5 Doherty.
6 Henderson.
7 Widdifield.
Rowe.
9 King.
Wilson.
11 Duffett.
Vipond.
13 Carrick.
14 Traviss.
15 Simpson.

Class III.

1 Reinke.
2 Fitzgerald.
3 Smyth.
4 Graesser.
Elliott.
6 Shorey.
7 Lailey.
8 McKay.
9 Thompson.
10 Wood.
11 Caldecott.

Horticulture.

Class I.

1 Robertson.
2 Wheatley.
3 King.
4 Christian.

Class II.

1 Kidd.
2 Reinke.
3 Henderson.
4 Buchanan.
5 Wilson.
6 Laird.
7 Widdifield
High.
9 Kennedy.
10 Shorey.
11 Simpson.
12 Thompson.

Class III.

1 Rowe.
2 Traviss.
3 Vipond.
Elliott.
Lailey.
6 Duffett.
7 Cook.
Carrick.
9 Smyth.
10 Fitzgerald.
11 Doherty.
12 Graesser.
13 McKay.

Failed.

Caldecott.

Agricultural Chemistry.

Class I.

1 Widdifield.
2 King.
Wheatley.
4 Henderson.
5 Kennedy.
6 Cook.
Robertson.
8 Buchanan.
9 Kidd.

Class II.

1 Doherty.
2 Carrick.
3 Rowe.
Wood.
5 Duffett.
6 Christian.
7 High.
8 Lailey.
9 Reinke.
10 Simpson.
11 Laird.

Class III.

1 Thompson.
2 Smyth.
Vipond.
4 Elliott.
5 Caldecott.
6 Wilson.
7 Traviss.
8 Shorey.
9 Fitzgerald.

Failed.

Graesser.
McKay.

* For general proficiency see page 229.

CLASS LISTS—EASTER EXAMINATIONS, 1894 (*Continued*)—SECOND YEAR.

Veterinary Pathology.

CLASS I.

1 Wheatley.

CLASS II.

1 King.
2 Fitzgerald.
3 Kidd.
4 Cook. / Kennedy.
6 Buchanan.
7 Robertson. / Doherty.

CLASS III.

1 Laird.
2 Henderson. / Duffett. / Simpson. / Vipond.
6 Reinke.
7 Rowe.
8 High. / Elliott.
10 Thompson. / Carrick.
12 Christian.
13 Wilson.
14 Wood.
15 Smyth.
16 Widdifield.
17 Traviss.
18 Graesser.
19 Lailey.
20 Shorey. / Caldecott.
22 McKay.

Practical Horse.

CLASS I.

1 Kidd.
2 Doherty.
3 Wilson.

CLASS II.

1 Cook. / Elliott. / Lailey. / Thompson. / Kennedy.
6 Christian. / Fitzgerald. / Vipond.
9 Reinke. / Robertson.
11 High. / Simpson. / Widdifield.
14 Laird.
15 King.

CLASS III.

1 Carrick. / Traviss. / Wheatley.
4 Wood.
5 Duffett.
6 Henderson. / Rowe.
8 Caldecott.
9 Smyth.
10 Buchanan. / Graesser.
12 Clunn. / McKay. / Shorey.

Literature.

CLASS I.

1 Doherty. / Lailey.
3 Widdifield.

CLASS II.

1 Wheatley. / Hender on.
3 High.
4 Reinke. / Elliott.
6 Simpson.
7 Robertson.
8 Kidd.
9 Rowe.
10 Cook. / Shorey. / Duffett.
13 Buchanan. / Kennedy.
15 Christian. / King.

CLASS III.

1 Laird.
2 Wilson. / Carrick.
4 Caldecott.
5 Smyth.
6 Graesser.
7 Thompson.
8 Traviss.
9 Vipond.
10 Fitzgerald.

FAILED.

McKay.

Political Economy.

CLASS I.

1 Wood.

CLASS II.

1 Buchanan.
2 Duffett.
3 Widdifield.
4 Robertson.

CLASS III.

1 Cook. / Lailey. / Wheatley.
4 Kidd.
5 Kennedy.
6 King.
7 Reinke.
8 Christian.
9 Elliott.
10 Shorey.
11 Carrick. / Simpson.
13 Caldecott.
14 Smyth. / Fitzgerald. / Henderson.
17 McKay.
18 Wilson.
19 Vipond. / Graesser.
21 Rowe. / High.
23 Traviss.
24 Doherty. / Thompson. / Laird.

Hydrostatics.

CLASS I.

1 Wheatley.
2 Robertson.
3 Kennedy. / Simpson.

CLASS II.

1 Buchanan.
2 Lailey. / Widdifield. / Rowe.
5 King. / Reinke.
7 Christian. / Cook. / Vipond.
10 Doherty.
11 Kidd.
12 Graesser.
13 Caldecott. / Duffett. / Henderson. / High.

CLASS III.

1 Elliott.
2 Traviss. / Wilson.
4 Thompson.
5 Carrick. / Smyth.
7 Laird.
8 Fitzgerald.
9 Shorey.
10 McKay.

Drawing.

CLASS I.

1 Buchanan.
2 Rowe.

CLASS II.

1 Reinke.
2 Robertson.
3 Kennedy.
4 Christian. / Carrick.
6 Laird.
7 High.
8 Henderson. / Wilson.
10 Elliott. / Simpson. / Vipond.
13 Caldecott. / Duffett.

CLASS III.

1 Fitzgerald. / Kidd.
3 Doherty.
4 Lailey. / Shorey.
6 King. / Thompson. / Wheatley. / Widdifield.
10 Cook.
11 Traviss.
12 Graesser.
13 Smyth.
14 McKay.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1894—FIRST YEAR.*

Agriculture.

Class I.

1 Clark, J. F.
2 Paterson, T. F.
3 Lang, L. W.
4 Rive, E.
5 Carlyle, S. C.
6 Summerby, W. L.
7 Campbell, W. G.
8 Thompson, W. J.

Class II.

1 Wilken, A. G.
2 Lewis, G.
3 McPhail, J. D.
4 McCallan, E. A.
5 { Knight, J. W.
Taylor, W. H.
7 Dunn, E.
8 Whetter, J. R.
9 { Kipp, A.
Maconachie, G. R.
11 { Edelsten, E. J. M.
Tye, C. W.
13 { McDougall, D. H.
Wallbridge, J. S.
15 { Cass, L. H.
McKinley, W. W.
Struthers, J. B.
18 Chadsey, G. E.

Class III.

1 Payne, G. Y.
2 Loghrin, S.
3 { McGillivray, J. W.
Smith, G. A.
5 { Ponting, E. A.
Wilson, A. C.
7 Macdonald, A. N.
8 Kippen, N.
9 Cowieson, W. R.
10 Rogers, C. H.
11 Wilson, N. F.
12 Maclennan, J. F.
13 Bard, A. L.
14 Silcox, C. P.
15 Balfour, T. B.
16 Evans, A. R.
17 Shotwell, W. M.

Dairying.

Class I.

1 Lewis.
2 Clark.
3 Campbell.
4 Summerby.
5 Loghrin.
6 Carlyle.
7 McCallan.
8 Lang.
9 Wilken.
10 McKinley.
11 Paterson.
12 Tye.
13 Chadsey.
14 McDougall.
15 Dunn.
16 Cowieson.
17 { Knight.
Cass.

Class II.

1 Wilson, N. F.
2 Whetter.
3 Payne.
4 { Kippen.
Rive.
6 Walbridge.
7 Taylor.
8 Thompson.
9 { Wilson, A. C.
Shotwell.
11 { Smith, P. B.
Smith, G. A.
13 McPhail.
14 Edelsten.
15 Kipp.
16 McGillivray.

Class III.

1 Thom.
2 { Evans.
Robinson.
4 Struthers.
5 { Maconachie.
Bard.
7 Silcox.
8 Maclennan.
9 Macdonald.
10 Macpherson.

Bee-keeping.

Class II.

Rive.

Class III.

1 Clark.
2 Carlyle.
3 Campbell.
4 { Maclennan.
Knight.
Kipp.
7 Chadsey.
8 Thom.
9 { Loghrin.
Lewis.
11 Lang.
12 { Paterson.
Silcox.
Taylor.
15 { Edelsten.
Summerby.
17 { Tye.
McDougall.
19 Rogers.
20 Kippen.
21 Cass.
22 { Clunn.
Thompson.
24 { Wilson, N. F.
Cowieson.
Wilson, A. C.
Smith, P. B.
Whetter.

Failed.

Shotwell.
McCallan.
Struthers.
Wallbridge.
Maconachie.
McPhail.
Wilken.
Ponting.
Machperson.
Smith, G. A.
Payne.
McKinley.
McGillivray.

Materia Medica.

Class I.

1 Paterson.
2 { Lang.
Clark.
Carlyle.

Class II.

1 Edelsten.
2 Chadsey.

Class III.

1 Knight.
2 Rive.
3 McDougall.
4 Summerby.
5 { Thompson.
Dunn.
Lewis.
8 Smith, G. A.
9 { Cass.
Campbell.
11 { Kipp.
Kippen.
13 { Wilken.
Loghrin.
McKinley.
Wilson, N. F.
17 { McCallan.
Maconachie.
19 Wallbridge.
20 Taylor.
21 { Macdonald.
McPhail.
23 { Ponting.
Thom.
25 { Rogers.
Smith, P. B.
27 Robinson.
28 Whetter.
29 { Maclennan.
McGillivray.
Tye.
32 Balfour.
33 Wilson, A. C.

Failed.

Bard.
Struthers.

* For general proficiency see page 229.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1894 (*Continued*)—FIRST YEAR.

Botany.

Class I.

1 Clerk.
2 Paterson.
3 Summerby.
4 Knight.

Class II.

1 Rive.
2 Loghrin.
3 Lewis.
4 Lang.
5 Campbell.
6 Chadsey.
7 { Maconachie. / Wilson, A. C. / Carlyle. }
10 { Edelsten. / Smith, P. B. }

Class III.

1 Kipp.
2 Thompson.
3 Wilson, N. F.
4 Dunn.
5 Wilken.
6 Ponting.
7 { Maclennan. / Smith, G. A. / McGillivray. }
10 { Kippen. / McCallan. }
12 Rogers.
13 { Cass. / McKinley. / Tye. }
16 Taylor.
17 Bowker.
18 Struthers.
19 { Thom. / Bard. }
21 Wallbridge.
22 { Whetter. / Payne. }
24 McDougall.
25 Merritt.

Literature.

Class I.

1 Rive.
2 Edelsten.
3 Clark.
4 Paterson.

Class II.

1 Summerby.
2 Cass.
3 Lang.
4 { McCallan. / Smith, G. A. }
6 Carlyle.
7 { Campbell. / Lewis. }

Class III.

1 Thompson.
2 { Knight. / Loghrin. }
4 { Maconachie. / Rogers. }
6 Kipp.
7 Tye.
8 Taylor.
9 Smith, P. B.
10 McKinley.
11 McDougall.
12 Wilson, A. C.
13 { Chadsey. / Dunn. }
15 Thom.
16 Maclennan.
17 McPhail.
18 Struthers.
19 { McGillivray. / Wilson, N. F. }
21 { Cowieson. / Kippen. / Payne. / Whetter. }

Failed.

Bard.
Ponting.
Smith, C. F.
Bowker.
Robinson.

Grammar and Composition.

Class I.

1 Summerby.
2 Clark.
3 Lang.
4 Carlyle.
5 Rive.

Class II.

1 Paterson.
2 McKinley.
3 Maconachie.
4 Smith, G. A.
5 Campbell.
6 Edelsten.

Class III.

1 Loghrin.
2 Cass.
3 McDougall.
4 Merritt.
5 Chadsey.
6 Struthers.
7 Taylor.
8 Dunn.
9 Thom.
10 McCallan.
11 Thompson.
12 { Smith, P. B. / Tye. }
14 { Knight. / Robinson. }
16 Lewis.
17 { Rogers. / Wilson, A. C. }
19 Macpherson.
20 Wilken.
21 Kipp.
22 McPhail.
23 Payne.
24 { Maclennan. / Wallbridge. }
26 McGillivray.
27 { Evans. / Whetter. / Smith, C. F. / Wilson, N. F. }

Arithmetic.

Class I.

1 Clark.
2 Summerby.
3 Paterson.

Class II.

1 McKinley.
2 Campbell.
3 Rive.
4 Lang.
5 Carlyle.
6 Tye.

Class III.

1 Taylor.
2 McCallan.
3 Dunn.
4 Wilson, A. C.
5 Smith, G. A.
6 { Loghrin. / Wilson, N. F. }
8 { Evans. / McDougall. }
10 { Cass. / Wallbridge. }
12 { Thompson. / Wilken. }
14 Lewis.
15 Whetter.
16 Chadsey.
17 { Bowker. / Struthers. }
19 Kipp.
20 Rogers.
21 { Knight. / Thom. }
23 { McPhail. / Smith, P. B. }
25 Edelsten.
26 Shotwell.
27 Maconachie.
28 { Cowieson. / Merritt. / Ponting. }

Failed.

Bard.
Payne.
Kippen.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1894 (*Continued*)—SECOND YEAR.*

Agriculture.

Class I.

1 Buchanan, Jno.
2 King, A. A.
3 Cook, J. H.
4 Robertson, G. A.

Class II.

1 Henderson, R. H.
2 Kennedy, W. A.
3 Christian, A. H.
4 Wheatley, Jno.
5 Duffett, G. P.
6 Fitzgerald, J. P.
7 Elliott, Wm.
8 Simpson, A. E.
9 Widdifield, J. W.
10 Doherty, M. W.
11 Vipond, J. M.
12 Reinke, C. E.
13 Rowe, F.
14 Kidd, D. F.
15 Lailey, F. T.

Class III.

1 Traviss, C. H.
2 Carrick, C. S.
3 Wilson, E. E.
4 High, A. M.
5 Laird, J. G.
6 Smyth, F. L.
7 DeHart, R. A.
8 Shorey, S. C.
9 Graesser, F. A.
10 Caldecott, F.

Failed.

McKay, W. E.

Dairying.

Class I.

1 Wheatley.
2 Elliott.
3 King.
4 Kennedy.
5 Buchanan.
6 Kidd.

Class II.

1 { Laird.
Henderson.
3 { Cook.
Duffett.
5 High.
6 Widdifield.
7 Robertson.
8 Vipond.
9 Reinke.
10 Doherty.
11 Rowe.
12 Christian.
13 Simpson.
14 { Smyth.
Wilson.
16 Fitzgerald.
17 Carrick.

Class III.

1 Graesser.
2 Lailey.
3 Traviss.
4 Caldecott.
5 DeHart.
6 { Shorey.
McKay.

Agricultural Chemistry.

Class I.

1 Wheatley.
2 Cook.
3 Robertson.
4 Widdifield.
5 Henderson.
6 Reinke.

Class II.

1 Lailey.
2 Kennedy.
3 Rowe.
4 { Buchanan.
King.
6 Laird.
7 { High.
Simpson.
9 { Christian.
Doherty.
11 Kidd.
12 Smyth.
13 { Graesser.
Wilson.
15 Duffett.
16 Elliott.
17 { Carrick.
Vipond.
19 Caldecott.
20 Traviss.

Failed.

Fitzgerald.
Shorey.
McKay.
DeHart.

Practical Chemistry.

Class I.

1 King.
2 Wheatley.
3 Smyth.
4 { Graesser.
Simpson.

Class II.

1 Widdifield.
2 { Cook.
Christian.
4 { Doherty.
Robertson.
6 Caldecott.
7 Carrick.
8 Rowe.
9 McKay.
10 { Elliott.
Kennedy.

Class III.

1 Kidd.
2 High.
3 Traviss.
4 { Buchanan.
Laird.
6 Henderson.
7 Reinke.
8 Fitzgerald.
9 Wilson.
10 DeHart.
11 Shorey.
12 Duffett.
13 Vipond.
14 Lailey.

Botany.

Class I.

1 Wheatley.
2 King.
3 Robertson.
4 Buchanan.

Class II.

1 Henderson.
2 Widdifield.
3 Kennedy.
4 Reinke.
5 Laird.

Class III.

1 High.
2 Simpson.
3 Kidd.
4 Cook.
5 Lailey.
6 { Shorey.
Duffett.
8 Wilson.
9 Vipond.
10 Elliott.
11 Fitzgerald.
12 Carrick.
13 { Rowe.
Doherty.
15 Caldecott.
16 Christian.
17 Smith.
18 DeHart.
19 Traviss.

Failed.

McKay.
Graesser.
Clunn, W. P.

* For general proficiency see page 229.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1894 (*Continued*)—SECOND YEAR.

Horticulture.

CLASS I.

1 Robertson.
2 Wheatley.
3 Widdifield.
4 Kidd.
5 Christian.
  Laird.

CLASS II.

1 Henderson.
2 King.
3 Kennedy.
4 Buchanan.
5 High.
6 Vipond.
7 Duffett.
8 Shorey.
  Elliott.
10 Lailey.

CLASS III.

1 Reinke.
  Simpson.
3 Smyth.
4 Rowe.
5 Cook.
  Wilson.
7 Doherty.
8 Carrick.
9 DeHart.
10 Fitzgerald.
11 Traviss.
  Caldecott.

FAILED.

McKay.
Graesser.

Veterinary Obstetrics and Laws of Breeding.

CLASS I.

1 Kidd.
2 Wheatley.
3 Kennedy.

CLASS II.

1 Simpson.
2 Widdifield.
3 Buchanan.
  Robertson.
5 Henderson.
  Doherty.
7 Wilson.
8 Cook.
  King.
  Lailey.
  Reinke.
  Laird.
13 Duffett.

CLASS III.

1 Rowe
2 Christian.
3 Elliott.
4 Fitzgerald.
  Carrick.
6 Vipond.
  DeHart.
8 Smyth.
  High.
10 Shorey.
11 Caldecott
12 Traviss.
13 Graesser.
14 McKay.

Literature.

CLASS I.

1 Lailey.

CLASS II.

1 Widdifield.
2 Rowe.
3 Kennedy.
  Wheatley.
5 King.
6 Doherty.

CLASS III.

1 Robertson.
2 Henderson.
3 Duffett.
4 Buchanan.
  Laird.
6 Cook.
7 Kidd.
  Shorey.
9 Reinke.
10 Simpson.
11 Wilson.
  Christian.
13 High.
14 Smyth.
  Elliott.
16 Carrick.

FAILED.

Caldecott.
Fitzgerald.
DeHart.
Vipond.
Traviss.
Graesser.
McKay.

Grammar.

CLASS I.

1 Kennedy.

CLASS II.

1 High.
2 Widdifield.
3 Cook.
  Duffett.
5 Wheatley.
6 Robertson.
7 Lailey.
8 Doherty.

CLASS III.

1 King.
2 Caldecott.
3 Wilson.
4 Rowe.
5 Carrick.
  Christian.
7 Fitzgerald.
8 Reinke.
9 Shorey.
  Traviss.
  Henderson.
12 Laird.
13 Vipond.
14 Buchanan.
  Kidd.
  Simpson.
  Elliott.

FAILED.

McKay.
DeHart.
Smyth.
Graesser.

Hydrostatics and Road-making

CLASS I.

1 Robertson.
2 Kennedy.
3 Kidd.
4 Widdifield.

CLASS II.

1 Wheatley.
2 Rowe.
3 Buchanan.
  Lailey.
5 Cook.
6 Duffett.
7 Reinke.
8 Christian.
  Doherty.
  King.

CLASS III.

1 High.
  Simpson.
  Vipond.
4 Fitzgerald.
5 Graesser.
6 Smyth.
7 Wilson.
8 Laird.
9 Henderson.
10 Elliott.
11 Traviss.
12 Carrick.
13 Shorey.

FAILED.

Caldecott.
DeHart.
McKay.

COLLEGE STUDENT CLASS LISTS.—GENERAL PROFICIENCY, 1894.

First Year.		Second Year.	
Easter.	Midsummer.	Easter.	Midsummer.
1 Clark.	1 Clark.	1 Wheatley.	1 Wheatley.
2 Summerby.	2 Paterson.	2 Robertson.	2 Robertson.
3 Lang.	3 Lang.	3 King.	3 King.
4 Paterson.	4 Summerby.	4 Kennedy.	4 Kennedy.
5 Carlyle.	5 Rive.	5 Widdifield.	5 Widdifield.
6 McCallan.	6 Carlyle.	6 Kidd.	6 Buchanan.
7 Lewis.	7 Campbell.	7 Cook.	7 Cook.
8 Campbell.	8 Lewis.	8 Simpson.	8 Kidd.
9 Chadsey.	9 Edelsten.	9 Buchanan.	9 Henderson.
10 { Gouin.	10 Loghrin.	10 Reinke.	10 Simpson.
Kipp.	11 Knight.	11 Christian.	11 Doherty.
12 Maconachie.	12 Chadsey.	12 Henderson.	12 Rowe.
13 Edelsten.	13 Cass.	13 Doherty.	13 Reinke.
14 Smith, G. A.	14 { McCallan.	14 { Elliott.	14 Christian.
15 Wilson, A. C.	McKinley.	High.	15 { Lailey.
16 Knight.	16 Thompson.	16 Lailey.	Laird.
17 Loghrin.	17 McDougall.	17 Laird.	17 Duffett.
18 Smith, P. B.	18 Smith, G. A.	18 Duffett.	18 High.
19 Taylor.	19 Tye.	19 Rowe.	19 Elliott.
20 Dunn.	20 Taylor.	20 Vipond.	20 Wilson.
21 Tye.	21 Kipp.	21 Wilson.	21 Carrick.
22 McKinley.	22 Dunn.	22 Carrick.	
23 Cass.	23 Maconachie.	23 Thompson.	
24 McDougall.	24 Wilson, A. C.	24 Fitzgerald.	
25 Thom.	25 Wilson, N. F.	25 Smyth.	
26 Thompson, W. J.	26 Smith, P. B.	26 Traviss.	
27 Rogers.	27 Whetter.	27 Shorey.	
28 Wilson, N. F.	28 Rogers.		
29 Wallbridge.	29 Thom.		
30 Ponting.	30 McPhail.		
31 Macpherson.			
32 McPhail.			

DAIRY SCHOOL STUDENT CLASS LISTS.—GENERAL PROFICIENCY, 1894.

Class I.	Class II.	Class III.
1 Stratton, R. W.	1 Robertson, L.	1 McKenzie, D. A.
2 { Campbell, Wm.	2 Ballantyne, John.	2 Scott, D. F.
Perry, A. D.	3 Calder, A. G.	3 Crosby, J. T.
4 Price, W. W.	4 Briggs, Jas.	4 Philp, D. R.
5 Potter, R. J.	5 Brown, S. P.	5 Miller, R. C.
	6 Hamilton, C. A. W.	6 Henderson, T. A
	7 Edgar, W. A.	7 Milne, R. R.
	8 Carlyle, W. J.	8 Dunn, E. H.
	9 Peacock, Miss G. C.	9 Brodie, G. B.
	10 Hill, J. T.	10 Makinson, T.
	11 Findlay, J. H.	11 Bell, J. W.
	12 Webb, Miss F. I.	12 Elliott, W. J.
	13 Brayley, C. H.	13 Borland, J.
	14 Bell, E. J.	14 Park, A. A.
	15 Pashley, Miss M. S.	15 McCullough, Miss A.
	16 Bell, E. A.	
	17 { Talbot, J. F.	
	Campbell, A.	
	19 Dwyer, Wm.	

1. *Salaries and*

2. *Summer Cou*

3. *Food—*

Meat, fish,
Bread and
Groceries,

4. *Household E*

Laundry, s
Women ser

5. *Business Dep*

Advertising

6. *Miscellaneous*

Chemicals,
Library and
Medals ...

Unenumera

Furniture and f
Repairs and alte
Fuel ....
Light ....
Water.........
Sewage disposal

Tuition fees ....
Fees for supplem
Charges for gas a
Balances for boar
side departm
Drippings ......
Sundries ....
Contingencies—b

Net expen

The net sum
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APPENDIX V.

FINANCIAL STATEMENT FOR 1894.

I. College Expenditure.

(a) College Maintenance.

1. *Salaries and Wages*			$16,340 81
2. *Summer Course for Teachers*			370 48
3. *Food*—			
Meat, fish, and fowl			8,687 19
Bread and biscuits, etc			644 37
Groceries, butter, and fruit			4,310 49
4. *Household Expenses*—			
Laundry, soap, and cleaning			362 98
Women servants wages—cooks, laundresses, housemaids, etc			1,866 45
5. *Business Department*—			
Advertising, printing, postage, and stationery			1,048 58
6. *Miscellaneous*—			
Chemicals, apparatus, etc., used in laboratories			499 97
Library and reading-room—books, papers, and periodicals			380 82
Medals			90 90
Unenumerated			833 71
			$30,436 75
(b) Maintenance and Repairs of Government Buildings.			
Furniture and furnishings		$662 57	
Repairs and alterations		961 52	
Fuel		2,574 15	
Light		792 87	
Water		650 00	
Sewage disposal		121 09	
			$5,762 20
			$36,198 95
College Revenue.			
Tuition fees		$1,867 08	
Fees for supplemental examinations		58 00	
Charges for gas and chemicals		82 59	
Balances for board after deducting allowances for work in outside departments		5,971 46	
Drippings		2 65	
Sundries		22 51	
Contingencies—breakage, fines, etc		152 55	
			$8,156 84
Net expenditure of College			$28,042 01

The net sum voted by the Legislature for the College and for the maintenance and repairs of Government buildings (see Estimates for 1894, pp. 35 and 41) was $31,611. Hence the unexpended balance under this head for the year 1894 is $3,568 89.

II. Farm Expenditure.

(a) *Farm Proper.*

1. *Permanent Improvements*—		
Fencing nderdraining, etc		$1,390 48
2. *Farm Maintenance*—		
Salary of superintendent	$1,200 00	
Wages	3,092 84	
Live stock	1,140 62	
Maintenance of stock	628 83	
Seed	283 29	
Binding twine	20 00	
Repairs and alterations	598 75	
Furniture and furnishings, etc	179 52	
Tools and implements	222 71	
Advertising, printing, postage, and stationery	238 08	
Fuel and light	77 84	
Contingencies	157 40	
		$7,839 88
		$9,230 36

Revenue of Farm Proper.

Sale of cattle	$692 20	
" sheep	298 90	
" pigs	595 21	
" horses	70 00	
" sheep skins	10 25	
" milk	99 13	
" wool	90 61	
" wheat	85 10	
" barley	5 00	
" oats	8 05	
" hides	1 50	
" old fence	71 50	
" potatoes	2 15	
Service of animals	117 00	
Keep of animals	148 00	
Rent of cream separator	5 00	
		$2,299 60
Net expenditure (see notes at end of this statement)		$6,930 76

(b) *Experimental Plots.*

Salaries and wages—	
Experimentalist	$1,500 00
Foreman and teamsters	923 00
Laborers	1,732 56
	4,155 56
Seed	422 03
Manure and special fertilizers	135 64
Furniture, furnishings, and repairs	233 52
Printing, postage, and stationery	117 05
Implememts	223 95
Contingencies	133 62
Expenditure for the year	$5,421 37

Unexpended balance for the year, $411 63.

III. Dairy Department.

(a) *Experimental Dairy.*

Salary of foreman		$600 00
Wages of cattleman, milkers, etc		581 07
Temporary assistance		148 45
		1,329 52
Purchase of stock—cows and pigs		2,378 98
Maintenance of stock		814 25
Furniture, furnishings and repairs (including blacksmithing)		430 87
Laboratory expenses—gas, chemicals, etc		118 98
Advertising, printing, postage and stationery		61 54
Fuel		389 39
Contingencies		264 97
		$5,788 50

Revenue of Experimental Dairy.

Sale of butter	$820 91	
" cheese	90 83	
" milk	64 08	
" pigs	665 77	
" cattle	95 00	
" hides	3 10	
Service of animals	1 00	
		$1,740 69
Net expenditure of experimental dairy		$4,047 81

Unexpended balance for the year, $662 19.

(b) *Dairy School.*

Wages of instructors, helpers, and engineer	$1,375 00	
Purchase of milk for use in school	6,006 63	
	$7,381 63	

Revenue of Dairy School.

Sale of butter	$2,029 86		
" cheese	1,162 72		
" whey	30 00		
" skim milk	1 84		
Fees	439 00		
		$3,663 42	
			$3,718 21

Unexpended balance for the year, $181.79.

(c) *Travelling Dairy*

Expenses of travelling dairy—1st May to 17th Dec	$2,073 42	
Less revenue—horses sold	80 00	
Net expenditure of travelling dairy	$1,993 42	

Unexpended balance for the year, $806.58.

Total expenditure of experimental dairy, dairy school, and travelling dairy	$9,759 44

(*d*) *Poultry Department.*

Salary of manager	$125 00	
Purchase of poultry	664 81	
Feed	20 96	
Furnishings	70 08	
Fuel and light for office	16 80	
Contingencies	2 35	
Expenditure of poultry department	$900 00	

III. Horticulture, Gardens, Lawn, Arboretum, Etc.

1. Permanent improvements—underdraining		$168 54	
2. Maintenance—			
Salary of gardener	$550 00		
Salary of assistant gardener	500 00		
Wages of teamster	336 00		
Wages of laborers	1,477 15		
	2,863 15		
Seeds, plants, shrubs, etc	106 60		
Manure and fertilizers	36 80		
Furnishings, repairs, etc	259 77		
Fuel and light for botanical laboratory and greenhouses	538 39		
Contingencies	64 15		
		$3,868 36	
		$4,036 90	
Less produce sold		11 70	
Net expenditure of horticultural dept			$4,025 20

Unexpended balance for the year, $490 80.

IV.—Mechanical Work—Construction of Buildings, Etc.

Salary of foreman	$700 00	
Salary of carpenter	650 00	
Tools, etc	30 12	
Fuel	21 02	
Expenditure for the year		$1,401 14

Unexpended balance for the year, $22.86.

Summary.

Total net expenditure of all departments in 1894—

I. College and Government buildings	$28,042 11
II. Farm—	
1. Farm proper (see notes below)	6,930 76
2. Experimental plots	5,421 37
3. Dairy dept—experimental dairy, dairy school, and travelling dairy	9,759 44
4. Poultry department—wages, stock, etc	900 00
III. Horticulture—gardens, orchard, lawn, greenhouses, arboretum, etc	4,025 20
IV. Mechanical work—construction of buildings, etc	1,401 14
	$56,480 02

Unexpended balances on the year's operations in all departments, $5,142 48.

The amount paid by the College to students for work in the outside departments in 1894 was $3,309.18 This was done by crediting on board bills the sums allowed to students from week to week by the foreman 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 30 to 70 quarts a day), and potatoes, turnips, etc., for College use.

(2) From the Dairy Department for 176 tons ensilage, 700 bushels mangels, some turnips, and the year's supply of pasture, hay and straw for 30 cows, 10 to 12 calves and a number of swine.

(3) From the Poultry Department for straw, chaff, etc., some mangels, the hauling of stone for foundations of buildings, and two or three days of man and team grading around the same.

(4) From the Experimental Department for the feed and bedding of four horses throughout the year, and for the clearing and cleaning of several acres of new land.

(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.

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 and Poultry Departments.

JAMES MILLS,
President.

APPENDIX VI.

MEETINGS OF FARMERS' INSTITUTES.

1895.

Division I.

Jno. McMillan, M.P., Seaforth, Ont.: "Cultivation of Corn," "Preparing Corn for the Silo," "Cultivation of the Soil for Roots or Grain Crops," "Farmers' Institutes," "Underdraining," "Care of the Manure Heap," "How to Apply Manure to the Land," "Breeding, Feeding and Exporting Beef Cattle to Britain," "The Benefits of Dehorning," "The Breeding and Care of Heavy Draught Horses," "Farm Implements," "Make Home Attractive," "Why Boys Leave the Farm."

Alex. E. Wark, Wanstead, Ont.: "How to Manage a Dairy Farm in Ontario and Make it Pay," "Vital Points to be Observed, Particularly in Supplying Dairy Goods to the English Market," "Pioneer *versus* Modern Life on the Farm."

D. W. Beadle, Toronto: "The Apple Orchard," "The Pear Orchard," "The Plum Orchard," "The Vineyard," and *any* of the *small fruits*, as the Strawberry, Raspberry and Blackberry, etc., including location, soil, preparation of ground, planting, pruning, cultivation, varieties, gathering, packing, marketing, injurious insects and how to destroy them, destructive fungi and how to prevent their injuries. "Elements of Success in Fruit Growing," "The Ideal Farmer," "Importance of Knowing the Life-Story of Our Insect Foes," "Some Interesting Facts in the Modes of Development of the Harmful Fungi."

1.	Drayton	W. Wellington	Jan.	2nd,	1.30 p.m.
2.	Clifford	W. Wellington	"	3rd,	1.00 p.m.
3.	Paisley	C. Bruce	"	4th,	10.00 a.m.
4.	Port Elgin	N. Bruce	"	5th,	10.00 a.m.
5.	Tara	N. Bruce	"	8th,	10.00 a.m.
6.	Durham	S. Grey	"	9th,	10.00 a.m.
7.	Ayton	S. Grey	"	10th,	1.00 p.m.
8.	Kenilworth	E. Wellington	"	11th,	1.00 p.m.
9.	Damascus	E. Wellington	"	12th,	10.00 a.m.
10.	Teeswater	S. Bruce	"	14th,	1.00 p.m.
11.	Holyrood	S. Bruce	"	15th,	10.00 a.m.
12.	Ripley	C. Bruce	"	16th,	1.00 p.m.
13.	Wingham	W. Huron	"	17th,	10.00 a.m.
14.	Brussels	E. Huron	"	18th,	10 00 a.m.
15.	Atwood	N. Perth	"	19th,	10.00 a.m.
16.	Milverton	N. Perth	"	21st,	1.00 p.m.

Division II.

Wm. Rennie, O.A.C., Guelph, Ont.: "Clover Culture," "Culture of Field Roots," "Rotation of Crops," "Ridding the Land of Weeds," "Stock Feeding," "Beautifying the Farm."

A. McNeill, Windsor, Ont.: "The Advantages of Spraying Fruit Trees," "Fruit Growing on the Farm," "When, Where and How to Plant Fruit Trees or Bushes," "When and How to Sell Fruit," "Underdraining," "Production, Care and Application of Manure," "Book-keeping for Farmers," "The Farmer's Library."

(†) Jas. G. Munro, Embro, Ont., representing the Good Roads Association of Ontario: "The Road Question in all its Bearings;" also "Mixed Farming," "Dehorning," "Bee-keeping on the Farm," "Poultry on the Farm," "Farm Life."

(*) Isaac Usher, Thorold, Ont. (alternate with Mr. Munro), representing the Good Roads Association of Ontario: "How Roads Should be Constructed," "How Best to Maintain Them." He will also speak on "Concrete Walls," "How to Build Them," "The Cost of Same," "Concrete Floors, Troughs, etc.," "The Proper Ventilation of Stables," and other topics connected with farm buildings.

*1. Galt	S. Waterloo	Jan.	2nd, 10.00 a.m.
*2. New Hamburg	S. Waterloo	"	3rd, 1.00 p.m.
*3. Mitchell	S. Perth	"	4th and 5th, 1.00 p.m. on 4th.
*4. Brucefield	S. Huron	"	8th, 10.00 a.m.
*5. Exeter	S. Huron	"	9th, 10.00 a.m.
*6. Parkhill	N. Middlesex	"	10th, 10.00 a.m.
†7. Thedford	E. Lambton	"	11th, 10.00 a.m.
†8. Camlachie	E. Lambton	"	12th, 1.00 p.m.
†9. Brigden	W. Lambton	"	14th and 15th, 10.00 a.m. on 14th.
†10. Appin	W. Middlesex	"	16th, 10.00 a.m.
†11. Mount Brydges	W. Middlesex	"	17th, 10.00 a.m.
†12. Byron	E. Middlesex	"	18th, 1.00 p.m.
†13. Coldstream	E. Middlesex	"	19th, 1.00 p.m.
†14. Ilderton	N. Middlesex	"	21st, 1.00 p.m.

Division III.

Prof. J. H. Reed, Guelph, Ont.: "Breeding Horses for Profit," "The Common Diseases of the Stomach of the Ox," "The Laws of Breeding," "The Care of the Horse," "The Points of the Horse," "The Education of the Horse," "Contagious Diseases, their Causes and Prevention."

A. H. Pettit, Grimsby, Ont.: "The Advantage of Cold Storage to the Fruit Growers," "The Varieties of Fruit to Plant," "Fruit Growing as a Business," "Fruit Growing on the Farm," "The Advantages of Spraying Fruit Trees."

Wm. Dickson, Atwood, Ont., representing the Good Roads Association of Ontario: "How Roads Should be Constructed," "How Best to Maintain Them, etc."; also on "Rotation of Farm Crops," "Dairy Farming in Connection with Cheese Production," "Tree Planting."

1. Waterford	N. Norfolk	Jan.	2nd, 10.00 a.m.
2. Port Rowan	S. Norfolk	"	3rd, 1.00 p.m.
3. Vittoria	S. Norfolk	"	4th, 1.00 p.m.
4. Delhi	N. Norfolk	"	5th, 1.00 p.m.
5. Norwich	S. Oxford	"	8th, 10.00 a.m.
6. Mount Elgin	S. Oxford	"	9th, 10.00 a.m.
7. Aylmer	E. Elgin	"	10th and 11th, 1.00 p.m. on 10th.
8. Shedden	W. Elgin	"	12th, 1.00 p.m.
9. Rodney	W. Elgin	"	14th, 10.00 a.m.
10. Blenheim	E. Kent	"	15th, 1.00 p.m.
11. Merlin	W. Kent	"	16th, 1.00 p.m.
12. Amherstburg	S. Essex	"	17th, 10.00 a.m.
13. Belle River	N. Essex	"	18th, 1.00 p.m.
14. Stony Point	N. Essex	"	19th, 1.00 p.m.
15. Chatham	W. Kent	"	21st, 1.00 p.m.
16. Thamesville	E. Kent	"	22nd, 10.00 a.m.

Division IV.

Prof. J. H. Panton, O.A.C., Guelph, Ont.: "Plants and Their Effect upon the Soil," "Spraying, its Objects and Results," "Nitrogen in Agriculture," "Insects and How to Destroy Them," "Parasitic Plants and How to Overcome Them," "Agricultural Science for Rural Schools," "The Sun in Relation to Life," "The Origin of Ontario Soil."

Thomas McMillan, Seaforth, Ont.: "Farming as an Occupation," "Making Our Way in Life," "Corn-Growing and the Silo," "Breeding and Feeding Cattle," "Cultivation of the Soil."

W. W. Hilborn, Leamington, Ont.: "The Farmer's Garden, How to Make it Pay," "What Fruits to Grow on the Farm and How to Grow Them," "The New Experiment Stations—Will They Benefit the Farmer? How?" "House Plants, How to Grow and Care for Them," "How Farmers' Horses Should be Fed."

1.	Freelton	N. Wentworth	Jan.	2nd, 10.00 a.m.
2.	Waterdown	N. Wentworth	"	3rd, 1.00 p.m.
3.	Jordan	Lincoln	"	4th and 5th, 1.00 p.m. on 4th.
4.	Niagara Falls South	Welland	"	7th, 10.00 a.m.
5.	Crowland	Welland	"	8th, 10.00 a.m.
6.	Pelham Town Hall	Monck	"	9th, 10.00 a.m.
7.	Attercliffe Station	Monck	"	10th, 10.00 a.m.
8.	Fisherville	Haldimand	"	11th and 12th, 1.00 p.m. on 11th.
9.	Glanford	S. Wentworth	"	14th, 10.00 a.m.
10.	Binbrook	S. Wentworth	"	15th, 10.00 a.m.
11.	Brantford	S. Brant	"	16th and 17th, 1.00 p.m. on 16th.
12.	St. George	N. Brant	"	18th and 19th, 1.00 p.m. on 18th.

Division V.

T. G. Raynor, B.S.A., Rose Hall, Ont.: "Tillage," "Selection and Breeding of Animals," "Selection and Management of a Dairy Herd," "Swine Breeding and Feeding," "Our Fodder Crops," "Drainage."

Joseph Yuill, Carleton Place, Ont.: "Fodder Corn and the Silo," "Care and Management of Dairy Cattle," "Winter Dairying," "Points of a Dairy Cow," "Care and Application of Manure," "How to Enrich an Impoverished Farm," "Sheep Husbandry," "Underdraining," "Swine Breeding," "Butter-making," "What Shall we Teach Our Sons and Daughters?"

(*) A. W. Campbell, C.E., St. Thomas, Ont., representing the Good Roads Association of Ontario: "How Roads Should be Constructed." "How Best to Maintain Them, etc.," "Draining Land."

(†) James Sheppard, Queenston, Ont. (alternate with A. W. Campbell), representing the Good Roads Association of Ontario: "How Roads Should be Constructed," "How Best to Maintain Them, etc."; also on "Drainage—When, Where and How it Should be Done," "Fruit Growing for Profit," "Fruit Growing on the Farm," "Spraying," "The Most Profitable Varieties of Fruit to Plant," "Care of an Orchard, etc."

*1.	Embro	N. Oxford	Jan.	2nd, 10.00 a.m.
*2.	Innerkip	N. Oxford	"	3rd, 10.00 a.m.
*3.	Elmira	N. Waterloo	"	4th and 5th, 1.00 p.m. on 4th.
†4.	Alma	C. Wellington	"	8th, 10.00 a.m.
†5.	Erin	C. Wellington	"	9th, 10.00 a.m.
†6.	Orangeville	Dufferin	"	10th, 10.30 a.m.
†7.	Shelburne	Dufferin	"	11th, 1.00 p.m.
†8.	Flesherton	C. Grey	"	12th, 1.00 p.m.
†9.	Owen Sound	N. Grey	"	14th, 10.30 a.m.

†10. Palermo	Halton	"	15th, 1.00 p.m.
†11. Acton	Halton	"	16th, 10.30 a.m.
†12. Guelph	S. Wellington	"	17th and 18th, 1.00 p.m. on 17th.
13. Brampton	Peel	"	21st and 22nd, 1.00 p.m. on 21st.

Division VI.

Prof. Geo. Harcourt, B.S.A., St. Ann's, Ont.: "Winter Dairying," "Butter-Making," "Care and Handling of Milk," "Fodder Corn and the Silo," "Stock Breeding and Feeding," "Fruit on the Farm," "Agricultural Education."

Robert Thompson, St. Catharines, Ont.: "Gathering and Marketing Fruit," "Cultivation of Plums, Berries, etc.," "Cultivation of Corn and Peas," "The Cultivation of Roots," "Swine Breeding and Feeding," "Country *vs.* City Life.

Simpson Rennie, Milliken, Ont.: "Underdraining," "Destruction of Weeds," "The Cultivation of Grain and Root Fields," "Cattle Feeding for the British Market," "Should Agriculture be Taught in Public Schools."

1. Weston	W. York	Jan.	2nd, 10.00 a.m.
2. Woodbridge	W. York	"	3rd, 10.00 a.m.
3. Bond Head	S. Simcoe	"	4th, 1.00 p.m.
4. Thornton	S. Simcoe	"	5th, 1.00 p.m.
5. Minesing	C. Simcoe	"	8th, 10.00 a.m.
6. Wyevale	C. Simcoe	"	9th, 1.00 p.m.
7. Coldwater	E. Simcoe	"	10th, 10.00 a.m.
8. Orillia	E. Simcoe	"	11th, 10.00 a.m.
9. Meaford	N. Grey	"	12th, 1.00 p.m.
10. Thornbury	C. Grey	"	14th, 10.00 a.m.
11. Collingwood	W. Simcoe	"	15th, 10.00 a.m.
12. Stayner	W. Simcoe	"	16th, 10.00 a.m.
13. Mount Albert	N. York	"	18th and 19th, 1.00 p.m. on 18th.

Division VII.

C. A. Zavitz, B.S.A., O.A.C., Guelph, Ont.: "The Best Varieties of Barley, Wheat, Peas and Oats," "Experiments in Growing Roots and Potatoes," "The Value of Clover," "Succulent Food for Live Stock," "Agricultural Experiments," "The Ontario Agricultural College."

D. E. Smith, B.A., Brampton, Ont.: "The Feeding of Dairy Cattle," "Ensilage and the Silo," "Butter-Making," "The Points and Characteristics of the Dairy Cow," "Essentials in Successful Breeding," "City *vs.* Country Life as an Educator," "How Law, Learning and Labor Affect the Farmer."

J. F. Beam, Black Creek, Ont.: "How to construct and Maintain Roads," "The Care of an Orchard," "The Culture of Small Fruits," "Dairy Farming as a Business," "Dehorning," "Stables," "Winter Care of Live Stock."

1. Oshawa	S. Ontario	Jan.	2nd, 10.00 a.m.
2. Pickering	S. Ontario	"	3rd, 10.00 a.m.
3. Agincourt	E. York	"	4th and 5th, 1.00 p.m. on 4th.
4. Uxbridge	N. Ontario	"	8th, 10.00 a.m.
5. Woodville	W. Victoria	"	9th, 10.00 a.m.
6. Beaverton	N. Ontario	"	10th, 10.00 a.m.
7. Lindsay	W. Victoria	"	11th, 10.00 a.m.
8. Fenelon Falls	E. Victoria	"	12th, 10.30 a.m.
9. Bobcaygeon	E. Victoria	"	14th, 10.30 a.m.
10. Peterborough	W. Peterborough	"	16th, 1.00 p.m.
11. Lakefield	W. Peterborough	"	17th, 10.00 a.m.
12. Keene	E. Peterborough	"	18th, 10.30 a.m.
13. Norwood	E. Peterborough	"	19th, 10.00 a.m.
14. Warkworth	E. Northumberland	"	21st and 22nd, 1.00 p.m. on 21st.

Division VIII.

H. L. Hutt, B.S.A., O.A.C., Guelph, Ont: "The Proper Management of an Orchard," "The Farmer's Fruit Garden," "The Farmer's Vegetable Garden," "Farming as an Occupation," "Window Gardening."

I. W. Steinhoff, Sebringville, Ont.: "Selecting, Breeding and Feeding Cows," "How Dairying Benefits the Farm," "Co-Operative Dairying a Necessity," "The Babcock Milk Tester," "Butter-Making on the Farm and in the Factory."

J. C. Judd, Morton, Ont.: Representing the Good Roads Association of Ontario, "How Roads should be constructed," "How Best to Maintain Them, etc.;" also on "An Agricultural Problem ; How shall we Keep the Boys and Girls on the Farm ?"

1.	Blackstock	W. Durham	Jan.	2nd, 10.00 a.m.
2.	Tweed	E. Hastings	"	3rd, 1.00 p.m.
3.	Tamworth	Addington	"	4th, 10.00 a.m.
4.	Centreville	Addington	"	5th, 10.30 a.m.
5.	Napanee	Lennox	"	8th, 10.30 a.m.
6.	Stella	Lennox	"	from 1.30 p.m. on 9th till noon of 10th.
7.	Shannonville	E. Hastings	"	10th, meeting at 7.30 p.m. and 11th till 4.45 p.m.
8.	Wellington	Prince Edward	"	12th, 10 00 a.m.
9.	Demorestville	Prince Edward	"	14th, 10.30 a.m.
10.	Grafton	W. Northumberland	"	15th, 1.30 p.m.
11.	Coldsprings	W. Northumberland	"	16th, 10.30 a.m.
12.	Orono	W. Durham	"	17th, 10.00 a.m.
13.	Bowmanville	W. Durham	"	18th, 10.00.

Division IX.

G. E. Day, O.A.C., Guelph, Ont.: "Selection in Stock Breeding," "Summer and Winter Management of Dairy Cattle," "The Brood Sow and Her Litter," "Foods and Feeding," "Corn and the Silo," "Draining," "Bacteria and Their Products," "Difficulties in Butter-Making."

L. Patton, Oxford Mills, Ont.: "Breeding, Feeding and Handling Dairy Cattle," "Paying for Milk at Cheese Factories According to Butter-Fat," "The Future of Dairying in Ontario," "Thoroughness Essential to Success on the Farm," "How to Preserve the Fertility of the Soil," "The Value to the Farmer of Experiments Conducted at Experiment Stations," "How to Make Farm Life Attractive," "The Education of Farmers' Sons and Daughters."

Mungo McNabb, Cowal, Ont.: "Essentials in Farming," "Breeding and Feeding Beef Cattle," "Selection and Breeding of Sheep," "Care and Management of Sheep," "Underdraining," "Corn as a Crop," "Management of Pigs," "The Successful Farmer."

1.	Oxford Mills	N. Grenville......	Jan.	2nd, 10.00 a.m.
2.	Kemptville	N. Grenville.......	"	3rd, 10.30 a.m.
3.	Winchester	Dundas	"	4th and 5th, 1.30 p.m. on 4th.
4.	Newington	Stormont	"	8th and 9th, 1.30 p.m. on 8th.
5.	Cornwall Centre	Cornwall.........	"	10th and 11th, 1.30 p.m. on 10th.
6.	Spencerville..........	S. Grenville	"	12th, 10.30 a.m.
7.	North Augusta	S. Grenville	"	14th, 10.00 a.m.
8.	New Dublin..........	Brockville........	"	15th, 10.30 a.m.
9.	Athens	Brockville........	"	16th, 10.30 a.m.
10.	Delta	S. Leeds	"	17th, 10.30 a.m.
11.	Lansdowne	S. Leeds	"	18th and 19th, from 2 p.m. on 18th till 5 p.m. on 19th.
12.	Sunbury	Frontenac........	"	21st, 10.30 a.m.
13.	Sydenham	Frontenac........	"	22nd, 10.30 a.m.

DIVISION X.

PROF. A. E. SHUTTLEWORTH, O.A.C., Guelph, Ont.: "Muck and Marl," "The Most Profitable Varieties of Farm Crops, which have been determined by Co-operative Field Experiments," "Milk, Cheese and Whey," "Composition and Cultivation of Roots," "Maintaining Soil Fertility," "Warming and Ventilating Habitations."

WM. S. FRASER, Bradford, Ont.: "Swine Breeding and Feeding," "Sheep Breeding and Feeding," "Clover Growing and Curing," "Cultivation of Corn and the Silo," "Underdraining," "Butter-Making on the Farm," "The Farmer's Needs."

F. MAHON, Aberfoyle, Ont, representing the Good Roads Association of Ontario: "How Roads Should be Constructed," "How Best to Maintain Them," etc.; also on "Growing Rape and Feeding Lambs," "Town *vs.* Country Life," "Growing Corn and Making Ensilage.

1. Lancaster	Glengarry	Jan.	2nd, 10.00 a.m.
2. Vankleek Hill	Prescott	"	3rd and 4th, 1 p.m. on 3rd.
3. Maxville	Glengarry	"	5th, 10.00 a.m.
4. Duncanville	Russell	"	8th and 9th, 1 p.m. on 8th.
5. Stittsville	Carleton	"	10th, 1.00 p.m.
6. Carp	Carleton	"	11th, 10.00 a.m.
7. Almonte	N. Lanark	"	12th, 1.00 p.m.
8. Pembroke	N. Renfrew	"	14th, 10.00 a.m.
9. Micksburg	N. Renfrew	"	15th, 1.00 p.m.
10. Renfrew	S. Renfrew	"	16th and 17th, 10.00 a.m. on 16th.
11. Smith's Falls	S. Lanark	"	18th, 10.00 a.m.
12. Perth	S. Lanark	"	19th, 10.00 a.m.
13. Lanark	N. Lanark	"	21st, 1.00 p.m.

DIVISION XI.

R. F. HOLTERMANN, Brantford, Ont.: "Bee-Keeping on the Farm," "Points Essential to Successful Bee Keeping," "Bees in Relation to Horticulture and Plant Life," "The Honey Bee—Points Interesting and Instructive," "The Proper Care of Poultry on the Farm."

THOS. H. MASON, Straffordville, Ont.: "Hog Raising," "The Home Dairy," "Butter-Making," "The Care and Food of a Dairy Cow," "How to Select a Dairy Herd," "The Outlook for the Ontario Farmer."

1. Bracebridge	Muskoka	Jan.	29th, 10.00 a.m.
2. Port Carling	Muskoka	"	30th, 1.00 p.m.
3. Utterson	Muskoka	"	31st, 1.00 p.m.
4. Emsdale	E. Parry Sound	Feb.	1st, 10.00 a.m.
5. Edgington	W. Parry Sound	"	2nd.
6. Trout Lake	W. Parry Sound	"	4th, 1.00 p.m.
7. Parry Sound	W. Parry Sound	"	5th, 1.00 p.m.
8. Hurdville	W. Parry Sound	"	6th, 1.00 p.m.
9. Broadbent	W. Parry Sound	"	7th, 1.00 p.m.
10. McKellar	W. Parry Sound	"	8th, 1.00 p.m.
11. Dunchurch	W. Parry Sound	"	9th, 1.00 p.m.
12. Magnetawan	E. Parry Sound	"	11th, 1.00 p.m.
13. Burk's Falls	E. Parry Sound	"	12th, 1.00 p.m.
14. Sundridge	E. Parry Sound	"	13th, 1.00 p.m.
15. South River	E. Parry Sound	"	14th, 10.00 a.m.
16. Powassan	E. Parry Sound	"	15th, 10.00 a.m.

Division XII.

J. B. Muir, North Bruce, Ont.: "Raising Hogs for Market," "First Steps in Dairying," "Butter-Making in the Home Dairy," "The Care and Food of a Dairy Cow," "How to Select a Dairy Herd," "How to Make Life Pleasant on the Farm."

Alfred Brown, Bethel, Ont.: "Special Farming," "Sheep Husbandry," "Saving Manure," "The Farmer's Fruit and Vegetable Garden," "The Proper Care of Poultry on the Farm," "How to Give our Sons and Daughters a Business Education at Home."

1.	East Korah School	C. Algoma	Jan.	23rd,	2.00 p.m.
2.	Base Line School	C. Algoma	"	23rd,	7.00 p.m.
3.	Maclennan	E. Algoma	"	24th,	1.00 p.m.
4.	Richard's Landing	St. Joseph Island	"	25th,	10.00 a.m.
5.	Marksville	St. Joseph Island	"	26th,	1.00 p.m.
6.	Tenby Bay	St. Joseph Island	"	28th,	1.00 p.m.
7.	Bruce Mines	E. Algoma	"	29th	1.00 p.m.
8.	Thessalon	E. Algoma	"	30th,	1.00 p.m.
9.	Iron Bridge	E. Algoma	"	31st,	1.00 p.m.

10. Manitoulin Island, Gore Bay, Manitowaning, Little Current and other points, Feb. 2, 4, 5, 6, 7 and 8th. Delegates to arrive at Gore Bay at 1 p.m. on the 2nd.

APPENDIX VII.

SIXTEENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

The sixteenth annual meeting of the Ontario Agricultural and Experimental Union was held at the Agricultural College, Guelph, on the 18th and 19th of December, 1894, commencing at 10 a.m. on the 18th.

The President, Mr. A. Shantz, occupied the chair.

The minutes of last meeting were on motion taken as read and passed.

REPORT OF COMMITTEES.

Mr. R. F. HOLTERMANN: Mr. Lick and myself had an interview with the Hon. Mr. Dryden, Minister of Agriculture, and requested an additional grant. We were very favorably received, and as a result we have an additional $50 grant to the Union.

GENERAL BUSINESS.

Mr. R. F. HOLTERMANN: The Executive Committee have for some time thought it advisable to have a little change in the by-laws. The Executive has to consult with the President of the Agricultural College; you will see the necessity of this, because the meetings are all held at the College and interfere, more or less, with the working of the Institution, and we think it advisable to make an amendment to Article II., and make it read as follows:

"The Executive Council shall consist of the President of the College, Hon. President, Vice President, Secretary, Treasurer and Editor."

Therefore, I move that Section II. be amended accordingly.

This motion, after being seconded, was passed by the meeting.

Mr. R. F. HOLTERMANN: It would be well to discuss if we do require an increased grant, and if so what will be done about it.

The PRESIDENT: The grant we get at present is a liberal one, of course, but we can extend our work if we have more funds to do it with, and I think it would be quite proper to ask for an increase.

Mr. ZAVITZ: The Treasurer is not here yet, and I don't know exactly how our funds stand. I know that in our line of agricultural experiments if we had more money we could do more work. We have done a large amount of work this year, much more than last year, because we had more money to do it with. We used up every cent we received, and I think used it well, and we certainly extended our work. If we can get an increased grant we will be able to do more work. I believe we are carrying on experimental work along five lines: Agriculture, Bee-Keeping, Horticulture, Dairying, and Botany and Entomology. If we are going to extend this work along all these lines, it will require more money than we receive now.

Mr. R. F. HOLTERMANN: I may say the Bee-Keeping Committee have spent a little more than the $25 grant. We spent the $25 in material. We have had some of the best men in the province taking part, and our work has been limited by lack of funds.

Mr. LICK: There are three or four features in connection with this. One is that these are hard times. If we, as an Experimental Union, are doing good work for the farmers of this county, and if that can be shown, I believe we may reasonably ask for almost any grant and we can get it.

Mr. MONTEITH: I think with Mr. Lick that usefulness should be the test that we should go by. I think the Experimental Union is beyond experiment, and I think we are quite within the bounds in asking for an increased grant. The work has extended immensely.

PRESIDENT'S ADDRESS.

The President, Mr. A. SHANTZ, then delivered the annual address:

GENTLEMEN,—We are again met in the capacity of the Agricultural and Experimental Union at this, the sixteenth annual meeting, to discuss the problems that are agitating the minds of the farmers of our province. Our aim in holding these meetings is to form a bond of union amongst the officers of this institution, the students, ex-students and visiting friends, and also to report in summarized form the results of our work during the year. The farmer friends who have attended these meetings in the past have always been courteously received, and I am sure in the future they will be similarly received. They have been a great help to us, and we warmly welcome them to participate in the proceedings and to profit thereby. The programme certainly is a mental "bill of fare" that will be of benefit to all interested in the tilling of mother earth.

A great many of our neighbors have not had the privilege of knowing what our Union has done or what it is for,—in fact, some are not aware there is such an organization in existence. Now, it has occurred to me, that while the depression in agriculture lasts, when men following that calling are seeking after more knowledge so that they may be enabled to make an honest living and to become worthier citizens, would not this be a grand opportunity to elighten them in regard to the work and usefulness of this Union? It behooves us jointly and individually to do all that lies in our power to help along this work. In order that we may accomplish the most as a body, we should have on our membership list the name of every student and ex-student. It is a deplorable reality that there have been so few names on our list during the past year, and I appeal to you who are eligible to become members, and who have the popularity of the O. A. C., the usefulness of our Union, and the prosperity or our farming community at heart, to register your names before the termination of this meeting.

The Minister of Agriculture has placed at our disposal this year the sum of $700—the largest amount that has ever been granted us. The Government can rest assured that whatever amount they place in our hands will be wisely spent. For the extension of our work we need still more. But since the value of all experimentation depends so much upon the exactness and accuracy with which the experiments have been conducted, we should not only aim to widen our field but also strive to be more thorough. Let us be more scientific. In the spring of 1886 the Association launched out upon the present plan of experimentation with, I think, twelve experimenters. Since then the work has steadily increased, and during the last three years it has gone forth with tremendous strides, insomuch that in 1891 there were 2,642 plots, while the past season there were upwards of 7,721 plots used for these co-operative tests over Ontario. In live stock experiments we have done nothing as yet. A few years ago a committee considered the advisability of undertaking such experiments, but the difficulties in the way at that time seemed to them insurmountable. Whether or not we shall ever be able to carry out experiments along that line I shall not conjecture. Our Union is as yet only in its infancy. Who can predict the work it may yet accomplish? Besides the experiments in agriculture we have experiments in apiculture, in horticulture and in dairying, all important branches of this great industry which has so often been termed "the back-bone of our country."

And now, in conclusion, let me urge upon you the necessity of your hearty co-operation in this work. The old adage "In union is strength" may be fittingly applied here. Let us then stand shoulder to shoulder marching in unison towards the goal ahead, and success will be ours.

I thank you, the members of the Experimental Union, for having elected me to this honorary office, and hope that in years to come this Union may achieve what has been undreamt of in the past.

REPORT OF EXPERIMENTS IN APICULTURE.

The Self-Hiver.

It will perhaps be remembered that it was the intention of the Apicultural Committee to test for a second season the improved Pratt Self-Hiver. Last season it was found that this instrument, by means of which the bees hived themselves, worked with success as far as hiving the bees in the process of swarming was concerned. It was, however, found that the bees were inclined to enter and take possession of the new hive underneath before swarming. This, whilst doing no harm in the production of extracted honey, was a disadvantage in the production of comb honey, it giving the product in a form different to the one desired by the bee-keeper. The evidence this year confirms last season's experience. For those having only a few colonies of bees, unable to watch for swarms or perhaps finding it difficult to hive them, the Self-Hiver would appear to be a useful invention. For the bee-keeper who *carefully* watches his bees during the swarming season, the above objections and the expense of additional hives would appear to take it outside the range of practical apiculture.

Five-Banded Bees.

Within the last few years what are known as five-banded Italian bees have come into very general notice. Your committee thought that owing to the great attention they were attracting it would be well to make a general test of these bees. Their longevity, hardihood, honey-gathering qualities and temperament are to be noted by those taking the work in hand. Several leather-colored queens were also supplied for the same purpose. In every case the leather-colored Italians were introduced safely, and went into winter quarters in good condition. Already two of the five-banded Italian queens were lost before safely introducing, two were since lost by superseding. and fourteen queens have gone into winter quarters. Wm. Couse, Streetsville; Thos. Dryden, Paisley; A. Pickett, Nassagaweya; E. M. Husband, Cairngorm; John Myers, Stratford; C. W. Post, Murray; R. H. Smith, St. Thomas; Wm. McEvoy, Woodburn; Alpine McGregor, Inglewood; W. J. Brown, Chard; Goold, Shapley & Muir Co. (Ltd.), R. F. Holtermann, Brantford; F. A. Gemmell, Stratford; F. A. Rose, Balmoral; M. B. Holmes, Athens, and S. T. Pettit, Belmont, were supplied with queens. From this it will be seen that some very thorough work may be expected. The queens were supplied too late to breed a full stock of bees for the 1894 honey flow, but a very full report may be expected covering the year 1895.

Respectfully submitted,

R. F. Holtermann.

QUESTION DRAWER.

Q. Would it pay the average farmer in Ontario to keep bees?

Mr. MONTEITH: In answer to that query, I think it is an open question as to whether it will pay the average farmer. I have found in my experience that it is unwise to have too many irons in the fire. The swarming season usually occurs at a very busy season of the year, and the matter is overlooked and swarms very often are lost. As far as my own experience is concerned the honey has been a source of pleasure to us during the year. But at the present price of honey I do not think bee-keeping would be profitable to the average farmer.

Mr. C. A. KEIL, Chatham: I generally keep three or four hives. I do not keep them for profit nor do I know much about them; but they always furnish us with plenty of honey, and we generally sell a couple of dollars worth, and it is not very much trouble.

Mr. HOLTERMANN: I believe we very often direct our attention and energies to too many things. I think it is a question of what irons in the fire are the best; bee-keeping may be one of those and it may not. The district you are in has something to do with it, and the interest which you naturally have in the subject; some of us are naturally adapted to certain kinds of work. When I lived on the farm I took a great interest in insects, and I believe my taste ran along that line. There were difficulties in connection with swarming. I believe those difficulties have been overcome by the self-hiver. The time required in connection with bee-keeping is not much. There are often members of the house who are anxious to earn a little money; it adds to the interest they take in the farm, and keeping a few colonies of bees on the farm is an advantage. Outside of the actual value of the honey the bee plays an important part in the fertilization of plant life; in fact I feel justified in saying that the primary object of their existence is to assist in the fertilization of flowers. Only recently it has been discovered that it was actually necessary to have a different variety of apple, for this reason, that the pollen which certain varieties of apples produced were not adapted to fertilize that blossom, and the pollen had to be obtained from another variety. Now the honey bee is certainly better adapted for this work than any other insect in our climate. The honey bee is not a native of our own country. In the wild state in the early spring there are very few blossoms, and the insects, though few in number, were sufficient to fertilize the flowers in that condition. But at the present time we have immense orchards all through the country and we need the honey bee to fertilize the blossoms. With other insects only the female survives, but in the honey bee, we have not alone the queen but we have ten or twenty thousand working bees which live through the winter with that queen, and as soon as the warm sunshine comes out in the spring they are flying, and of course assist in the fertilization of this plant life, and for that reason alone it would pay the farmer to have some bees in his own vicinity, if there is not an extensive bee-keeper in his neighborhood.

Q. What kind of winter storing would you recommend?

Mr. HOLTERMANN: I try as much as possible to winter upon the natural store of the hive. Honey is worth wholesale say 8 cts. a pound. Granulated sugar is worth wholesale $4\frac{1}{2}$ cts., but by the time you have extracted your honey and sold it, and feed your bees with sugar syrup stores and if you calculate the expense of marketing the honey, there is a certain amount of loss in feeding sugar syrup stores. I believe it pays best to winter upon the natural honey store.

Q. Is it as economical to use pure-bred cows as it is to use grade cows for a dairy herd?

Mr. KENNY: I believe it is economical to use grade cows from the fact that they give you just as much produce and do not cost half as much money. I think that is a self evident fact.

Professor DEAN: There is so much difference in cows, you may get a good cow in a grade cow and she may be a better cow than the pure bred cow. I could agree with Mr. Kenny, for all practical purposes a good grade cow is the best thing for the dairy.

The CHAIRMAN: What are a few of the most important points you look at in selecting a cow?

Mr. KENNY: You may hit a thing nine times out of ten but you will be sure to miss sometimes. I have found from my experience that a great many promising heifers have proved to be poor milkers, and the weeding system has got to be the weight with us. We must weed out our herds, and keep those that prove most satisfactory at the milk-pail.

Professor DEAN: You may get a cow with all the fancy points and yet she may be a poor animal.

Q. Are there varieties of apples that fertilize themselves?

Mr. WOOLVERTON: That is not definitely settled yet with regard to the apples. A large list of grapes have been found that do not fertilize themselves; this list will be published in the next report of our Association. It was given us in a very interesting paper by Professor Beach, of Geneva, New York, Experiment Station. He showed us that there were many varieties of grapes of which the pollen, for some reason or other, does not fertilize itself, and consequently a large number of one variety by itself without other varieties near it would be unfruitful. That is a very important thing, and opens a vast field for study in the future, and explains why a great many people are unsuccessful in fruit growing.

REPORT OF THE COMMITTEE ON DAIRY EXPERIMENTS.

Although a committee on dairy experiments has been appointed for some time, it was not until this year that any work was done in this line. The following circular letter, together with blank forms for making the experiments, was sent to about 100 leading dairymen throughout the province:

GUELPH, April 2nd, 1894.

DEAR SIR,—The Committee on Dairy Experiments, appointed by the Ontario Agricultural and Experimental Union, desire your co-operation in regard to this experimental work in dairying. We feel that every dairyman, cheese-maker, and butter-maker should be an experimenter. To secure co-operative experiments on the same lines, we have selected the two enclosed for 1894, and hope that you may be able to undertake one or both of them during the year, and that you will send the results to us as soon as possible after the work is done.

The results of all the experiments will be published in the Annual Report of the Experimental Union which appears in the College Report of which a copy will be sent to each one who sends in a report to the Committee.

H. H. DEAN (Director)
H. L. BECKETT,
S. P. BROWN.
} *Committee.*

Early in November a card was sent to each person, asking them to report to us not later than December 1st. Some said that owing to various reasons, such as lack of a tester, lack of proper vats, lack of time and help, they had been unable to do either of the experiments, while others admitted that if they had made an effort they might have done at least a part of one or the other.

The experiments sent to makers were also carried on at the dairy of the College.

There were five reported on each experiment, two men (Messrs. Roode and Muir) conducting a part of both experiments. I may specially mention the work done by Mr. Roode, of Hulbert, who had a special vat made for experimental work, and the thanks of the Committee are due him for his trouble. This work was done wholly at the expense of the experimenter, we supplying nothing but the blank forms to be filled in.

The object of experiment No. 1 was to observe the effect of an increase in the per cent. of fat in the whole milk on the yield and quality of cheese.

The following directions were sent with this experiment: "We would like, if possible, one experiment each month during the season. Secure as wide a range of the per cent. of fat in the milk as can be got. Not less than 300 pounds of milk should be used in each experiment. Try to make the cheese from poor and rich milk on the same day or on consecutive days of each month, and work them as nearly alike as possible."

The results of the dairy experiments and of the work done in the factories are seen in the table :

1894. Name of experimenter.	Month.	Average per cent. fat in milk.	Lb. milk.	Lb. fat.	Lb. cheese.		Lb. milk for lb. cheese.		Lb. cheese for lb. fat.		Average per cent. fat in whey.
					Green.	Cured.	Green.	Cured.	Green.	Cured.	
O. A. C. Dairy Department. Guelph.	May	3.80 3.48	2,100 2,100	79.80 73.08	206.50 194.75	194.75 183.25	10.03 10.78	10.77 11.46	2.59 2.68	2.44 2.51	0.26 0.25
	June	4.18 3.60	1,800 1,800	75.24 64.80	195.50 181.25	183.75 170.00	9.21 9.95	9.79 10.59	2.60 2.80	2.44 2.62	0.19 0.19
	July	3.84 3.23	1,800 1,800	69.15 58.05	184.00 164.25	172.25 154.50	9.79 10.97	10.46 11.66	2.67 2.83	2.49 2.67	0.28 0.27
	August...	3.93 3.25	1,800 1,800	70.80 59.50	178.50 161.50	169.00 152.25	10.10 10.15	10.68 11.83	2.53 2.76	2.59 2.56	0.26 0.20
	Sept.....	3.97 3.03	1,800 1,800	71.40 54.60	188.25 161.25	179.75 152.75	9.56 11.16	10.01 11.80	2.63 2.95	2.52 2.79	0.09 0.15
	Oct......	3.95 3.56	1,500 1,500	59.25 53,40	161.75 150.75	153.50 142.50	9.27 9 95	9.77 10.52	2.81 2.82	2 59 2.68	0.14 0.14
	Nov.	3.88 3.47	1,800 1,800	69.90 62.40	190.00 175.75	183.25 168.25	9.47 10.24	9.82 10.69	2.72 2.82	2.62 2.70	0.14 0.11
	Averages and totals	3.94 3.37	12,600 12,600	495.54 425.83	1,304.50 1,189.50	1,236.25 1,123.50	9.63 10.60	10.19 11.22	2.65 2.81	2.50 2.65	0.19 0.18
	Diff......	0 57	0	69.71	115.00	112.75	.97	1.03	0.16	0.15	0.01
A. T. Bell, Tavistock.	Oct. 19 ..	4.70 3.45	500 500	23.50 17.25	59.25 48.50	57.00 46.50	8.44 10.31	8.77 10.75	2.52 2.81	2.42 2.69	0.30 0.20
J. B. Muir, Avonbank.	Oct. 29 ..	4.00 3.70	5,338 5,116	213.52 189.29	584.00 519.00	568.00 507.00	9.14 9.85	9.40 10.09	2.73 2.74	2.66 2.67	0.20 0.20
L. L. Phelps, Mt. Elgin,	May 24..	3.40 3.00	4,500 4,500	153.00 135.00	481.50 434.00	470.50 424.00	9.34 10.36	9.91 10.61	3.14 3.21	3.07 3.14	....
E. A. Roode, Hulbert, Dundas Co.	July 23-24	3.80 3.20	750 750	28.50 24.00	75.00 70.00	72.00 66.00	10.00 10.71	10.41 11.34	2.63 2.92	2.52 2.75	2.20 0.20
	Aug. 1-2.	3.80 3.60	750 750	28.50 27.00	75.00 72.50	72.00 70.00	10.00 10.34	10.41 10.71	2.63 2.08	2.52 2.59	0.30 0.30
	Sept. 6-7.	3.80 3.20	300 300	11.40 9.60	31.00 28.00	30.00 27.00	9.68 10.71	10.00 11.11	2.72 2.91	2.63 2.81	0.30 0.40
	Oct. 9-10.	4.30 3.80	500 500	21.50 19.00	62.00 56.00	60.00 53.50	8.06 8.93	8.33 9.35	2.88 2.95	2.79 2.81	0.30 0.30
Average of Mr. Roode's expm'ts.	Four months.	3.92 3.45	2,300 2,300	89.90 79.60	243.00 226.50	234.00 216.50	9.43 10.17	9.79 10.63	2.72 2.87	2.62 2.74	0 28 0.30
	Diff.	0.47	0	10.30	16.50	17.50	.74	.84	.15	.12	0.02
*Wm. Dwyer, Chesterville, at the Gowan Brae factory.	Sept. 10-11	4.50 2.80	1,350 1,350	60.75 37.80	150 130	147 126	....	9.32 10.71	....	2.42 3.33	0.40 0.20

*In this experiment cream was added to get the richer milk and the partially skimmed milk used to secure the lower per cent. fat.

Conclusions from No. 1 Experiment.

1. An increased percentage of fat in the milk gives an increased yield of cheese, though not in exactly the same proportion.

2. That a pound of butter-fat in milk averaging 3.37 per cent. of fat will make more cheese than a pound of fat in milk averaging 3.94 per cent. of fat is shown by the results of the experiments at the dairy of the O. A. College, and all the other Canadian experiments quoted point in the same direction.

3. There is little difference in the per cent. of fat lost in whey whether the milk is rich or poor in fat, what difference there is being in favor of the whey from the poor milk.

The object of experiment No. 2 was to determine if composite samples of milk could be successfully tested with accurate results at the end of two or more weeks.

The directions were:

"Select one or more patron's milk and test samples every day. At the same time put a sample into the composite jar and test it at the end of the periods named. The same patrons need not be selected each month."

The subjoined details of the testing show that composite testing may be successfully practised for one month, but owing to the risk in case of breakage, souring, or other mishap, we would not recommend a longer period than two weeks at present.

Name of experimenter.	Month.	Patron No.	One week.		Two weeks.		Three weeks.		One month.	
			Average daily tests.	Per cent. fat in jar.	Average daily tests.	Per cent. fat in jar.	Average daily tests.	Per cent. fat in jar.	Average daily tests.	Per cent. fat in jar.
E. A. Roode, Hulbert, Ont., Dundas Co.	May	1	3.73	3.90	3.82	4.00	3.97	4.00	3.75	3.90
	June	1	3.766	3.90	3 70	3.70	3.70	3.50	3.68	3.60
	July	1	3.500	3.50	3.38	3.30	3.50	3.40	3.46	3.40
	August	1	3.375	3.40	3.387	3.20	3.372	3.30	3.42	3.40
	Sept.	1	3.460	3.50	3.66	3.70	3.460	3.60	3.60	3.80
	October	1	3.880	3.80	4.00	4.10	4.09	4.20	4.14	4.20
	Av. 6 months..	1	3.62	3.66	3.66	3.66	3.68	3.66	3.67	3.67
G. B. Brodie, Brantford, North Brant factory, Brant Co.	June	1	3.26	3.20	3.209	3.20	......	......	......	......
	July	1	3.66	3.70	3.66	3.60	3.745	3.6	3.698	3.50
		2	4.30	4.30	4.31	4.30	4.310	4.3	4.280	3.90
	Sept.	1	4.36	4.30	4.36	4.20	4.340	4.1	......	......
		2	4.32	4.00	4.16	4.30	4.130	4.0	4.19	4.1
	October	1	4.20	4.10	4.23	4.20	4.320	4.5	4.32	4.5
		2	3.10	3.00	3.18	3.10	3.320	3.4	3.337	3.4
	Av. 4 months..	....	3.89	3.80	3.87	3.85	4.03	3.98	3.965	3.88
J. B. Muir, Avonbank, Perth Co.	October	1	4.15	4.1	4.03	4.00	3.81	3.8	3.85	3.70
		2	3.93	3.9	3.99	3.80	3.90	4.0	3.95	3.80
		3	3.66	3.7	3.70	3.80	3.69	3.6	3.68	3.60
	Av. 1 month..	....	3.91	3.9	3.90	3.87	3.80	3.80	3.83	3.70
A. D. Perry, Harrowsmith, Frontenac Co.	July	1	3.50	3.40	3.80	3.60	3.45	3.55	......	3.60
		2	3.90	3.90	3.81	3.90	3.50	3.75	......	3.70
		3	3.62	3 60	3.81	3.70	3.80	3.75	......	3.75
	Av. 1 month..	....	3.67	3.63	3.80	3.73	3.58	3.68	......	3.68
Jas. A. Gray, Atwood, Perth Co.	May	1	3.62	3.55	3.20	3.20	3.80	3.40	3.32	3.40
O. A. C., dairy dept.	Av. for 8 mo's.	1	3.69	3.67	3.52	3.47	3.33	3.30	3.18	3.14
		2	3.44	3.45	3.21	3.12	3.10	3.09	3.09	3.17
	Average......	....	3.57	3.56	3.37	3.30	3.22	3.20	3.14	3.16

In conclusion we may say that there are many difficulties in the way of securing the co-operation of any large number of cheese or butter-makers in factories. During the summer when such work should be done, the amount of work on hand renders it difficult for makers to give the time necessary for experimental work. In winter when they have the time there is no milk for them to work with.

Again, there is little inducement offered, beyond the satisfaction of knowing the results, and considerable expense and trouble are incurred. If we could arrange that experimenters should receive something to in part pay for the trouble it might be well. In the other departments, experimenters receive grains, roots, seeds, plants, etc., which in a measure repay them, while in the dairy there is nothing whatever, so far.

I would suggest that the co-operation of the dairy associations be asked in this work and a suitable number of experiments be decided upon jointly, and that the Dominion station be also asked to co-operate in such experiments as these joint committees shall decide upon.

All of which is respectfully submitted on behalf of the committee.

H. H. DEAN.

CLOVER CULTURE.

BY T. B. TERRY, HUDSON, OHIO.

The subject I am to talk on this afternoon is clover culture. I suppose that means really the treatment of clover, and the care of it, but I want to give a few moment's time before beginning on that, to inquire what we are growing clover for? what we are to gain by growing clover? and I must touch on these points very briefly. Because we can grow more hay to the acre than we can by growing timothy or any of the grasses, and when we get this clover hay it is worth more per ton to the farmer to feed. And then we are growing it largely to get fertility for our soil and to get it in the cheapest possible way. That is what we have been doing on our farm for a long time. How much fertility can we get by growing a crop of common red clover? About $57 worth of plant food per acre. That is at market rates of plant food in our commercial fertilizers. That is about what we have been getting on our farm for some time. Let me explain that briefly. We sow the clover with the wheat in the early spring —on the wheat. We get a crop in the wheat stubble that fall that would make probably a ton to the acre on an average; of course in a dry year less and a wet year more. The next year we get a crop of hay that would make 2½ tons on an average. The second crop will make about one ton and a half, making in all, five tons of growth. The root growth would be about two tons to the acre, dry weight. So we have about seven tons altogether, in the ground and above the ground, and this is worth, as you know, about $8.20 per ton at the market rates of plant food. Seven tons at that rate amount to $57 per acre. This amount of fertility we are growing on our farm by growing clover. That is equal to about a ton and a half of high grade complete fertilizer per acre. Many of our farmers would think they were feeding their land very liberally if they put on a half ton. Now comes an important point. Where does this come from? Does it come from the soil directly? If so we will not be the gainers by growing clover, because we will simply be able to run our lands down faster. But we know now that it does not. Clover has the ability to get its nitrogen from the free nitrogen of the air. How much is there of that? Eighty per cent. of the air you are breathing is free nitrogen. On about an acre of your land there is $90,000 worth of nitrogen at market rates. So if you have got 100 acres of land you are a millionaire. You cannot sell nitrogen, but you can get from the air for nothing not only for twenty years or for a lifetime, but for ever, all the nitrogen you want, to grow just as large crops of grain as can stand up on your land. Perhaps you will think that is a strong statement, but I believe just what I say. This is one of the most wonderful qualities that the clover plant has, and it has another which perhaps is almost as important. It sends its feeding roots deeply into the subsoil, and gathers up mineral matter and brings it up into the soil, pumps it up into the large tap roots and into the tops of the clover Mineral matter, that your grain and wheat cannot get hold of, clover can, and then when you have brought the two together—the nitrogen from the air and the mineral matter from the deep subsoil—you can make your soils just as rich as you want them for growing your many crops that follow the clover.

Now, of course there are many little points that might be brought up in regard to this collection of the mineral matter. For example, some land that I noticed this morning in coming here from Buffalo, would need drainage before the clover would do this work. This rolling land around Guelph perhaps does not, before the clover can go down into the subsoil and gather up this mineral matter. Did you ever notice how the clover plant grows? The large tap root goes right through the soil. It does not send out any fibrous roots, scarcely, in the soil. Just see how different it is from timothy, or wheat, or rye that you grow. In clover the tap root goes right down through the soil, and when it gets there, these little fibrous roots are sent out in the deep subsoil. They go down three, four and five, and I have traced them down eight feet deep. There they are gathering up this mineral matter and bringing it to the surface, and then when you plow that sod under you have the mineral matter brought up there. You may ask where this comes from. The mineral matter is continually working downwards. The clover steps in and pumps it to the surface again.

We went on a farm 25 years ago that was run down by careless farming until it would not produce a paying crop of anything. It was called worn out. Nine men out of ten would have told you that farm is worn out. Well, it was not worn out. You cannot wear out any land in one lifetime or one hundred years. It was run down simply by growing corn and oats and wheat and timothy, and practically selling everything off the farm. This had been going on for 60 or 70 years. The last corn crop grown on that land, before we owned it was the year before we went there. Very little of it got more than three feet high. I do not believe one bushel of corn was gathered from an acre. The best crop of wheat grown for three or four years was eight bushels to the acre. We began growing clover, not knowing anything like as much as we do now about what clover would do for us. We had to put all the manure on we had, to get the clover started. After we had the clover in for two years we found to our surprise we were getting good, fair crops, and it set us to thinking and the result was we used the clover more, and used all the manure we could to make a top dressing to get the clover started, and we found we could grow good crops after that, and that we could gradually increase the crops without any manure or fertilizers. Perhaps we could have built the land up faster if we had had some plant food, but we had no more manure and at that time very little commercial fertilizer was used in our vicinity. In 13 years from the time we began on that land in the condition I have told you of, we brought the fertility up to such a point that we got 35 bushels of wheat an acre on an average for five years.

About this time our State Board of Agriculture offered a $50 prize for the best farm of fifty acres in Ohio, and we got the $50 to our surprise, beginning on the worst run down farm in our locality. We have been growing clover in regular rotation ever since. This last year we had the largest crop of wheat we have ever grown. Perhaps I could best illustrate the point I want to bring out by comparing our yield with that of a neighbor's right over the fence in an adjoining field. This land of our neighbor's, originally, belonged to our farm. The land was all cleared by one man and farmed as one field for 50 years; finally it was sold. The character of the soil is exactly the same. I would as soon take one as the other. My neighbor has been following three year rotation something the same as we have for many years. I will just take the last three years to illustrate this point. Each of us had wheat on these two fields this year. The year before we each had potatoes. The year before we had clover on our field as large as we could make grow after 25 years' experience growing it. It was good every square foot. Where it was not good we made it good by top-dressing. It was clover alone—no timothy. My neighbor had timothy on his field that year with a little clover in it. If you went there and asked him what he grew he would say timothy and clover; but it was mostly timothy.

We cut our first crop for hay and so did our neighbor, and I presume he got as many tons to the acre as we did. He is one of the best farmers in our section. As clover is worth about one-third more to feed to stock than timothy, we were a little ahead of him. Our clover, cut when in bloom, grew right up rapidly and made a second growth, one I think that would have given us two tons to the acre if we had cut and cured it as hay. But we did not; we let it go back into the land to plow under for our potato crop the next year. Our neighbor had no second growth on his field to amount to anything, because timothy don't give a second crop. He keeps a dairy—quite a large one—and about this time he began hauling out manure from his stables and spreading on this timothy sod. He kept it up all winter. He put all the manure made from his whole farm on this one field. Of course you can see the object; it was to beat us. Here were the two fields side by side, and he wanted a better crop than we, and we were just as anxious to get a better crop than he had. The road runs right along so that parties can see these two fields side by side. When I went home in the spring and saw the amount of manure he was putting on that field, I thought he would beat me. Of course we could sit down and figure up that it would take about ten or twelve loads per acre to make that timothy seed equal to our clover seed with the second crop of clover sod plowed under, but he put on about twice that amount and of course there was a reasonable show for him to get the larger crop. By common consent we began planting our potatoes on the same day. This was in the spring of 1893. They were put in with the same kind of machinery. The cultivation all through the season was practically the same, and it was just as good as we could give on both farms. When it came to digging time we were a little ahead of our neighbor. I do not say this to brag at all, but to illustrate this point of the value of clover. We had more bushels and more dollars to the acre than our neighbor. He said you have beaten me on the potatoes but I will have the largest wheat crop. It has been too dry for my potatoes to get the benefit of that manure, but the wheat will get it. Well I naturally thought he would beat me on the wheat. We put in our wheat at the same time, and prepared our land in the same way. The wheat was taken from the same bin —some we had saved purposely for seed. It was graded in the same machine as perfectly as possible, only sowing the very best grains. I recognized the fact that we had a foundation there for the largest crop of wheat that would grow. The land was well drained. We gave it the best of tillage and the best of seed. I drilled that wheat myself. The last week in March last spring, I got home from my institute work for good, and as I passed these two fields I thought they were the handsomest I had ever seen. The stand of wheat was perfect, there was not a square foot that was not just as good as any other in the field all over on both fields. Of course I imagined that my wheat was a little bit better than my neighbor's. But I tell you I would not dare to say so. Just before harvest time we had two or three storms that knocked this wheat down badly on both fields so that it did not do quite as well as you would expect. My neighbor threshed first—he had 42 bushels to the acre. That was a good crop, one seldom equalled in our neighborhood. I always change work with this neighbor. When I threshed my wheat, along toward night as I was passing through the barn he said to me "There is 42 bushel to the acre out now," and the separator was still running. I had him mark the number of bushels himself. He said "You have beaten me on the wheat just the same as you did on the potatoes." The separator kept on running till we got out an even 50 bushels per acre on this field. We had one other field in wheat, the poorest one on the farm, one that when we went there 25 years ago was really so poor that it would not grow decent weeds. On this field we had a trifle over 45 bushels per acre. So that the average was $47\frac{3}{4}$. That is the largest crop of wheat ever grown in our section. The larest on record on ten acres or more of land.

There have been men that have grown a single acre to come up to this. I do not say these things to boast, but simply to illustrate this point: the amount of fertility that we can get by a systematic growing of clover. We have been working right on that line for a long time. Take this farm that originally was the most run down of any you could pick out, by continuously raising surface-growing crops. By taking that land and growing clover in regular rotation we have been able to bring it up until it has produced the largest crop on record anywhere in our locality, and a crop 50 per cent. larger than this land ever grew in its virgin state of fertility. Many farmers, I think fail to get the best results in this line of growing-fertility by not giving the clover very much of a chance. In many cases I find they grow timothy seed in the fall, and then in the spring they sow their clover seed on timothy and wheat sod. The timothy and wheat occupy the soil, use up all the plant food there is there, and the clover seed has very little chance. Drainage is often necessary before we can get the best results in this line. Also we found we must keep all stock off from this land, to get the very best results in tillage; not to go on the land at all except when necessary to draw manure or draw off the crops. It took years to find all these points out. We had to find it out by experience. It did not take a great while for us to see that it was not wise to turn our stock on to our young clover after harvest, but it took longer to find that we must not turn on to our clover at all. If we wanted the very best results we must keep the ground loose, not having it tramped by animals at any time. Of course it might be done when the land was quite dry. I think we have been the gainers through our treatment of the clover—by clipping the clover and wheat stubble after harvest, running the mowing machine over it once or twice and letting it all go back to the land as a mulch. If there are any weeds there at all, they will die at once, and you will not have any trouble from mice. If you pasture the clover a little and they leave spots here and there high the mice will get in and do damage. Of course we prevent all weeds going to seed. We expect to have a crop without regard to season. I do not care whether it it rains a drop after the 1st of April next season or not. I will have a couple of good clover crops anyway. In fact we do not care much about dry weather now anyway; we can get on without it if we can only get rain in the winter. I always cut the wheat myself and I always notice how the young clover is. If there is a spot in the field where it is not doing well we give it a top dressing of manure and put on quite a good dose of it. We use all our manure in this way on this young clover to make it grow evenly and strong all over the field. We are after that $57 worth, more or less, of plant food per acre.

Q.—When do you put on that top dressing?

A.—Right after harvest. Any time when we have time along in July or August. Practically we cannot spread that manure unless it is rotten. We do it by machinery. We use a manure spreader.

Q.—What other crops do you grow in rotation?

A.—We have followed a three-year rotation of clover, potatoes and wheat, plowing the second growth clover under the next spring for potatoes, and then putting wheat in after we take the potatoes off without plowing, and then seed the wheat to clover in the following spring again, and keep this rotation up.

Q.—You do not plow after potatoes?

A.—No; there is no time to plow land and get it settled again.

Q.—Take off the tops?

A.—We have to take off the tops if the potatoes are at all late. We can grow early potatoes and get the tops decayed so that we can break them up without taking them off. If we grow medium early potatoes we have to rake off the tops. We do not burn them; we spread them on the clover land we are going to plow next spring. You notice, the second crop of clover we let go back to the land.

Q.—How many pounds of clover do you sow to the acre?

A.—About a bushel to five or six acres. Leaving the young clover in the ground through the winter not only mulches the surface and increases fertility in that way, but it keeps live roots in the soil to gather up any fertility that may otherwise go to waste in the winter when we have heavy rains. It is just as bad for land to be idle as it is for man to be. The more we make our land do the better. Bare land grows poorer and shady land grows richer. Keep that clover to shade the land until you are ready to put in another crop.

Q.—How do you sow your clover seed?

A.—Use a Cahoun clover seeder. Carry it by a strap around your neck. I always sow about the last of February when the conditions are favorable. *Honey comb* surface, when freezing and thawing first begin.

Q.—Do you harrow?

A.—No, sir; that is too early to harrow. You could not get on the ground for a month after that with a harrow.

Q.—Is your land clay?

A.—Partly. A light sandy soil you might harrow—not on ours.

Q.—What stock do you keep on your farm?

A.—Work horses and one cow to give us milk is all we have had for many years. Years ago before science had discovered that clover had these abilities, or was able to prove these points true, many ot us practical farmers knew these things must be so from our experience and I have preached this doctrine through the papers and at institutes long before science could back me up. You were calling out the point that I was not keeping any stock. When I first began this plan I was laughed at and sneered at by a great many men—intelligent men, too—but I felt certain we were right on these points. I remember this neighbor said to me 14 or 15 years ago: "How are you going to get along without manure?" and I said to him, "You just watch and you will see."

Q.—What quantity of potatoes did you get?

A.—I do not suppose our yields will seem large to you, because you are further north. 200 bushels per acre is pretty good. We have grown 300 bushels.

Q.—Do you feed your clover hay or sell it?

A.—We feed whatever we can, and if we get ahead we let it go back to the land.

Q.—Do you think clover hay is better for horses than timothy?

A.—Worth about one-third more per ton. If you want horses to go fast clover is bulky, and it is better perhaps for some to use timothy and grain. There is no question about the nutritive quality of clover if cut when in bloom.

Q.—How do you harvest the clover?

A.—We generally mow in the afternoon, beginning about two o'clock. Much depends on one's judgment of the weather. We try to mow just after a storm centre has passed. We keep a barometer. In fact I would not know how to farm without one It is generally cool then, and the next day will be a clear day but not very warm. We let the clover lie till it is right to rake up. Then we rake it into large windrows. I rake it myself, because I want to turn these heads all down—butts up in the air. Dew on the butts will not do as much harm as on the heads. Next day, about nine o'clock, we run through with the fork and lay them over on to dry ground, and in about a hour after rush into the barn. Of course if the weather is threatening we do not leave it in the windrow over night.

Q.—Suppose it is a little green have you any trouble with its keeping quality.

A.—No; if it is drawn in in the middle of the day when it is warm, that is a great point. We do not use any salt.

Q.—When do you cut?

A.—I like to cut when the clover is in full bloom. Speaking about feeding clover to horses, I ought to have said clover hay is more likely to produce heaves. We sprinkle when we feed. We have a pair of work horses that we have been experimenting on for thirteen years. We took a pair of good blocky horses six years old. I paid $380 for them and refused $500 the next spring. They had been fed timothy hay and grain heavily. We gradually worked them off the timothy on to clover. We were a month doing it. At the end of the month we got them on clover without any grain. For 13 years they have had nothing but clover hay. They have done all the work of our farm, and there has not been a time they were not in as good order as any other team in the neighborhood of the same age. They are nineteen years old now. Of course we had to be careful in feeding. We water the horses first, feed them lightly in the morning, lightly at noon, and then heavily at night; if they were working hard, about all they would eat at night. You have no idea how much of a furore this created in Northern Ohio. My neighbors would not believe it.

Q.—Did you cut the hay?

A.—No, sir; we fed it whole.

Q—What do you call feeding lightly?

A.—About what they would eat in an hour and a half. I am not advising this way of feeding. There are many times it would have been handier to have fed grain at noon They would eat about thirty or thirty-five lb. of clover a day.

Q.—How do you handle your horse manure to keep it to the best advantage.

A.—We usually keep five horses in the stable, winter and summer. We spread this manure evenly in our covered barnyard, and we pack it so that the air will not get in. We have a cement floor in the stable and the liquid manure is absorbed and that makes it soft and moist.

Q.—Is it the ordinary red clover you use?

A.—Yes. We could not grow Mammoth clover and get two crops.

Q.—Did you ever have any experience with scarlet or crimson clover.

A.—I have seen it in Delaware. It is termed the mortgage lifter there. I do not hink you could get very much out of it here. It is too far north.

Q.—Have you had any trace of clover sickness?

A.—No. The probabilities are that we are growing clover too continuously. There may be some disease come along that will prevent us growing clover. We might sow cow peas one season.

Q.—How do you get the wheat straw into manure?

A.—We have not been able to do so. We draw it out and spread it on the land. It don't gain anything by rotting.

Q.—Do you plow deep or shallow?

A.—We plow deep, but the deepening has been very gradual. We plow a little deeper every time we break up the sod, because I am certain potatoes do best in a deep soil, especially in a dry year.

REPORT OF COMMITTEE ON ECONOMIC BOTANY AND ENTOMOLOGY.

PRESENTED BY 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 200 circulars of enquiry to the secretaries and some others of the Union.

The replies received come from the following 24 counties: Renfrew, Lanark, Leeds, Prescott, Addington, Lennox, Hastings, Russell, Prince Edward, Peterboro', Waterloo, Perth, Lambton, Peel, Welland, Grey, Wellington, Huron, Brant, Middlesex, Oxford, Dufferin, Durham, Bruce. The accompanying blank form shows the nature of information sought—and if properly filled supplies very valuable notes upon weeds and insects.:

GUELPH, October, 1894.

DEAR SIR,—At the last meeting of the Ontario Experimental Union, a committee was appointed to collect information regarding the presence of injurious insects, fungi (mildews, smut, blights, etc.), and weeds throughout Ontario. You will confer a favor by filling out the following and sending it to me at as early a date as possible.

F. C. HARRISON, Secretary.

1. Names of ten most common weeds in your district.	2. The ten worst mildews, blights, smuts, rusts, etc.	3. The ten worst insects.	4. Names of any new weeds or blights likely to be injurious.	5. Names of any new insects likely to be injurious.

Information in reference to colums 4 and 5 is particularly requested. If you have applied any remedies for injuries from insects or mildews, etc., *give your results.*

REMARKS.—

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The following is a summary of the replies received:

1. The worst weeds reported.

1. Canadian Thistle (Cnicus arvensis).
2. Couch grass (Agropyrum repens).
3. Mustard (Brassica Sinapistrum).
4. Ox-eye Daisy (Leucanthemum Vulgare).
5. Ragweed (Ambrosia artemisiæfolia).
6. Burdock (Arctium Lappa).
7. Wild Oat (Avena fatua).
8. Blueweed (Echium Vulgare).
9. Cockle (Lychnis Githago).
10. Milkweed (Asclepias Cornuti.)

47 species of weeds are referred to, but the above ten are those which have been mentioned by ten or more observers.

2. New weeds reported as likely to be injurious.

Perennial Sow Thistle (Sonchus arvensis).
Rib grass (Plantago lanceolata).
Russian Thistle (Salsola Kali var. Tragus). Near Tilbury and Smith's Falls.
Teasel (Dipsacus Sylvestris).
Spring Clotbur (Xanthium spiriosum).
Water Hemlock (Cicuta maculata).
Bladder Campion (Silene inflata).
Chickweed (Stellaria media).
Penny Cress (Thlaspi arvense).
Mare's Tail (Equisetum arvense).
Wild peas (Vicia Cracca).

It is hoped that observers will report the technical names of plants as far as possible, as the use of common names in many cases is very confusing, as is seen in such names as redroot, wild peas and pigweed. Bulletin XLVI, or Report O. A. C., 1889; Bulletins LXXXV and XCI, Report O. A. C., 1893; Bulletin XCVIII, Report O. A. C., 1894, will be found useful in the study of weeds.

3. Worst Fungi reported.

Rust (Puccinia graminis).
Smut (loose), (Ustilago Carbo).

Apple "Spot" (Tusicladium dendriticum).
Black Knot (Plowrightia morbosa).
Gooseberry Mildew (Sphærotheca mors-uvœ).
Pear Blight (Entomosporium maculatum).
Peach Curl (Taphrina deformans).
Strawberry Rust (Sphærella fragariæ).
Potato Rot (Phytophthora infestans).
Potato Blight (Macrosporium Solani).
Pea Mildew (Peronospora Viciæ).
Elm Leaf fungus (Dothidella ulmea).

4. New fungi likely to be troublesome.

Plum Rot (Monilia fructigena).
Anthracnose of Raspberry (Glœosporium Venetum).
Tomato Rot (Macrosporium Solani).

Those who report having tried Bordeaux mixture to prevent fungi, mention that they have had favorable results. This fungicide may be considered one of the best in use. A successful mixture known as Bordeaux mixture is 5 lb. of Copper Sulphate, 4 lb. good, fresh lime and 40 gallons of water. O. A. C. Reports, 1886, 1888, 1890, 1894, contain information upon some common forms of fungi (see part II).

5. The worst insects reported.

Potato Bug (Doryphora decem-lineata).
Grasshopper (Melanoplus fernur-rubrum).
Cabbage Worm. (Pieris rapæ).
Horn-fly (Hæmotobia Serrata).
Codling Moth (Carpocapsa pomonella).
Currant Worm (Nematus Ventricosus).
Tent Caterpillar (Clisiocampa Americana).
Pea Weevil (Bruchus pisi).
Curculio (Conotrachelus nenuphor).
Turnip-fly (Phyllotreta viltata).

Besides the above, 25 additional species were reported, but only by a few observers.

6. New insects reported likely to be injurious.

Aphis on turnips, oats and peach leaves.
Bud Moth (Tmctocera ocellana).
Bark Louse (Mytilaspis pomorum).
Borers (apple), (Saperda Candida), (Chrysobothris femorata).
Maple Worm (Dryocampa rubicunda).
Army Worm(Leucania unipuncta), near Petrolea.
Granary Weevil (Calandra Granariæ).
Cabbage Maggot (Anthomyia Brassicæ).
Poplar Borer (Seperda calcarata).
Lice (cattle), (Hæmotopinus —).

Bulletin LXXXVII and O. A. C. Report, 1893, furnishes information upon insecticides and how to use them.

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 Natural History 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.
G. A. Robertson.
J. Hoyes Panton.

ADDRESS BY MR. WM. MULOCK, M.P.

Mr. President and Gentlemen,—When I listened to Professor Panton telling us of the number of enemies that the vegetable kingdom had to encounter, he enumerated ten weeds and ten parasites, and I thought of when I used as a student to pick up a medical book belonging to a medical student and imagine I had every disease that the book described. As I listened to Professor Panton it seemed to me that the whole of our efforts on behalf of agriculture were likely to be counteracted by these desperate parasites. However, the College exists to show that there is a way of dealing with the enemies of agriculture. We know that in the whole of society there is one parasite living upon the other; in the human race, amongst the lower animals, and throughout the world it is the same—

"Big fleas have little fleas
Upon their backs to bite 'em;
And little fleas have lesser fleas,
And so, *ad infinitum.*"

And it is to provide the remedies to protect against these thistles and mustard and burdocks and the army worm, that has gone into winter quarters to come out next spring—it is to protect us against these things that science is encouraged through this and kindred institutions.

I am greatly pleased to be here to day, both for the sake of seeing the work done and to meet our friend Mr. Terry, whose name has been a household word to all who take an interest in the great cause of agriculture. (Applause). For years I have been reading his works, and what he has written in the agricultural journals, and I can venture to say with the utmost truthfulness that to no sources have I gone with greater profit than to these books, magazines and papers which he advantages by his contributions; and when he gave his account of the way he restored fertility to his soil, it was almost as if he was giving an account of a similar experiment I made at my own farm and with similar results. In fact I cannot accuse him of having borrowed a lecture I delivered to him at lunch, but it did sound to me almost like an account I was telling him. In other words, when he summed it up by saying, he kept only one cow, it simply illustrated what we all ought to know, that the manure is right over the soil and that every farmer can grow his own manure. I am conducting experiments on that line and every year I grow a large quantity of manure. I have not always confined myself to clover; when I want to grow it more rapidly, I grow peas. It was thought at first a mere experiment, but now I think in my district it is recognized as an economical way of adding to the soil.

I want to express my own direct indebtedness to Mr. Zavitz for some useful advice he gave me a year ago. I was extremely anxious to get hold of a better corn for our section for ensilage purposes, and he gave me the result of his experiments here, gave me his various reasons why this, that and the other kind would thrive in this, that and the other place. Acting upon his advice I purchased a kind of corn from Wisconsin called Salzer's North Dakota, and we planted fifteen acres of it and we planted it in rows three and one-half feet apart, and we never hoed that corn once. The corn being a shallow feeder there is danger of destroying a great many roots by hoeing, and last summer the hoe was never put into the corn once. Instead of that we used a weeder, and I can say with all truthfulness, I am not an agent for the weeder, but I happened to see this weeder recommended and I got the weeder from Boston. A boy and one horse would go over the land in the forenoon. The field was kept cultivated that way all through the summer, and the corn matured much earlier than any corn I have had in previous years. We began to cut it about the middle of September. I estimate my silo to hold 200 tons—about 8,000 cubic feet. This corn was not dry when it was put in and it packed solid. The silo was filled up to the ridge, and we let it settle. I had two men in tramping as it was going in, and also afterwards for three or four days. When it had settled down a little, we filled it again up to the ridge, and it settled down to the plates, so we have 8,000 cubic feet from that point to the ground. Mr. Pearce says that means 200 tons, and it does not represent more than half the yield of that fifteen acres. The land was good, strong soil, had been in wheat, was well manured, plowed in the fall, manured in the spring, cultivated well and treated with this weeder—never one single moment's hoeing, during the whole summer—and no hand labor upon it, except one boy for five days and a fraction over went up and down the rows to pick out the odd mustard seed that had escaped the weeder. I am indebted to Mr. Zavitz for having recommended a corn that yielded nearly thirty tons to the acre. That is an illustration of the fact of keeping the soil up. Keeping it fine on top acted as a mulch all through the summer, and resulted in the soil continuously acquiring fertility from the nitrogen in the air.

I would say in conclusion that the work done by the agricultural institutions, such as this, and the farmers' institutes, and so on, are making the Ontario farmer the most advanced farmer under the sun. (Applause). We recognize now that the Ontario farmer is treating his former finished article as raw material, and produces a more advanced article in the shape of butter and cheese and live stock. In that way our farming industry is destined to progress.

However, I thank you, Professor Mills, for looking at your watch. (Laughter). I am reminded that time does fly. When I get talking agriculture my heart being in the subject I forget all else, and I would be reminded of it when I get home if I missed the train. Therefore, with best wishes for the success of this institution, and that these re-unions may continue, and that the twenty-five hundred or three thousand young men that we have throughout this land now, graduates of this institution, may be devoted to the advancement of our country, and that we may have many, many more Terrys to assist us—with all these wishes, and thanking you for having listened to me so faithfully, I say good-night.

FRUIT EXPERIMENTAL WORK.

By L. Woolverton, Secretary Ontario Fruit Growers' Association, Grimsby.

For a long time I have been watching with great interest the progress of the work conducted by the Experimental Union, and noticing the valuable results which are being brought about by the systematic plan of work that has been pursued.

All expermental work is necessarily slow and unremunerative to the individual, and the results are more frequently for the benefit of others than for himself, but to the man who loves it, the many avenues, as yet untrodden, opened before him are delightfully attractive. How much Canadian fruit growers owe to such men as the late P. C. Dempsey, of Trenton, who delighted in experiments in hybridizing apples, pears and other fruits, and whose Dempsey pear is to-day one of the claimants for the first place among pears of its country; to Professor Wm. Saunders, of the Central Experimental Farm, Ottawa, for the many new fruits and flowers which are the results of his careful experimental work; and to the late Charles Arnold, of Paris, whose Ontario apple, in addition to his other hybrids, is rendering his memory famous. Let us hope that the experimenters have not yet all passed away, but that the many young men who are now coming to the front will not only emulate these illustrious names, but will aspire to write their names one niche higher on the rock of fame.

For many years I have been more or less engaged in this work, though not especially in the lines of raising new varieties, but rather in that of testing varieties already introduced. I have spent much time and money in this line, but the longer I engage in it, the more anxious do I feel to pursue it still farther.

I come here not only as the representative of your sister organization, the Ontario Fruit Growers' Association, but also as one of the representatives of that new departure of experimental work which has been lately undertaken by the Minister of Agriculture, and of which I have the honor to be secretary. The object of this organization is to work along specific lines, and to use every effort to make fruit growing what it ought to be, as it should be one of the most paying industries of our province.

The plan of operation is uniqne. We select as experimenters only such men as have already had long experience in the lines which they are to pursue. For instance, we have chosen one of the most experienced grape growers in the Niagara district as experimenter in grapes—a man who is already largely engaged in this work commercially as well as experimentally. To the eighty varieties of grapes which he has in hand, we we will add all known varieties, and furnish him with forms, a sample of which I here place before you, which are to be used by him year by year and duplicate copies sent in, one to myself, as secretary, and one to Mr. Hutt, representative of the college at Guelph. Two kinds of forms are furnished each experimenter, one for a descriptive list of varieties, and the other for a record of the experiments of each season. In all, ten stations are contemplated, which we hope will cover all the principal varieties of fruits and the different climatic conditions of the Province of Ontario. The annual report of the work done at each of these stations will be published year by year, and will become more and more valuable.

We need your co-operation in carrying out our object. You can aid us by testing in your own localities such varieties of fruit as have been approved of by our experimenters, and you will thus be able to report upon the adaptability of these fruits to your own conditions, soil and climate. The advice so often given in the past is surely played out. It was "Plant what your neighbors plant." This would lead to no improvement, and we would be as conservative as the Chinese, and three thousand years from now would be "in *statu quo*."

Suppose now that I try to point out to you some lines of work in which experiments are needed. For example, let us first consider the grape, and ask ourselves what does the public most wish to know with regard to this work? First, What soil is best? Will clay or sand produce the finest fruit? I have a Concord vineyard on sandy loam that produces from three to four tons of the finest bunches per acre, but a neighbor of mine, Mr. F G. H. Pattison, claims that in his vineyard, which is on clay, the fruit ripens and can be marketed before I commence picking. Is it possible that grapes will ripen so much earlier upon clay soil than upon rich, deep, sandy loan? Then, some claim that the Concord is sweeter when grown upon clay than upon sand. Is this true, or is it simply the result of the somewhat earlier ripening, and the contrast thus noticed at the time of early picking?

Then, second, How much manure should be given the vineyard, and what kind? Should strong growers like the Concord and Wilder receive as much as weak growers like the Delaware? My Wilder vines are on good rich, sandy, loam. The ground has been well enriched and the vines grow rapidly, but give little fruit. A neighbor of mine, Mr. T. P. Carpenter, of Winona, says that his Wilders are among his most productive varieties, and he attributes this to the fact that he applies to them a very small quantity of fertilizer and also ceases cultivation early in the season. My Concords under this same treatment bear immense loads. This would seem to indicate that the Wilder should receive very little fertilizer of any kind in order to bring about the best results. Then as to the kind of fertilizer that should be applied to the vineyard. Many say that barn manure makes too strong a growth of wood and gives too little fruit, and that potash as found in wood ashes, and phosphates as found in bone meal and apatite is most suitable. Who can give us a definite reply?

As for cultivation, I do not believe this can be too good. This is the one thing in our country concerning which we are too careless, and we need to take a lesson from the old country gardeners. We expect grapes to grow in sod without cultivation and hope to reap paying crops. The sooner this notion is exploded the better for all concerned.

And what about trellising? This is an important yet extensive part of grape growing, and why does it need to be as expensive as many make it. I have found that No. 13 galvanized wire is heavy enough, and in my experience about three strands are sufficient for the Fuller system of training and two for the Kniffen. Then posts do not need to be so numerous as we often see them. Good cedar posts six feet high above the ground and twenty-five apart will answer every purpose, if upright slats are set up between, and the wires firmly stapled fast to these as well as to the posts.

The best method of bracing is often a great bug-bear to inexperienced grape growers. I have found the simplest plan is to brace with wire, one end fastened to the top end of the post and the other to a stone firmly buried in the ground, and the wire thus held at on angle of about forty- five degrees. This method of bracing is both next and permanent.

The pruning of the grape is in a very unsettled state so far as the system is concerned. What plan is the best for Ontario? This should be decided by the comparative test of each plan in the same vineyard. At present we find many systems. For instance, the fan system, which is much practiced in the Niagara district, the Fuller system, the Kniffen system, and the "sluggard's" system. The last is very common, for by it the vine takes care of itself and climbs up over fences and trees until the grapes themselves are almost out of reach. I once saw an instance where the best grapes hung on the top of an old apple tree twenty feet high where they could only be gathered by the birds. Certainly no experiment is needed to test the value of this method. In my opinion, the fan system is not the best. The old wood rises yearly higher up and soon the whole trellis is covered with a mass of old vines. Besides it is, as handled by most people, no system at all. I do not think it necessary to experiment much further with this method. The question of desirability lies between the Fuller and the Kniffen systems. According to the Fuller system two arms are trained along the lower wires and the young wood yearly trained back within one or two buds of these arms. The young wood is then tied up to the other wires as it grows during the summer. The Kniffen system, on the other hand, has four arms, two about three feet and the other two about six feet from the ground, and from these the young wood hangs down as it grows during the summer. It is not necessary for me to describe these methods in particular, as no doubt you are all familiar with them. There is no doubt that the latter method requires the least labor, but in my experience the Fuller system has this advantage that the vineyard has a neater appearance, if properly cared for, and the old wood kept so near the ground that it is quite easy to give it winter protection if necessary.

The time of pruning is also another subject of inquiry. Many defer this operation until the month of April when the vines bleed profusely. The question is: Does this bleeding reduce the vitality of the vines and consequently fruitfulness, or does it not? On this there is a variety of opinion, and experiments in this line are, in my opinion, very much needed. Then should we attempt to do any summer pruning? It has been laid down in books that it is wise to pinch the end of every bearing branch within a couple of leaves beyond the last bunch of grapes. No doubt this is desirable, but should more than this be attempted? Some think it wise to remove in summer certain amount of young wood which is not bearing fruit, but in doing so a certain amount of foliage is removed and the foliage is necessary for the proper ripening of the fruit.

Then the question of ringing for early ripening is still before us. It has been advocated by some experimenters that there is an excuse for ringing, that some varieties which would otherwise not ripen at all can be ripened and marketed at a good profit by this method, and the quality is little, if any, impaired. I was surprised during the last grape season when walking through my experiment vineyard to find one branch of a Goethe, Roger's No. 1, fully ripe, while the whole of the rest of the vine was laden with green grapes. This variety as you know seldom ripens in our climate, but the fruit on the branch to which I have referred was not only highly colored, but had attained its natural flavor. Should we then entirely condemn the practice of ringing, or should we defend it under certain circumstances?

Then the old question of varieties will never be settled, and will offer constant opportunity for experiment for all time to come. The public is always inquiring what are the best varieties for profit and what are the best varieties for dessert purposes. In my experimental grounds at Grimsby I have over seventy-five varieties, and out of them all I would choose very few for planting for profit.

Of black grapes the Concord still takes the lead. It is an excellent all-purpose grape of strong, vigorous Lubrusca blood, and withstands more than most varieties, all insects and fungi. It originated with E. W. Bull, of Concord, Mass., who, they say, is now living a poor man notwithstanding he gave to the world so excellent a gift. This grape was first exhibited at Boston in 1853. My Concords were harvested this year between the 12th of September and the 12th of October. During this time they were constantly improving in flavor, and after the first of October they were, to my taste, much superior to the Worden. The yield was seven tons, and although these sold at the low price of $30 per ton, yet I cannot complain when I compare the profits derived from other lines of agricultural produce.

Of the other black grapes I may mention Wilder. With me so far, it is one of the finest black grapes in quality, but a poor bearer, but it succeeds so well with others that I shall yet hope to have better results in the near future.

Moore's Early I am much pleased with as an early grape to precede the Concord. This year it colored well and sold well in the markets.

Black Giant is a large productive grape, but, in my opinion very poor in quality.

Of white grapes, I do not yet know of any variety more profitable than the Niagara. It is like the Concord in productiveness and nearly as healthy, but somewhat subject to peronospora which causes the berries to shell off, especially on poor land, and to become insipid. When well ripened, I consider the Niagara an excellent general purpose grape, and, on account of its great yield, one of the most profitable. Yet when you speak of it as a dessert grape, it lacks quality. Indeed it will surely be pronounced insipid by one who first tastes a Salem or a Lindley.

The Victoria, one of the numerous seedlings raised by Mr. T. B. Miner, of Linden, N.Y., was this year a favorite white grape with me, and I am inclined to think that it will yet take the foremost place among white grapes. The bunches are well shaped, the skin has a fine waxen lustre, heavy bloom and the berries are of a good size and fair quality. The vine is very productive. By some this grape is called a white Concord.

El Dorado greatly took my attentien this season. It is one of Rickett's seedlings, a cross between the Concord and Allen's hybrid. The berry has a beautiful waxen-white appearance and when fully ripe attains a golden yellow color with a thin white bloom. It shows beautifully when contrasted with red and black grapes on a fruit dish. The quality is, in my opinion most excellent.

The Triumph (Campbell's Concord Hybrid, No. 6) also took my fancy, but unfortunately it is too late for our climate and does not ripen as well as the Catawba. Otherwise it is an excellent bearer and the bunches are very large and fine. It is a cross between the Concord and Chasselas Musque.

Noah is another grape that is a little late for Ontario, but ripened very well with me this season. The bunches are fine, but the berry is small. It is a heavy bearer. This grape was first disseminated in 1876.

The Pocklington ripened well this season at Grimsby and is, in my opinion, superior to the Niagara in quality, but is not nearly so productive.

Of red grapes the Lindley is my favorite red grape for profit. The vine is very healthy and productive, the fruit is good quality and beautifully colored. It packs well in baskets with the Concord and Niagara, and these three so far as are my favorites for the vineyard, because they sort up well together when I wish to make an assorted package of red, white and black grapes for dessert purposes. The Lindley was produced by Mr. Rogers by hybridizing the Wild Mammoth grape of New England with the Golden Chasselas.

The Delaware will probably rank as the choicest table grape, but I consider it scarcely productive enough to be planted largely for profit. This year it produced a crop of fine bunches, but, as a rule, averages less than the Lindley and the vine is much less vigorous.

Woodruff Red was this year a most showy grape in my vineyard. The berries were large and of a bright carmine color, with a heavy bloom. It ripens earlier than the Concord. The quality, however, of this grape is not good enough to deserve much commendation. Still for a fancy package of assorted grapes, I would like to try for a change Woodruff Red for red, Victoria for white, and Wilder for black. This grape originated with Mr. C. H. Woodruff of Ann Arbor, Mich., in 1874.

The Brighton grape did fairly well with me this season, but suffered from downy mildew more than usual. Perhaps it was because it grew in close proximity to the Salem, which is quite subject to that form of mildew. The skin of this grape is almost too tender to make it very desirable as a first-class shipping variety, and when fully ripe it is too dark in color to rank high as a red grape, but of all the grapes of which I know, none please me better for my own table.

I have thus given you a few extracts from my own notes of varieties which succeeded with me during the past season, hoping that it may lead some of you to make further tests in this direction during the coming season.

There is another wide field of experiment before us in reply to the constant inquiry as to how we shall best overcome the insects and fungi to which our fruits are subject. The experiments which have been conducted during the past season go to prove that the mildew of the grape may be almost entirely overcome by the faithful application of sulphate of copper previous to the appearance of the foliage, and the Bordeaux mixture later on during the season. This latter should be applied first when the leaves are from one to one and a half inches in diameter, and the second application when the flowers are open, and the third about fourteen days later. The application of powdered sulphur, especially for the destruction of the powdery mildew, is very effective, but for both forms the Bordeaux will be found equally effective, and probably more simple of application.

Now, I have opened up a large enough list of questions of interest to grape growers which will afford a field for experiments for a long time to come, and when we consider that some inquiries meet us in connection with the growing of the various other kinds of fruits, you will see that the field for experiment and investigation before us is very wide, and will agree that we are not attempting too much when we are devoting to each principal kind of fruit a separate station in order to secure the most careful results.

Mr. Lick: I think there is one idea we must remember, that is, the importance of experimenting in these fruit lines, and of following these experiments for a term of years until we arrive at the conclusions which will be safe for us to follow and put in practice. I may ask if you have much difficulty in getting out varieties of fruit, true to name from the nursery?

Mr. Woolverton: In some instances I have had difficulty, but it would not be fair on an occasion like this to say where I have succeeded in getting plants true to name and where I have not. I have now over 70 varieties of grapes and I have been identifying them with descriptions in books, and I think out of that list of grapes there are not over two which are not true to name. I know on one occasion I got 20 varieties of plums and when they came to bear I tried them, and I think perhaps five out of the 20 varieties were true to name, all the rest were quite wrong.

A Member: I think the best way is to deal with honorable nurserymen.

Mr. A. M. Smith: It does not seem fair for me to get up and blow my own horn—but with regard to getting fruit that is not true to name I think the fault rests with yourselves You very seldom see an agent come along with a blank order but what you will see in it a clause "If we haven't got the varieties called for we may substitute others which we think equally desirable." And in a great many instances these agents may have the trees that are called for, and they may have certain varieties that they are anxious to get rid of, or that they can buy a great deal cheaper than the ones called for, and they think best to substitute the varieties they have, for the ones called for. I do not know that all nursery agents are dishonest; there are a great many that are no doubt honest men. I was much pleased with Mr. Woolverton's paper. There was a great deal in it that I would like to have discussed. I would like to ask him in what way he thinks our work here could be connected with the experiment stations? Could the two not be worked together so that one will be an extension of the other?

Mr. Woolverton: I think it is quite possible to do that in this way, as the stations find that certain varieties are of particular value and adapted, as far as they know, to Ontario. You, individually, might have these plants sent to you by the Union—single plants or cuttings for testing—so that you may see how they are adapted to your own particular soil and location. That the stations cannot do, and you can do; and that is the only way these varities can be properly tested.

OBSERVATION AND EXPERIENCE DURING A SEASON WITH THE TRAVELLING DAIRY.

By F. J. Sleightholm, Humber, Ont.

I will just say a few words as to the travelling dairy. That question is pretty well understood; everybody knows about the travelling dairy, and there is no need of an introduction. As regards the effects of the travelling dairy we have heard considerable, especially through counties where the travelling dairy has been before. I have heard very encouraging remarks of the travelling dairy and its work through the province. Very frequently, after meetings, farmers and their ladies come and say this and that and the other of the travelling dairy. Sometimes it runs in this line: "We find the travelling dairy has been a benefactor in this section; the butter is better. We find the storekeepers speak very highly of it."

Now and again at our meetings there will be a gentleman come up and want to know the price of the butter worker, and then he will want to take the measurement, and so we find that in this and similar ways interest is spreading in regard to making butter on the farm. In some sections not so much interest was evinced, as in other parts, this season owing to the extreme amount of rain; people who live on clay land had such an extraordinary amount of work to do in a short time, that they could hardly be persuaded to leave home.

During the summer our meetings were fairly well attended. During the whole season we found much satisfaction in the work of the travelling dairy. In the last two counties we visited—Elgin and Norfolk—we had exceedingly fine meetings; people having turned out in great numbers. We meet with different sorts of experience. I was at one meeting, and had been talking some little time on the work, and the question of working butter came up. I had spoken of the worker and drawn attention to it, and a gentleman stepped up from the audience and he said, "I would like to ask you a question." "The women of this section don't work the butter as you do. They sent me up here to ask you whether you think it advisable to work butter, as you are doing it with this worker, or whether you think it would be better to work it up with your hands." I just simply said I thought the worker was the better way. All these things have to do with the travelling dairy. I must say we have met very many intelligent men and women who are well acquainted with the ins and outs of making butter on the farm. Sometimes I have felt that despite what we might offer, if we could only get the people to do as much talking as we were doing we would have been much more in the position of pupils than they. We have found satisfaction in our work and it certainly has been an enjoyable journey.

I find that people take interest in the churn. They want to know why butter does not work this way or that way, and I judge from what I see and the interest that people take in these things, not only the young men but the old men, that they are very strongly impressed with our way of handling butter in every shape and form. At one meeting a gentleman brought us a sample of skim milk and butter-milk all the product of one cow, and he said, "I want to know what are in these." So we ran them through the Babcock tester for him, and when I got through I gave him the result. The test said something like this: whole milk 4.2, skimmed milk 1.5, and the buttermilk .6; of course it was not very good churning. I made a few remarks on these points and he allowed me to get through. Then he got up and said, "Mr., I would like to say a word. I want you to understand that we drink all our skim milk and buttermilk, and if we don't get it one way we get it another." I sat down. He had a perfect right to drink his buttermilk; but I said if he was a farmer with 20 cows on his hands he would need to have a family with considerable capacity to drink all the buttermilk and skim milk he would have.

At one meeting a gentleman brought us a sample of skim milk from shallow pans setting 6 inches deep, and there was 2 per cent. of butter-fat in it. He had not a very satisfactory milk room, and he was making a mistake. People brought us samples of skim milk set in deep pans in water drawn from the well or set in the well, and we found that, with very rare exceptions, there was not good skimming. When we had skimmed milk brought to us set in ice-water we found first-class skimming. Then again some would bring us a sample of 24 hours' or 36 hours' setting in shallow pans, and they would want to know if it was advisable to set 24 or 36 hours.

Usually we find there is no more butter-fat in 24 than 36 hours' setting. There is the possibility of over-confidence in Ontario as regards ability to make cheese. A man will come to me and start to talk about butter, and say: "Of course we know how to make cheese; we are on the top in cheese; what we want to know is how to make butter as well as we can make cheese." There may be a great error creep in here, because when a man gets so far on that he knows all about anything, he will never learn any more. And there is another possibility in the same direction as regards the effect of feeding. I remember in one case, I was speaking regarding the effect of feeding roots upon the quality of butter and cheese, and one gentleman said, "I can feed turnips and turnip tops to my cows, and an expert does not know whether I feed them turnips or not, unless I tell him." Another gentleman said he had fed turnips to his cows always, since he had been a boy. A lady got up in the meeting and said, "Sir, in this section there is a man kept a large herd of cows and fed them turnips and made butter, but the butter was so strong he could not eat it, and so he sold the milk to the cheese factory." It was all right to send milk that was not fit to make butter to the cheese factory. A gentleman brought me a sample of cream, and I told him I could smell turnips on the cream with my nose two feet away from the can. And I told them if they were feeding turnips to their cows in that section they would have to consider whether their butter and cheese could be sold. I told them I met a cheese buyer some time ago, and he bought cheese largely in that section, and I asked him regarding their cheese and he said, "As a rule we make from a half to three-quarters of a cent difference on cheese where the cows had been fed on turnips. I suppose you are aware that two factories in this county have cheese on hand that they cannot sell, it tasted so largely of turnips." I find very many people here experts on butter and we get some very fine samples of cream, and we find some very poor cream, and there was considerable cream which would be called ordinarily fair cream. I must say we are a little too well satisfied with middling good butter, and I find a great many people are just at that stage that they don't get any further.

ANNUAL SUPPER.

After the close of the afternoon session, President Mills invited all the guests, ex-students and other visitors present, to join the College officers and students in the College dining hall to partake of the matron's hospitality.

After supper was served various toasts were proposed and ably responded to by members of the Union and by visitors. Mr. T. B. Terry, in response to the toast to the visitors, gave his popular address on

The Wife's Share.

Mr. President, Ladies and Gentlemen,—We have been holding farmers' institutes in our state and our country for a number of years the same as you have here, and we have tried at the evening sessions to discuss some subject that would be of interest to mixed audiences where ladies came from the town as well as from the country. We tried to get up something that would be interesting as far as we could and still instructive.

Now, it is one of the speeches that your speaker has given a good deal at night sessions of institutes, that was selected for this evening. I am sorry that there are not more ladies here to-night, I would like to have them here to back me up. Of course I am going to talk in favor of the ladies entirely, and as I have an audience mostly of men, perhaps I will do the most good. If you will kindly listen closely to the first few sentences, they are the foundation on which I will try to build.

Two men go into partnership to do business together. Each one of them has a little capital, perhaps, which is thrown into a common fund. They both work faithfully for the good of the partnership. Now, the profits that arise from the business are equally divided as a rule; at any rate each partner has a certain fixed share of the income that is his individually.

Now, will you please tell me why, when a young man and a young woman enter into a partnership to do business for life the same rule should not hold good? Why should one partner hold all the salary and the other one, when she wants anything, have to go to him and ask him for something in a begging way. Woman is not yet looked on as quite the equal of man, that is all the trouble. That old curse pronounced against Eve when she sinned, "Thy desire shall be to thy husband and he shall rule over thee," has not yet been quite forgotten. By the way, that is one command of his Maker that man has never failed to obey. (Laughter).

An old clergyman who heard this lecture one evening, said he liked my lecture on potato culture a great deal better than he did my theology. But, my friends, my potato lecture may be wrong in some respects, I believe my theology is right, because it is based upon everlasting truth and justice, and this cannot change. I am going to try and convince you it is right before I get through.

How do some of our best Bible students now understand that passage? I quote rather as a prophecy than a law which should be always binding It is considered an announcement of a fact that should occur through a long period of time but not necessarily one that should hold forever. As Eve in yielding to the tempter acted alone, now as a penalty she should in the person of her descendants be made to suffer from the cruel and tyrannical treatment of the other sex. Well, we have only to consult the history of the race to see how completely this prophecy has been fulfilled in all ages—more particularly in the east, of course—down to the present time. The spirit of christianity and of simple justice of these latter days is fast doing away with this part of woman's severe sentence. No doubt very many can be found in this christian land who can say with Paul, "Wives submit yourselves unto your husbands as unto the Lord, for the husband is head of the wife, even as Christ is head of the church." Possibly some of you old men have quoted that to your wives before now.

Well, my friends, it is not fair to quote Paul on one side and not on the other. You know Paul also says, "Husbands love your wives even as Christ also loved the church and gave Himself for it." Oh! What love could be stronger than that? What husband could love his wife like that, and not make her a full partner with all the partner's privileges, rather than a slave to be tyrannized over. You see Paul's counsel was all right when we take it as a whole in one sentence by itself. We must remember the time when Paul wrote these words and the condition of woman at that time, and then we can hardly fail to see the more than human wisdom contained in them. The men of that day would read that first passage about the husband being the head, and of course they would say that was all right; they would come to the second passage about loving your wife and they would not object to it, and if they lived up to all Paul said the wife would get all Paul asked for and still get it in such a way as not to antagonize the public sentiment of that day. I believe if Paul were on earth again and re-writing these words, with civilization advanced as much as it has the last nineteen hundred years, he would leave all that out about the husband being the head. It seems to me that the time has come when the last vestige of this old curse should be wiped away; when woman should be acknowledged the full equal of man in every respect, and when in partnership with her husband as having earned a certain share of the income by her individual effort. Otherwise she is a slave, and there is no partnership about it. Perhaps you will think these pretty strong words, but see if I will not prove them before I get through

Suppose one of you should hire a woman to help your wife in the house, you pay her a stated sum per week in cash, thus acknowledging woman's labor as having a cash value; but perhaps this very same man does not think of paying his wife anything. No, that is another matter altogether. If she wants any money to do what she pleases with, she must select a time when her husband is in good humor, after a good dinner such as we have had here to-night, to ask him for some change. It is not impossible that she may be met with a harsh refusal. Why, he may even say, "Where is all that I gave you last time."

Imagine one partner speaking to another like that; how long would two men stand that sort of work? But it makes a difference when one partner is a man and the other a woman. Perhaps when the wife asks for change the husband says, "What do you want to do with it?" just as though it were his business. Just as though she had not earned a portion of that money.

I remember some 10 or 12 years ago of having something to say on this point at a farmers' institute in Wisconsin, and as I was going out of the hall that night a lady came up to me and said, "I never wanted to speak in a meeting so badly in my life, as I did to-night." Well, of course, I asked her what she had on her mind, and this is what she told me. She said, "I was calling on a farmer's wife only last week; he is a well-to-do man; his wife and he have worked hard, and they have got in real good circumstances. While I was there a sewing-machine agent came along who was selling a little attachment for the machine, which the wife decided she wanted (the price of it was only 60 cents), and finally she turned around to her husband who was sitting in the room reading, and very pleasantly said, 'John, would you please let me have 60 cents?' And his reply was, 'No, I have no money to invest in such tomfoolery as that thing is.'" Now, my friends, I say that woman was a slave, a white slave, there is no other word in our English language to express her condition. Only one will in that house could have its way, and that was the will of its lord and master. Do I put it too strongly? Not one dollar could that woman have as her own after 30 years hard labor, not 60 cents to do as she pleased with; her will must be under the control of another. If that is not slavery don't blame me. Webster does not define it correctly. I would not have you think however, because I have drawn this illustration from the farm that all men of this kind are found on our farms; human nature is about the same all over. We will draw an illustration from the town to match this. Perhaps to-morrow morning I will have something to say about a little fruit garden we have, where we get all the berries we can eat for 11 weeks. Every day we can pick a half bushel of some kind out there. We do not intend to grow berries to sell, but just have all we want ourselves, but of course there will be times when there are more than we can use. On an occasion of this kind I once took a half bushel of black berries to a friend of mine who lives in the town, and the next morning when his wife was canning these berries her mother came in and saw her putting them up, and she thought it would be nice for her to have some to can, and so she wrote me on a post card and asked me to bring her a half bushel, and I took a half bushel to this lady's house. Her husband is one of the solid business men of our town, one of our best citizens. He is a wealthy man; I do not believe he spends one-fifth of his income,—an old man soon to drop into the grave where he cannot take any of his money with him. He is also one of the pillars in our church. He came to the door when I rang the bell, and I told him my errand, and he said, "Come in, and we will see Mrs. ——." I knew what was coming right straight. I told him I had brought the berries his wife had ordered. I followed him in. His wife arose when we came into the room, and he says to her, "Mr. Terry says he has brought you up a half bushel of berries you ordered; how is it?" "Why," she says, "I was over to Jane's the other morning she was canning some berries she got from him, and I thought it would be nice for us to have some to can to, and I ordered them." "Well," he says, "you know I don't care anything about canned black berries myself; if you want them of course you can have them." There was not anything particularly unkind in the way in which he spoke, but it was between the lines what would happen if that poor woman dared to take these berries after she had ordered them. In fact I was standing there all this time with the berries in my arms in a half bushel basket. He did not ask me to put them down; just because the order did not come through him—because his wife had gone ahead and done a little matter like that. Well, she looked as if she would sink through the floor when her husband spoke in this way, and I felt about that way. And at last she said, "Mr. Terry, if it won't make any difference to you I guess I won't take the berries;" And, friends, I got out of that house some way. I choked down my wrath and got out; I never knew how from that day to this; I was thoroughly angered. I felt as though I would give every dollar I ever had in my life for a chance to choke the man Of course that is not a right spirit to show; it was not the man I wanted to choke, it was the action. I am not saying that the man or any others are bad men, not at all. He is not a bad man; he is one of the best men in our community. How is it that men can go on in this way and still not be conscious of it. I will tell you a little incident that occurred in Cameron, Missouri, while I was illustrating the point. A lawyer got up in the audience when I got through talking and said, that up to the time he was 20 years old he lived at home on the farm and his mother had always done the milking although she was then 65 years old. It was the custom in that neighborhood for the women to do the milking. A young lady came there to teach school, from a part of the country where this was not the custom, and she thought to do a little missionary work I suppose, and she said to this young man one day: "George, if I were a great, strong, hardy boy like you I would not let my poor old mother milk." "Why," he said, "it went through me like a flash of lightning." He had never thought anything about it, he added, to the large audience composed of his neighbors and friends, and he said, from that day till he left the farm his mother never milked another cow, showing the noble spirit of the man. Now, these two illustrations that I have given you, one from the farm and one from the town, are, of course, extreme ones I have purposely selected such in order to make this matter very plain. There are few men that would act anything like as badly as these two men I have picked out. I think there are a good many who are not quite willing to acknowledge the wife's rights, the simple right to dip her hand right down in the money bag and take out some just as she pleases, because she has helped to earn it just as much as her husband has.

In the year of our Lord, 1894, there is only one right way to look at this matter. I want to give you my matrimonial platform. It is about time we had an improved one. I am very glad there are so many young men in the audience to-night. If you only had your girls here with you I would be all right. Possibly something I may say may do these young people some good; that is what I want to do. I always like to talk to young people. I do not suppose the older ones here will change much. In fact, my old gray-haired friends, I do not believe it would be safe to let your wives into the pocket book since they have been kept shut out so long. (Laughter.) If we can start the young ones on the right track that will be all right. At the close of the afternoon session in one of the institute meetings, a young farmer and his wife invited me to go home with them to supper. They said they had a particular reason and they wanted me to go home with them and I must go, and of course I went. After supper we were sitting around the fire, and the husband said to me, "You did me a special favor once and didn't know anything about it yourself. It was to tell you about this we invited you here. Some four or five years ago you were making the speech of the "Wife's Share" at the Farmers' Institute, and I was there with my best girl. Up to that time I had been very bashful, I had long been wanting to go into partnership with this young lady, but never had quite courage enough to say anything to her about it. I had been over to her home half a dozen times with my mind made up that I would have that matter settled for life, but when it came to the point I could not say a word to save my life. While listening to you, a way out of my trouble came to me, so in going home I said to her, 'How did you like that matrimonial platform?' 'Well," said she, 'I thought that was just exactly right.' 'Well,' I says, 'will you start out on life with me on that platform.' 'Well,' says she, 'I will.' (Laughter and applause.)

Now, if any of you young men would try this plan on your girls in the future just let me know how you come out. Suppose our young farmer just starting out with his wife, says to her, "I will plow, sow, reap and attend to the out-door business generally, while you do the work that is only connected with the home; we are full partners, and I will consult with you about any important matters and shall expect you to do the same with me; whatever we make shall be just as much yours as mine." There is no uncertain sound about that plank, that means something. "Neither of us shall ask the other for small sums of money that we may want to do with as we please, but simply help ourselves out of the general fund. In large deals we will of course consult together about it as partners should. We will have confidence in each other's judgment not to ask any questions about small amounts. The fund shall be just as accessible to you as to myself. If you take out a dollar simply put down in the cash book, 'Wife one dollar," I would have him a business farmer and know what he is about, so when his wife takes out any money she must make an entry. "I would pay you," he continues, "a stated amount each month to do with as you please; but that would then place you in the light of a hired servant. We pay our servants, and we give money to beggars." You cannot pay your wife or give her money without making her a servant or a beggar. "Whereas," he continues, "you are my trusted equal partner, and I consider your labor just as important and just as laborious in its way as my own is."

Now, I want to ask you in all seriousness, if you don't think a man and the wife would live happily together on such a platform as this? Even if Paul did say, nearly two thousand years ago, "Wives submit yourselves unto your husbands as unto the Lord, for the husband is head of the wife, even as Christ is head of the Church." And if Dr. Albert Barnes, in commenting on that passage, says "So in every family there should be a head; some one who is to be looked up to as the counsellor and ruler; some one who should be superintendent. God has given that prerogative to man, and there is no family prosperous where this arrangement is violated." I do not want prosperity on any such terms; I would rather go without.

I am very glad to be able to state to you, and I have it directly from an intimate friend of the family, that Dr. Barnes was not such a sort of man in his family arrangements. His wife and he were as fully partners as any couple on earth could be. Why did he preach so far behind what he practiced? Men do not generally do that. They generally preach better than they practice. We can only conclude that he thought that the time had not come for preaching as advanced ideas as he practiced. You can lead men better if you do not get too far ahead of them; so I think if Dr. Barnes were on earth again, with public sentiment as far advanced as it is, he would leave out about the husband being the head.

Man can no longer claim, when urged to admit their wives as equal partners with them, that they are not of equal ability. When admitted to our colleges they show that they are sometimes better. At Cleveland a few years ago, the trustees met together and decided to admit young ladies to the college, to obtain an education on equal terms with the young men. For some 60 years the institute had existed and only young men were allowed to go in. They tried admitting young ladies for three or four years, and then they met again, and in a quiet way they said no more young ladies can come into this institution. What was the trouble? Just this, and nothing more: they were afraid that the young men would not come there—the institution would not be popular with young men, because the young men would have to study as they had never studied before—the young ladies were taking too large a proportion of the honors; hence this step backwards, that every true man in our state is ashamed of. Mark my words, that college will never prosper. What have they done now? Built an annex, and call it the "Woman's Annex," where young ladies can come and obtain an education; but they cannot compete with the young men, because, forsooth, they are too smart. Nor can we claim that woman's work is not of much importance. It is good to work hard, if you do not work too continuously. It is the everlasting monotonous character of the farmers' wives' work that makes it so hard. It is not washing dishes, baking, and sweeping floors; but this she has to do week in and week out for all time, seven days in the week and 365 days in the year. In our work there is more change and variety; our work takes us to the blacksmith's shop and to the mill, while the good wife's work goes on, sweeping the same carpet with the same old broom—washing the same dishes in the same dish-pan. It is that everlasting sameness that makes it so hard, and then the fact of working seven days in the week at regular hard work. You men don't work but six days in the week, and if you go to church does not your wife have a little of the hardest day on the Sabbath, particularly when there are children in the family? I think she does, unless you men are different to the majority. Some men cannot get ready for church themselves without calling on their wives to help them.

Many a time I have seen my wife finish dressing after she got in the carriage to start for church. Why? Because she was working as fast as she could to get us all ready. How is it when you come home from church? Why, we well-to-do farmers keep on our best clothes, and get in our easy chair and take our paper, religious paper of course, and read and have a good time. Does the wife do the same thing? No; our farmers' wives do not as a rule. She must change her clothes and go out in the kitchen and get the next meal for the men, and when it is all ready we move up and eat it. Then we men clear off that table and wash those dishes, don't we? No, we do not; the good-wife does it just the same as she has done every day in the week. Now, it is these facts taken together, that are filling the insane asylums of this bright land with such a large proportion of farmers' wives. There is no question about that. I remember going home with a farmer at the close of a morning session of an institute some years ago to dinner. He asked me to go with him; it was only about a mile out. He has one of the finest herds of Holstein cattle in our state. We went through the barn before going to dinner, and of course he was proud in showing me around; his cows were bedded in straw up to the knees, two men to take care of them, and he had the best arrangement that could be made for them. We went in to dine, and we had a good dinner, but it was presided over by such a tired, worn-out, despondent-looking wife, that it completely ruined the dinner. I could not help contrasting the position of that man's wife with his cows in the barn. We would not have worked a horse out the way that woman was. I thought over the matter while at dinner, and at the close of the meal I asked his wife, "Cannot you come with us to the institute this afternoon?" Her eyes brightened up a little and she turned around to her husband, and he spoke right up for her, and he says, "Ma don't care about going out to such places as that," and that settled the matter. Cannot we learn a practical lesson from this. Take our wives with us as much as we can when we go away from home. Let us take them to the institutes with us, and to farmers' clubs and granges, as I think these are doing a noble work all over the world;—a place where a man can go and take his wife and daughters with him. In some parts of our country where I go to institutes, it is the custom to give the wife her share out of the chicken money, in other places it is the butter money. Well, now, is the wife to do just as she pleases with it? Pin money as we call it. I remember at one institute, after I got through talking a lady stood up in the audience, and her husband was right beside her, and she put her hand on his shoulder and said, "What do you think of my husband? He gives me the chicken money, and then he expects me to buy all the groceries for the family with it.

At a little town in Pennsylvania last winter a lady said that she had the butter money, and she was very economical; she never went upstairs but what she got out her bag of money and looked the money over, and said, "That is mine; I have earned all that." But that she never got ten dollars ahead in the world but what her husband would borrow it from her and never pay it back. (Laughter and applause.)

Now, honor bright, friends, as we boys used to say at school, is not this giving the wife the butter money, under these circumstances, putting her off with the tail end of the business? It don't look like taking her in as a full equal partner. Don't misunderstand me. I don't object to the wife keeping chickens, but what I do object to is, pointing to that little pile as the wife's and the big pile as the husband's money. Put it all together and call it ours. I don't want my wife earning money in some little side show apart from me; no, we will pull right together as long as the good Lord lets us live.

There is one view of this question that interests me deeply; it may be new to some of you. It is getting to be a common custom among the ladies who move in the higher society to get money out of their husbands in a questionable sort of way, for example: A lady gets a dress made; we will suppose it comes to \$20—I do not know as I have got that high enough; she says to the dressmaker, "you make out a bill for \$30 and send it to my husband, and give me the difference, \$10; he will pay it to you; but if I ask him for money he will say, 'what do you want with money when I pay all the bills?'"

After speaking on this subject in one large city, a lady came to me and said she had \$300 in one savings bank in that place and her husband did not know anything about it. She told me how they began life poor and worked up. Her husband was then well-to-do, but when she would ask him for a little money he would sometimes say things to hurt her feelings, and she just made up her mind she would not ask him again, so when she went down to his store and he was busy waiting on the store, and she saw enough in the drawer so that he would not miss $5 or $10 she took it out and banked it in her own name. "Now," she says, "I suppose you call that stealing but I do not;" Well, I did not know what to say—it is a pretty serious question.

At one institute in northern Indiana, the wife of a leading professional man came to me at the close of the institute, introduced herself boldly and told me her husband's occupation, and told me what I do not think he would have put in print with his name attached for $10,000—he is one of the solidest men in the state. She said, "I have a new way of getting money that you have not spoken of to-night. I go to Chicago to do our trading; my husband is known there; I have a commutation ticket and he gives me enough money to pay my street car fare, and that is about all. Now, the neighbors often send in by me to get articles—sometimes ten or fifteen dollars worth, and if it is anything I can have charged to my husband I do so, putting the money in my pocket, and for years I have systematically got my spending money in that way unknown to my husband."

In a little town in Pennsylvania last winter, some of the business men came around after the meeting and said, "You need not go out of this little town for examples. One grocer said that the wife of a well-to-do farmer who was in the audience that night came to his place a few days before, and she had a list of goods she wanted put up; in it was a dollar's worth of sugar. She took me to one side and whispered to me and said she wanted me to leave that sugar out, to charge it to her husband, not putting it up, and give her the dollar. It was just before Christmas and she wanted some money to buy presents for the children, and did not know any other way to get it.

Now, all these things can be corrected by taking the wife in as a trusted partner. The serious point of this is, what are the children and grandchildren to be from such parents? Would it be any wonder if we have stealing and deceiving children growing up in such families. Do you suppose the little people do not know what is going on. Unless they are duller than I was when I was a boy they will know. If mother can do it of course the children can when they get a little older.

You have probably noticed that our laws are beginning to acknowledge the husband and wife as equal. Now, let me say that if you are not willing to go on this platform of equal rights, don't go home and say mean things. If you are not ready to come up on this platform, let me beg of you to give your wives the wages of a servant girl; don't oblige her to ask you for a little change when she wants it. I remember once going out from an institute and a good old lady came up to me—one of those good motherly-looking ladies, her hair almost as white as snow; I presume she was nearly 70 years old, and the tears were standing in her eyes as she talked to me. She said, "I do not remember that my husband ever positively refused me a dollar in the world when I asked him for it, but as old as I am, if there is any way under Heaven that I could earn the money unknown to him I would do it before I would ask him for it." I have been in that family visiting three or four times, and I assure you she is one of the most refined ladies I ever met. There are thousands of women all through this land feeling like that down at the bottom of their hearts, and it is for these women I plead to you to-night; try this same plan. If you won't go the whole platform, give your wife five or ten dollars a month and never ask her to account for one cent of it; let her feel like a free woman, and let her say that she has got a husband and not a lord and master, and you need not fear but what she will make this money go as far as you would. Ten to one she will spend more of it for your comfort than she will for her own, (applause,) and it will do her a world of good to buy presents for you and the children with money she has earned. You ask how I know this. I know how grinding it would be for me to have to ask my wife for every dollar I got—I simply would not do it. Now, friends, I fear I would go a little further, perhaps, than I ought, but I would dissolve the partnership, and so would nine men out of ten. Well, talking on this subject at an institute, a lady told me after the meeting, another lady sitting in the audience behind her whispered to her "If our husbands would only all treat us as that man speaks of we women would not want to go to heaven." Is there another thing that would come nearer bringing heaven down to earth. Of course, what has been said has been in a kindly spirit; you notice I am not blaming any of these men. We get into the habit of doing certain things, and I think some good can be done by talking over these matters. If as a result of what has been said here to-night one woman shall be given her just rights, or one young man should be led to start out on the real platform, I should feel the time of this meeting had been most grandly spent. (Applause.)

SECOND DAY—MORNING SESSION.

ELECTION OF OFFICERS FOR 1895.

The following is a list of officers and committee elected:

Honorary President	Dr. James Mills, O.A.C. Guelph.
President	C. A. Kiel, Chatham.
Vice President	D. Z. Gibson, Willow Grove.
Secretary	R. F. Holtermann, Brantford.
Treasurer	H. L. Hutt, O.A C., Guelph.
Editor	C. A. Zavitz, O.A.C., Guelph.

Auditors: Messrs. Patterson and Clark.

Committees on Experiments.

Agriculture. C. A. Zavitz, B. S. A. (Director); Dr. Mills, Prof. Shuttleworth, P. O. Vannatter and R. Harcourt, B.S.A.
Horticulture. H. L. Hutt, B.S.A. (Director); E. Lick, N. Monteith, B.S.A.
Apiculture. R. F. Holtermann, (Director); R. M. Husband, E. G. Emigh.
Dairying. Prof. H. H. Dean, (Director); H. L. Beckett, B.S.A., S. P. Brown.
Economic Botany and Entomology. Prof. J. H. Panton, (Director); L. W. Lang, F. C. Harrison, B.S.A.
Live Stock. G. E. Day, B.S.A., (Director); N. Monteith, B.S.A., W. W. Ballantyne, R. E. Cowan.
Representative to the Central Farmers' Institute, R. F. Holtermann.

On motion, the matter of selecting County Secretaries to fill the vacancies in the list, was left in the hands of the Executive Committee.

POINTS ESSENTIAL TO SUCCESS IN HOG RAISING.

By J. C. Snell, Edmonton, Ont.

The men who have succeeded in originating, establishing, and perpetuating distinct breeds of swine and other classes of live stock have been men of genius, men of skill and good judgment, who have conceived an ideal in their mind, an object and aim which they kept constantly in view and to which they patiently worked. These men have been among the world's greatest benefactors, have been instrumental in adding millions to the wealth of the nations, and their names and work are worthy to be held in lasting remembrance by those who follow them.

The originating of a breed is, generally speaking, the work of a life time, requiring patience, perseverance and a determination of purpose which will not be swerved from the straight line—which leads to the desired goal. It would perhaps not be wise for many men to attempt such a work, and the best thing for the average farmer to do in this line is to take up the work where successful men have left off, and study to maintain the excellencies already attained, and to improve upon them if they can by judicious selection, mating and management.

The choice of a breed is, to the new beginner, an important matter, but not the most important. The question which is the best breed of swine has not been settled and probably never will be by anything near unanimous consent of the breeders. In England, the home of most of the breeds, there is as much difference of opinion upon the subjects as there is here. And in the United States, where several very useful breeds have been originated, the battle of the breeds is being as fiercely fought as ever it was. There are many good breeds of swine, and the keeping up the standard of excellence is more important than the choice of a breed. The choice should only be made after a careful consideration of one's circumstances and surroundings, of the objects in view, and of the market he has to supply. When a choice has been made, and it is found by experience to be reasonably well adapted to these surroundings, the man who takes pride in the breed he has adopted and stands by it, through evil as well as good report, will, in the long run, prove a successful breeder. "Be not carried about with every wind of doctrine" is safe advice to follow in the business of breeding, as well as in theology. Fashions may change and "booms" for a breed may come and go, every breed will have its ups and downs, its seasons of prosperity and of adversity, but the man who stands by his favorites, keeps them up to the highest standard of the breed, and seeks to improve them by judicious selection, so as to conform as nearly as possible to the type which the market for the time being calls for, will, in the long run, find himself as often "in the swim" as any other.

Having made choice of a breed, we should next fix in our mind an ideal or standard of type to which we aim to attain, and in all our work the effort should be to maintain a uniform type, to breed so that each animal in the herd shall be as nearly as possible like all the rest in general appearance, in stamp or style, and that, of course, a good stamp. This will necessarily involve a rigid system of weeding out of the weakest and worst, and a careful selection of the best, for the purpose of maintaining the standard of excellence of the herd

Good judgment will especially be required in the selection of the sires to succeed each other, and here a false economy may do much to impede improvement—may indeed work much mischief and upset the work of years. Do not grudge a good price in order to secure the stamp of sire you feel sure you need, if you can find him. The best is generally the cheapest if the price is a reasonable one. "The sire is half the herd" is a strong statement but is probably not too strong when we consider that he has a part in all the increase of the herd, while the dams have only a part in the production of their own offspring. It is mainly if not entirely, by the use of the sire that changes in style or improvements in the quality of the herd is attained. If we find that individuals among the females of the herd are deficient in some point, we aim to correct this in the offspring by using a sire that is exceptionally good in that point, and if the general character of the herd is not in harmony with the changed or changing demands of the general market, the best and wisest course, in my judgment, is to seek to work a gradual change in the type by the selection and use of a sire which comes as near to the desired type as can be secured, and then, by selection of the females in the produce which are nearest to that type, the characteristics of the whole herd, may, in a comparatively short time, be changed without going outside the breed we have for fresh blood.

Success in hog raising, in my opinion depends very largely upon the application of common sense to the methods of management, and the points to be observed are but few. In the first place, I think that for the best results the dam should be at least twelve months old before producing her first litter. If she is 15 or 18 months old I believe it will be better for her, as she will grow larger and stronger. It is a mistake to depend too much upon young sows and to kill off the older ones before their usefulness is gone. As a rule the older sows produce larger and stronger litters, and make better nurses. The sow should have abundant exercise and access to the earth during the season of pregnancy. When the latter is not practical, as in the winter months, such substitutes as ashes, charcoal and roots should be supplied, but exercise must be secured even if it has to be compelled, and to this end they should be fed at some distance from their sleeping apartments, and in cold weather upon dry feed, with access to water at will.

I think the best seasons to have the pigs farrowed are early spring and early autumn. Pigs born in March and April can be got out upon the ground in five days for exercise, and the variety of condiments which instinct teaches them to look for and which seem to be essential to their health and growth can be obtained. Pigs born in these months are old enough and large enough in the following November and December for breeding—

the boars for service and the sows to produce litters when a year old. If intended for the butcher, they may, by good feeding, be fitted for the market from September to November, having attained the weights required by the market in these times. As a rule it is best to select the sows to be kept for breeders from *spring litters*, for the reason that the summer months are most favorable for out-door exercise, which tends to develop bone and muscle, and to lay the foundations of a strong constitution, which is an indispensable essential to the best results in breeding.

Pigs born in September and October may have, and should be given, abundant exercise during the first two or three months of their lives in order to secure strength of bone and development of muscle to fit them to endure the confinement necessarily incident to fattening pigs in our winters, but if they are to be kept for breeding purposes, every effort should be made to give them exercise in fine weather—even in winter. Pigs born late in the fall and in the winter are liable to go off their legs for want of exercise, or to get stunted, and from having to be confined in close quarters have not the best chance to grow into strong and vigorous stock. Those farrowed in the early autumn will be of good size in April and May to breed for early fall litters again, and those designed for the butcher will be fit to go off in the early summer months, when pork generally brings the highest price. While I do not, as a rule, favor breeding a sow to produce more than one litter in the year, yet I will say that it is quite practicable; and when the sow has attained maturity and is strong and vigorous, she may, if well cared for, produce two litters in the year, and keep it up for several years to advantage. There are few animals on the farm that are more profitable than a good brood sow, and when one has a sow that is doing good work he should prize her, and keep her breeding as long as she is satisfactory.

Success in hog-raising depends very much upon the start the young pigs get, and in order to a good start a good deal depends upon the treatment and condition of the mother before the pigs are born. If she has had sufficient exercise and a proper variety of food to keep her in perfect health, and is placed in a pen by herself a few days before farrowing, with a fender of plank around the pen, about eight inches from the floor to protect the pigs when the mother lies down, and with a scanty bedding of litter of short straw, the sow may best be left in quietness to produce her litter. In the majority of cases, and when the conditions are favorable, she should not be meddled with, and will attend to her own business better than any one can do it for her, but in exceptional cases, when the weather is cold and the pen not warm enough for the comfort and safety of the little ones, or the sow is restless or vicious, it is well to be on hand, to take the pigs away as they arrive to a warmer place, to rub them dry and return them at intervals to the mother till she gets over her trouble, when they may safely be left with her. The pigs may be induced to eat when quite young—say at three weeks—by placing some warm milk in a low, flat trough in an adjoining pen, or a part of the pen partitioned off so that the sow cannot take it. They should not, for best results, be weaned before they are eight weeks old, although the common practice is to wean at six weeks. After they have been weaned a week or ten days and have learned to eat well, they should be allowed to run out upon the ground in fine weather, and for the rest of their lives, if kept for breeding purposes, should never be confined for many days without access to the earth. If intended for the butcher at an early age, or at any age, they will be the better for a fair amount of exercise and a run upon the ground.

In closing this paper let me say that I think the farmers of this province do not sufficiently realize that in these times of low prices for grain they may readily make themselves independent of the grain buyer by turning their attention more to dairying and hog-raising. These two industries work well together, the skim milk being one of the very best foods for pigs, and there is scarcely room for doubt that a much better price can be obtained for grain by turning it into butter or cheese and pork than by placing it on the market. This is a change which can be brought about without any large outlay of money, and which any farmer in average circumstances may gradually adopt to his manifest advantage. The establishment in our own country of large slaughtering and packing houses, where live hogs are bought at good prices all the year round, is now a realized fact, and the farmer may, by coupling these two lines of work, secure a good market for his grain, enrich his farm, and have a little money coming in every week in the year.

Mr. Wm. Rennie, (Superintendent of College Farm): For the last few years that I was on my own farm, I bought all my pigs at from $1.50 to $2 each. I had made up my mind that it was cheaper than keeping a sow all the year round. Since I have been at the College it has been with a view to breeding altogether. A system we have adopted at the College with very great success, is feeding all breeding animals on coarse feed instead of concentrated feed, such as grain. Our pigs since last spring have not tasted grain. We have commenced feeding our breeding pigs on coarse food—simply bran and middlings, mixed with boiled roots, the year round; we commenced this system last spring and we have had very good success by this method of feeding. This was illustrated very strongly yesterday in Mr. Terry's address on clover. The same holds good with cattle. I was pleased with Mr. Terry's address, in which he stated he has fed his working horses on clover for eighteen years, and the sooner the farmers of Ontario understand that it is better for the stock, the better it will be for them. The bill for grain at the College the past year is a mere nominal one—the cattle are not getting any grain. We have some steers, and they are merely getting a taste of grain with this coarse food, and they will be finished off with grain.

Some persons told our President that our pigs were not looking good—they were pot bellied. That was just what we were aiming at; we wanted good stomachs. At the time of the sale the reason our pigs were looking so well was because we carried out this idea. A few weeks before the sale we gave them a little grain and that took away the pot belly and made our pigs look healthy, and slick and nice. Of course there are a number of details: we rub them in the summer with seal oil. That keeps all vermin and flies away. We do the same with all our cattle. No flies touch the cattle, if you keep seal oil on. The same with regard to the sheep. I have no doubt the heads of the College will admit the sheep never looked better, and they have not tasted grain since last winter. Two or three of them have lambs at the present time and the lambs came nicely.

Mr. Monteith: Mr. Rennie made mention of the fact that he put seal oil on cattle; has it proved successful in the prevention of the horn-fly?

Mr. Rennie: Yes; we do it once a week; every Monday morning we rub the cattle with oil, and when you go out in the fields you will find the cattle lying comfortably around and no flies bothering them. We put a little carbolic acid in the oil—about a tablespoon full to the quart and that seems to kill this horn-fly; it is just the crude carbolic acid.

Hon. Mr. Dryden: Mr. Rennie said there were certain little details; I want to point out that these little details are where people fail. If he had not told you about the carbolic acid you would have failed in putting on the seal oil. I practiced this same thing and found it efficient. He did not tell me seal oil; he said fish oil. I went to the best oil men I knew and asked for fish oil, and they did not have anything in the oil trade by that name and did not know what I meant; they sent me down some samples of awful stuff that was not fit to put on cattle, or pigs, or anything else. I afterwards found out what it was that was wanted and I got the right thing. Don't let us forget that in all these discussions we must pay attention to the *little details*; if a man gets half a truth and finds some error, he thinks the whole thing is a fraud. Tanner's oil will do just the same thing. I think carbolic acid is an important part, and the crude carbolic is very cheap.

Mr. Rennie: Seal oil is fifty cents a gallon in Toronto. The cost of putting this oil and carbolic acid on cattle is about one cent a week for each animal; it makes the animals handle better, and they do better. And when the flies are troublesome to the horses it is better than the fly net. We just buy a cheap sponge and use it for the purpose of putting on the oil.

Hon. Mr. Dryden: You must cover the whole of the animal; if you leave any part not covered the flies will gather on that part.

Mr. Rennie: There is no trouble in finding where you have missed any space on the cattle in rubbing, because you will find a whole bunch of flies on that part.

A Member: I clip my cattle and put the oil on, and I find it does one take so much oil. I clip them in the fall.

REPORT OF EXPERIMENTS IN AGRICULTURE.

PRESENTED BY C. A. ZAVITZ, B.S.A., AGRICULTURAL COLLEGE, GUELPH.

As Director of the co-operative experiments in Agriculture, I wish to submit the report of the work carried on by the committee during the year 1894. There were in all fourteen experiments—two with fertilizers, three with fodder crops, three with root crops, five with grain crops, and one with potatoes. As there are a good many before me, who are somewhat unfamiliar with the exact work which is being carried on by the Committee on Agricultural Experiments, I will endeavor to give in a few words the outline of this co-operative work. There is a regular system underlying the whole of the work as carried on by the Experimental Union. During the past few years we have carried on extensive experiments at the Agricultural College with all kinds of farm crops. Within the past six years, we have tested about 150 varieties of oats, 110 varieties of corn, 180 varieties of potatoes, etc. After growing varieties for five years in succession, we drop out the poorer ones and keep on with the leading varieties. For instance up to the spring of 1894 we had grown 80 varieties of oats side by side for five years in succession, we then dropped out about 60 of the poorer varieties and kept on with seventeen of the kinds which had given the best results. New varieties are added to our lists each year and you see on these sheets before you about fifty kernels of each of all the varieties which were grown during 1894. There are about 350 varieties in all. The varieties which are thus represented are the best among those which have been tested at the college during the past six years. From these varieties we have again selected the best, and sent out over Ontario some five or six varieties of each class for experimental purposes. In so doing we try to get all the characteristics of each class of grain or roots, or corn, etc., combined in the varieties which are sent out. For instance, in the case of oats the aim is to send a variety possessing a long straw, and one possessing a short straw; one with a spreading head and one with a side head; one early to mature and one later to mature; one with a white grain and one with a black grain, etc. So that from the six varieties sent out there is almost sure to be one or more varieties which will prove highly satisfactory upon the soil in which they are sown, whether it be of a heavy or a light character.

During 1894 we sent out 7,721 packages of seeds and fertilizers to 1,340 experimenters. Nearly all of those who received this experimental material wrote to us after harvest, giving the results of their experiments. Owing to the exceedingly wet weather during the Month of May and the drouth which followed, a number speak of failure. Grasshoppers, poultry, etc., caused other failures. Great care has been exercised in selecting only the full reports of carefully conducted tests for the summary report here presented. Five hundred and four experimenters sent in satisfactory reports, which are certainly of very great value. These successful reports were from all parts of Ontario.

The greatest advantage of this co-operative work is, perhaps, derived by the experimenters themselves who test these different varieties or different fertilizers upon their own farms; but the summary results also possess much useful information in themselves. These corroborate the experimental work carried on at the Agricultural College; and these, when combined with the experiments at the college, make the results much more reliable. When the results of this work are published and distributed over the province, it brings the Experimental Union very prominently before the farming community, and shows them that, instead of the Agricultural College drawing young men away from the farm, it prepares them for making the very most out of their opportunities, as seen through the noble work carried on by the ex-students, through their association known as the Experimental Union. When the farmers realize that not only are the different varieties of farm crops, etc., tested at the Agricultural College, but also that the leading varieties are grown in an experimental way in different localities over the province, it gives them very much more confidence in the reports which are issued.

The following circular was sent out in February to the members of the Union, to previous experimenters, and to those who applied to the college for seeds:

AGRICULTURAL COLLEGE, GUELPH, February, 1894.

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 Association 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 there were 5,500 plots, and in 1893 upwards of 7,000 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 1894 they are again prepared to distribute into every township of Ontario material for experiments with fertilizers, fodder crops, roots and grains. Upwards of 800 varieties of farm crops have been tested at the Experimental Farm, Guelph, during the past five years. These consist of nearly all the Canadian sorts, and about four hundred new varieties imported during the past seven 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 really choice varieties.

Prosperous farmers need not find much difficulty in conducting any of these experiments successfully, but care will certainly need to be exercised in every instance, and where this is done the committee feels assured that the experimenters will be far more than repaid for all the time and labor expended. Each experimenter will glean information from his own work, and also have the benefit of the reports 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 Association, held in December at the Agricultural College, Guelph, and are afterwards printed more fully, along with the proceedings of the meeting, in the annual report of the College. Each experimenter is invited to this annual gathering of the Association, and 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 1894, 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 experiments. 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 1894, and that he will be very careful and accurate in his work, and forward to the director by October 25th, 1894, a complete report of the results obtained from the tests.

Yours truly,

C. A. ZAVITZ,

Director of Co-operative Experiments in Agriculture.

At the same time the above circular was sent out, the following list of experiments for 1894 was forwarded, along with blank forms, upon which each person could make his application for the desired experiment:

No. of experiments.	Name of experiments.	No. of plots required for each.	Size and shape of each plot.
I.	Testing nitrate of soda, superphosphate, muriate of potash, mixture and no manure with oats..	5	2 rods x 2 rods
II.	Comparing the advantage of nitrate of soda alone and nitrate of soda with superphosphate over no fertilizer with rape	3	2 rods x 1 rod
III.	Ascertaining the relative value of four varieties of millet...	4	2 rods x 1 rod
IV.	Growing lucerne as a crop for fodder	1	4 rods x 4 rods
V.	Testing six leading varieties of fodder corn	6	1 rod x 1 rod
VI.	Testing five leading varieties of turnips	5	1 rod x 1 rod
VII.	Testing five leading varieties of mangels	5	1 rod x 1 rod
VIII.	Testing five leading varieties of carrots	5	1 rod x 1 rod
IX.	Testing five leading varieties of spring wheat	5	1 rod x 1 rod
X.	Testing five leading varieties of barley	5	1 rod x 1 rod
XI.	Testing six leading varieties of oats	6	1 rod x 1 rod
XII.	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.

FORM OF APPLICATION.

To be filled and returned to C. A. Zavitz, Agricultural College, Guelph, Ontario.

Experiment chosen (*Indicate by number*) { First choice
Second choice

Name.................................... ....Line of railway..............................

Post office.... .... Township ....

Express office.......................................County.............. ....

There was a greater demand for the co-operative experiments in agriculture in 1894 than in any previous year. We were, however, enabled to supply nearly all the applicants except those who applied very late. Instructions for conducting the different tests were sent at the same time that the seeds were forwarded to the different applicants.

The following letter was at the head of each instruction sheet:

AGRICULTURAL COLLEGE, GUELPH, March 1894.

DEAR SIR,—Your reply to our letter regarding the co-operative experiments for Ontario during 1894 has been received. We are forwarding to your address the material for the experiment or experiments which you chose from the list in the circular letter sent to you. If you have asked for No. 1 experiment, the material is addressed to your nearest express office; but if your application calls for any of the other experiments, the material is herewith forwarded to you by post. This sheet gives the instructions for conducting, and the blank forms on which to report the results of the different experiments with fertilizers, fodder crops, roots and grains. It is of the utmost importance that each experiment be conducted in its entirety, and that all weighings be correctly made and carefully recorded. Should you desire any further information regarding your experimental work, kindly write us to that effect.

For each experiment, soil of a uniform character should be chosen, and the plots should be so located that there would be no danger of trespassing by poultry, etc. The preparation of the soil should be similar to that for the same crops in larger fields.

We hope the material which we are now forwarding will reach you safely, and that you will have good success with your experimental work.

Yours truly,

C. A. ZAVITZ, Director.

The following table shows the number of experiments used each year since 1886. It also shows the number of complete reports of successful experiments for each of these years. In the last column the number of plots used for these experiments is mentioned:

Co-operative work in agriculture. Successful experiments for 9 years:

Years.	Experiments.	Experimenters.	No. of plots.
1886	1	8	33
1887	1	27	135
1888	1	40	240
1889	4	21	76
1890	6	20	64
1891	12	126	662
1892	12	295	1,585
1893	13	416	2,105
1894	14	504	2,520

The uniformity of results of 1892, 1893 and 1894 are very marked. The fertilizers used have given almost the same comparative results for the three past years. There is also a very marked uniformity in the average results of the co-operative experiments and of the experiments carried on at the Agricultural College. The following gives the instructions, individual results, summary results and the conclusions of each of the experiments in agriculture carried on during 1894:

I. FOUR FERTILIZERS, AND NO FERTILIZER WITH OATS.

(1) Upon uniform land, which has received no manure for at least four years, mark off five plots of one-fortieth of an acre each, leaving a clean path, three feet wide between the plots. Two rods square is the size recommended.

(2) Treat all plots alike as regards cultivation of ground, etc., and sow the packages of Bavarian oats upon 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.

(7) It is of the utmost importance that all the fertilizers and grain be sown, and that all weighings be accurately made and carefully recorded.

Individual results of 18 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	When and how last manured.	Weight of oats per plot. Mixture.	Nitrate of soda.	Muriate of potash.	Superphosphate (mineral).	No fertilizer.
					lb.	lb.	lb.	lb.	lb.
Thos. Armstrong	Muskoka	Light loam	Oats	1893, b.y.m.	34	32	24	21	20
Dan. Campbell	Dundas	Clay loam	Wheat	1891, b.y.m.	45	33½	33	34	28
W. P. Widdifield	Ontario	Sandy loam	Turnips	1886, b.y.m.	50	43	36	40	37
J. Baxter	Perth	Clay loam	Clover sod	....	28	32½	29	30½	18½
J. B. Warren	Ontario	"	Spring wheat	1889, b.y.m.	66	61	53	68½	46
J. M. Horne	Frontenac	Clay	Oats	1885, b.y.m.	36	41	40	38	33
Jno. Bedford	Elgin	Clay loam	Buckwheat	1893, b.y.m.	57	59	56	57	55
W. D. Foss	Oxford	Medium sandy loam	Corn	1890, b.y.m.	17½	18½	9	13	8½
J. L. Fair	Durham	Clay	Barley	1891, b.y.m.	45½	37	39½	37½	41
Jno. H. Fair	Hastings	Deep clay loam	Indian corn	Never	35	41	31	24¼	40
J. D. Drummond	Middlesex	Heavy clay loam	Fall wheat	1888, b.y.m.	35	30	32	30	36
Geo. Aspden	Simcoe	Clay loam	"	b.y.m	55	50	45	48	38
P. W. Pearson	York	Light, sandy loam	Alsike clover	Never	79	80	77	73	71
B. J. Palmer	Oxford	Heavy clay loam	Corn	1891	22	27	23	27½	27
Geo. Luxton	Grey	Clay loam	Fall wheat	1889, b.y.m.	33	42	35	38	32
F. A. Rose	Haldimand	Heavy clay	Barley	1891, b.y.m.	34¼	29	28¾	36¼	24
Thos. B. Murray	Simcoe	Clay loam	Oats	1892, b.y.m.	24	38	23	22	17
Ernest A. Morgan	Middlesex	Clay	Wheat	5 years ago.	50	40	45	38	32

It will be observed that the soil upon which the fertilizers were applied varied in character from a sandy loam to a heavy clay. Some of the land had been manured in 1892, while for other experiments the soil had never received any manure. These individual experiments are worthy of careful study.

The following table shows the amount of each kind of fertilizer applied, and the cost of that fertilizer per acre.

Fertilizer.	Fertilizer applied per acre.	Cost of fertilizer per acre.
	lb.	$ c.
Mixture	213	4.35
Nitrate of soda	160	4.40
Muriate of potash	160	4.48
Superphosphate	320	4.16

The mixed fertilizer was composed of nitrate of soda, muriate of potash, and superphosphate, in the proportion of 1, 1 and 2 by weight. The nitrate of soda was applied when the plants were about two inches in height, and the muriate of potash and superphosphate at the time of sowing the grain.

Average of 18 experiments :

Fertilizers.	Yield of grain per acre.			Average 3 years, 45 tests.	
	1892. 7 tests.	1893. 20 tests.	1894. 18 tests.	Straw.	Grain.
	bush.	bush.	bush.	tons.	bush.
Mixture	53.0	41.3	48.8	1.34	47.7
Nitrate of soda	47.9	38.6	48.0	1.33	44.8
Muriate of potash	43.9	37.6	43.1	1.21	41.5
Superphosphate (mineral)	42.4	36.2	44.2	1.21	40.9
No fertilizer	40.3	31.4	39.5	1.13	37.1

CONCLUSIONS.

1. The average results obtained by 18 experiments over Ontario in 1894, show that the fertilizers increased the oat crop as follows: Mixture—grain 9.3 bushels, straw .21 tons; nitrate of soda—grain, 8.5 bushels, straw .2 tons; superphosphate—grain, 4.7 bushels, straw .08 tons, and muriate of potash—grain 3.6 bushels, straw .08 tons.

2. The mixed or "complete" fertilizer gave an average increase yield of 23.5 per cent.; nitrate of soda, 21.5 per cent.; superphosphate, 11.9 per cent., and the muriate of potash 9.1 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 7 out of 18 experiments the mixed fertilizer gave the highest yield of grain per acre.

5. The fertilized plots gave a greater yield of grain per acre than the unfertilized in 17 out of 18 experiments.

6. In 1894 the fertilizers occupied the same relative position in regard to yield of grain per acre when applied upon either heavy or light soils.

7. With but one slight exception the fertilizers occupy the same relative position in yield of grain per acre for the years 1892, 1893 and 1894.

II. TWO FERTILIZERS 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 but three uniform plots, each one rod wide by two rods long, and leave a path three feet wide between each two 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 three packages of rape seed upon their respective plots.

(5) Sow the superphosphate at time of seeding upon No. II. plot, and when the young plants are about two inches high, sow one of the packages of sodium nitrate upon plot No. I., and the other package of sodium nitrate upon plot No. II., after which stir the soil in each plot.

(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.

(8) It is of the utmost importance that the whole of the experiment be conducted and that the weighings be correctly made and carefully recorded.

Individual results of two experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of green crop per plot.		
					Nitrate of soda.	Nitrate of soda and super-ph'sphate.	No fertilizer.
					lb.	lb.	lb.
Ont. Agr. College	Wellington	Clay loam	Barley	1890, b.y.m.	532	523	510
Henry Munro	Parry Sound	"	Oats	1893, b.y.m.	230	238	228

Nitrate of soda was applied at the rate of 80 lb. per acre upon number one plot and nitrate of soda and superphosphate were applied upon number two plot, each at the rate of 80 lb. per acre. Number three plot was left unfertilized. The superphosphate was sown at the time of seeding and the nitrate of soda when the plants were about two inches in height. The cost price of the fertilizer on the nitrate of soda plot was $2.20 per acre, and the cost of the nitrate of soda and superphosphate combined on the other fertilized plot was at the rate of $3.24 per acre. The Dwarf Essex variety of rape was used.

Average results of 2 experiments :

Fertilizers.	Yield of green crop per acre.	
	1894 two tests.	Average for 3 years, four tests.
	tons.	tons.
Nitrate of soda	15.24	14.5
Nitrate of soda and superphosphate	15.22	.....
No fertilizer	14.76	12.3

Conclusions.

1. The demand for rape seed for experimental purposes in 1894 was about as small as in 1893 and in 1892.
2. The superphosphate had no influence in increasing the rape crop, and the nitrate of soda had but a very small influence in this respect during the past year.
3. Rape can be grown to produce an average of about 13 tons per acre over Ontario.

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.
(6) It is of the utmost importance that all the varieties be used in the test, and that all weighings be correctly made and carefully recorded.

Individual results of five experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	When and how last manured.	Yield of green millet per plot.			
					Salzer's Dakota.	Golden Wonder.	Common.	Hungarian Grass.
					lb.	lb.	lb.	lb.
Alfred Baker	Kent	new land	....	....	220	185	118	80
F. B. Doud	Brant	clay	oats	1893	241	240	136	96
Wm. Cumberland	Simcoe	clay loam	fall wheat	1894, b.y.m.	95	80	130	110
Jno. Henderson	Hastings	"	nothing	pasture	65	85	38	42
Ontario Agricultural College	Wellington	"	fall wheat	1890, f.y.m.	137	117	72½	81

Average results of five experiments :

Varieties.	Yield of green crop per acre.	
	1894, five tests.	Average, 3 years, 12 tests.
	tons.	tons.
Salzer's Dakota	6.13	6.4
Golden Wonder	5.7	5.4
Common	4.0	4.1
Hungarian Grass	3.3	...

Conclusions.

1. The average number of days from the time of seeding until that of harvesting of the different varieties was as follows : Golden Wonder, 100 days ; Salzer's Dakota, 96 ; Common, 75 ; and Hungarian Grass, 75.

2. The Salzer's Dakota millet gave an average increase of green fodder of 55.8 per cent. in 1892, 53.6 per cent. in 1893, and 53.2 per cent. in 1894 over that of the common millet in the co-operative experiments.

3. The Salzer's Dakota millet possesses a strong stem, a large amount of leaves, and has the tallest growth of the varieties tested.

IV. THE GROWING OF LUCERNE.

(1) Select a one-tenth acre plot, conveniently situated to the stables, and in such a position that it may remain unbroken for a number of years.
(2) Cultivate the ground thoroughly, making a fine seed bed.
(3) Sow the 1.8 lb. of lucerne in the same way as you would red clover.
(4) If there is a heavy crop of lucerne in the autumn, cut high ; if the crop is light, leave uncut.

Average results of 27 experiments with lucerne seeded in the spring of 1894 :

Lucerne.	1894, 27 tests.	Average 3 years, 58 tests.
Number of days for seed to germinate	10.0 days	10.9 days
Average height of crop in autumn (1st year)	11.9 inches	12.2 inches

The lucerne seed was sown broadcast at the rate of 18 pounds per acre. The seed was obtained in Ontario, In most instances no grain crop was grown with lucerne.

Conclusions.

1. The average number of days for the seed to germinate, and the average height of crop in the autumn for 1894, were quite similar to the results of 1893 and 1892.

2. A large crop of lucerne cannot be expected during the same season in which the seed is sown.

3. Marked variations are noticeable in the growth of lucerne upon different soils of the province.

Individual results of twenty-seven experiments with lucerne:

Experimenter.	County.	Nature of soil.	Nature of subsoil.	Character of drainage.	Remarks.
R. Findlay	Algoma	sandy loam	hard clay	natural	The first part of season it grew very well, but seemed to wither away last part.
R. Deelbridge	Huron	clay loam	clay		Started to grow very rapidly, then dry weather set in, then grasshoppers.
Geo. W. Maxwell	Peel	sandy loam	gravelly	good natural	
Thos. G. Patton	Halton	"	clay	surface sloping	Almost decided to cut down or plow up, but late rains improved greatly.
Abram Rowand	Bruce	"	sand	natural	It made a very short growth, but there is a good root for next year.
D. A. Stirton	Middlesex	medium clay	sand	self-draining	I cut the lucerne on 28th July, as it was flowered out and appeared to be ripening. There was about 7 cwt. of green grass came off it.
Crawford Scott	Stormont	black loam	clay	Surface drainage	I cut a heavy crop off the land seeded in 1893, and it had splendid after-grass.
W. S. Scott	Stormont	black clay	clay	none	The lucerne I sowed in 1893, I cut July 22. It was heavy and grew up again about 12 inches. I pastured it and it grew up the third time about 8 inches.
Gordon Young, jr	Huron	loamy clay	light	natural good	Lucerne started well, as also did the weeds. The weather in July being very dry the weeds got ahead of lucerne, which was very short. About the end of July I ran the mower over it to stop the weeds from seeding. The wet weather has started the lucerne, and think it will come all right yet.
Thos. W. Hamilton	Russell	red clay	gravel	well drained	Grew well, cut three times. Is getting pretty thick, covering the ground.
W. K. Foreman	Muskoka	sandy loam	clay	natural	Came up well and roots about 12 inches long, but seemed to stand still.
G. Butler	Lambton	clay loam	clay	underdrain	Lucerne grew well until the middle of July, when the drouth set in, and it grew no more until the rains of Sept. 10th; since then it is growing rapidly.
Alf. Brown	Addington	fine loam	sand	natural good	Owing to the extra drouth in August the lucerne has not grown after cutting.
C. M. Macfie	Middlesex	sandy loam	sandy	tile	About 10 inches high this fall, although hindered much in growth by dry weather.
Jas. Cruickshanks	Kent	sandy	sandy	open ditch	The dry weather nearly killed the crop, until the rains came, and clover came up well and it is now doing nicely. I have cut weeds off and it looks well.
W. S. Fraser	Simcoe	clay loam	clay	fair	
Wm. Irvine	Grey	sandy loam	sand	natural drainage	During the drouth in June, July and August it withered and the weeds got up, but since the rain came it has again made some progress and is quite green and about 7 inches high on October 3. Do not consider it a success.
Geo. P. Sills	Addington	sandy loam	gravel	side hill	
A. R. Hodgins	Stormont	"	sand	surface	
O. M. Rombough	"	loam	sandy	natural surface	
Robt. McDonald	Glengarry	sandy loam	gravel	natural	Owing to drouth which continued from middle of April to the end of May, germination was slow, in fact the plants seemed to be weakened.
W. J. Brown	Prescott	"	sandy loam	good	Grew nicely, but weeds got the lead and nearly choked out the clover. I think it would not be as profitable for the farmer as Alsike or Vermont.
Jas. Tesky	Addington	clay loam	clay shale	natural. Too dry	Had not the season turned out too dry I would have had a second excellent crop.
A. S. Hodgins	Stormont	sandy loam	sand	surface	Under adverse circumstances it has made a growth of 6 and in spots 8 inches.
C. D. Lawrence	Parry Sound	"	building sand	surface	I think it will prove a valuable crop in this district.
Joshua Knight	Frontenac	clay loam	clay	natural good	
A. Quinn	Perth	rich clay loam	hard fine sand	fair	

V. TESTING SIX LEADING 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 3 feet 4 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.

(7) It is of the utmost importance that all the varieties be sown, and that the weighings be correctly made and carefully recorded.

Individual results of 21 experiments :

Experimenter.	County.	Date of planting.	Nature of soil.	Cropping of 1893.	Weight of whole crop per plot. Cloud's Early Yellow.	Mammoth Cuban.	Salzer's North Dakota.	Wisconsin Earliest White Dent.	Compton's Early.	Early White Flint.
					lb.	lb.	lb.	lb.	lb.	lb.
Geo. A. Snyder	Lincoln	June 9	black loam	hay	120	100	75	65	60	50
Harry E. Beamer	Norfolk	" 12	heavy sandy loam	wheat	160	200	75	90	75	110
C. A. Keil	Kent	May 11	sandy loam	wheat & corn.	206	185	162	161	124	141
David N. McCallum	Middlesex	June 6	clay loam	corn	145	125	90	95	85	85
T. A. Cox	Brant	" 12	"	peas	200	180	175	130	116	117
Byram Roblin	Lennox	May 5	"	sod	205	237	200	197	183	96
Joshua Knight	Frontenac	" 15	dark loam	corn	400	420	220	340	225	210
Jno. Datton	Simcoe	June 8	clay loam	turnips	215	178	192	137	154	142
Nelson Gies	Waterloo	" 8	a dark, loamy soil	oats	220	114	185	117	101	127
Jas. Pate	Brant	" 8	soft clay loam	potatoes	244	216	191	189	189	146
Hugh McPhee	Huron	May 22	clay loam	vegetables	204	152	178	114	160	132
H. L. Beckett	Wentworth	June 21	"	oats	161	158	150	102	80	122
Robt. Shaw	Durham	" 2	sandy loam	barley	357	297	287	225	262	175
Jno. W. Richardson.	Haldimand	" 12	clay loam	wheat	297	308	228	211	223	287
Thos. McAfee	Grey	" 1	light loam	spring wheat.	90	82	75	72	68	70
W. H. Clubine	York	" 19	clay loam	oats	165	150	142	90	120	145
Robt. Watson, jr	Grey	" 8	limestone loam	"	945	960	630	780	475	525
Chas. Young	Algoma	" 10	light loam	barley	525	360	442	361	440	355
Alex. Wood	Oxford	" 15	rich clay loam	potatoes	189	130	105	80	88	89
Jno. McKee	Oxford	May 31	clay loam	roots	387	375	250	225	200	212
J. D. Stewart	Perth	June 26	"	green fodder..	170	148	103	102	96	96

Average results of 21 experiments :

Varieties.	Average of 21 co-operative tests, 1894. Green ears per acre.	Average of 21 co-operative tests, 1894. Whole crop per acre.	Experimental Farm test, average of 4 years. Whole crop per acre.	Experimental Farm test, average of 4 years. Stage of maturity when cut.	Sections of Ontario for which the corns are best adapted.
	tons.	tons.	tons.		
Cloud's Early Yellow	4.1	21.4	20.1	late milk	Southern.
Mammoth Cuban	4.0	19.3	18.0	dough	Central to southern.
Salzer's North Dakota	3.8	15.8	17.0	firm dough.	Central to northern.
Wisconsin Earliest White Dent.	3.8	14.8	15.9	firm dough.	Central.
Compton's Early	3.4	13.4	15.0	ripe	Northern.
Early White Flint	3.4	13.1	13.3	ripe	Northern.

Conclusions.

1. The comparative order of the different varieties in yield of whole crop per acre was the same in the average of 21 co-operative experiments in 1894 and in the average of the Experiment Station tests for four years.

2. The greatest number of well developed ears was produced by the Salzer's North Dakota and the Early White Flint; and the least number by the Cloud's Early Yellow.

3. The Cloud's Early Yellow and the Compton's Early gave the largest number of inferior ears.

4. The Cloud's Early Yellow and the Mammoth Cuban grew to the greatest average height and the Early White Flint to the shortest height.

5. The individual experiments show that no one variety of corn is equally well suited to all parts of Ontario.

VI. Testing Five Varieties of Turnips.

(1) Five plots, each containing 272 square feet, are required for the experiment with turnips.
(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, 16 feet 4 inches long; or (*b*) four drills, 32 feet 8 inches long; or (*c*) two drills, 65 feet 4 inches long.
(4) Sow the different varieties upon their respective plots.
(5) Thin young plants in the rows to ten inches apart.
(6) Be careful of the plants when cultivating and hoeing the ground.
(7) It is of the utmost importance that the five varieties be grown in every case, and that all weighings be accurately made and carefully recorded.
(8) In harvesting the plots, watch carefully the requirements of the blank form below.

Individual results of eighteen experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of turnips per plot. Jersey Navet.	Early American Red Top.	Carter's Elephant.	Hartley's Bronze Top.	Carter's Prize Winner.
					lb.	lb.	lb.	lb.	lb.
Herbert Watson	Peel	clay loam	peas	....	401	290	274	254	245
J. Knight	Frontenac	"	potatoes	1894, b. y. m.	422	540	510	380	385
C. D. Lawrence	Parry Sound	sandy and clay loam	"	1893, b. y. m.	354	350	200	328	265
J. F. Mannen	Wentworth	sandy loam	"	1894, b. y. m.	685	728	620	535	640
Angus Munro	Parry Sound	clay loam	buckwheat	1892, b. y. m.	304	360	214	239	354
Jas. F. Knapp	Frontenac	"	mixed peas and oats	1893, b. y. m.	295	169	256	325	325
Adam Betz	York	"	peas	1893, b. y. m.	725	426	368	453	370
M. Fraser	Perth	sandy loam	none for 10 years	1894, b. y. m.	325	280	300	290	300
T. A. Walker	Wentworth	"	barley	....	190	216	230	225	220
Jas. B. Muir	Bruce	"	buckwheat	1894, b. y. m.	323	244	183	222	200
W. D. Ventress	Peterboro'	"	turnips	1894, b. y. m.	570	422	346	231	242
F. Foyston	Simcoe	clay loam	oats	1893	218	290	222	237	192
Benson J. Wallace	Wellington	"	oats	1893, b. y. m.	690	630	570	490	510
C. A. Kincaid	Leeds	"	corn	Pasture land	320	370	279	256	180
Michael Schuerter	Bruce	sandy loam	....	1894	338	316	174	224	175
Geo D. McMillan	Ontario	loamy	oats	*	276	251	211	197	186
R. Findlay	Algoma	sandy loam	peas	1894	375	390	450	395	400
A. G. McKenzie	Perth	....	....	....	391	265	171	177	168

* Plowed in crop of green clover in 1889.

Average results of eighteen experiments:

Varieties.	Average yield per acre.		
	18 co-operative tests, 1894.	Experimental Farm tests, 4 years.	Experimental Farm dry matter, 1894.
	tons.	tons.	tons.
Jersey Navet	32.0	24.2	1.51
Early American Red Top	29.1	23.6	1.28
Carter's Elephant	24.8	19.0	1.00
Hartley's Bronze Top	24.3	23.1	1.12
Carter's Prize Winner	23.8	21.5	.71

The Jersey Navet and the Early American Red Top turnips are both fall varieties, and the Carter's Elephant, Hartley's Bronze Top and Carter's Prize Winner are all Swede varieties. Prof. Shuttleworth determined the amount of dry matter of the turnips which were grown in the college plots in 1894. The amount of dry matter per acre being represented in the right hand column of the summary above.

Conclusions.

1. The fall turnips gave a greater yield of roots per acre than the Swede varieties in the co-operative tests of 1894.
2. The Jersey Navet gave the largest yield of roots per acre in the co-operative tests for both 1893 and 1894 and in the College tests for the past four years.
3. The Jersey Navet was spoken of by nearly all experimenters as being a more desirable variety than the Early American Red Top.
4. The Carter's Elephant Swede made rather higher results comparatively in 1894 than in 1893.

VII. Testing Five Varieties of Mangels.

Instructions.—Same as those given for turnips.

Average results for thirty-four experiments:

Varieties.	Average yield per acre.		
	34 co-operative tests, 1894.	Experimental Farm tests, 4 years.	Experimental Farm dry matter, 1894.
	tons.	tons.	tons.
Long Red Selected	32.5	22.2	3.22
Giant Yellow Intermediate	29.9	22.8	3.10
Mammoth Red Intermediate	27.4	20.1	2.60
White Silesian Sugar Beet	25.2	18.9	3.11
Warden Prize Orange Globe	20.9	15.7	2.89

There were four varieties of mangels and one variety of sugar beets tested in 1894. These were grown at the College, and the amount of dry matter in each variety determined in the chemical laboratory by Prof. Shuttleworth. The yield per acre on the College plots, multiplied by the percentage of dry matter in each variety, gives the results which are found in the right-hand column of the above summary.

Individual results for thirty-four experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	When and how last manured.	Yield of mangels per plot.				
					Long Red Selected.	Giant Yellow Intermediate.	Mammoth Red Intermediate.	White Silesian Sugar Beet.	Warden Prize Orange Globe.
					lb.	lb.	lb.	lb.	lb.
Jno. Hamilton	Simcoe	sandy loam	turnips	1890	275	245	215	210	185
Wm. Wilson	Bruce	loam	barley	1894	540	710	780	445	550
Adam Betz	York	clay loam	peas	1893, b. y. m.	472	538	294	286	241
J. Knight	Frontenac	"	potatoes	1894, b. y. m.	620	618	560	343	480
W. Hyde	Perth	"	"	1894, cow manure	372	306	278	250	294
Jno. Jas. Burns	Victoria	"	"	1893, b. y. m.	668	609	520	543	443
F. McN. Ward	Parry Sound	"	"	never	304	324	245	195	263
T. J. M. Skelly	Simcoe	sandy loam	peas and oats	1894, b. y. m.	372	456	349	439	230
A. Wiancko	Muskoka	clay	turnips and carrots	1893	130	203	173	175	156
W. V. Nigh	Middlesex	clay loam	millet	1894, b. y. m.	299	300	235	284	190
Martin Johnston	Simcoe	sandy	oats	1894, b. y. m.	147	220	275	328	137
Andrew Chisholm	Waterloo	sandy loam	potatoes	1893, b. y. m.	231	248	198	200	300
J. H. Garbutt	Peterboro'	light clay loam	buckwheat	1894	175	182	134	135	115
Jno. Edwards	Lambton	clay loam	oats	1892, b. y. m.	275	253	203	190	200
Walter Hick	Huron	dark clay loam	oats	1894, b. y. m.	228	240	150	180	120
Arthur Ribble	Elgin	clay	summer fallow	1894	510	370	520	470	200
R. E. McKee	Peterboro'	clay loam	wheat and roots	1894	215	241	244	194	225
Jas. Laurie	Kent	black loam	potatoes	new land	600	512	325	400	300
Chas. Madden	Bruce	clay loam	"	1894, b. y. m.	668	476	452	560	368
Edgerton Roe	Huron	muck	oats	1894	515	400	490	350	300
Don. McDiarmid	Kent	black clay loam	potatoes	never	588	480	448	380	260
Jas. Smith	Lambton	sandy loam	"	1893	266	240	208	245	230
E. B. Yarwood	Pr. Edward	"	buckwheat	1894	220	232	156	127	112
Richard Stutt	Lambton	clay loam	fall wheat	1894, b. y. m.	570	306	282	350	198
Robt. Edge	Grey	light clay	carrots	1893	327	228	183	347	187
Wm. Aitchison	Huron	clay loam	oats		339	154	270	276	102
Wm. H. Briston	Simcoe	clay loam	turnips	1893	765	600	550	715	420
Aaron Wismer	Lincoln	sandy loam	sugar beets	1892, b. y. m.	278	435	310	268	271
Robt. Currie	Lambton	clay loam	meadow last two years	1894, hog m.	540	400	410	360	320
Jas. D. Hutton	Victoria	sandy loam	fall wheat	1894, b. y. m.	675	620	600	210	326
Geo. Hodgins	Stormont	"	oats	1893, b. y. m.	280	340	315	180	244
O. M. Rombough	"	light loam	hay	1894, b. y. m.	266	306	284	174	230
Nicholas Dehart	Simcoe	light clay loam	peas	1894	497	431	509	441	322
T. C. Ponting	Shelby, Ill.	prairie loam	carrots and corn		573	486	475	447	351

CONCLUSIONS.

1. The Steele Bros. Long Red Selected Mangel gave the highest yield of roots per plot in 8 of the co-operative experiments out of ten conducted in Ontario in 1892, 11 out of 18 conducted in 1893, and 16 out of 34 conducted in 1894.
2. The White Silesian Sugar Beet holds the same relative position among the mangels in yield per acre in 1894 as it did in 1893.
3. The yield of dry matter per acre in the experiment at the College in 1894 shows the highest results from the Steele Bros. Long Red Selected mangel and the White Silesian Sugar Beet, and the lowest results from the Warden's Prize Orange Globe and the Mammoth Red Intermediate varieties of mangels.

VIII. TESTING FIVE VARIETIES OF CARROTS.

INSTRUCTIONS.—Same as those given for turnips.

Individual results of twenty-nine experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of roots per plot.				
					Improved Short White.	Large White Vosges.	Large White Belgian.	Guerande.	Danver's Half Long Orange.
					lb.	lb.	lb.	lb.	lb.
Jas. W. Fisher & Son	Norfolk	sandy loam	melons & onions	1893, b.y.m.	610	605	595	555	490
T. J. M. Skelly	Simcoe	"	peas and oats ..	1894, b.y.m.	686	522	367	411	293
J. F. Mannen	Wentworth .	"	potatoes	1894, b.y.m.	450	430	410	445	435
C. D. Lawrence	Parry Sound	s'ndy & clay loam	"	1893, b.y.m.	350	342	278	265	280
J. Knight	Frontenac ..	clay loam	"	1894, b.y.m.	385	410	390	360	410
Wm. Wilson	Bruce	sandy loam	"	1894........	556	668	768	750	749
A. Wiancko	Muskoka ..	hard clay	peas	1894........	60	39	41	68	50
Angus Munro	Parry Sound	clay loam	buckwheat	1892........	398	378	394	385	380
Adam Betz	York	"	peas	1893, b.y.m.	336	246	275	318	261
Jas. Hill	Lincoln	sandy loam	mangels	1894........	63	73	64	49	59
Jonathan Cross	Prescott....	"	roots and corn..	1894, b.y.m.	344	288	304	344	296
Robt. Cinnamon....	Dundas	clay loam ..	wheat	1894, b.y.m.	260	280	260	300	250
R. O. Smith	Middlesex ..	"	potatoes	1894, b.y.m.	402	450	418	364	278
Jos. W. Newman ..	Grenville...	sandy loam	"	1893, b.y.m.	380	365	370	290	310
J. H. Osborne	Muskoka...	"	onions..........	....	309	397	351	361	330
Jas. Bell	Lanark	clay loam	turnips	1893, b.y.m.	370	321	324	338	286
Edwin Chambers ...	Welland ...	muck	"	....	243	223	275	248	240
Jas. A. Chisholm...	Waterloo ..	sandy loam	wheat	1893, b.y.m.	310	201	249	165	121
Jno. P. Rutherford.	Algoma	clay loam	carrots	1893, b.y.m.	225	197	206	173	168
R. Ewens	Grey	"	potatoes	1893, b.y.m.	602	434	451	356	403
Wm. Ireland	Parry Sound	sandy	"	1894, b.y.m.	720	600	480	900	900
P. S. McLaren......	Lanark ...	sandy loam	"	1894, b.y.m.	388	300	243	292	237
D. Macfarlane......	Parry Sound	clay loam	corn	1893, b.y.m.	410	460	408	370	390
Chas. Collins	Victoria....	sandy loam	mangels	1892, b.y.m.	550	420	520	320	336
Wm. Stitzinger	Welland ...	light sand	fall wheat	1891, b.y.m.	464	500	400	480	420
Jos. Abell	Lambton ..	dark loam	potatoes	1893	702	650	714	420	540
L. Dillabough	Dundas	loam	oats	1893, b.y.m.	595	480	570	450	450
T. C. Ponting	Shelby Co., Ill	prairie loam....	carrots and corn.	....	344	273	290	192	173
Jno. B. Landon	Leeds	sandy loam	potatoes	1894, b.y.m.	456	424	392	264	264

Average results of twenty-nine experiments:

Varieties.	Average yield per acre.	
	Twenty-nine co-operative tests, 1894.	Experimental Farm tests, three years.
	tons.	tons.
Improved Short White	33.0	32.9
Large White Vosges	30.3	28.9
Large White Belgian........................	29.8	25 4
Guerande	28.2	21.5
Danver's Half Long Orange	27.0	24.6

Conclusions.

1. The Improved Short White Carrot took the lead in point of yield in 50 per cent. of the co-operative experiments during 1892, in 42 per cent. of the co-operative experiments in 1893, and in 55 per cent. of the co-operative experiments during 1894.

2. The White Fleshed varieties of carrots all gave better yields of roots than the Yellow Fleshed varieties in both 1894 and 1893.

3. The Guerande was the easiest to remove from the ground, and the Large White Belgian the hardest of all the varieties tested.

IX. 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 and 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.

(5) In harvesting the plots, watch carefully the requirements of the blank forms on this page.

(6) It is of the utmost importance that all the varieties in the particular experiment chosen be sown, and that the weighings be correctly made and carefully recorded.

Individual results of nineteen experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1893.	When and how last manured.	Yield of grain on plot. Herison Bearded.	Hayne's Blue Stem.	Manitoulin.	Pringle's Champion.	Red Fern.
					lb.	lb.	lb.	lb.	lb.
G. Sutherland	Lanark	loam	corn	1893	5	5	3	3	3
Geo. Luxton	Grey	clay loam	potatoes	1893, b.y.m.	8.5	10	8	8	9
Chas. Bard	Muskoka	sandy loam	clover	1891, b.y.m.	4	4	4.2	4.7	6.1
Geo. Gatecliffe	Lambton	clay loam	potatoes	1893	13	8	7	10	8
W. J. Falconer	Dufferin	"	"	1893, b.y.m.	8	10.5	10	8	8
J. R. Maddock	Simcoe	"	spring wheat	......	8	9	8	10	8
Hiram Moses	Wellington	"	potatoes	1893, b.y.m.	9	12	8	11	9
Thos. Stephenson	Grey	gravel mixed with clay	"	1893, b.y.m.	4.5	5.8	4.8	6	6.3
Bernard Kelly	Simcoe	clay	peas	1890, b.y.m.	7.5	5.3	5	6	5.5
Jas. Rea	Victoria	clay loam	wheat	1890	6	4	6	6	7
W. J. Duun	Simcoe	"	none	never	12	10.3	9	7	8.5
Jno. Hunt, jr	Simcoe	"	tall wheat	1889, b.y.m.	8	5	7	5	5
Fred. J. Macklin	Northuml'd.	loam	peas	1889, b.y.m.	2	3.5	2.8	1.8	2.8
No name	......	dark clay loam	barley	1894	7.3	8	7.5	7	6.5
Jas. Henderson	Hastings	clay loam	potatoes	1893, b.y.m.	4.5	3	5	4.5	4.5
Angus Munro	Parry Sound	"	oats	never	5.5	5.3	5	5 8	6
Sid. H. Tripp	Welland	clay	mangels	......	4	1.5	1.8	1.6	3
Wm. C. Wilson	Simcoe	clay loam	peas	1894	8.3	6.8	7.6	6.7	6.8
J. Kerr	Prince Ewd.	......	potatoes	1893	8.5	9	12	8	6

The Herison Bearded variety of spring wheat was imported from France by the Agricultural College in the spring of 1889, and the Pringle's Champion was imported from Germany in the same year. The Haynes Blue Stem was sent from the North Dakota Agricultural Experiment Station in the spring of 1892. It was a variety which proved the best among a great many tested at the Experiment Station.

The Manitoulin and the Red Fern are both Ontario varieties.

Average results of nineteen experiments :

Varieties.	Yield per acre. Straw. Nineteen tests, 1894.	Straw. Exp. Farm tests, three years.	Grain. Nineteen tests, 1894.	Grain. Exp. Farm tests, three years.
	tons.	tons.	bush.	bush.
Herison Bearded	1.6	2.3	18.8	32.0
Hayne's Blue Stem	1.5	1.9	17.7	27.0
Manitoulin	1.5	1.9	17.0	26.4
Pringle's Champion	1.6	2.2	16.9	30.4
Red Fern	1.6	2.4	16.7	33.5

Conclusions.

1. The Herison Bearded heads the list in yield of grain per acre in the average of twenty-nine co-operative experiments in 1893, and of nineteen co-operative experiments in 1894, and also in the College tests with spring wheat for the past six years.

2. The Hayne's Blue Stem, which stood second in average yield per acre over Ontario in 1893, holds the same place relatively among the varieties tested in 1894.

3. The Red Fern, which is a well known variety in many parts of Ontario, gave the lowest average yield of grain per acre in 1894, and second lowest in 1893.

4. The Hayne's Blue Stem variety was the freest from rust among the five kinds tested over Ontario in 1894.

X. TESTING FIVE VARIETIES OF BARLEY.

Instructions.—Same as those given for spring wheat.

Average results of 28 experiments :

Varieties.	Yield per acre. Straw. 28 tests, 1894.	Straw. Exp. Farm tests, 5 years.	Grain. 28 tests, 1894.	Grain. Exp. Farm tests, 5 years.
	tons.	tons.	bush.	bush.
Mandscheuri	1.6	1.8	38.6	68.5
Black Hulless	1.4	1.7	30.1	50.5
Kinna Kulla	1.6	1.6	27.7	59.2
Duckbill	1.7	1.7	27.3	50.7
Hungarian	1.6	1.6	25.3	45.3

The Mandscheuri barley was imported from Russia, the Kinna Kulla from Sweden, and the Hungarian from Hungary, in the spring of 1889. The Black Hulless and the Duckbill are both Ontario varieties. Of the five varieties used in this experiment, the Mandscheuri is a six-rowed variety, the Black Hulless and Hungarian are hulless, and the Kinna Kulla and Duckbill are two-rowed varieties.

Individual results of 28 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of grain on plot.				
					Mandscheuri.	Black Hulless.	Kinna Kulla.	Duckbill.	Hungarian.
					lb.	lb.	lb.	lb.	lb.
Michael Addis	Simcoe	a rich clay loam.	oats	never	14	10	6	5	4.5
Wm. Ireland	Middlesex	clay	"	pasture	12	6.3	5	7.5	6
Otto Mosser	Wellington	clay loam	roots	1892, b.y.m.	24	14	12	13	9
Wm. McKenzie	Perth	"	potatoes	1892	16	7	8	9	10
Jas. Pegg	Grey	sandy loam	oats	1893	14.3	10.9	9.2	11.1	9.3
Jno. E. Rice	Lanark	sandy and clay	fall wheat	1892	5	5	4	3.1	2.8
E. A. Maddock	Simcoe	clay loam	spring wheat	1893	22	17	16	16.5	14
Dan. Madden	Bruce	"	bare fallow	1893, b.y.m.	12	9	9.5	10	10.5
Thos Gadd	Grey	"	potatoes	1893, b.y.m.	8	8	5	6	4
D. H. McDougall	Glengarry	clay	mixture of oats and barley	1883, b.y.m.	9	6	17	8	9
Geo. Hood	Huron	clay loam	potatoes	1894, sheep m	13	8.5	8	7.5	12
Jas. Smith	Bruce	"	turnips	1893, b.y.m.	3.8	4.3	3.3	4.5	3.5
Geo. W. Beckett	Welland	"	winter wheat	1892, b.y.m.	8.5	8.5	5	6	8
R. Braithwaite	Lambton	"	corn	....	14	13	10	11	10
Jno. White	Kent	black clay	fall wheat	never	12	9.5	10	10	9
Simon Burns	Lambton	clay	roots	....	13	12	11.5	10.5	14.5
Jno. G. McKay	Bruce	clay loam	peas	....	19.3	14	11.3	10.8	12
Dan. Marshall	Grey	"	turnips	1893	10.5	8	9	10	7.5
Alex. S. Weir	Muskoka	sandy loam	potatoes	1893, b.y.m.	5	8	7	6	5
Jno. Armbrust	Welland	black loam	oats	....	9	8	9	4	7
W. R. McGarry	Lanark	clay and gravel.	"	....	9.5	7.8	2	2	1.3
P. R. Longworth	Kent	black, heavy clay	fall wheat	never	8.8	11.3	6.5	6.8	7.5
W. J. Hunt	Parry Sound	sandy loam	peas	1894, b.y.m.	12	5	7.8	7.8	4.8
Wesley Buskin	Grey	clay loam	"	1890, b.y.m.	12	15	7	8	6
David Armstrong	Lambton	sandy loam	potatoes	new land	8	7	9	12	9.5
Chas. Irwin	Huron	dark	corn	....	8.3	5.3	7.3	6	2.3
F. A. Whetter	Victoria	clay loam	oats	1894	9	7	5	9	7.5
Geo. North	Wellington	sharp clay loam.	peas	1894	12	8	12.5	8	6

Conclusions.

1. The Mandscheuri variety of barley gave the highest yield of grain per acre in the co-operative tests for 1892, 1893 and 1894.

2. The six-rowed varieties of barley have surpassed the two-rowed and the hulless varieties in the co-operative experiments over Ontario, for three years in succession.

3. The Mandscheuri barley was surpassed by no other variety in 75 per cent. of the co-operative experiments over Ontario in 1894.

4. The Mandscheuri variety of barley was the freest from rust, and the Duckbill the second freest from rust of the five varieties tested over Ontario in 1894.

5. The average yield per acre of barley in the tests at the Agricultural College for five years is about double that given in the co-operative experiments over Ontario in 1894.

XI. TESTING SIX VARIETIES OF OATS.

INSTRUCTIONS—Same as those given for spring wheat.

Individual results of 121 experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of grain on plot.					
					Siberian.	Poland White.	Joanette.	Bavarian.	Lincoln.	White Schonen.
					lb.	lb.	lb.	lb.	lb.	lb.
Wm. Field	Middlesex	h'vy cl. loam	fall wheat	1893	12.0	10.0	10.5	10.0	9.0	9.0
John Foulkes	Muskoka	clay loam	peas	1893, b.y.m.	12.5	11.0	10.0	13.5	10.0	11.5
John A. Sexsmith	Peterborough	sandy loam	potatoes	1892, b.y.m.	13.3	14.5	9.5	13.3	10.0	9.5
F. H. Clark	Lambton	clay loam	...	1893, b.y.m.	8.5	13.0	10.5	11.8	9.0	11.5
P. Smith	Perth	“	pasture	4 years ago	17.8	11.8	16.0	11.8	10.8	11.8
Wm. Flynn	Simcoe	“	fodder corn	1893, b.y.m.	8.5	10.5	9.0	11.0	12.0	11.5
George R. Bell	Northumberl'd	“	beans	1893	15.8	13.5	14.0	12.3	12.8	14.0
Jno. F. Campbell	Dundas	“	wheat	1892, b.y.m.	12.5	8.5	10.8	11.3	7.8	8.3
John Wetheral	Ontario	black muck	meadow	never	7.0	8.0	8.0	7.0	9.0	7.0
John Bell	Grey	clay loam	potatoes	never	11.3	9.8	9.6	10.2	10.2	9.3
E. W. Tufgor	Wentworth	muck	willows and cattails	never	7.0	8.0	9.0	6.0	7.0	6.0
V. Springsteen	Kent	clay loam	corn	...	8.2	8.3	7.8	6.5	7.0	7.5
John McKessock	Grey	lt. clay loam	peas	1889	6.5	7.0	7.0	7.0	9.0	6.0
Dun. McVannell	Perth	clay loam	pasture	none	7.0	8.0	10.0	6.0	7.5	8.0
Matthew Dykes	Victoria	sandy loam	barley	1892	20.0	22.0	17.0	24.0	20.0	19.0
Louis Adolph	Perth	black loam	oats	...	10.0	14.5	9.0	10.0	9.5	9.5
Edmund E. Cook	Dufferin	sandy loam	rape	1893, b.y.m.	16.0	13.0	16.0	12.0	12.0	14.0
O. H. Coulter	York	black loam	oats	...	8.5	9.0	9.5	10.0	9.0	8.0
Paul Scott	Peterborough	clay loam	roots	1893, cow m	14.0	15.0	14.0	16.0	17.0	13.0
L. Stoutenburgh	York	“	fall wheat	1892, b.y.m.	11.5	20.5	23.5	12.0	12.5	7.0
George Jackson	Huron	light loam	potatoes	1893	10.0	13.0	9.0	8.0	7.0	8.0
Wm. C. Wilson	Simcoe	clay loam	peas	1894	10.5	9.8	11.3	8.4	9.5	10.0
M. Addis	Simcoe	“	oats	never	12.0	14.0	12.0	12.0	11.5	11.0
Thomas Henry	Kent	“	corn	...	8.0	12.0	12.5	9.0	11.5	11.0
Wm. J. Cook	Monck	sandy loam	hay	never	3.5	4.0	4.5	3.0	4.3	3.0
Wm. H. Gervin	Norfolk	“	corn	1893, b.y.m.	9.3	8.3	8.0	8.3	7.0	7.8
A. T. Horne	Ontario	clay loam	corn	1893, horse m.	13.8	16.3	12.5	14.0	10.8	13.0
Richard Connolly	Oxford	“	corn	1893, b.y.m.	9.0	9.0	10.0	8.0	7.0	10.0
John B. Stone	Northumberl'd	“	peas	summer fallow	14.0	12.0	10.5	13.0	11.5	11.5
Jos. Martineau	Prescott	“	oats & barley	1894	7.0	5.5	7.3	7.5	7.5	6.0
J. B. Lindsay	Huron	clay	potatoes	1893, b.y.m.	13.5	12.5	14.0	13.5	14.0	14.0
F. A. Whetter	Victoria	clay loam	oats	1894	11.5	13.0	13.5	11.0	11.5	12.0
J. H. Schweyer	Haldimand	stiff clay	timothy hay	1888	5.0	5.5	4.0	5.0	6.0	5.0
James Brodie	Grey	clay loam	potatoes	1893, b.y.m.	16.0	17.0	15.0	16.0	16.0	14.0
Henry Miller	York	heavy clay	roots	...	10.0	16.0	16.0	9 0	9.0	8.0
George Brent	Lambton	clay loam	barley	1892	15.5	13.5	12.0	15.3	13.5	15.4
A. Waldie	Halton	“	potatoes	1893, b.y.m.	17.0	16.0	17.5	16.5	13 5	13.3
Wm. Miller	Bruce	“	peas	not lately	18.0	19.0	15.0	24.0	20.0	18.0
George Nixon	Durham	loam	wheat	...	9.0	7.0	8.0	9.0	7.0	8.0
D. McEwen	Renfrew	clay loam	...	never	6.5	9.5	5.0	6.0	9.5	6.0
Wm. Simpson	Kent	sandy loam	corn	1891	15.0	15.0	14.0	21.0	16.0	15.0
H. P. Jeffrey	Essex	blk sandy lm	corn	1894	13.5	8.0	12.5	9.5	14.0	13.5
John Priddle, jr.	Norfolk	sandy loam	wheat	1892, b.y.m.	5.5	6.0	8.5	6.0	5.0	7.0
W. J. Wilson	Dundas	clay loam	turnips, beans	...	10.0	8.5	9.0	10.0	8.3	8.0
Hobart Morton	Carleton	sandy loam	hay	1889, b.y.m.	6.0	6.0	4.5	4.0	4.5	3.8
W. M. Comfort	Monck	...	...	...	11.0	11.0	8.0	7.0	8.0	7.0
W. J. Standen	Simcoe	sandy loam	potatoes	1892, b.y.m.	8.0	7.5	10.0	6.5	9.5	13.5
Thos. W. Klinck	York	blk clay lo'm	potatoes	1893, b.y.m.	19.5	12.0	20.0	12.5	12.5	17.0
Wm. Fitzgerald	Bruce	“	pasture	1891, b.y.m.	7.5	7.0	17.0	13.5	16.0	8.0
Nichol Dawson	Northumber'd	clay loam	potatoes	1893	10.8	11.3	12.5	10.0	12.0	9.8
C. W. Otis	Oxford	sandy loam	potatoes, cabge	1893, horse m.	5.5	5.5	5.0	4.0	7.0	5.0
Cor. Ketchabaw	Elgin	hard clay	wheat	1892	4.3	6.0	5.5	6.8	6.5	6.0
J. Davidson	Bruce	clay loam	corn	1893, b.y.m.	10.8	11.5	11.0	11.8	10.0	10.5
T. F. Howell	Brant	mild loam	corn	1893, b.y.m.	14.0	11.5	10.5	10.0	10.5	13.5
Andrew Murphy	Dufferin	sandy loam	turnips	1893, b.y.m.	5.0	6.5	5.0	5.0	4.0	4.0
J. Johnston	Dufferin	clay loam	meadow	1888, b.y.m.	14.0	11.5	13.0	12.0	15.0	11.0
W. J. Beatson	York	“	peas	...	16.5	20.0	14.5	15.0	16.0	11.5
James D. Rose	Wentworth	clay	wheat	...	7.0	7.0	8.5	7.0	8.0	9.0
John H. Gray	Oxford	clay loam	corn	1893, b.y.m.	8.0	6.0	7.5	6.5	7.0	7.0
Wm. Wood	Simcoe	loam	fall wheat	1892, b.y.m.	10.0	10.0	11.0	8.0	9.0	8.0
Jas. W. Partridge	Simcoe	clay loam	turnips	never	9.0	9.5	9.0	11.0	9.0	9.0

XI. TESTING SIX VARIETIES OF OATS.—*Continued.*

Individual results of 121 experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of grain on plot. Siberian.	Poland White.	Joanette.	Bavarian.	Lincoln.	White Schonen.
					lb.	lb.	lb.	lb.	lb.	lb.
John Phillips	Huron	cl&san. loam	corn	1893, b.y.m.	14.5	8.0	10.0	9.0	10.0	14.0
Chas. Holton	Essex	clay loam	corn	never	15.0	16.2	14.0	17.1	16.8	15.3
Robt. Paterson	Middlesex	dk.clay loam	corn	1893	15.0	12.0	12.0	14.0	14.5	14.0
David L. Graham	Hastings	clay loam	barley	1893, b.y.m. & s. phosp. & salt	14.0	15.0	17.0	13.0	14.0	16.0
Wallace Megraw.	Bruce	"	pasture	1888	10.0	9.0	11.0	10.0	10.0	13.0
John Davidson	Lambton	clay	peas		8.5	7.0	9.0	7.0	8.0	6.5
Hugh Hunter	Parry Sound	sandy loam	carrots	1893, b y.m.	20.0	17.5	12.5	18.0	17.5	18.5
E. F. Casselman	Parry Sound	clay loam	turnips	never	14.0	15.8	10.5	13.0	14.5	14.0
John Spaulding	York	clay bottom.	potatoes		8.0	7.0	6.0	10.0	7.0	4.0
Adam Watson	Muskoka	sandy loam	peas	1894, b.y.m.	4.6	3.9	4.4	5.1	5.1	4.0
Leonard Buckton	Welland	clay loam	wheat	1832, b.y.m.	4.4	5.9	4.3	4.2	4.6	3.3
J. Knight	Frontenac	"			13.0	12.0	14.0	14.5	13.0	12.0
A. J. Griffith	Carleton	sandy loam	fodder corn	1890	8.0	9.0	6.0	7.0	8.0	5.5
Har. P. Westgate	Lambton	clay loam	wheat	1892, b.y.m.	7.0	6.0	7.0	5.5	5.0	9.0
Abram Schooley	Elgin	sandy loam	fall wheat	6 years' sod	7.3	7.3	14.0	9.3	6.5	12.0
Henry Johnson	Perth	clay loam	mangels	1893	9.5	9.0	13.5	9.0	9.5	10.0
Richard Senior	Wellington	"	potatoes	1894	5.0	9.0	7.0	10.0	11.0	6.0
Wm. Dickson	Perth	"	hay		8.0	10 0	10.0	9.0	9.0	13.0
Wesley W. Fisher	Huron	gravelly l'm.	hay	never	5.0	4.0	5.0	6.0	5.0	3.5
John Reid	Algoma	clay	oats	never	8.5	8.0	11.0	10.0	8.0	8.0
Don. Sutherland.	Oxford	clay loam	pasture	never	17.0	17.0	11.0	15.5	13.0	13.0
Archie Stewart.	Middlesex.	rich b'k loam	hay		6.0	8.0	7.0	8.0	5.0	5.0
Richard Moore	Frontenac	clay	corn	1893, b.y.m.	12.5	11.0	7.3	8.0	9.5	10.0
Wm. Ramage	Grey	sandy loam	sod pasture	1889, b.y.m.	7.0	7.5	6.3	6.3	5.5	5.0
Theo. Parker	Perth	"	hay	1890	15.0	16.0	10.0	19.0	20.0	24.0
Wm. Wilson	Bruce	clay loam	potatoes	1893	11.0	9.0	11.0	10.0	9.0	11.0
W. J. Westingdon	Northumber'd	"	peas	never	9.0	8.0	7.0	9.5	8.0	7.0
George North	Wellington	blk. cl. loam	turnips	1893	10.0	11.0	12.0	8.0	10.0	12.0
M. Munroe	Glengarry	loam	wheat	1892	5.5	5.0	3.3	4.0	4.8	4.0
Jas. D. Tully	Peterborough.	clay loam	potatoes		15.0	14 0	15.0	16.0	15.0	14.0
Well. Armstrong.	Lambton	sandy loam.	potatoes	new land	9.0	8.5	11.0	10.5	7.0	9.0
Charles McCrae	Huron	clay loam	fall wheat	1894, b.y.m.	18.0	16.0	16.0	16.0	20.0	15.0
David Armstrong	Lambton	sandy loam.	potatoes	new land	8.0	9.0	12.0	10.0	10.5	9.0
R. A. Robertson.	Durham	fine clay	spring wheat	1893, b.y.m.	16.0	14.5	13.0	17.0	15.0	14.0
J. G. Dickenson.	Simcoe	clay loam	spring wheat	1890, b.y.m.	11.5	12.0	5.0	9.0	10 0	11.0
Robert Robertson	Simcoe	clay	turnips	1893	9.0	6.0	9.0	8.0	7.0	7.0
D. S. Campbell	Middlesex	gravelly lo'm	fall wheat	1893	18.0	16.0	10.0	17.0	18.0	17.0
Fred. Swaine	Bruce	sandy loam.	oats	previous to '93 by pasturing	5.0	4.5	5.0	5.0	7.0	5.3
George Doe	Elgin	loam	fall wheat		9.5	8.5	11 0	9.0	9.5	9.0
Thomas Robson	Oxford	clay loam	fall wheat	1892, b.y.m.	6.0	6.0	6.5	5.5	4.5	5.0
Andrew Timmins	Dundas	sandy loam.	barley	never	13.0	13.5	8.5	14.0	11.0	13.0
John C. Nichol	Middlesex	sandy loam.	oats	1893	11.3	10.5	9.8	10.3	8.3	9.0
Thomas Strachan	Huron	clay loam	peas	1892, fall wheat	10.5	13.0	14.0	13.5	13.5	11.0
Thomas Foulds	Middlesex	"			8.8	6.0	5.0	8.0	6.0	4.5
W. A. Longworth	Kent	blk hvy clay	fall wheat	never	8.5	10.3	6.5	7.3	10.3	10.5
Andrew Quinn	Perth	clay loam	sod	none for 5 yrs.	9.0	10.0	15.0	8.0	12.0	10.0
Alex. McIntyre	Brant	sandy loam.	winter wheat	1892, b.y.m.	4.0	5.0	4.0	7.0	5.0	6.0
A. Wardrop	Bruce	"	hay	1893	7.0	8.0	8.0	7.5	8.0	6.0
Wm. Kaufman	Oxford				6.5	7.0	8.8	8.0	8.5	5.0
Robert Brock	Lambton				5.5	5.5	3.5	5.5	2.5	5.0
Elmer S. Tucker.	Russell	a poor clay	peas		8.2	4.7	8.8	7.1	8.0	7.5
W. J. McKinley.	Leeds	sandy loam.	clover meadow	1892	8.0	7.0	6.0	12.0	6.0	10.0
R. Cullis	Northumber'd	hvy. cl. loam	turnips	1893	6.0	5.0	5 0	5.5	5.3	5.5
John Stewart	Durham	clay loam	clover meadow	1891, b.y.m.	5.3	4.7	8.0	3.3	6.7	4.7
John L. Eidt	Waterloo				10.5	8.0	10.5	6.5	7.5	7.0
Charles Irwin	Huron	dark loam	brk'n from sod		11.3	11.0	11.5	11.5	14.0	10.0
Francis Bole	Grey	loam	peas	1892, b.y.m.	4.5	6.0	5.0	5.5	7.0	5.3
J. Stephens	Simcoe	high cl. loam			10.0	8.0	9.0	9.5	8.0	11.0
James F. Knapp.	Frontenac	clay loam	wheat	1891	20.0	19.0	20.0	21.0	19.0	16.0
John Kelly	Dufferin	"	alsike		9.5	10.0	8.0	9.0	9.0	9.0

Average results of 121 experiments :

Varieties	Yield of straw per acre.		Yield of grain per acre.	
	121 tests. 1894.	Experimental Farm tests. 2 years.	121 tests. 1894.	Experimental Farm tests. 2 years.
	tons.	tons.	bush.	bush.
Siberian	1.7	2.8	48.7	79.7
Poland White	1.7	2.6	48.1	70.4
Joanette	1.6	2.6	47.7	82.5
Bavarian	1.7	2.8	47.7	67.8
Lincoln	1.7	2.2	46.9	63.2
White Schonen	1.6	2.3	45.7	70.8

The Siberian variety was imported from Russia, and the Joanette and Poland wheat were imported from France in the spring of 1889. The seed of the Bavarian, the Lincoln and the White Schonen was obtained in Ontario.

Conclusions.

1. The Siberian, which stands at the head of the list in average yield of grain per acre of 121 experiments in 1894, also occupied first place in the average of 105 experiments in 1893 and 125 experiments in 1892.

2. The Joanette, which stands third in the list of 1894, occupied third place in the list of 1893, and also occupied third place in 1892.

3. The imported varieties have given a higher yield per acre than the Ontario varieties in the co-operative experiments over Ontario for three years in succession.

4. The Joanette is the shortest strawed variety of those tested in the co-operative experiments.

5. The Poland White was the freest from rust, and the White Schonen the most subject to rust of the six varieties tested over Ontario in 1894.

6. The average yield of grain per acre of the six varieties of oats tested at the Agricultural College during two years is about double the yield of the same varieties grown over Ontario in 121 different localities in 1894.

7. There is a great demand for oats in Ontario.

XII. TESTING FOUR VARIETIES OF PEAS.

Instructions.—Same as those given for spring wheat.

Average results of 63 experiments :

Varieties.	Yield per acre.			
	Straw.		Grain.	
	63 tests 1894.	Experimental Farm tests, 3 years.	63 tests 1894.	Experimental Farm tests, 3 years.
	tons.	tons.	bush.	bush.
Prussian Blue	1.08	1.7	27.9	36.0
Canadian Beauty	1.05	1.4	27.1	31.9
Fall White Marrowfat	1.09	1.7	26.8	35.6
Egyptian Mummy	1.11	1.6	26.3	36.8

The Prussian Blue and the Canadian Beauty were sown at the rate of $3\frac{1}{3}$ bushels per acre, and the Mummy and Tall White Marrowfat, at the rate of 4 bushels per acre. The grain was sown broadcast.

Individual results of 63 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of grain on plot. Prussian Blue.	Canadian Beauty.	Tall White Marrow Fat.	Egyptian Mummy.
					lb.	lb.	lb	lb.
Jno. McKowen	Parry Sound	clay loam	oats	1892	20.0	16.0	15.5	14.5
Andrew Kennedy	Dundas	"	corn	1893, b.y.m.	15.0	13.0	17.0	13.0
David Rendall	Wellington	sandy loam	pasture	1890	8.3	9.0	10.5	7.5
George Baird, Sr	Huron	clay loam	oats	1893, b.y.m.	10.0	12.0	12.0	10.0
R. W. Hermon	Prince Edward	"	....	....	6.8	8.8	6.5	10.5
Jno. Mosser	Wellington	"	mangels	1893, b.y.m.	6.0	6.5	3.0	6.0
H. B. Currie	Grey	"	fall wheat	1892, b.y.m.	15.0	11.0	12.0	8.0
Joel Brenton	Hastings	sandy loam	potatoes	1893, b.y.m.	8.5	7.0	8.5	10.0
Wm. Roth	Haldimand	stiff clay	hay, clover	1892	5.0	6.5	5.0	4.0
J. A. Hunter	Lambton	clay loam	oats	1892, b.y.m.	5.5	3.8	3.5	4.0
Jno. Sirr	Parry Sound	"	clover	never	10.5	12.5	13.5	14.0
Chas. Stroh	Waterloo	sandy loam	potatoes	1893, b.y m.	12.5	12.5	11.5	11.5
Jas. Haylow	Oxford	clay loam	corn	1893, b.y.m.	4.0	3.0	4.5	3.5
P. Hutchins	Grenville	....	....	....	7.0	7.5	5.5	8.0
Chas. Kruegar	Grey	light loam	meadow	1891, b.y.m.	6.5	7.0	6.0	5.5
Jno. Grierson	Grey	clay loam	sod 3 years ago	....	14.0	16.0	13.0	15.0
J. H. Montgomery	Essex	"	corn	new ground	9.0	6.0	9.0	9.0
Jas. Wiggins	Grey	"	fall wheat	1894	6.5	7.0	8.0	7.0
Thos. Dryden	Bruce	loam	peas and corn	never	4.0	10.0	8.0	6.5
G. S. Hull	Middlesex	clay loam	first crop	never	15.5	14.0	12.0	13.0
J. W. Hetherington	Queens, N. B	gravel and clay	potatoes & oats	1893, b.y.m.	7.5	12.0	12.0	9.0
R. B. Fleming	Bruce	sandy loam	hay	never	13.0	10.0	12.0	12.0
Jno. McGugan	Middlesex	clay loam	corn	....	11.5	9.0	9.5	10.5
Ronald Dick	Norfolk	sandy	turnips	1893	7.0	6.0	1.3	2.3
Simon Miller	York	clay	hay	....	22.0	20.0	30.0	20.0
Francis Collison	Parry Sound	sandy loam	hay	never	11.1	11.6	11.4	11.5
Wm. Clarke	Muskoka	clay loam	oats	pasture in '92	8.5	8.5	6.8	8.0
Sam. Brown	Parry Sound	sandy loam	potatoes	1892, b.y.m.	8.0	5.0	7.0	6.0
Jos. Kinder	Renfrew	light loam	grass	1894, b.y.m.	7.0	5.9	8.5	5.0
C. R. Stevenson	Elgin	good clay loam	oats	1890, b.y.m.	6.0	6.5	4.8	5.5
Jno. Steele	Lanark	sandy loam	potatoes	1892, b.y.m.	14.0	11.0	12.0	11.0
Lewis Lamb	Bruce	str'ng cl'y loam	fall wheat	pastured	5.5	6.5	10.3	5.0
Chas. Venn	Algoma	heavy clay	oats	never	41.0	38.5	40.0	37.0
Jno. Closson	Kent	s'ndy clay loam	potatoes	1893	8.5	14.0	9.0	10.0
O. A. Lawrence	Halton	stiff clay	new ground	never	6.0	6.3	6.1	6.5
J. F. Wilson	Oxford	clay loam	turnips	1893, b.y.m.	8.0	10.0	9.0	9.0
Robt. Templeman	Lanark	clay	oats	1892	25.0	23.0	23.0	12.0
Herbert Elford	Huron	sandy loam	clover & tim'y	never	6.3	5.3	6.0	6.5
Wm. Rayner	Halton	clay loam	peas	1891, b.y.m.	3.5	4.0	3.5	3.0
Jno. Henry	Middlesex	"	carrots	1892, b.y.m.	33.5	25.0	24.0	30.0
Jno. Shiell	Huron	"	oats	1894	12.0	12.0	14.0	11.0
F. McDonald	Bruce	"	wheat	3 y'rs in f'l'ow	9.0	9.5	10.0	8.0
H. E. Hind	Haldimand	"	spring wheat	never	6.5	5.0	6.0	6.0
D. Hartley	Halton	....	....	....	3.5	5.0	4.0	4.5
Jno. Wilson	Muskoka	sandy loam	potatoes	1893, b.y.m.	14.0	10.0	9.0	15.0
Frank Small	Oxford	clay	pasture	never	11.5	10.0	9.0	8.5
Wm. Newson	Dufferin	clay loam	old sod	never	6.0	6.0	5.8	5.5
D. G. Grey	Middlesex	warm clay loam	clover	1892, b.y.m.	6.0	4.5	4.5	4.5
Andrew Quinn	Perth	clay loam	pasture	none for 5 yrs	6.0	12.0	9.0	8.0
M. Frazer	Perth	sandy loam	....	....	3.5	4.0	4.0	8.5
Jas. F. Knapp	Frontenac	clay	peas and oats	1890	14.0	10.0	8.5	8.0
V. E. Gawley	Bruce	rich clay	pasture	1889	12.0	9.0	15.0	13.0
Jno. E. Rowland	Perth	....	pasture	....	16.5	13.0	14.0	18.5
J. C. Nichol	Middlesex	....	....	....	9.5	7.0	7.3	6.5
Henry Johnson	Perth	clay loam	mangels	1893	8.0	10.0	9.0	8.5
Wm. Wood	Simcoe	loam	clover sod	1894, b.y.m.	15.0	16.0	14.0	19.0
W. J. Standen	Simcoe	....	....	....	8.0	9.5	8.5	7.5
Wm. Fitzgerald	Bruce	black clay	pasture	1891, b.y.m.	7.0	13	5.0	11.5
Peter E. Miller	Welland	loam	oats	1893	5.0	5.5	4.0	4.5
Thos. J. Fair	Hastings	clay loam	Indian corn	never	9.0	9.5	7.5	9.3
Fred. Foyston	Simcoe	"	fall wheat	1892	13.8	12.6	14.3	16.4
Francis Morley	Huron	str'g clay loam	fall wheat	1894	10	9.5	10.0	9.5
Wm. F. Haines	Parry Sound	heavy clay	roots	....	11.3	11.0	10.0	9.8

Conclusions.

1. The Prussian Blue variety of peas gave the largest average yield of grain per acre in the average of 63 co-operative experiments in 1894, and also in the average of 73 co-operative experiments in 1893.

2. In the average of 63 experiments with peas in 1894, the yield per acre of grain varied only 1.3 bushel per acre between the best and the poorest of the four varieties tested.

3. There is a great demand in Ontario for good varieties of peas, the applications being only second in number to those for oats.

XIII. 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 66 pieces of each variety.
(3) One row 66 feet (4 rods) long is required for each kind. If the rows are placed side by side a distance of 30 inches should be allowed between the rows.
(4) Drop the pieces 1 foot apart in the row, and aim to have the potatoes placed 4 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.
(7) When harvesting the crop, watch carefully the requirements of the blank form below, and be very particular that all weighings are accurately made and carefully recorded.

Average results of 38 experiments:

Varieties.	Yield per acre. 38 tests, 1894.	Yield per acre. Experimental Farm tests, two years.	Average number of days to mature.	Table quality, 100-best.
	bush.	bush.		
Empire State	303.1	291.8	122	91
Pearl of Savoy	271.3	295.5	127	87
Burpee's Extra Early	264.8	231.3	102	100
Summit	253.5	247.3	117	82
White Star	247.9	264.7	116	73
Rural New Yorker No. 2	231.5	228.2	127	75

Previous to the year 1894 the work of the Horticultural Committee was devoted to the testing of varieties of potatoes. As the Committee on 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 experiments to carry on tests with varieties of small fruits, the experiments with potatoes were transferred from the Horticultural Committee to the Committee on Agricultural Experiments.

Conclusions.

1. The Empire State and the Pearl of Savoy gave the largest average yield per acre in 38 co-operative experiments in 1894 and in two years' trials at the Agricultural College.

2. The Burpee's Extra Early is the earliest, and the Pearl of Savoy and the Rural New Yorker No. 2 are the latest to reach maturity of the six varieties tested over Ontario in 1894.

3. The average table quality of the varieties tested in the autumn of 1894, as given by the experimenters is as follows, commencing with the best: (1) Burpee's Extra Early, (2) Empire State, (3) Pearl of Savoy, (4) Summit, (5) Rural New Yorker No. 2, (6) White Star.

4. The percentage of the crop of each variety which was marketable was as follows: Rural New Yorker, No. 2, 88.2; Empire State, 87.5; Pearl of Savoy, 86.2; White Star, 85.9; Burpee's Extra Early, 81, and Summit, 78.9.

5. The average weight of 30 best developed potatoes of each variety was as follows: Empire State, 13.5 lb.; Pearl of Savoy, 13 lb.; Rural New Yorker No. 2, 12.3 lb.; Burpee's Extra Early, 10.7 lb.; White Star, 10.7 lb., and Summit, 10.3 lb.

Individual results of 38 experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of potatoes per plot.					
					Empire State.	Pearl of Savoy.	Burpee's Extra Early.	Summit.	White Star.	Rural New Yorker No. 2
					lb.	lb.	lb.	lb.	lb.	lb.
B. Johnson	Pr. Edward	clay loam	garden	....	60	54	53	38	34	30
W. S. Morrison	Haliburton	sandy	hay	....	58	45	56	50	42	45
Jas. Pegg	Grey	sandy loam	carrots	1893	63	49	55	63	54	56
M. Clipsham	Muskoka	clay loam	potatoes	1893	66	59	51	57	47	46
T. G. Raynor	Pr. Edward	sandy loam	potatoes	1893, b.y.m.	107	109	68	90	82	42
John Williams	Elgin	clay loam	virgin soil	none	51	17	23	41	41	42
John Burns	Perth	light loam	clover sod	1893	48	42	53	40	47	37
W. H. Metcalfe	Brant	sandy loam	turnips	....	53	55	40	45	38	47
T. C. Wheatley	Lambton	swamp muck	potatoes	....	91	61	88	88	59	73
J. F. Dix	Victoria	clay loam	fall wheat	1894	80	43	45	49	54	35
W. A. McGeachy	Kent	sandy loam	wheat	1894, b.y.m.	61	35	46	44	35	33
F. B. Hutt	Welland	sandy loam	onions	1893, b.y.m.	62	60	61	51	53	46
Alex. S. Weir	Muskoka	sandy loam	wheat	1894	75	90	100	70	110	80
Wm. Goodger	Oxford	gravel loam	turnips	....	41	34	29	35	27	30
C. A. Cass	Prescott	slaty loam	potatoes	1893	95	70	80	84	62	50
R. A. Richards	Lanark	sandy loam	oats	....	72	92	74	74	81	78
Geo. A. Carlaw	Northum'land.	light clay loam	peas and oats	1893, b.y.m.	71	66	64	62	42	38
S. W. Christie	Glengarry	gravelly loam	oats	1893, b.y.m.	66	37	53	40	65	50
T. L. Dunkin	Oxford	clay loam	new ground	new ground.	60	68	38	48	43	46
C. H. B. Angell	Wellington	sandy loam	vegetables	....	44	30	27	48	20	38
John Watson	Ontario	loam	hay	1893, b.y.m.	120	83	75	102	86	74
John Spear	Hastings	good sandy loam	potatoes	....	133	134	148	118	122	135
Thos. Dryden	Bruce	clay loam	potatoes	....	50	26	35	36	22	34
Donald McLaren.	Renfrew	sandy loam	peas	1893, b.y.m.	82	129	69	63	65	59
Donald McLaren.	Lanark	sandy loam	turnips	....	65	56	73	70	72	47
J. V. Lazonby	Simcoe	clay loam	....	....	62	60	60	59	64	61
H. J. Marsh	Middlesex	clay loam	potatoes, roots and corn	....	64	42	43	47	48	41
Wm. Ramage	Russell	light loam	....	....	63	72	80	57	62	47
Josiah Burton	Elgin	clay loam	sod	....	104	99	70	68	95	96
H. L. Beckett	Wentworth	clay loam	oats	1894, b.y.m.	41	42	23	26	29	26
T. A. Walker	Wentworth	sandy loam	....	....	84	75	53	72	81	102
John Havercroft.	Simcoe	sandy loam	timothy sod	....	41	37	55	36	31	24
James Miller	Renfrew	black loam	wheat	1893	67	73	82	62	68	44
S. H. Rittenhouse	Lincoln	sandy loam	corn	1893	51	46	45	32	41	25
Anson Groh	Waterloo	sandy loam	wheat	....	29	29	26	23	29	32
Roger Dunn	Middlesex	clay loam	carrots	....	50	50	75	59	45	49
A. C. McArthur	Glengarry	black ground.	oats	....	126	98	132	95	106	73
Peter Anderson	Bruce	sandy loam	turnips	1894	60	64	36	46	38	48

XIV. TESTING FIVE PROMISING VARIETIES OF WINTER WHEAT.

Instructions.

(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.

(5) In harvesting the plots, watch carefully the requirements of the blank form on this page.

Individual results of 81 experiments, received before August 20th, 1894 :

Experimenter.	County.	Nature of soil.	Previous cropping.	Yield of grain per plot.				
				Dawson's Golden Chaff.	Early Red Clawson.	American Bronze.	Golden Drop.	Bulgarian.
				lb.	lb.	lb.	lb.	lb.
Jno. Hilbert	Northumberland	clay	peas	10.0	8.0	8.0	8.0	9.0
J. Watson	Norfolk	loam	clover	12.5	12.5	11.0	11.5	13.0
David Greig	Brant	clay loam	oats	16.8	15.8	16.5	15.5	17.0
Jas. J. Howston	Kent	clay loam	....	12.0	12.0	10.0	8.0	6.0
Hopper Ward	Middlesex	clay loam	potatoes	3.8	2.0	1.5	2.0	2.5
L. V. Burnham	Lambton	sandy loam	corn	13.3	12.0	12.0	12.5	14.0
Robert Riddell	York	light loam	clover & peas	16.0	14.0	14.0	16.0	13.0
Jno. Barron	Norfolk	clay	loam	13.0	11.3	[illegible]	10.6	10.0
Nathaniel Dunbar	Bruce	loam	peas	15.0	14.0	10.5	13.0	13.5
Roderick Grey	Huron	clay loam	....	19.5	15.3	15.3	16.3	14.5
Jno. F. McCracken	Huron	....	....	20.5	23.5	17.5	19.0	14.0
Wm. Bell	Bruce	clay loam	barley	12.0	5.0	8.0	10.0	6.0
Jas. W. McLean	Lambton	light clay	....	7.5	9.0	10.5	11.0	8.0
Allan H. Cochrane	Huron	sandy loam	wheat	8.5	9.5	10.0	9.0	8.0
Frederick Fach	Norfolk	sandy	peas	9.0	8.0	10.0	8.3	6.0
Wm. Vorghi	Kent	clay	oats	15.5	12.0	15.0	16.0	14.0
Robt. Richardson	Lambton	clay loam	potatoes	19.0	14.0	12.0	15.0	11.0
Anson Beamer	Brant	sandy loam	hay	12.0	10.0	12.0	10.0	8.0
R. D. McCormick	Essex	heavy loam	potatoes	16.0	14.0	11.0	9.0	10.0
Jas. B. Byran	Middlesex	clay	peas	26.0	20.0	32.0	19.0	18.0
Chas. E. Henry	Lambton	clay	clover	12.5	13.5	14.0	14.0	13.0
Daniel Wood	Middlesex	clay loam	potatoes	11.5	13.0	10.0	10.0	11.0
Angus McLachlan	Lambton	gravelly loam	vegetables	12.3	10.0	9.0	9.0	8.0
Jno. Watson	Ontario	loam	potatoes	9.0	8.0	6.0	10.5	7.5
Jno. Burke	Norfolk	....	....	9.6	7.5	8.1	6.9	7.0
Andrew W. Baird	Lanark	sandy loam	clover sod	10.3	8.5	7.0	6.0	10.5
Michael Regan	Middlesex	light gravel	potatoes	15.0	14.0	13.0	14.0	16.0
A. G. McIntosh	Bruce	clay loam	peas	12.0	16.0	12.5	16.0	7.0
Jas. D. Marsh	Norfolk	sandy loam	turnips	14.0	12.0	13.0	11.0	11.0
George Jackson	Huron	loam	potatoes	5.0	6.0	5.0	5.5	4.5
J. A. James	Middlesex	sandy loam	oats	30.0	25.0	26.0	22.0	17.0
A. Wilcox	Kent	clay and sandy loam	beans	17.5	9.0	10.0	14.0	13.0
Sam McKinney	Simcoe	sandy loam	....	25.5	21.0	18.0	21.0	26.0
Albert Page	Wentworth	dark loam	hay	14.0	13.0	11.0	11.0	9.0
M. Drummond	Middlesex	clay loam	oats	6.5	7.0	12.0	8.0	13.5
Herbert Ingleheart	Halton	black clay	oats	12.5	11.5	13.0	13.0	10.0
					Jones' Wntr. Fyfe.	Early Gen'e. Giant	Surprise.	Early White Leadr
J. W. Fleming	Kent	clay loam	roots	33.0	36.0	28.0	30.0	20.0
David Smith	Peel	sandy loam	alsike	11.0	15.0	13.0	16.0	15.0
Geo. W. Beckett	Welland	clay loam	potatoes	6.4	12.0	9.3	7.8	8.5
Geo. McKay	Bruce	heavy loam	fall wheat	18.0	15.0	13.0	13.0	16.0
T. J. M. Skelly	Simcoe	sandy loam	....	11.0	4.0	8.5	5.0	5.5
Fred. Foyston	Simcoe	sandy loam	....	15.1	17.1	14.6	14.7	10.8
Joseph Ingles	Lambton	clay loam	....	12.0	12.0	11.0	9.5	11.0

Individual results of 81 experiments, received before August 20th, 1894.—*Concluded.*

Experimenter.	County.	Nature of soil.	Previous cropping.	Yield of grain per plot.				
				Dawson's Golden Chaff.	Jones' Winter Fyfe.	Early Genesee Giant.	Surprise.	Early White Leader.
				lb.	lb.	lb.	lb.	lb.
Geo. Doe	Elgin	clay loam	oats	8.0	8.0	10 0	8.5	8.5
Chris. J. Howes	Oxford	clay	oats	10 5	10.0	12.5	7.0	9.5
Jno. M. Armstrong	Bothwell			8.0	9.0	6.6	6.0	6.3
I. L. Chadwick	Norfolk	sand loam		10.5	11.5	12.0	11·0	10.5
D. C. McBain	Elgin	clay loam	corn	21.0	14.0	15.0	14.0	17.0
Samuel Doupe	Bruce	clay loam	peas	15.0	7.5	9.5	14.0	8.3
P. McNaughton	Middlesex			6.0	13.5	12.5	11.0	8.5
Robt. G. Graham	Brant	clay loam		5.5	4.5	6.8	4.8	3.0
James Dowswell	Norfolk	sandy loam	peas	4.1	4.0	4.4	4.0	3.5
Jno. Lawson	Huron	clay	peas	10.0	10.0	9.0	9.0	9.0
Thos. Scissons	Carleton	clay	oats	12.0	5.0	13 0	7.0	9.0
Wm. Hill	Norfolk	sandy loam		12.5	9.5	7.0	11.0	6.5
S. R. Wallace	Oxford	clay loam		14.5	9.8	12.0	15.0	13.3
Peter E. Miller	Welland	clay loam		13.0	7.0	10.0	9.0	12.5
Jonathan Austin, Jr.	Norfolk	sandy loam	clover	10.0	6.0	7.0	5.0	5.0
D. M. Anderson	York	sandy	potatoes	13.0	13 0	13.0	14.0	10.0
Jas. W. Hugill	Victoria	clay loam	peas	4.0	6.5	5.5	4.0	5.5
Leonard Eaton	Leeds	sandy loam	potatoes	18.0	13.0	10.0	15.0	12.0
Geo. N. Harris	Wentworth	sand		15.0	17.0	14.0	12.5	16.0
Samuel Christie	Bruce	sandy	peas	21.0	21.5	20.5	20.0	19.5
Daniel Quinlan	Simcoe	clay		8 5	7.8	8.0	16.0	8.0
Jas. Hooper	Huron	sandy loam		8.0	7.5	7.0	6 0	8.0
J. W. Stewart	Kent	sandy loam	potatoes	8.8	8 8	11.0	9.8	7.0
Hugh Lamont	Huron	sandy loam	peas	10.0	10.0	9.0	9.5	10.5
Isaac Laurence	Huron	clay		12.5	8.5	13.3	9.0	11.8
Duncan McVannell	Perth	clay loam	peas	16.0	13.0	12.0	14.0	10.0
David Yule	Northumberland	clay loam	corn	16.0	12.0	12.0	9.0	14.0
Jas. Black	Wellington	sandy loam		12.0	13.0	11.0	12.0	9.0
Jos. E. Lumley	Simcoe	heavy clay		21.8	16.8	15.2	16.4	15.4
Jos. McMahan	Lambton	sandy loam	potatoes	22.0	16.0	18.3	12.8	15.0
Sam. Lee	Wentworth	clay loam	potatoes	21.0	20.0	20.5	21.3	19.0
Wm. Kains	Middlesex	gravelly loam		8.3	4.8	8.5	7.8	5.3
Jno. S. Gesner, Jr.	Kent	clay loam	beans & corn	19.6	21.0	17.0	17.0	14.3
W. H. Wensley	Grey	clay	wheat	10.8	14.5	4.0	10.5	14.0
A. S. Hodgins	Stormont	sandy loam	potatoes	6.0	13.0	12.0	15.0	8.0
Arthur Pearce	Brant	clay loam	oats	14.0	10.0	10.0	11.0	9.8
T. H. Medcraft	Elgin	clay loam	barley	19.0	17.0	13.5	9.5	12 5
W. J. Standen	Simcoe	sandy loam	potatoes	17.0	11.0	13.3	15.0	11.5

In the autumn of 1893, nine valuable varieties of winter wheat were selected from seventy kinds tested at the Experimental Farm. These were divided into two sets, with five varieties in each set, the Dawson's Golden Chaff being used in every instance for the sake of comparison. Each applicant chose the set he desired, and the five varieties were then sent to his address. Each plot was one one-hundred-and-sixtieth of an acre in size, and the seed was sown at the rate of one and one-third bushels per acre. One hundred and fifty-seven experimenters with winter wheat have already been heard from this season. Of this number, eighty-one favored us with satisfactory reports of carefully conducted experiments, sixty-one furnished partial reports, and fifteen wrote of failure or unreliable results. The eighty-one satisfactory reports came from twenty-six counties, thirteen of which were situated east and thirteen west of the city of Guelph. The nine varieties were grown upon the experimental plots at the Farm in exact accord with the instructions sent out over Ontario. As the Dawson's Golden Chaff was sent to every experimenter, it is possible to obtain a very reliable comparison of all the kinds distributed. The following table gives the average amount of straw and of grain per acre, of the varieties grown on eighty-one Ontario farms :

Name of variety.	Straw per acre (tons.)	Grain per acre (bush. 60 lb.)
Dawson's Golden Chaff	1.84	35.7
Jones' Winter Fife	2.02	32.5
Early Genesee Giant	1.88	31.7
Early Red Clawson	1.66	31.5
Surprise	1.73	31.4
American Bronze	1.83	31.2
Golden Drop	1.90	31.1
Early White Leader	1.80	29.2
Bulgarian	1.93	28.8

As the reports of the partial and the unreliable experiments have been discarded, and only the satisfactory ones used for the above table, this summary should be of great value and one well worthy the careful attention of the farmers of Ontario. The conclusions drawn and the remarks made by many of the experimenters indicate much thought, accuracy and good judgment.

Conclusions.

1. The 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. The Dawson's Golden Chaff was decidedly the most popular variety with the experimenters in both 1894 and 1893.

3. The American Bronze, Dawson's Golden Chaff and Early Genesee Giant possessed the strongest and the Bulgarian the weakest straw.

4. The Dawson's Golden Chaff and Surprise were the least and the Early Genesee Giant and American Bronze were the most affected by rust.

5. The Dawson's Golden Chaff and Early Red Clawson were the first to mature.

6. The Dawson's Golden Chaff and Early Red Clawson produced the largest quantity of grain per hundred pounds of straw.

7. The counties of Norfolk, Middlesex, Huron, Lambton, Bruce, Simcoe and Kent furnished fifty out of the eighty-one best reports received.

8. The average yield of the nine varieties of winter wheat tested over Ontario was 31.5 bushels per acre, and the average of the same varieties grown on similar sized plots at the Experimental Farm was 39.5 bushels per acre.

9. The general behavior of the varieties tested over Ontario was quite similar to that of the same varieties grown at the Experimental Farm.

10. Among the 156 experimenters who reported the results of their tests with winter wheat, only five speak of wishing to discontinue the co-operative experimental work, and much interest is manifested throughout.

For more detailed particulars regarding these nine varieties, as well as those of seventy-one others, which have been tested at the Experimental Farm, the reader is referred to the bulletin on Winter Wheat, which is now being printed by the Department of Agriculture, Toronto.

Distribution of Seeds.

The Experimental Union has furnished sufficient money for the distribution of two thousand five hundred packages of winter wheat over Ontario this year. These will supply five hundred experimenters with five varieties each. The following varieties have been chosen and are divided into two sets, as indicated below :

Set 1.	*Set 2.*
Dawson's Golden Chaff,	Dawson's Golden Chaff,
Early Red Clawson,	Early Genesee Giant,
Jones' Winter Fife,	Early White Leader,
Surprise,	Early Ripe
American Bronze.	Pride of Genesee.

The seed will be sent out by mail free to all applicants, and the produce of the plots will, of course, be the property of the experimenters, and in return we will hope to receive full reports of carefully conducted tests. The grains will be forwarded in the order in which the applications are received until the limited supply of some of the varieties is exhausted. The "instruction sheets" and "blank forms" necessary for the work will be sent at the time the grains are forwarded. Those who wish to join in the work the coming year may choose either of the sets mentioned above. To make the results of the most value to both the experimenters and the "Union," the five varieties should be sown in every instance.

C. A. Zavitz,
Director.

Ontario Agricultural College.

The address was made very interesting by having the summary results upon charts, which were fastened upon the wall directly in front of the meeting. A great many questions were asked Mr. Zavitz during the two hours in which he was presenting this report. The answers to the most of them, however, are embodied in the foregoing report.

STRAWBERRY CULTURE.

By Mr. T. B. Terry, Hudson, Ohio, U. S.

I always prefer to speak of a fruit garden as a whole. I am not growing berries on a large scale; we have never grown more than half an acre of strawberries. What we have done is to try and grow all we can possibly make use of for our own use, and to try and encourage farmers to do the same. One word on the fruit garden as a whole. We have about half an acre devoted to small fruits for our own use, where we grow raspberries and blackberries and currants, and we have been trying to arrange so as to grow these with the least possible expenditure and labor. We are always busy in the summer, but still we want the berries and want the best ones. For six years now we have not cultivated the ground at all, not been in there with a horse, but simply mulch the surface all over with straw nearly a foot deep; put it on early in the fall before the snow, and by spring it is pretty well gone, and we put on more in the spring. We have been doing that for six years. We get abundance of berries, and in a dry time we get almost as perfect berries as we would in a wet season. We have, one year with another, about twenty-five bushels of berries on this fifty-four rods of land. Of course, we have different varieties coming along—early red ones and late red ones, and early blackcaps and medium and late blackcaps—and the same with the blackberries and currants; so that, taken in connection with the strawberry patch, which is right close by, there is not a single day for about eleven weeks that we cannot pick half a bushel of some kind of berries out of that fruit garden.

We think there is a great deal of luxury out of a little land in that way. I have estimated some years that the actual labor put on these raspberries, blackberries and currants that I have spoken of would not exceed six dollars a year at the price we pay for hired labor. We simply pinch all the tops off the canes; we do not bunch them or tie them up at all, and then we cut out the old canes any time when we have leisure in the fall and burn them, and the next spring trim them back into a nice head shape. We are not very particular about it, cutting them, perhaps, two feet wide, the blackberries about four feet high, and the raspberries, of course, lower. I can cut them in less than a day with a pair of grape shears. Putting on this mulch and hoeing off any suckers that may come up means only two or three hours each time, and that labor does not actually cost more than six dollars a year, while there are thirty or thirty-five bushels of berries of all kinds. There is not one farmer in ten thousand has any such thing, and still at only the expense of about six dollars a year. I have been trying to encourage farmers to put out a fruit garden and take care of it. I would not like to encourage them unless they would go at it and make a success of it. We have had too many fruit gardens growing up to weeds, and there is no money in that at all.

The strawberry patch we manage differently, of course. For our own use we have set out a new bed each spring for some years back—about sixteen rods—a strip two rods by eight. Now, I would take three times this amount of land, and rotate the berries the same as we do our other crops. After you have picked the bearing bed, plow it and sow clover, and then by plowing that under you get ready to set out another bed.

A MEMBER: What time do you sow that clover?

MR. TERRY: Right after we get the berries picked in July; I have never had any trouble unless it was an exceedingly dry time. Just harrow and roll it until you get it as fine and settled as it is possible to make it; then sow the clover seed, and if it is at all moist it will come up and grow like anything. I have never failed to get a stand of clover that would be as good as the clover sown on our wheat in the spring. We set these plants in rows four feet apart, and two feet apart in the row, setting out a new bed each spring and then plowing the old one under after picking. In this way you can have the best plant in the world right on your own ground. Old strawberry plants should not be set out; you know they are not the best. We ought to have plants grown from plants that have produced no fruit and the longer you keep that up the better. From generation to generation it should be that way, and we can do that where we set out a new bed each spring. I would rather take care of a new bed than clean out an old one; and you get the best berries in the world the first year. Of course it is the second year after they are set out. For about six or eight weeks after setting out in the early spring, as soon as the ground is dry enough to work, we cultivate these strawberries just the same as we would potatoes or corn. We do not hoe potatoes and corn, but we have to do so with strawberries, because the weeder we use in potatoes would catch the strawberries out. For six or eight weeks we hoe them and keep all weeds down. Here is the secret of success. The constant stirring of clean soil is not an unpleasant job at all, and it is very cheaply done by keeping them cleaned about two months in this way. At the end of that time we let the runners grow. Do not allow any runners to grow or any blossoms to come out during these two months. Do not let them bear any and keep the runners cut off; keep them clean for the two months. In this way we get a strong, thrifty plant to start with to grow our runners on. Get the ground so free from weeds that there is very little trouble in taking care of the patch later. Of course I would not want to set out a strawberry patch where chick weed abounded. On ordinary clean land you can take care of them nicely. I would let the runners grow after about two months; of course they grow out to one side and they should be separated a little like the spoke of a waggon wheel running out from the hub, separate the runners so that they will cover all the ground. Now comes the trouble. These runners will grow too thickly; you get too many plants, and the result will be comparatively small berries not as large and as nice as we ought to have. When we had a half or quarter of an acre we practiced thinning them out. It is an extensive job, and we cannot attend to it all along through the season, so we let them grow and then thin them out till the plants stand from six to eight inches apart each way, and that will give each one sufficient feeding ground to do its best. If you take that precaution, and have good varieties and fertility enough in the soil to feed them well, you can grow berries as large as early peaches; and if you live near a large town you can get up a trade for these at a very high price. We did this with a half acre two or three years, just for the fun of it. We had some horticulturists who were growling about the berry business—no money in it, and we wanted to beat them just for the fun of it. We said if a man had something good he could sell it for a big price, so we grew fifty or one hundred bushels in this way. I suppose on a half acre we spent about twenty-five dollars' worth of time in thinning out these plants; many men would say, that was time all thrown away, fifty dollars on an acre. What was the result? We sold every berry we had at wholesale (and we did not have one-tenth enough) at four dollars a bushel, when you could buy all you wanted of common berries at $1.25 or $2.00. People would not look at common fruit at all. It was not the most wealthy people either; the laboring class in our town would not go past berries of this kind without taking some of them home. None of them were retailed for less than fifteen cents a quart and common berries sold at six cents. I simply told the grocer when I went with the first half-bushel to sell them at fifteen cents a quart and no less, and that if he did not sell them I would take them back. He said, "If I can do that I will give you twelve and one-half cents; but I do not think I can do it." But he did. This is the line on which I would work if I were going into berry growing on a large scale. The world is running over full of "ordinary" in any direction, I do not care what it is. The average farmer is in a bad way and always will be; you have got to get above the average. We have got a great many large towns and cities, and wealthy people living in them to whom a little money is of no importance. If you can get something that is extra nice they will buy it. Get the very best varieties. I would not care so much about yield per acre, because it is quality that will enable you to get the big price, and by this thinning out the plant will have a chance to do its best. In this way it will be an easy matter for me to get from six hundred to eight hundred dollars from an acre of berries, even from the little town where I live, containing only about 1,800 inhabitants. In a large city like Cleveland there is no limit hardly to the quantity that might be sold. Such berries are taken to the houses of wealthy people and sold for twenty-five cents a quart, while common berries are sold for six or eight cents.

We have always practiced mulching our berries, and I think it is very important. We keep them perfectly clean that way, and we know we are going to get a crop any way without any regard to the weather. We do not care whether it rains or not, for we are just as independent of the rain in the strawberry patch as in the potato field. I have been to berry conventions, where the growers were talking about irrigating, and how their crop would have been splendid if it had not been for the dry weather. We do not have any trouble in the dry weather at all in our berry patch. I do not see why the growers do not follow this practice of mulching thoroughly. We cover ours with ordinary wheat straw; of course this is free from weed seed and grass seed, because we do not allow any grass to get ripe on our farm. There are other mulches that would be better—marsh hay if we had that—but we use common wheat straw and spread it all over the patch, paths and plants, and just thickly enough so that we can see through. We put it on about the middle of November, but I do not think any harm is done if you put it on earlier than that. After the ground is frozen you can put it on as thick as you please—you cannot smother the plants then. In the spring when we have a rainy, misty day we rake off about half of this straw from over the plants and tread it down in the paths. Of course in the fall we hoe out these paths if they have not been kept clean with the cultivator, so that we will have twenty inches wide of path to walk in. We rake the straw off the berries and into the paths, making a double quantity there, and we tread it down; that is why we do it on a damp day, because it will pack down. I leave just as much over the plants as I think they will come up through safely and not be smothered or dwarfed. That amount of mulching will protect them on our farm (if there is plenty of plant food in the soil) against any drouth we have had. If it rains the berries will be clean, with no sand on them. All these things help when we are going to sell them at a fancy price. Then it helps very much to have lots of berries when other people do not have them. That is the way we make money in the potato field, by growing a large crop when other farmers fail. Of course this is a survival of the fittest, and it is hard on the other fellows; but I do not know any way that we can work up in the world but to fight, each man for himself, in this way. It is little more trouble to take care of the strawberries than the other fruits I spoke of. We make it a rule to go through the strawberry patch when we hitch up to cultivate after a shower. It does not take over thirty minutes. There are always three men: The hired man perhaps will go through the patch with the cultivator going twice through the row, and my son and myself will take our hoes and hoe the strip that is left and in a very few minutes the sixteen rods is nicely stirred all over. That is the first year; no cultivation the second year, the mulching takes the place of it. The cultivator we use for this purpose is a very light one with fourteen little teeth, they are so small they will not throw any dirt at all on the plants. Right next to the row we put two teeth of the harrow, end down, and the other are cultivator teeth, so we can run so close that you would look at it after we cultivated it and you would say we hoed it all.

Dr. Mills: Do you always go twice in a row?

Mr. Terry: Yes, it is necessary to go twice to do nice work, and you can do it very rapidly. I have a neighbor who follows rather a mixed system of farming and I have been trying to get him to grow strawberries for his own use. He has a number of children, and I know how well they like berries, for I have given them some lots of times. I have been trying for years to get that man to set out a strawberry patch. He came along two or three springs ago when I had just commenced working on our patch. He leaned over the fence and began talking to me. I thought there was a chance to do a little missionary work, and I said, "Why don't you set out a strawberry patch this spring? I will give you the plants if you will do it, and I will go over and help you set them out." "No," he said, "it is no use; I have got a great deal more to attend to now than I can possibly take care of on the farm." I kept right on hoeing as I was talking (it only takes a few moments to get over the patch), and that man leaned over the fence and talked to me till I got the whole patch hoed. That is about how it is with farmers who say they have not got time.

One of the most pleasant remembrances that I have had in the small fruit garden was this summer when a neighbor came along one day just as I was picking some "Shaffer" raspberries (they are very large and somewhat juicy.) He has a pair of twin daughters that he thinks about the nicest children in the world. He had one on each arm, and I had about two quarts of these berries in a can, and I stepped up before him and held them up and told the children to help themselves. They began very cautiously but soon got to work on them very rapidly. Well now, it would have done you good to see how they looked in a few minutes. I would give fifty dollars for a real nice painting of that picture. Still I cannot induce that man to set out any berries at all for these children.

I remember an old friend of mine in Chicago, a Chicago coal baron, worth many millions. He was in my Sunday School class when he was a little boy, and comes to see me once in a while. I hope he has made his millions honestly. He came to my place one time and we were standing under a tree on the lawn talking, and two of his children were with him and of course dressed in silks and satins. I suggested to them that they could go out into the fruit garden and help themselves. (They had probably never seen one before.) They soon found the way to their mouths, and as we were talking I noticed my friend look around that way, and a scowl came over his face. I looked around to see what he was scowling at. "You ought to have seen those children," he said, "they are making pigs of themselves." I said, "Jim, there is one thing certain, that with all your millions my children have some things that yours have not." He said, "You are right there; that is one of the advantages that only parties of your calling have. The farmer and his family ought to make the best of such things." Why, it is the longings of all wealthy men in cities to get out on to some land and to raise their fruits and vegetables and have something growing. There is a club in New York city composed of seventy-five millionaires—the Vanderbilts belong to it, Chauncey Depew and all these men belong too. I was invited to speak before that club last night. These men just long to get out on to some land and enjoy these things we farmers do not half appreciate.

A Member: Q. Don't you think in mulching strawberries heavily, that with a heavy fall of snow there would be a danger of smothering them?

Mr. Terry: No, sir. Mr. Crawford, of our country, says that after the ground is frozen hard he did not think two feet of manure would destroy them. I was on a patch in Black River Falls, Wisconsin, some years ago where they had actually drawn five hundred loads of manure on one acre of land in the winter when the ground was frozen solid. It did not seem to me they could possibly spread it on the land. I said, "Won't that destroy these berries?" "No," he said, "we are in the habit of doing it." The ground, of course, was frozen hard, but if you put it on when the ground is soft, then it will cause them to decay. We have practised lengthening the season in this way by putting a heavy mulch on part of our patch in the winter when the ground is frozen. If you leave a small portion of the patch without any mulch, and then mulch a third a little and a third heavier, we can extend the season about ten days. That is we can have strawberries about ten days longer and possibly more than that. The uncovered ones of course come on first, and those that have the heavier mulch are kept back about a week. The ground is kept frozen so that vegetation does not start.

Mr. PEARCE: What time do you set out your plants?

Mr. TERRY: Early in the spring; of course an expert may do it almost any time in the year.

Q. What variety do you grow?

Mr. TERRY: We have to have quite a number in order to get all the advantages that we want. One berry will be very nice to can and perhaps not as good for eating. Tart berries are better to can. The old Wilson was good. The Charles Downing is delicious to taste, but I would not want to raise them to sell at market rates. If I could sell them at fancy prices it would pay to grow them.

Q. Do you consider the Wilson the best general purpose berry.

Mr. TERRY: It was at one time, but I would be afraid to say so now. It has been running so long most growers are giving it up. We have the Stirling in place of that. It has very much the same flavor and habit of growth. It is the best berry we have got for family use.

Q. How do you plant them?

Mr. TERRY: We just plant a few for our own use. We plant with a trowel. It is handier, however, for a man to make holes with a spade and then follow with a trowel. If planting on a large scale I should mark out with a horse. The prettiest mark we ever made was with our potato planter.

Q. What width do you allow them to grow?

Mr. TERRY: For our own use about twenty-four inches, but I suppose twenty-eight would do.

Q. How do you confine them to that width?

Mr. TERRY: I cut them off in the fall.

Dr. MILLS: How do you do this thinning?

Mr. TERRY: We have done it with a sharp trowel. Simply taking out the weakest plants, and where there are too many strong ones, take them out. If we want to do our best we take the old plant out. It has exhausted itself producing runners and will not produce fruit. I would not do it myself for $200 an acre. It is quite a tedious job.

Q. Do I understand you to say that you set the plants out in the spring, and after they have been growing about two months allow them to run?

Mr. TERRY: Yes, we want to get the plant strong before we allow it to produce, and at the same time we get the land clean before we let the runners grow, and then we don't have much h ndwork after that. We do the thinning in the fall about the first of October, and the mulch is put on in the fall.

Q. Where do you take the plants from in the spring?

Mr. TERRY: Just commence at one end of the bed and take it clean as you go.

Q. What kind of soil gives the best results?

Mr. TERRY: It does not make any difference. We have berries that will do well on drifting sand or on the heaviest clay. I have seen berries that grow on sand in Wisconsin; I would not give one dollar an acre for the land, but they have to put on lots of manure. And I have seen them grow on clay that when it is dry you can nail a board down on it and it will stay there. Mr. Crawford has made a national reputation from growing strawberries on three acres of land, and has put three sons through college from that three acres of land. He has done it by high culture and by attending to every plant right up to the handle. For years he did not have a horse on the patch.

Q. What rotation would you advise for strawberries.

Mr. TERRY: Just clover. If I were doing a little market gardening I would put the land into market crops one year.

Q. Do you plow this clover down again?

Mr. TERRY: I would for the strawberries; it is the cheapest way of manuring. We do not want to take any manure from the farm for the strawberries. We have sold an even $300 worth of berries from a half acre that had no manure put on it.

Q. Is not there danger of the plant dying out on clover sod?

Mr. TERRY: Yes, if a man did not do his part; but if he will roll and harrow the land until it is settled I do not care whether it rains at all or not. It is simply making the ground firm enough. If it is fine and firm it will stand the drouth.

ADDRESS BY HON. JOHN DRYDEN.

Mr. CHAIRMAN AND GENTLEMEN,—I have been greatly interested in the discussions that have taken place on this occasion. I have always believed that the work you have in hand in connection with the Experimental Union is very important. I believe it is important because there are dollars and cents in it for the farmers of the country. What are you seeking to do? Seeking to find out what the truth is in reference to these various varieties of grain, etc., when grown under different conditions and sown at different times. Now, there is a great deal of labor in finding out exactly what the results are. These young men who have gone through the college know that Prof. Shuttleworth will take you into the laboratory and under his instructions you will be able to find out for yourself what are the component parts of certain substances submitted, and you will also learn how to combine certain elements so as to manufacture certain articles for yourself. Well defined rules govern your action. The truth has been accurately ascertained. But in order to find out the truth in grain growing we must depend entirely on actual experiments and the difficulty is that after you have found out the truth in one case you are no nearer in another; after Mr. Zavitz has discovered the truth at Guelph and after Mr. Terry has found out what the truth is in Ohio, then the true thing for them to do, as I discovered, unfortunately, is not always the true thing for me in my peculiar circumstances; with my peculiar soil, with the difference in climate in Ontario and Ohio, or, for some other reason, when I follow Mr. Terry's instructions implicitly I find I cannot reach exactly the same result. The fact is, we must all be experimenters and we should be helpers to each other in this regard.

Co operative work in this matter of experimental work is what we want. I would like to say that in agricultural pursuits there is no word I would like to impress on everybody present more than this word "co-operation." We heard a fine address from Mr. Terry last night on co-operation in marriage. I suppose you all agree with what he said and are prepared to carry out the platform he laid down. There is a great deal in it, but there is immensely more in connection with the work which the farmers of this province have in hand. I do not know anything that pains me more than to find farmers refusing to link themselves together for mutual help and benefit. There is no class of people who naturally stand aloof from one another more than the farmers. But this is a great mistake and prevents general progress. Take these experiments that are carried on in the different parts of the province. If I were a young man, and had the time, I would be one of your experimenters, and if I could get a half dozen others around me to do the same thing, how much easier it would be for all of us? I could suggest that one man take barley, another man fall wheat, another spring wheat, another potatoes, and so on. The result would be that I would receive the benefit of all these different experiments. What suits one does not suit others, but there are always a certain number of persons who are almost exactly similarly situated, therefore, they could utilize these experiments which are thus carried on. Do you think it means anything to me if I can succeed in finding out a variety of wheat and a variety of oats, or a variety of barley that would actually give me ten bushels an acre more than any other varieties? Will anybody in the country say that if we can by the work of this Experimental Union enable our farmers to secure such varieties as will accomplish this, there is no use in carrying on this work? It adds immensely to the wealth of the province, and therefore every man and woman in the country ought to be interested in the work of this Experimental Union.

Who ought to experiment for the Union? Certainly not an ignorant man such as our friend Mr. Terry has been describing. Certainly you must not have a superstitious man who won't plant his potatoes or sow his barley except when the moon is right. Nor should you have a man so full of prejudice that you cannot get any new light into his mind at all; a man who has learned long ago all there is to know about it. These are not the men who will make successful experimenters. You want an intelligent man; you want a man who has got some reasoning power; you want a man who is likely to take into consideration the various circumstances which surround the experiments.

There is in such matters great danger of jumping at conclusions. One of my neighbors, not very many years ago, was pointing out to me that his barley had been almost entirely destroyed by frost. The funny thing about it was that we had not had any frost since he had sown. The young men here know that barley is not a delicate plant, that it is not easily hurt by the frost. I have seen the ground frozen so that I could walk over it, when my own barley was just appearing through the ground, and I have seen the sun come out and take away the frost and the little tender shoots come up the same as ever. My neighbor said his barley was ruined by frost. Why did he say so? Because he saw the color was changed, it was turning yellow and some of it white. Most farmers have seen that. This man jumped at a conclusion without taking into consideration all the circumstances. If he had thought a little, he might have known we had not frost enough to do his barley any injury. If he had gone to my field he would have found barley sown two weeks before his, that did not show that indication at all. Whatever the cause, it was not frost. You need in these experiments to take into consideration all these circumstances, and I cannot impress upon you too strongly just what I said this morning about these little details. All these things must be thought of when you want to find out correctly what are the results.

Who of all the farmars in the country would be more likely to carry on successful experiments than the students who have gone through this college? Those who have gone back to their farms with all the knowledge of the experimental work here. Those are the persons, it seems to me, who ought to take an interest in it. I believe a good many of them are interested. Of course this Experimental Union started with the ex-students. But I am told by the officers of the Union there are some ex-students who do not give this work as much attention as they ought to.

If you are able, by carrying on these experiments, to produce a better quality of potatoes or to produce better strawberries, what is accomplished? You have not only benefited yourselves but you have benefited the man who lives in the city and who never sees your farm. You have brought comfort and blessing to his home. I venture to say by the work in connection with this college and the travelling dairy we have brought comfort to many a home, simply by giving people better butter to eat. It is an awful trying thing to have to submit to the torture of attempting to eat something which is not fit for human consumption. Therefore, when you produce a better article you are not only benefiting yourself by securing a better price but you are bringing comfort and blessing to those who are consumers of the article which you produce. Therefore, taking all these things into consideration, the work we have in hand, in connection with this Experimental Union, is important.

I am glad to see the work is growing; I am glad it commenced to grow rapidly about the time I began my work as Minister of Agriculture. I do not know why that should have been exactly, but I see it is the year I commenced that you began to spread out. I commenced in the latter part of 1890, and you began to spread out in 1891. The more ground you cover the more money you will require from the Legislature. I believe this Experimental Union is carried on quite as economically as any kindred association in Ontario. I believe the officers are trying to do their best in accomplishing the most good with the least money. I am seeking to stimulate all our associations; some of them have come now to think that I am generous and have the faculty of getting money out of the Legislature. I have had two or three hints from different associations that they would like to have a little more money this year. They said, "we have hard work to make both ends meet," and I said, "don't you think you can do better work when you are squeezing and tightening up a little? If I give you too much money you think you have plenty and you spend it in unimportant work. You had better try it again and you will make it go just as you did before."

I am sure this Union will in the future accomplish as much work for the good of the country as any of our associations. I am greatly interested in it. I shall be proud to declare its worth anywhere, and I tell you the truth, when I say, I would not have been here to-day were it not that I felt the importance of this meeting, and I desired by my presence and voice to give you all the encouragement I could. (Applause) I can assure these young men that I did not come here because I had nothing else to do. I am busy every day, but it is very pleasing to know that one can labor in work such as that in which I am engaged, and do some good for the country. My politics all lie in that direction. There are one or two gentlemen from London here. I told the people in London that I considered good work was the best politics. I meant what I said. I believe this Union is doing good work and I would like all the young men to be interested in it. I hope when they return home they will connect themselves with this Union and send for some samples of seed for experimental purposes.

It is necessary for all to be interested in the work. If we ever see the day when the farmers of this country, recognizing a common interest, will take each other by the hand and recognize that they are brothers in every sense; that when they are helping another they are surely helping themselves, then we shall have better farmers, better institutions, better legislatures, and a great deal more success than we have now. It is towards that end we are working in connection with this Experimental Union, and I once more appeal to the young men here to use their influence to help all they can in carrying forward this very important work. (Applause.)

REPORT OF THE COMMITTEE ON HORTICULTURAL EXPERIMENTS.

By H. L. Hutt, B. S. A., Agricultural College, Guelph.

The report of the Committee on Horticultural Experiments this year is not one of resultsattained, but of progress made. In the past the work of this committee has been principally in testing varieties of potatoes, and different methods of growing these. This year it was thought advisable to give over this work to the Committee on Agricultural Experiments, and to devote our attention to the testing of varieties of fruits.

A start was made in this direction last year, when two sets of experiments were outlined and the plants for twelve lots of each set sent out.

No. I experiment was a test of four varieties of strawberries: Haverland, Williams, Wilson and Bubach No. 5, under the hill and matted row systems of cultivation. Two dozen plants of each variety were sent to each experimenter.

No. II was a test of three varieties of raspberries: Cuthbert, Marlboro' and Golden Queen, under pruning at different heights, viz.: 1, 2, 3 and 4 feet. Eight plants of each variety were sent to each experimenter.

In response to enquiries sent out this year as to the results of these experiments only seven replies have been received, most of these reporting that owing to one cause or another the experiments had been a failure. Our most valuable conclusion arrived at from these experiments is that it is inadvisable to expect successful reports from experiments quite so complicated. In the future we will feel quite satisfied if we can get simply the reports of yields from different varieties all under the same treatment.

In accord with this conclusion the experiments drafted for this year were much simpler, all being variety tests as follows:

I. Testing four varieties of strawberries: Wilson, Bubach No. 5, Williams and Bedderwood—12 plants of each.

II. Testing four varieties of red and white ras[illegible]rries: Marlboro', Cuthbert, Shaffer's Colossal and Golden Queen—6 plants of each.

III. Testing four varieties of black raspberries: Souhegan, Gregg, Palmer and Tyler—6 plants of each.

IV. Testing four varieties of currants: Fay's Prolific, Victoria, Raby Castle and White Grape—3 plants of each.

With but $50 for this work, only fifteen lots of plants for each experiment could be sent out, or in other words only sixty experimentors could be furnished with plants with which to experiment.

Two hundred circulars were sent out, inviting farmers and fruit growers to co-operate with us in carrying on these experiments. In response to these, 103 applications for plants were received—43 more than could be supplied. The plants were sent out from the nursery of E. D. Smith, of Winona A circular giving full instructions for planting and caring for the plants was prepared and sent to each experimentor. This circular also contained a blank form on which to report at the end of the season as to how many of the plants had lived and what growth they had made. No yield of fruit of course, could be expected from any of them this year.

In all 47 reports have been received as follows: 9 on strawberries, 13 on red and white raspberries, 14 on black raspberries and 11 on currants.

Some of them report partial failure on account of the lateness of planting and the extreme drought during summer. Sufficient reports of complete success have been received, however, to warrant us in looking for valuable results in a year or so. From the strawberries we may look for results next year. We are much pleased with the willingness which experimentors have shown to co-operate in this work, and after it has had a little time to develop, we expect to obtain valuable results and hope next year for a larger grant to enable us to extend the work.

HORTICULTURE IN CONNECTION WITH AGRICULTURE.

By Elmer Lick, Oshawa.

Without a thorough knowledge of the essentials to success in any occupation, favorable results from our labors cannot be expected. There is no occupation open to man but requires careful consideration before it is entered upon. On virgin soils this may not be as necessary as in this Ontario of ours. The time has passed when a good crop can be expected under unfavorable conditions. In fact, the past season has shown that unless we as agriculturists perform our operations in the best possible manner we may look for poor results. One of the essentials to success in horticulture, as in all pursuits of life, is the man. The horticulturist must have a liking for his business, must feel that the trees or plants he grows are living things, with needs and wants. He must study these needs and wants. He must also study how best to supply these needs and wants. A suitable soil is one of the necessities. A soil that is best suited for peaches will not be as satisfactory for apples, although under proper treatment both may be made to do fairly well. A suitable climate for the crop grown is also necessary. It would be useless to attempt to grow here at Guelph peaches, or even some varieties of apples, which would do well along the shore of Lake Ontario. A good market at no great distance from home for small fruits and other perishable fruits is essential to their profitable growth. For apples it is apparent that England is to be the market for most of our surplus. For this market, it is essential that only varieties having good shipping qualities with good size, color and form be sent. Nearly all varieties of fall apples should not be sent to that market. Poor and second-class stock of winter varieties are a great detriment to the reputation of our Canadian apples. Having briefly mentioned the above there yet remains two other essentials, with which we wish more particularly to deal. The first of these is the question of manure. This is a very important consideration in horticulture. Where can suitable manure be obtained? It is universally accepted that farmyard manure is the best fertilizing agent known for orchards. It is somewhat uncertain whether commercial fertilizers can be economically used for the production of apples. These will supply the chemical requirements, but the humus of the farmyard manure is of great benefit in loosening the soil and acting as a mulch and assisting in retaining moisture. If it can be shown that commercial fertilizers can be substituted for farmyard manure in the profitable growth of apples, then horticulture can be successfully managed separate from agriculture proper. The second question that requires attention is the work connected with it. There must be help sufficient to perform the various operations at the proper time; pruning in March, plowing or other cultivation in May and June, picking and marketing, in case of apples, in October. In May and June it may also be necessary to spray or use other means to overcome insect and fungous enemies. These must all be performed at the right time or loss is certain to follow.

Having said this much about horticulture, let us enquire what branches of agriculture will give the necessary time and manure without hampering the agricultural operations. Dairying, to my mind, is one of the best, if not the best branch of all. There is only one time of the year when dairying and horticulture will clash to any extent as to time and attention required by each, that being the month of October, when apples must be picked and also a month when cows need greatest care, as it usually is weather requiring stabling and feeding. However, an extra hand will overcome this difficulty. Dairying is one of the most profitable branches of farming, and when combined with hog-raising may be reasonably made to use up all rough grains grown on the farm, with a considerable quantity of purchased food in the shape of bran, oil cake, cotton-seed cake and other foods rich in manurial properties. I wish to be understood as strongly advocating this as the cheapest and most satisfactory method of procuring manure for our orchards, and that, too, without impoverishing the soil of our farms. There is, however, one provision necessary in order that the above statement may be correct, and that is, the acreage devoted to horticulture must not be too large a portion of the whole. My own idea on this is that not more than four acres of each hundred should be devoted to horticultural purposes. If this four acres be an apple orchard a dressing of eight to twelve loads per acre each year of farmyard manure may be reasonably expected to give profitable returns for the labor and manure used in the orchard. The feeding and fattening of cattle may be made to take the place of dairying, but unfortunately is not as profitable at the present time, although it may be in the near future. Grain growing and horticulture cannot be made to go together without one or the other being neglected. In dairying and horticulture the best care and treatment will pay, and anything less will not pay. Many of the branches of farming can be made to pay on a large scale where a company engages overseers and help. I do not expect that these two branches will ever come under large companies or syndicates. There is one insurmountable barrier, that of a personal interest, which is, to my way of thinking, more necessary than in any other occupation. For this reason I think that dairying and horticulture are safe branches for the farmer to engage in if other conditions are favorable.

In the neighborhood in which I reside there are several forceful illustrations of the profits to be derived from an apple orchard. In one instance south of us, a small orchard of about two acres has paid more than any 10 acres, of a very productive farm. This year this orchard produced 187 barrels of apples which were sold at $1.50 per barrel. This orchard has averaged nearly this for a term of years. Another orchard to the east, has done nearly as well, and would have given better results had there not been too many fall apples. One of our own orchards sometimes exceeds $200 per acre, and averages over $100 per acre. These are exceptionally good returns, but show that there are large returns under favorable conditions. On the other hand another person has 30 acres of orchard without any additional farm. He uses but little manure, cultivates fairly well, complains that he does not get apples, thinks his orchard is too thick, and notices the leaves ripen and fall early in October. It is needless to add that his returns are far from satisfactory. In conclusion I would like to impress this one idea: Do not undertake more work in horticulture than you have time and manure for. Remember that there is no crop that will pay better, but on the other hand their is no crop in which the risks are greater. A few days' rain at blossoming time, heavy winds in fall, or heavy crops in all portions of the world may cause very poor financial results.

Mr. KENNY: I find there is a great deal of uncertainty with regard to the returns of our orchards. I know numbers who had two and three hundred barrels of apples three years ago that this year did not have thirteen barrels in their orchards. Hail swept through and they had hardly an apple left. With regard to manure, I believe ashes are about the bes to put around our trees; not piled up agai st the trunk but scattered around the roots. Some one has said you might just as well feed a horse oats around his hind legs as to put ashes around the trunk of a tree.

The CHAIRMAN: Do yo spray your apple trees?

Mr. LICK: We have about thirty acres of orchard, and this year we have had a lot of other work thrown on our hands, and I have never been able to get down to the spraying. There is another difficulty we have to face--a difficulty I have been trying to overcome. My father got it in his head that he could make five acres of orchard pay, and used to put near all the manure raised on that orchard. And that orchard certainly produced more apples than any other orchard during the last ten years in the Province of Ontario; but the other two hundred acres of land were not treated fairly. I have had the management for the last four years, and I am trying to manure the other land, and not altogether neglect the orchard.

A MEMBER: What varieties do you grow?

Mr. LICK: The most paying are the Baldwin, Greening, King, Pippin, Golden Russet and other varieties; we have a few Northern Spies and Rhode Island Greenings.

A MEMBER: Are you troubled with the wood being tender?

Mr. LICK: No; we are just east of Toronto on the shore of Lake Ontario.

Q. Did not you find the Baldwins subject to black heart?

Mr. LICK: A great many orchards in our locality are troubled in that way, but there seems to have been great care exercised in selecting our trees, and very few of them are troubled with black heart; the greatest trouble we have had was that ice storm a year ago which hurt many of our trees and destroyed many of our bearing ones. The Cranberry Pippin being a straight tree, it nearly destroyed the whole of them. They are nearly equal to the King as a selling apple in the English market.

Q. Have you tried wood ashes as a manure?

Mr. LICK: It is difficult to get them, everybody burns coal. We put a few wood ashes in the orchard—but not enough to give us a good result as to their value.

Q. Did you notice the Northern Spies rot this year?

Mr. LICK: I noticed that nearly all our apples rotted this year. What few apples we did have are being sold on the English market, and I am shaky about the result, for on handling them over we have found an apple that was apparently sound and if we squeezed it a little hard we found our finger went through and it was rotten in the centre.

A MEMBER: I thought one cause of this was the continued drouth and then wet and growing weather following, which gave a second growth and that growth has been too rapid and not as firm as it should be.

A MEMBER: Would you use wood ashes in place of barnyard manure, or in addition to it?

A MEMBER: I would use wood ashes altogether if I could get plenty. Spread within a few yards around the trees, especially the pears, and you will find it of great use.

Mr. MONTEITH: I think we need considerable nitrogen and phosphoric acid also in connection with the tree in order to give it that vigor that will carry blossoms through an unfavorable spell of weather. We plow our orchard in the latter part of May or early in June, sow buckwheat and harrow it early. If the buckwheat comes to anything we sometimes harvest it or allow the hens and turkeys to do so.

A MEMBER: I think it is a great mistake having trees too thick. If I were planting an orchard I would have them forty feet apart; you cannot grow anything if they are too close together.

A MEMBER: I do not want to grow anything except apples. If I can get an average of $100 per acre after paying all expenses, I am satisfied.

Q. Could you do that?

A. We have been doing it; of course we did not do it this year.

MR. HUTT: I think all young orchards should be kept cultivated. Keep them cultivated till they come into bearing. I never would stop that cultivation as long as the trees give good results. I am not in favor of plowing in the orchard. The orchard should be kept cultivated from year to year without plowing, by cultivation like that and manuring. If after a time the trees begin to show a tendency to woody growth, then allow them to go a year or two in sod. You can sometimes check that woody growth as soon as the orchard has been a year or two in sod this way. It is also well to protect it by manuring. I think there is no manure better adapted for apple trees than wood ashes. They contain all the inorganic elements that go to make up a tree. It is the tree burnt down. Of course nitrogen is necessary, but we can get enough of that in the soil. That question of growing clover on the soil I am not quite certain of yet. I would not seed down with clover and plow it down again, but give good cultivation without plowing at all. The most important thing in apple growing has been neglected, and unless we follow up spraying there will be more orchards rooted out. The question of spraying is one that we must pay attention to. There is an apple rot they call "bitter rot," but if trees are properly sprayed with the Bordeaux mixture the fruit will not be so liable to this rot. The first spraying should be the copper sulphate solution, about one pound to fifty gallons of water. This should be applied before the leaves come out, and it will kill any spores of this fungi that may be on the branches of the trees. Then later on, as soon as the leaves come out, before the blossoms open, spray them with the Bordeaux mixture, and after the blossoms have formed give them another spraying; and this may be repeated once or twice after that at intervals of ten days or two weeks. Of course Paris green should be used with that for the codling moth.

POTATO CULTURE.

MR. T. B. TERRY, HUDSON, OHIO.

I have spoken of growing the clover in spite of dry weather, and I think perhaps I will talk in this direction as regards potato growing. How can we get a crop in a so-called poor year? Any man can grow potatoes when you have a good season, but how are we going to get a good crop when the conditions are against us? That seems to me the most important point I can speak of. The whole subject is too large to go into in a single day. In the first place, as a foundation, in most cases more vegetable matter is needed in the soil. We have farmed our lands perhaps for a long time, and they are becoming hard and solid. The vegetable matter is largely used out of them, and you cannot get the best results in potato growing until you get that back. Old men in our locality have often told me how, when they were boys, they could plant potatoes around where I was, and in the fall kick them out by the bushel without having done any work upon them. They cannot do it now, for a man has to work hard to get a crop. Is it not wise for us to try to get this old position back? We are trying to do it largely by clover growing. We cut one crop for hay, and then turn the second under, and in that way we are gradually increasing the vegetable matter in our soil. This will help us in getting a crop in a dry year. The more vegetable matter you have in the soil the more water it will hold. Mucky soil will hold a larger quantity of water, simply because there is more vegetable matter in it. When we have this foundation we then want to pay attention to the tillage of the crop so as to save all moisture during the growing season. I might say that in our land with this clover mulch, through the fall and winter and spring, it very rarely lets any water run off on the service, and that obliges the land to soak it down, and enables us to store up water in a wet season. Then we have it there the next year to draw on.

There is hardly ever a season that water enough comes from the clouds to supply what moisture the crops need We have to depend on the water stored up in the sod as well, and we draw on that during the dry weather as we want it. If we let nature manage this she is very wasteful of this water; we must manage it ourselves and prevent loss. The very best way would be to mulch the surface, as I spoke of this morning, as we do in the small fruit gardens. But it is not practicable on a large field. The only practicable way there is to stir the surface two or three inches deep and form an earth mulch as we call it to check the evaporation of moisture. You know that water is constantly working up during the dry weather through the soil to the surface. If we let that water come right up to the surface it will be rapidly evaporated by the sun and wind, and if we stir the earth up the water keeps coming up to this stirred surface and is spread around among the roots of our crops. We might save hundreds of barrels of water on an acre of land by careful attention to this point. We cannot say, as our fathers used to, that we will cultivate once a week or once in ten days. No, we have got to cultivate just as soon as the land is dry enough to go on to, after each shower. No matter if we cultivate the day before and it rains that night, we must go on the next morning. Of course we do not always know that it will help us, because we may have plenty of rain in the future, but the only way is to act as if every shower we get is the last we are going to have that summer. Once in two or three years it will pay tremendously when we have a dry season. Do not think this is all theory, because I can assure you that it is a scientific fact. We have made thousands and thousands of dollars on our little farm by just paying attention to this one point, which has long been taught us by science. We have sold as high as twelve or fifteen hundred dollars' worth of potatoes in one year to farmers living right around us, beginning with our very next door neighbor. We have had men come to our door and take potatoes at 75 cents and $1 per bushel, and these men all planted some in the spring and didn't have any in the fall; and we had them to sell to them and made a profit on them that no trust in our country has dared to make. Why did we have them and these men not have them? Because we paid attention to these scientific points that have long been taught us—getting vegetable matter into the soil and then by careful attention seeing that there should not be any unnecessary waste of moisture. You young men of course know that it takes about 400 to 500 pounds of water to grow one pound dry weight of weeds. Is not there a practical lesson in that to us farmers? Many men would think they had a pretty clean potato field if there was not more than 300 or 400 pounds of weeds on the acre. Just figure up how many tons and tons of moisture these few weeds have taken out of that soil. In a wet year it does not make much difference, but in a dry year it is very great, there is not enough moisture for both weeds and plants. When we take these two points into consideration, the plant food used up and the water used up, it makes a great difference. If we want to grow a crop of potatoes in a dry year we do not want to let any weeds grow. The weeds should never see daylight in our farming operations in any of our crops—that is, hoed crops. Of course we do not sit up all night to get the last weed out of our crops, but practically I believe we could have carried on a wheelbarrow all the weeds you could get on ten acres of our potatoes last year. I have had visitors before now point to one and feel quite triumphant to think they had found a weed. Now, I am not at all afraid to make a statement, that I can grow a crop of potatoes—not of course a large crop, but say 150 bushels per acre of early potatoes, planted early—and carry them through on the spring moisture without a drop of rain from the time they are planted until they are done. I have come so near doing this that I actually know it can be done, simply by paying attention to these points I have spoken of, getting vegetable matter in the soil and then taking care all along the line of tillage. We have sold potatoes in a dry year for a price that would net us after paying the whole cost of production and 6 per cent. interest on the value of the land at $100 per acre—a price that would net us more than the price such land sold for in our locality. These are facts, and does it not pay to give our attention to these points? In fact, if I could have my choice I would have a so-called poor year every year, for these are the years that farming pays best if followed up. You may, however, think that it would cost too much to till a crop so thoroughly, but really it does not cost any more than it used to cost an acre in the old way.

We have implements now that will do the work very rapidly. A man growing a few potatoes of course cannot afford machinery for doing this work, and hence I think in the future we must look for the most success where potatoes are grown as a special crop. Where a man grows enough of them to make it a business, he gives his whole attention almost to it. We use the Thomas Smith harrow. After the crop is planted until they come up, going over the ground probably three times on an average; 20 acres are done in ten hours without any trouble, and it keeps the ground perfectly clean from weeds. Fifteen or eighteen years ago we would let the weeds and potatoes grow together, and when they got up we would go through with the cultivator and tear up all we could and then go through with the hoe for the rest of them. How silly that was, for the weeds had used up the plant food and moisture out of the soil. Now they come up in perfectly clean land, and we use a lighter smoothing harrow after they are up, known as the weeder. There are several different kinds made. This is drawn by one horse, and takes two rows at a time; it stirs up the soil where the land is clean and reasonably free from stones and not heavy. You cannot get the best success of course growing potatoes on very heavy land; you must have a moderately light soil. On such soil this weeder will do a good deal of work in one day. It will go over about fourteen acres and cultivate and hoe them thoroughly. Keep the surface stirred up so that the weeds are destroyed while they are just about to start in the soil, and they never get started. So the work is not any more than many farmers put on a field in a bad year. They do as much work, but they have not the implements to do it so rapidly. We have now very many implements to reduce the cost of production. We can grow a crop of potatoes now and put them on the cars for just half the money we could fifteen years ago, and on the average we get as much for them as we used to; so you see there is a good chance to make a good deal more money out of them. That is one of the advantages of giving your attention especially to some single line of farming.

In the line of planting we put them in very much deeper than we used to. A potato planter will open the furrows and drop the seed and cover four or five acres in ten hours if the field is large; however, it won't do perfect work, but where the soil is sandy and light the planter will do. Our soil is heavy, most of it being a strong loam, and we find we cannot use a planter to advantage. We have gone back from the planter to the old way of planting; we have to drop by hand and it costs about $1 per acre. The best way on earth to mark out for potatoes is to mark the furrow with the plow. All your operations ought to be loose for the potato crop, exactly the reverse of the wheat crop. For wheat and corn make the ground solid. To plow out the furrows as we used to do fifteen or twenty years ago, one at a time, is too slow, so we attach two plows to a sulky. We had an arrangement made on purpose. I went to the carriage shop, and sat over the man till I got it done. We have two plows attached to the axle of the sulky, one with a right and the other with a left hand mould board, with the mould boards towards each other—good sized one-horse plows. We can gauge the depth by the sulky wheels, so that we can mark out on our clover sod, after having cut the sod and turned it up. Then the furrows are turned up together between the rows, and we have it in shape so that we can reverse the operation and turn over two rows at once, with another instrument something like the snow plow drawing the other ends to. These implements are the best I know of for planting and covering the potatoes. There is no patent on them; you can make them if you wish to. By plowing two furrows at once you can do it faster. We have got our rows so uniform that we can go once in a row and do good work on both sides. We have a field so long, and only go the long way of the field, and thus reduce the cost of production. There are hundreds of such little points, and you could not begin to figure on them, which we have studied just to produce the crop a few cents less every year. That is the way we have brought it down in the last fifteen years.

Q. How wide do you keep your lands?

Mr. TERRY: We have about six acres in each strip. We have six strips of about six acres each, and we plow each one in a land by itself, as a rule. We waste a little time in going across the ends. We have actually figured out that the loss of potatoes on one row where a dead furrow was, would more than pay for the loss of time in drawing the plow across the ends. That is a small matter, but there is possibly two or three dollars gone in that way on the field.

When it comes to handling the crop after it is grown, we have managed to reduce the cost of production one-half in that line. Not over fifteen years ago we used to dig potatoes and pile them in the field when we could not haul them to market as fast as we dug. We would select a spot large enough to make a fifty-bushel heap and then carry them to that heap. I have had forty heaps in that way in a field. Now, it is a great deal of trouble in handling these over. It took time to carry them together, it took time to get straw and cover up, and it took some time to pick them up from the pile with your hands. We found this took too much time, and we got bushel boxes made by the hundred that would hold a bushel level full, and we carted the boxes directly to the basement of the barn where we have storage for the potatoes, and we emptied them there on the floor, where we could shovel them up and not have to handle them, and they keep in better shape, and they are under cover and safe. We sort them, as a rule, when we pick them up. We manage to grow them in a good year so that we do not have any little ones. Take the Early Rose or Clark's No. 1, and we have grown a good many acres where the little ones would not pay for a man's time to pick them up. We scatter these boxes all down through the field, and two men pick up together. We take alternate rows, and give each man a row to pick up. They have just one thing to do. The men will complain that they could pick these up so much faster if we let them pick them all up clean. We put watchers on to watch them, and invariably they picked them faster when they have one row to pick up. If they are picking two rows at a time they waste their time. When there is just one row to pick they pick that row, and when they get the box full they leave it there. In that way we handle the crop for a good deal less money. We dig by machinery. There are two or three diggers made now on the elevator plan. They are very successful. The one we use cost $125. It is drawn by four horses. We dig four or five rows first thing in the morning, and then I take the leading team off, hitch them on to the wagon that will hold seventy-five bushel boxes in a load, and go down through the fields and scatter these boxes. I get to the back end just as the men have picked them up down there, and they set the boxes in the back of the wagon, and I will pile them up. It takes about ten minutes to put on a load of forty or fifty bushels, and I go to the barn and empty them and get more boxes. As soon as the men need more dug, we hitch on to the digger and dig more. Three hundred bushels is a very ordinary day's work. We have often put in about four hundred in one day with about four men. We calculate a good man will pick up about one hundred bushels. Of course in a poor season it would require more help. The larger the potatoes are the faster you can pick them up. I never feel so much that a farmer is somebody as when I get on that digger, and manipulate three levers and do the work of about fifteen men and do it easily. Not a great many years ago the horses stood in the barn and did nothing, while I paid men to dig the potatoes up by hand. This elevator digger takes them entirely from the ground up in the air, and free from vines and dirt. They are shook and left right on the surface of the ground in a narrow row behind, about eight or ten inches wide.

A MEMBER: Why let your potatoes back on the ground after you get them dug

Mr. TERRY: That is a thing the manufacturers have been trying to get over for a long time, but they cannot, because no machinery can tell the difference between a potato and a clod of earth or a stone. On perfectly clean, sandy land, such as they have in New Jersey and Delaware, you might do it after a fashion; still I do not think you would be satisfied.

A MEMBER: Do you let your potatoes dry before picking them.

Mr. TERRY: No. Of course if they were wet enough that the dirt would stick to them it might be better; the potato keeps in the ground moist, so what is the good of drying them?

A MEMBER: In sorting them how deep would you put them in the cellar?

Mr. TERRY: Four feet; or three feet would be better. I had a pile sixty feet long and four feet deep right through the basement of the barn. Of course if there were any rotten ones you would not dare do that, but in an ordinary year we do it. I have given you an idea of how we have worked to reduce the cost of production. Now, I often go by a farm in our locality where there is a farmer and his son, a full grown young man, working along in the old way just as we used to work twenty odd years ago. They put the potatoes in and let the weeds and the potatoes grow up together. They put them in and plow one furrow at a time. The old gentleman holds the plow and the young man leads the horse, and they cover them in the same way. There are thousands of farmers who do not do much better. They take them up by hand in the fall, and by the time they get these potatoes they cost them more than they are worth. They had better work out for somebody for wages. That man is growing poorer and poorer right along, while we are growing richer and richer. It comes from taking one line of business best adapted for our soil under the circumstances, and studying over it in every way. That is the way in which we have made a little money on our farm. We may check the evaporation of moisture better if we would cultivate three or four inches deep. The soil was made for the roots to grow in; we want to disturb the roots as little as possible. Before our potatoes are six inches high the roots are all over between the rows. Two inches will check the evaporation all right, and won't disturb the roots to amount to anything. When you hill up your potatoes you tear up the roots, and in a dry year this would be injurious; and more than that, if your soil is at all heavy when you hill up the potatoes you make a nice lot of ditches between the rows and allow the water to run off when the showers come in summer, and that is the worst thing you could do. Water is what you want in the potato field.

A MEMBER: How do you select your seed?

Mr. TERRY: We prefer to take the best potatoes. Practically we take the best portion of the field to take our seed from. For some years I followed up by selecting the best hills and the best tubers in the hills, and by so doing we found we could improve the variety. This is hardly practicable for extensive growers.

A MEMBER: About how many eyes do you leave?

Mr. TERRY: We cut to one eye, but I would not advise you to do it unless you understand all the conditions. You want fertile soil, plenty of vegetable matter and sound seed that is not sprouted, and then the best of cultivation. I can grow more dollars per acre from seed cut to one eye than in any other way. We commenced cutting at the stem end; but the first eye at the stem end is often a weak one; if it is a little bit of an eye we pay no attention to it. We just cut with a slanting cut. When we get up to the upper end and have a piece left about the same size as the other piece, there is a cluster of eyes on that and usually one or two eyes around the edge separated from the cluster. We just shave off the cluster and throw it away, thus destroying that cluster of eyes and leaving one or two eyes at the edge. Then you have a piece which is as good as the other ones; it would not do to split that cluster up to one eye. I would rather plant just after I cut. We plant the seeds from twelve to fifteen inches apart in the row, according to the variety, and according to the size we want the potatoes. If you want large ones plant a little further apart.

Mr. TERRY: We have not had much trouble with the Colorado bug of late years. All we do is to pick the first beetles that appear for the first few days, perhaps two weeks, and after that there are not many come on.

Q. How do you handle seed potatoes from the time you pick them?

Mr. TERRY: We put them in the cellar first. As soon as the earth is cooler than the cellar, which would be early in November, we bury them outside and keep them there till spring, making two air spouts overhead. That is, we put on a covering of straw and then a covering of earth and when frozen in the winter put two or three feet of straw mulch over the whole end, covering it all over deep,, keeping the frost out in that way. We can keep early potatoes till pretty near the first of June, before sprouting.

Q. Do you ever sprout the seed for early potatoes?

Mr. TERRY: No. I would rather they would not start at all until put in the ground. If you wanted to have early ones you might do it, but for field culture I would not do it. I know some have done it, but I see nothing gained by it. Potatoes that lie in the ground all winter are the ones that come up the strongest in the spring.

Q. How deep do you put them in?

Mr. TERRY: Four inches on our drained land; but if the land was not drained that might be too deep.

Q. If you don't hill them at all won't these large varieties get sunburnt?

Mr. TERRY: Practically we cannot grow them without hilling a little. There is a little dirt turned to them. I suppose the ridges are two or three inches higher than between the rows.

Q. How far apart are your rows for early potatoes?

Mr. TERRY: We have settled on 32 inches, perhaps 33 would be better, because that would give you exactly six rows to the rod. If you want them larger plant them a little further apart.

Q. What varieties do the best?

Mr. TERRY: We have made most money out of potatoes like the early Hebrons, New Queen, Clark's Number One. Of course that is largely a matter of locality, there are farms in our township where potatoes will not do well, that do well for me. No man can tell except by actual experiments on his own land what potatoes are best to grow.

Q. Did the Freeman do well with you?

Mr. TERRY: It does with this exception that it is inclined to start a great many potatoes, and they cannot all grow large. By cutting to one eye and planting far apart we have good results. If I wanted to grow the most bushels possible on an acre, if my life depended on it, and I could have everything I wanted to work with, I would grow the Freeman, but to grow to ship by the carload I would not do it, because they would not sell on their merits. I can grow a larger, coarser potato that will sell better in a market where they are not tested.

Q. What style of weeder do you use?

Mr. TERRY: I have two kinds of weeder, the Original weeder, but Bread's Universal weeder is the best one I have.

Q. Do you try seed potatoes from different soils?

Mr. TERRY: It is better to get seed from a soil better than your own. We send north for our seed because it is better. Up in the northern part of Maine the potatoes grow splendidly.

Q. Have you tried fertilizer on your potatoes?

Mr. TERRY: We have tried it, but with no good results whatever.

Q. You strongly advocate underdraining, and then you say for this potato growing you want to retain the moisture?

Mr. TERRY: The underdrain only takes up the surplus water that would be injurious. It is not taking the water from the subsoil but simply from the seed potato, the surplus that would otherwise be injurious. The water does not run away when it comes from the crops when the drains are properly put in. The water should soak down into the earth, and fill the earth up and when it gets all the water it wants it runs off and with plenty of vegetable matter in the upper soil it holds more there.

A MEMBER. I thought if we had a dry season it would be better to stop up the outlet.

Mr. TERRY: It is a fact that on well tile-drained land in a dry season you could raise better crops than you can on land that is not well drained. I always do my own tile draining. I won't trust anybody else with it, because it is something like a doctor's mistake—they are all buried, you cannot tell anything about them I do not put any straw on top of the tile, I put the tile close together. I generally lay the tile from two and a half to three feet deep. Some of them are put in four feet, where our subsoil is heaviest we put tile in every two rods.

Vote of Thanks to Mr. Terry.

Moved by Dr. Mills, seconded by R. F. Holtermann, that the members of the Experimental Union and others present return their sincere thanks to Mr. Terry for the very excellent addresses with which he has favored them; that they express their high estimate of Mr. Terry's ability, and their appreciation of the great services which he has rendered to the cause of agriculture on this continent. They have been greatly pleased with the simple, direct, and eminently practical character of Mr. Terry's addresses; and they beg him to accept this very inadequate expression of their appreciation. Carried.

TREASURER'S REPORT.

——	Dr.	Cr.
	$ c.	$ c.
To balance from last year, including members' fees	75 03	
" Government grant	700 00	
" Additional members' fees	12 50	
By grains, fertilizers, postage, expressage, printing, etc. (agricultural experiments)		454 47
" small fruit plants, printing, postage, etc. (horticultural experiments)		50 00
" bees, printing, postage, etc. (apicultural experiments)		28 46
" printing (committee on botany and entomology)		5 00
" reporting, editing, etc.		95 00
" travelling expenses of officers, printing programmes, circulars, etc.		52 51
" Secretary's salary		25 00
" expenses of speakers at meeting		44 76
" balance on hand		32 33
Total	787 53	787 53

Auditors' Report.

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.

(Signed) { L. W. Lang,
T. F. Patterson.

After considering the requirements of the different committees on experiments for 1895, Messrs. Holtermann and Lick were appointed a committee to wait upon the Honorable Minister of Agriculture, with the object of having the Government grant increased to $1,000 during the coming year. The Union was grateful to the Government for the grants received in the past, but believes that the value of the results of the co-operative experiments are worth many times their cost to the farmers of Ontario. The committees on agricultural, horticultural and apicultural co operative experiments could all extend their work over Ontario to great advantage with the grant increased to $1,000, but the work cannot be extended much beyond its present scope unless the grant to the Union be increased for 1895. A new committee on live stock Experiments has been appointed at this meeting, and if this committee carries on any co-operative experimental work, some money will also be required for this.

After a vote of thanks to the retiring officers had been passed, the sixteenth annual meeting of the Agricultural and Experimental Union was brought to a close at about 5 p.m.