NINETEENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEG

AND

EXPERIMENTAL FARM

FIFTEENTH ANNUAL REPORT

OF THE

AGRICULTURAL AND EXPERIMENTAL UNIO

1893

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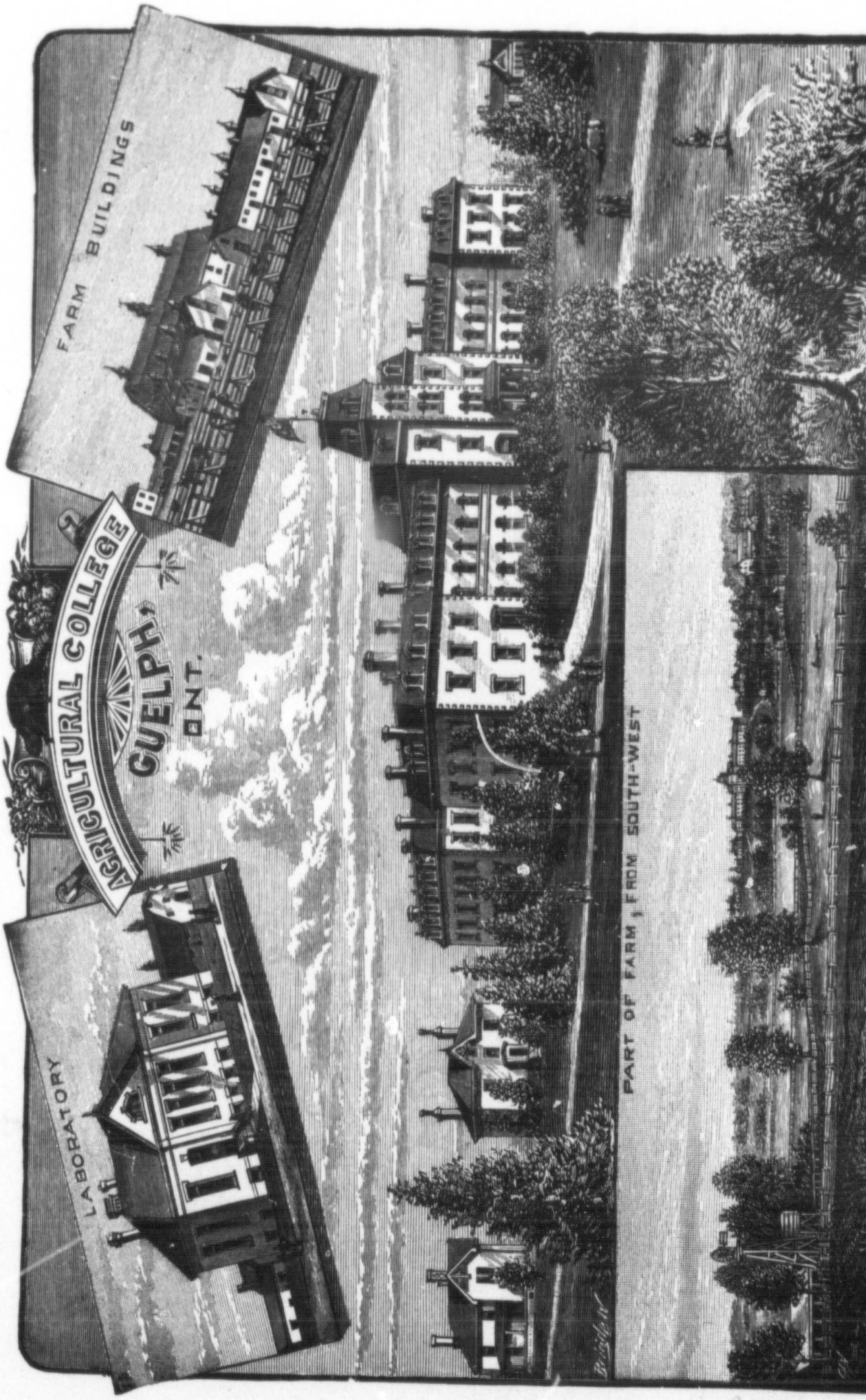
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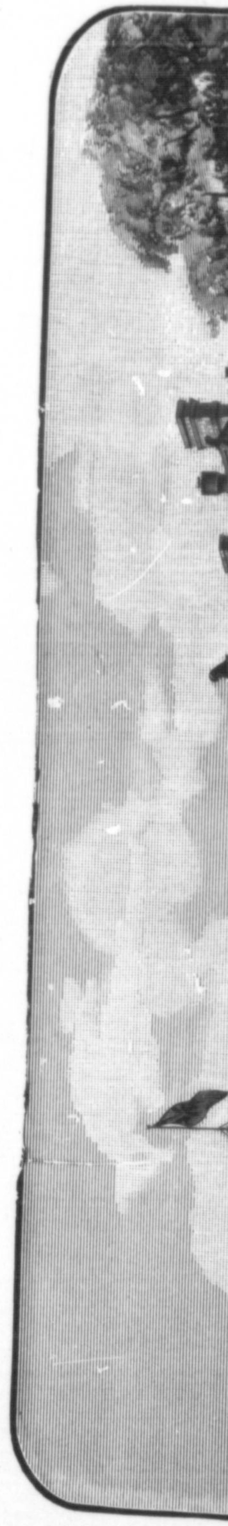

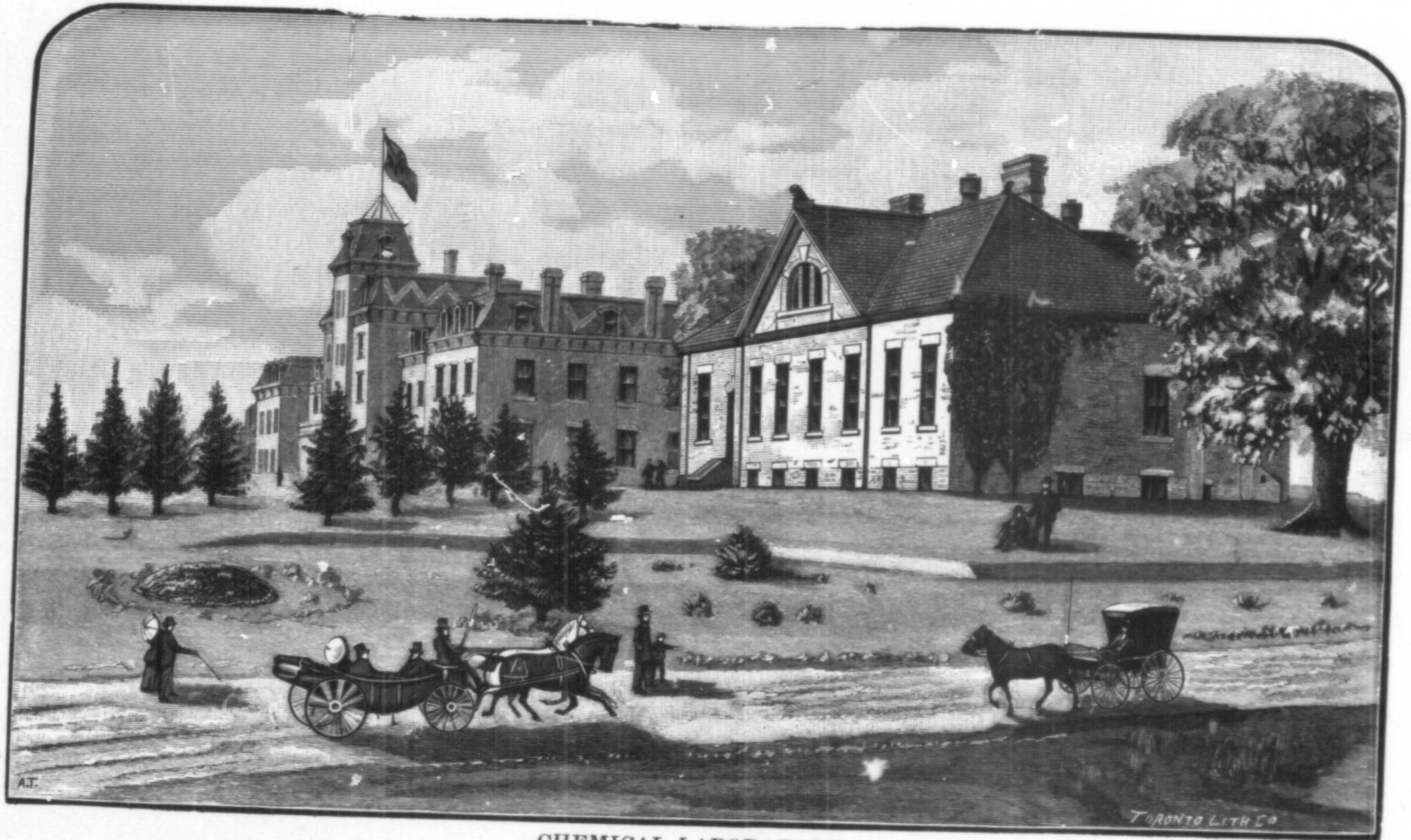

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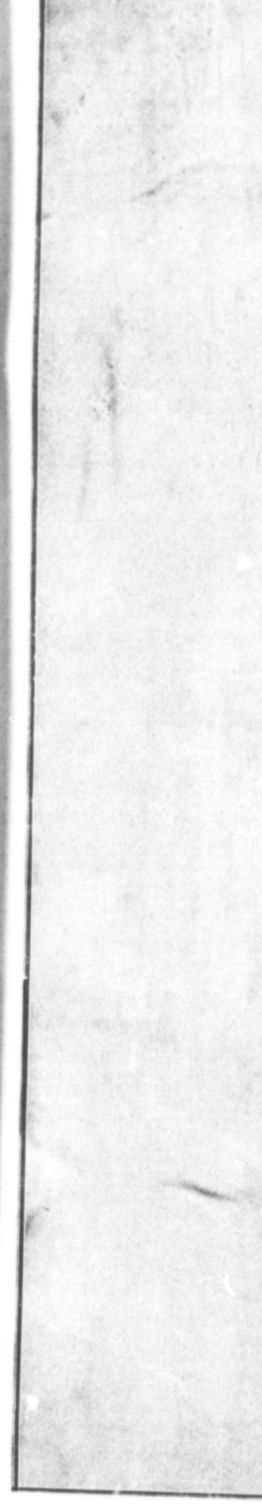

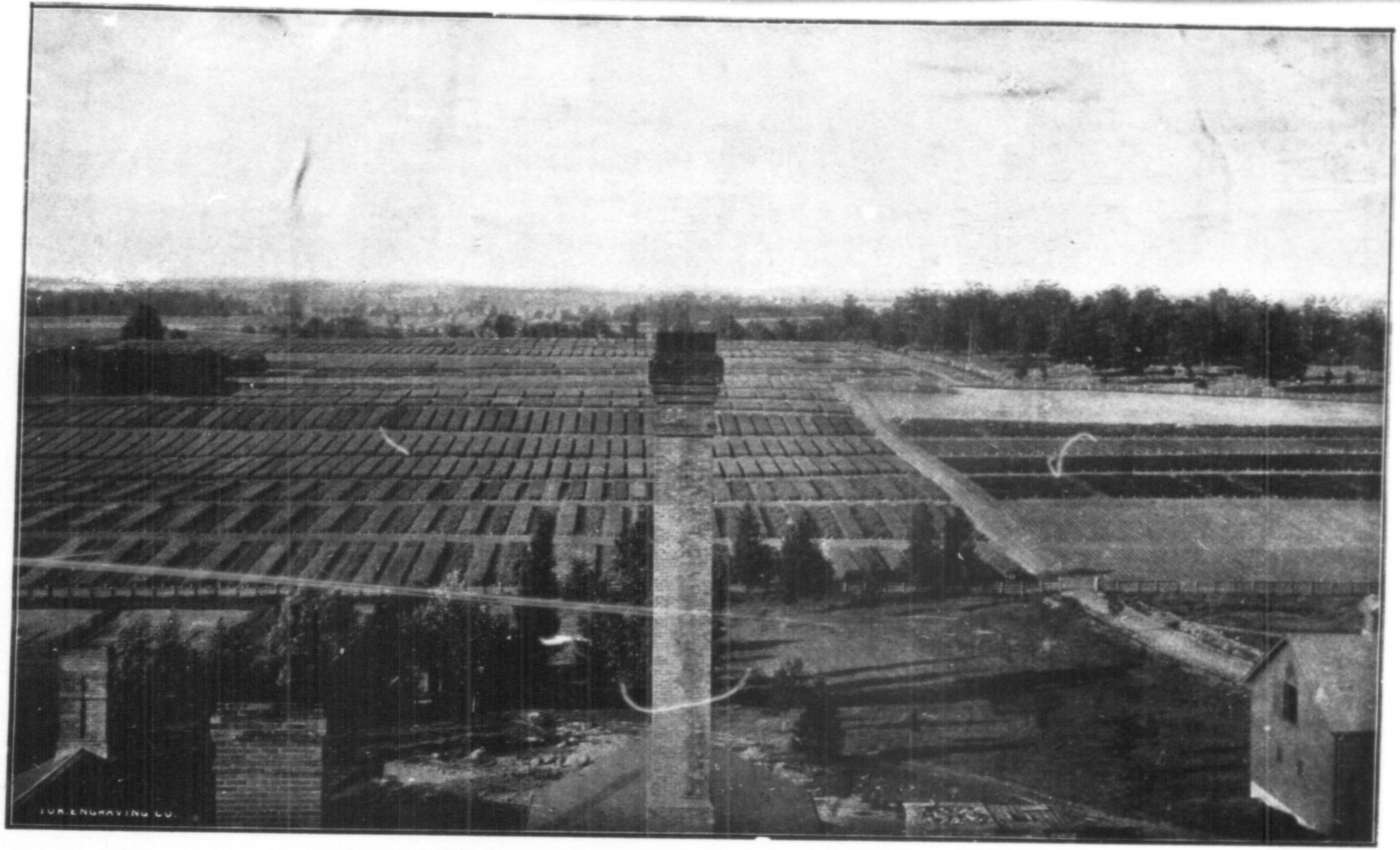

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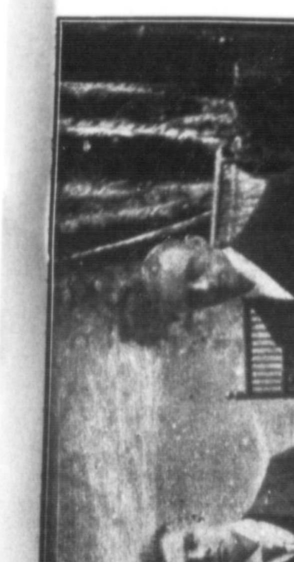
ONTARIO AGRICULTURAL COLL

Ontario Agricultural College Exhibit at the World's Columbian Exposition, Chicago, 18



STAFF OF O. A. C. REVIEW

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To the Honorable Jo

DEAR SIR,—I h

the Ontario Agricult

In this Report

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NINETEENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND EXPERIMENTAL FARM.

GUELPH, January 2nd, 1894.

To the Honorable JOHN DRYDEN,
Minister of Agriculture:

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

In this Report we have reviewed briefly the work of the year 1893, under the following heads:

PART I. REPORT OF THE PRESIDENT.
PART II. REPORT OF THE PROFESSOR OF GEOLOGY AND NATURAL HISTORY.
PART III. REPORT OF THE PROFESSOR OF CHEMISTRY.
PART IV. REPORT OF THE PROFESSOR OF VETERINARY SCIENCE.
PART V. REPORT OF THE LECTURER ON HORTICULTURE.
PART VI. REPORT OF THE LECTURER ON AGRICULTURE.
PART VII. REPORT OF THE FARM SUPERINTENDENT.
PART VIII. REPORT OF THE EXPERIMENTALIST.
PART IX. REPORT OF THE PROFESSOR OF DAIRYING.

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, under Control of the Minister of Agriculture.

OFFICERS, 1893.

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.,	Lecturer on Agriculture.
H. L. HUTT, B.S.A.,	Lecturer on Horticulture.
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.

PART I.

REPORT OF THE PRESIDENT.

In consequence of an extreme pressure of work, my report for 1893 will be shorter than might be expected from the President of an institution which receives so much attention at home and abroad as the Ontario Agricultural College and Experimental Farm.

PROGRESS.

Those who have visited our College from time to time have observed, above everything else, that our history has been one of continuous progress in the improvement of our equipment, the enlargement of our staff, and the extension of our work. The year 1893 has not been an exception in this respect. It has been marked by progress on several lines—the completion of our greenhouses, the construction of a large farm piggery, the erection of a dairy building and two dairy cottages, the appointment of a lecturer on horticulture, the organization of a summer school for teachers, and the commencement of a home dairy course for farmers' sons and daughters.

STUDENTS IN ATTENDANCE.

The attendance of students is quite satisfactory. We began the year with all rooms occupied; and in October last we had applicants for every vacancy. The total number on the roll in 1893 was as follows:

Regular students	186
Dairy students	60
	246

To these may be added an attendance of 34 at our summer school in July last, making a grand total of 280.

For the information of those who wish to know the facts regarding our attendance, I may repeat what I have often stated, viz., that the number on the roll for the whole year is always considerably larger than the number in attendance in any particular term. This is due to the fact that the associates and graduates of each year leave on the 1st of July, and new students are admitted to take their places. The following table shows the attendance for the last sixteen years, and indicates the places whence our students have come:

Comparative Statement of Attendance.

Year.	Ontario.	Other Provinces.	British Isles.	United States.	Other Places.	Total.
1878	122	18	6	....	....	146
1879	141	18	3	....	....	162
1880	142	25	8	1	....	176
1881	164	33	18	1	1	217
1882	144	27	30	1	4	206
1883	134	34	30	2	2	202
1884	120	32	32	2	2	188
1885	103	28	41	....	3	175
1886	94	20	33	....	2	149
1887	78	12	20	....	....	110
1888	91	9	26	....	5	131
1889	94	10	22	1	7	134
1890	107	16	17	1	5	146
1891	103	9	16	1	3	132
1892	131	10	13	1	4	159
1893	207	15	18	1	5	246

Students in General and Special Courses for Last Fourteen Years.

1880—Students in General Course	166	
Students in Short Winter Course	10	
Total		176
1881—Students in General Course	199	
Students in Short Winter Course	18	
Total		217
1882—Students in General Course	181	
Students in Short Winter Course	10	
Students in Special Live Stock Course	15	
Total		206
1883—Students in General Course	187	
Students in Special Live Stock Course	15	
Total		202
1884—Students in General Course	162	
Students in Special Live Stock Course	26	
Total		188
1885—Students in General Course	170	
Students in Special Live Stock Course	5	
Total		175
1886—Students in General Course		149
1887—Students in General Course		110
1888—Students in General Course		131
1889—Students in General Course		134
1890—Students in General Course		146
1891—Students in General Course		132
1892—Students in General Course		159
1893—Students in General Course	186	
Students in Dairy Course	60	
Students in Teachers' Course	34	
Total		28

Other Places.	Total.
....	146
....	162
....	176
1	217
4	206
2	202
2	188
3	175
2	149
....	110
5	131
7	134
5	146
3	132
4	159
5	246

TEEN YEARS.

166
10
... 176
199
18
... 217
181
10
15
.. 206
87
15
.. 202
62
26
.. 188
70
5
.. 175
.. 149
.. 110
.. 131
.. 134
.. 146
.. 132
. 159
36
60
34
. 28

ATTENDANCE IN FALL TERM 1883 AND 1893, THE YEARS RECENTLY SELECTED F
COMPARISONS.

Fall Term, 1883—In General Course	94	
In Special Live Stock Course	15	
Total		109
Fall Term, 1893—In General Course		111

Without the dairy students, we have had 147 from Ontario in 1893. See the Co lege roll in Appendix I.

CLASSIFICATION OF STUDENTS ON ROLL IN 1893:

Students in the general course:

Third year	23	
Second year	53	
First year	110	
		186
Dairy students		60
Total		246

COUNTY STUDENTS.

Each county in the Province is allowed to send one student free of tuition. Th nomination is made by the County Council. Of those on the roll in 1893, fifty were so nominated, and as a consequence, were exempted from the payment of tuition fees. The counties represented were the following:

Brant, Bruce, Carleton, Dundas, Durham, Elgin, Essex, Frontenac, Glengarry, Grenville, Grey, Halton, Huron, Kent, Lambton, Lanark, Leeds, Lennox, Lincoln, Middlesex, Muskoka, Norfolk, Ontario, Oxford, Parry Sound, Peel, Perth, Peterboro', Prescott, Prince Edward, Renfrew, Simcoe, Stormont, Waterloo, Wellington, Wentworth, York.

FEES.

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

RELIGIOUS DENOMINATIONS.

Students in General Course:

Methodists	62
Presbyterians	53
Episcopalians	45
Baptists	13
Congregationalists	6
Roman Catholics	4
Friends	2
Evangelical Reform	1
	186

Dairy Students:

Methodists	25
Presbyterians	21
Episcopalians	5
Baptists	5
Roman Catholics	3
Congregationalists	1
	60

Students in General and Dairy Courses.

Methodists	87	Congregationalists	7
Presbyterians	74	Roman Catholics	7
Episcopalians	50	Friends	2
Baptists	18	Evangelical Reform	1
		Total	246

Ages of Students in General Course.

8	16 years of age.	4	24 years of age.
23	17 "	5	25 "
30	18 "	2	26 "
17	19 "	5	27 "
25	20 "	4	28 "
31	21 "	1	29 "
17	22 "	1	30 "
12	23 "	1	32 "

Average age—21 years.

Changes in Staff.

Several changes in our staff have taken place since the issue of our last report. H. B. Sharman, B.S.A., Assistant Chemist, resigned his position on the 1st of August, and the vacancy was filled by the appointment of Robert Harcourt, B.S.A., on the 1st of December. On the 1st of October, John McCrae, our Assistant Resident Master, returned to the University to complete his course, and J. B. Reynolds, B.A., was chosen as his successor. Prof. Shaw left for Minnesota at the same time; and his place was filled by making C. A. Zavitz, B.S.A., head of the Experimental Department, appointing G. E. Day, B.S.A., Lecturer on Agriculture, Live Stock, etc., and placing Wm. Rennie of Swansea, in charge of the farm. As Farm Superintendent, Mr. Rennie devotes his whole time to the management of the farm and live stock, and the control and oversight of men and students at work. By this arrangement, the office of Farm Foreman has been dispensed with, and the services of J. E. Story, who has held the position since July, 1887, are no longer required.

Horticultural Department.

We have had an efficient foreman in this department from the beginning, but until this year we have never had anyone to discharge the functions of Professor of Horticulture—one who would devote his whole time and attention to work and instruction in this department. We have often felt the need of such an officer, but, till recently, we have not had the buildings and other appliances necessary to warrant the appointment of a professor.

In 1891, we constructed four new greenhouses, and erected a large botanical laboratory. The laboratory, which contains a class-room and offices for the Horticulturist and the Professor of Botany, was completed and furnished in 1892; and during the summer of 1893 we built two additional greenhouses, and divided one into sections for practical work by students. These houses are now completely furnished, and ready for the most thorough and advanced work in botany and horticulture. Everything being in shape for satisfactory work, H. L. Hutt, B.S.A., was appointed Lecturer on Horticulture in May last. Mr. Hutt was brought up in the Niagara district, is an enthusiastic horticulturist, and enters upon his duties with everything in his favour. I have faith in his ability and industry, and have no doubt that he will do work which will be of much benefit, not only to our students, but to the country at large.

LIBRARY AND BIOLOGICAL DEPARTMENT.

For some time past the Professor of Natural History has been in a general w responsible for the reading-room, library, and museum. Till the end of 1892, a stude was employed to put papers on file in the reading-room, and attend in the library stated intervals; but this arrangement became more and more unsatisfactory, till length we had to ask for the appointment of some one to look after the reading-room, ta charge of the library, and assist Professor Panton in a variety of special work in conn tion with his department.

No one has yet been appointed to this work, but F. C. Harrison, B.S.A., has fai fully and efficiently discharged the duties of the position since the 1st of May la During the spring and summer Mr. Harrison gave some attention to the library a reading-room, but spent most of his time in looking after Prof. Panton's botanic instruction beds, performing certain experiments under the direction of Prof. Panto collecting and arranging plants and entomological specimens, and taking note of inse pests and their ravages in this vicinity. During the fall and early winter he has be making slides for the magic lantern, and preparing and mounting objects for microscop work in the second and third year classes, but has spent the greater part of his time arranging and indexing books in the library. Henceforth we hope to make the libra more useful to our students.

FARM PROPER.

About 330 acres of our College land is managed as an ordinary farm. Work in th department has gone on as usual throughout the year. Our cattle have done fairly wel Our sheep also are in good health, and look much better than usual. We have a floc of very nice young rams and ewes, of different breeds, which we hope to sell by auctio in September or October, 1894. Our pigs have paid much better than anything els this year. As yet we have only three breeds—Berkshire, Tamworth, and Improve Yorkshire—but in the large farm piggery recently built, we have room for two or thre other breeds, and we may possibly try the Chester Whites and Poland Chinas next year.

The sides of the road north of the College grounds were plowed last spring, an allowed to rot during the summer. In the early part of October they were plowed a second time, and in November the work of straightening and grading began. This work was done chiefly by the students in charge of Mr. Story, the Farm Foreman, under th direction of Mr. Rennie, our new Farm Superintendent. The whole road, sides an centre, is now in splendid shape, and the work done upon it will be a great improvemen to that side of the College grounds.

Mr. Rennie has also graded the road leading from the College to the experimenta grounds. He also spent a good deal of time in paving the sides of this road and in ridding up the unsightly [illegible] which for a long time has been a discreditable eyesore below the carpenter shop and implement shed. That part of the grounds now looks as neat and tidy as any other section of the College lawn.

I mention these last two items under this head, because the work was done by the Farm Proper.

EXPERIMENTAL DEPARTMENT.

Our experimental work has been carried on with vigor throughout the year, especially in testing varieties of grain, dates of seeding, and methods of cultivation.

On the plots at the College, Mr. C. A. Zavitz, our experimentalist, tested 70 varieties of winter wheat, 73 of spring wheat, 73 of barley, 133 of oats, 81 of peas, 3 of buckwheat, 157 of potatoes, 54 of Swede turnips, 37 of fall turnips, 49 of mangels, 10 of sugar beets, 33 of carrots, 93 of fodder corn, 10 of millet, 2 of sunflower, 12 of rape, 18 of clover, and 40 of grasses. He has also tried different dates of seeding on 16 plots, mixtures of grain on 107 plots, application of different fertilizers on 30 plots, different methods of cultivating fodder corn, potatoes, and roots on 150 plots, methods of preparing potatoes for planting on 20 plots, and miscellaneous experiments on 161 plots.

To this may be added some live stock experiments, conducted under the supervision of Mr. Zavitz, as follows:

With steers	2 experiments	6 animals.
" cows	1 experiment	4 "
" lambs	3 experiments	160 "

For detailed information on the nature and results of all these experiments, see report of the Experimentalist in Part VIII. of this volume.

In addition to the experiments at the College, the following valuable work has been done under the control and supervision of our Experimentalist, with the assistance of a committee appointed annually by the Ontario Agricultural and Experimental Union:

Co-operative Experiments in Agriculture, conducted by Ex-students of the College and other interested Farmers throughout Ontario.

Numbers of Experiments.	Names of Experiments.	Number of Plots required for each Experiment.	Class of Experiments.	Number of Plots used for these Tests by Farmers over Ontario. 1891.	1892.	1893.
1	Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure, with oats...	5				
2	Testing nitrate of soda, superphosphate, and no fertilizer, with rape............	3	Fertilizers.	70	165	322
3	Ascertaining the relative value of three varieties of millet....................................	3				
4	Growing Lucerne as a crop for fodder...........	1	Fodder crops.	196	470	894
5	Testing six promising varieties of fodder corn	6				
6	Testing five promising varieties of turnips........	5				
7	Testing five promising varieties of mangels.......	5	Root crops.	350	705	1230
8	Testing five promising varieties of carrots........	5				
9	Testing six promising varieties of spring wheat...	6				
10	Testing six promising varieties of barley	6				
11	Testing six promising varieties of oats	6	Grain crops.			
12	Testing four promising varieties of peas..........	4		2026	4348	4735
13	Testing four promising varieties of winter wheat..	5				
				2642	5688	7181

There were 1,204 experimenters over Ontario in 1893, and 7,181 plots were used for the tests. See report of Experimental Union after Part IX. in this volume.

Dairy Department.

Our Dairy Department has kept pace with the rapid growth of interest and enterprise in dairy matters throughout the Province. We have, I think, led the van in one or two instances, especially in the matter of dairy instruction—in our Dairy School at the College, and by means of the Travelling Dairies throughout the Province.

Our Dairy School last winter was in every sense a marked success, and the app cations for admission being so many more than we could accept, we decided that should make an effort to increase our accommodation. The Minister of Agricultu promptly taking in the situation, authorized the necessary expenditure, and we went work—completed our dairy stables, enlarged our cheese-curing room, put in a ne engine, built a dairy waggon shed and two dairy cottages, and let the contract for a lar dairy building for milk-testing and butter-making on the factory plan. The result that we now possess one of the most complete dairy establishments to be found an where on this continent. We have commodious dairy stables, with a circular si attached and a waggon shed close by, an annex containing a cream separator run by tre power, a dairy piggery, and dairy cottages for our head dairyman and dairy cattlema also apartments for a home dairy course, and a cheese-room, butter-room, separator-roo and laboratory for work on the factory plan; likewise a large lecture room, a live sto class-room, and a general business office, with cloak, sitting and bath-rooms for bo ladies and gentlemen—all heated by steam and well ventilated.

The following is a copy of the special dairy circular which we issued on the 15 December:

DAIRY SCHOOL.

Our Dairy School, opened on the 1st of February last, was an experiment. Whe our first special dairy circular was issued, we were doubtful as to what the result wou be. Our misgiving, however, soon came to an end. The attendance was all we cou desire. Our instructors did their work satisfactorily; and, at the end of the sessio both students and teachers were more than satisfied. As a consequence, the Dairy Scho is now an established department of our College work.

A large new dairy building has been erected, which will enable us to accommoda twice as many students as we had last year. We have enlarged our cheese-curing roo and are putting in four new cream separators, of different kinds; new vats, churn workers, etc., in the butter department; and a complete outfit in a large new room fo milk-testing.

With these new applicances, in addition to new lecture and live stock rooms, ne library, sitting rooms, cloak and bath-rooms for both ladies and gentlemen, we hope t be able to give a very thorough, complete, and in every way satisfactory course o theoretical and practical instruction in milk-testing, cheese-making, and butter-making.

Length of the Course.

The school will open on the 15th of January, and continue in session for two months. When the dairy students leave, the instructors will devote their attention to our regular students for half a month.

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 book-keeping, explaining fully the decimal system.

Lectures will commence at 8.30 a.m., and will continue for one hour, after which the students will be distributed to the different departments for practical work. A portion of each afternoon will be devoted to discussions by instructors and students on special points, and difficulties to be overcome, in milk-testing, butter-making, cheese-making, etc. Some time will also be spent in discussing the best methods of fee ding, salting, watering, and managing dairy cattle.

Practical Work.

Students will be sent in rotation to (1) the cheese room ; (2) laboratory for milk-testing ; (3) cream separator, and (4) churns, butter-workers, etc. When possible some latitude will be allowed in the selection of work ; but as a rule, the regular rotation will be followed. Work will commence immediately after the morning lecture and continue until each student has finished the part assigned to him, including all necessary cleaning, tidying up, etc.

In the butter department, full and detailed instruction will be given in the operation of Cream Separator, Butter Extractor, and other machines, and in the handling of cream, the making, printing, and packing of butter, etc. In the Cheese-room, practical object lessons will be given daily on the best methods of making cheese on the factory plan, and full instructions as to the use of rennet tests, the proper care and curing of cheese, etc. Likewise, in the Laboratory full information, with practice in the testing of milk, will be given daily throughout the course.

Some attention will also be given to the judging of butter and cheese. Samples will be obtained from time to time : the students will be required to judge them by points ; and their judgment will be compared with that of experts.

Home Dairy Course.

For those who do not want, or cannot take, the factory course, we have provided a short Home Dairy Course. This is intended especially for farmers and their sons and daughters who may wish to learn something about the latest utensils and appliances used in private dairies; the best methods of setting milk and handling cream ; the important points in churning ; the salting, working, printing, packing, and marketing of butter ; the use of the Babcock milk-tester, and the running of cream separators by hand, tread power, and steam.

Students in the Farm Dairy Course will have the privilege of attending all lectures given to students in the factory course. A portion of our dairy building has been set apart exclusively for home dairy work ; and our own butter-maker will devote his undivided attention to the students in this department from the 15th January to the 1st April, 2½ months.

Applicants for this course, may commence on the 15th January, or at any time thereafter and remain as long as they think proper. Those who apply, will please state when they wish to enter and how long they propose to stay.

Instructors.

The following instructors will take charge of the work in the different departments, under the control of H. H. Dean, Professor of Dairying :

1. In Cheese-making. Instructor, Adam Bell, Tavistock, Ont.

Assistant, T. B. Millar, Burgoyne, Ont., Instructor and Inspector of Western Dairymen's Association.

2. Milk-Testing. Instructor, L. A. Zufelt, Chesterville, Ont.

3. Cream Separators. Instructor, H. L. Beckett, B.S. A., under the supervisio the Instructor in butter-making.

4. Butter-making. Instructor, Mark Sprague, Ameliasburg, Instructor of Creame Association of Ontario.

Assistant, John McTavish, Travelling Dairy butter-maker.

5. Home Dairy Course. Instructor, F. C. Rogers, our own dairyman.

Certificates.

Certificates of standing will be given to those who pass all prescribed written a practical examinations—some during the course and a more difficult one at the clo The standard for passing is 40 per cent., ; for second-class honors, 60 per cent. ; and first-class honors, 75 per cent.

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

(1) by at least two years' experience as manager, one which must be subsequent his college course.

(2) by sending monthly factory reports during at least one season to our Professor Dairying ;

(3) by passing a satisfactory inspection as to cleanliness, tidiness, and quality 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 th course.

Incidentals. A payment of $5 in advance for incidental expenses will be require of all students in the regular course. Also, a deposit of $2 to cover possible breakag This sum of $2, or a portion of it, if not required for breakage, will be refunded when th student leaves.

Board and Lodging can be obtained in Guelph (a mile and a half from the Colleg 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 b worn in the Dairy—white and blue gingham dress, with white cap and white apron, fo ladies ; and white linen or cotton suit, with white cap and white apron, for men.

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

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

Home Dairy Course. A charge of $2 for incidential expenses, and a deposit o $1.00 to cover breakage. The latter, if not required, will be refunded when the studen leaves. One suit of working clothes will be sufficient for this course. Board and lodgin the same as for the regular course.

A Prohibition.

Smoking, tobacco-chewing, and spitting in any of the dairy buildings are strictl prohibited.

Ladies Invited.

Ladies are invited to take this course—the full course, a portion of it, or the Hom Dairy course. The latter is specially intended for them. Five ladies took the course las year, three of whom passed all the prescribed examinations and received certificates. Two of them came out near the head of the list.

Travelling Dairies.

Our Travelling Dairies have continued their work during the year, 1893. They started out on the 1st May and returned on the 28th November. One of them was in charge of W. L. Carlyle, B.S.A., with John McTavish as his butter-maker; the other was represented by G. E. Day, B.S.A., till the early part of September, after which date the work was done by H. L. Beckett, B.S.A., with Jas. Hume as his butter maker.

The counties and territories in which the dairies worked during the season are the following: Lambton, Huron, Bruce, Grey, Dufferin, Simcoe, Ontario, Durham, Peterborough, Victoria, Muskoka, Parry Sound, and Algoma. A considerable amount of time was spent in the northern territories, including Manitoulin and St. Joseph's Islands.

The whole of Ontario has now been covered, excepting Halton, and parts of Peel and York. These counties are, of course, entitled to the same consideration as other portions of the Province, and some districts are asking for a second visit. Hence I would recommend that one of these dairies be kept at work for another year, at least.

For a full account of the year's work in the Dairy Department, see Prof. Dean's report in Part IX. of this volume.

Class-Room Work.

Our class-room work has gone on as usual during the year. Twelve candidates wrote for the degree of B.S.A. in the University of Toronto, eight of whom passed in everything and four were starred in one subject each—three in drawing and one in Latin. A fair proportion of the first and second year students gained a respectable standing in our College Examinations, but the number of failures is still much larger than it should be. (See class-lists in Appendix IV. at the end of this report.)

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:

D. Z. Gibson, B.S.A., Willow Grove	2nd Year Chemistry.
T. C. L. Armstrong, M.A., LL.B.,	2nd Year Literature.
Professor W. J. Alexander, University College	2nd Year Literature.
J. M. McEvoy, B.A., LL.B., University College	Political Economy.
E. L. Hill, B.A., Guelph	2nd Year Botany.
William Tytler, B.A., Guelph	1st Year English.

Bachelors of the Science of Agriculture.

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

Beckett, H. L	Hamilton, Wentworth, Ont.
Bell, T. G	Q'Appelle, Assa., N.W.T.
Burns, J. A. S	Halifax, Nova Scotia.
Crealey, J. E	Strathroy, Middlesex, Ont.
Curzon, S. R	Norbiton Place, Surrey, England.
Day, G. E	Guelph, Wellington, Ont.
Dyer, W. D	Columbus, Ontario County, Ont.
Eaton, L. W	Dartmouth, Nova Scotia.
Harcourt, R	St. Anns, Lincoln, Ont.
Shaw, R. S	Guelph, Wellington, Ont.
Soule, A. M.	Niagara Falls South, Welland, Ont.
Story, H	Picton, Ont.

"To take supplemental examinations before admission to the degree of B.S *Latin*, Burns; *Drawing*, Curzon, Eaton, Story."

Messrs. Eaton and Story have since passed the required examinations and recei their degrees.

Recipients of Associate Diplomas

Twenty-three, having completed our regular course of two years, were examined Associate Diplomas. Of these, nineteen passed in all the subjects, and four were star as indicated in the list. The diplomas were presented by the Hon. G. W. R Minister of Education, at our closing exercises on the 30th of June, and the names of recipients are as follows, excepting the four that have stars opposite their names:

Atkinson, James	Seaforth, Huron, Ont.
Burns, J. H	Kirkton, Perth, Ont.
*Brooks, W. C	Brantford, Brant, Ont.
Brown, W. J	Dunboyne, Elgin, Ont.
Conn, Joseph	Heathcote, Grey, Ont.
Cooper, W. W	Kippen, Huron, Ont.
Dean, Fred	Harley, Brant, Ont.
Elmes, W. A.	Princeton, Brant, Ont.
Ferguson, J. J	Smith's Falls, Leeds, Ont.
*Hamilton, C. A	Leamington, Hastings, England.
*Hay, Leopold	Ruda, Guzowska, Poland.
Husband, E. M	Cairngorm, Middlesex, Ont.
Kennedy, P. B	Sarnia, Lambton, Ont.
*Lehmann, R. A	Orillia, Simcoe, Ont.
McCallum, W	Guelph, Wellington, Ont.
McCrimmon, W. D	Glen Roy, Glengarry, Ont.
McNaughton, K	Walkerton, Bruce, Ont.
McMordie, R	Kippen, Huron, Ont.
McKenzie, W. G	Fairview, Oxford, Ont.
Phin, A. E	Hespeler, Waterloo, Ont.
Roper-Curzon, A. C. H	London, England.
Spencer, J. B	Brooklin, Ontario County, Ont.
Stewart, J	Snake River, Renfrew, Ont.

*To take Supplemental examinations: Brooks, in English Literature: Hamilton, i Geology and Inorganic Chemistry; Hay, in Hydrostatics and English Literature; Leh mann, in Analytical Chemistry.

First-Class Men.

The work in the College is divided into five departments, and all candidates who ge an aggregate of 75 per cent. of the marks allotted to the subjects in any department, ar ranked as first-class men in that department. We would like to have a larger number o 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 1893, arranged alphabetically:

First Year.

1. *Atkinson, John*, Seaforth, Ont.—In three departments; Agriculture, Natural Science, and Mathematics.
2. *Buchanan, J.*, Hensall, Ont.—In one department; Agriculture.

3. *Christian, A. L.*, Danforth, Ont.—In one department ; Mathematics.
4. *James, D. A.*, Nilestown, Ont.—In one department ; Mathematics.
5. *Kennedy, W. A*, Apple Hill, Ont.—In three departments ; Agriculture, Natural Science, and Mathematics.
6. *Macfie, C. M.*, Appin, Ont.—In five departments ; Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
7. *Newman, W. M.*, Gilbert's Mills, Ont.—In one department ; Mathematics.
8. *Pettit, F. E.*, Burgessville, Ont.—In one department ; Mathematics.
9. *Robertson, G. A*, Kingston, Ont.—In four departments ; Agriculture, Natural Science, Veterinary Science, and Mathematics.
10. *Rowe, G. F.*, London, England.—In one department ; Natural Science.
11. *Werry, M. J.*, Tyrone, Ont.—In three departments ; Agriculture, English, and Mathematics.
12. *Wheatley, John*, Blackwell, Ont.—In two departments ; Natural Science, and Mathematics.

Second Year.

1. *Atkinson, James*, Seaforth, Ont.—In five departments ; Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
2. *Ferguson, J. J.*, Smith's Falls, Ont.—In five departments ; Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
3. *Kennedy, P. B.*, Sarnia, Ont.—In one department ; English Literature.
4. *McCallum, W.*, Guelph, Ont.—In four departments ; Agriculture, Natural Science, Veterinary Science, and Mathematics.
5. *McKenzie, W. G.*, Fairview, Ont.—In three departments ; Agriculture, Veterinary Science, and Mathematics.
6. *McCrimmon, W. D.*, Glen Roy, Ont.—In one department ; Veterinary Science.
7. *McMordie, R.*, Kippen, Ont.—In one department ; Veterinary Science.
8. *Phin, A. E.*, Hespeler, Ont.—In one department ; Mathematics.
9. *Spence, J. B.*, Brooklin, Ont.—In two departments ; Agriculture, and Veterinary Science.

MEDALISTS.

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

Gold Medalist. James Atkinson, Seaforth, Ont.
Stanley Silver Medalist. J. J. Ferguson, Smith's Falls, Ont.
Second Silver Medalist. Wm. McCallum, Guelph, Ont.

FIRST YEAR PRIZEMEN.

Agriculture and Dairying. 1st. C. M. Macfie, Appin, Middlesex, Ont.; 2nd, G. A. Robertson, Kingston, Frontenac, Ont.

Natural Science. 1st, C. M. Macfie ; 2nd, G. A. Robertson.

Veterinary Science. 1st, C. M. Macfie ; 2nd, G. A. Robertson.

English Literature. 1st, C. M. Macfie ; 2nd, M. J. Werry, Tyrone, Durham, Ont.

Mathematics and Book-keeping. 1st, C. M. Macfie ; 2nd, M. J. Werry.

General Proficiency. 1st, C. M. Macfie ; 2nd, G. A. Robertson ; 3rd, M. J. Werry.

Second Year Prizemen.

Agriculture, Live Stock, and Dairying. 1st, James Atkinson ; 2nd, J. J. Ferguso

Natural Science. 1st, W. McCallum ; 2nd, James Atkinson.

Veterinary Science. 1st, J. J. Ferguson ; 2nd, R. McMordie, Kippen, Huron, On

English Literature and Political Economy. 1st, James Atkinson ; 2nd, J. J. Ferguson.

Mathematics. 1st, W. McCallum ; 2nd, W. G. McKenzie, Fairview, Oxford, On

General Proficiency. 1st, James Atkinson ; 2nd, J. J. Ferguson ; 3rd, Wm. McCallum.

Special Prizes for Essay on Fat Stock Show. 1st, James Atkinson ; 2nd, Wm McCallum ; 3rd, F. Walker, Norwich, Oxford, Ont.

Closing Exercises.

Our closing exercises for the year took place on the 30th of June. The day wa fine and we had a large attendance of visitors, some of whom came a long distance t show their interest in our work. The Hon. G. W. Ross, Minister of Education, and th Rev. E. H. Dewart, D.D., were present and delivered excellent addresses. Mrs. Ross Mrs. Dewart, and Mrs. Wm. Mulock favored us with their presence ; and also a larg number of ladies and gentleman from Guelph, and the surrounding neighborhood.

Valedictory Address.

The valedictory address is always delivered by a second year man. The successful candidate for the honor in 1893, was J. J. Ferguson, Smith's Falls ; and the subject of his address was "Weeds," literal and metaphorical.

On the 1st of June, we sent out the following circular to the Public School Teachers of Ontario :

Short Summer Course in Agriculture.

The great majority of the people of this Province are dependent on our Public Schools for the whole of their secular education. They have neither the time nor the means to attend a High School, an Agricultural College, or University. With such instruction and training as they get in the Public Schools, they are expected to discharge the duties of citizenship and make an honest living for themselves and their families. Hence the Public Schools are in some respects the most important schools in the country ; and in connection with these schools, two things are of the greatest moment : (1) That the course of study be the best possible, and (2) that the teachers be fully equipped for their work.

The primary aim of Public School teachers should undoubtedly be to teach well the elements of a general English education—to give a thorough, exact, and practical course of instruction in reading, writing, spelling, arithmetic, English grammar, composition, and geography ; in other words, to make all their scholars good readers, good writers, correct spellers, good arithmeticians, and correct, if not elegant, speakers and writers of English. This work is of fundamental importance, and nothing should be allowed to interfere with it in any Public School. We insist upon it as the first duty of all Public School teachers ; but, at the same time, we maintain that, in this Province at least, there is also another duty, which, though secondary, is by no means unimportant, viz., to consider the occupation which most of the children will follow on leaving school, and, as far as possible, give them instruction, not only in the elements of a general education, but also in some of the principles that underlie successful practice in the industry by means of which they will have to earn a livelihood for themselves and those depending upon them.

Two things should not be forgotten: (1) That farming is the main industry in Ontario; (2) That whatever improves the condition of farmers and makes them more successful workers, benefits all classes of the people. These are facts which no one will question; and, because of their importance, some of our best educators and wisest Statesmen are of opinion that the teachers in the Public Schools of this Province should, incidentally or otherwise, give some instruction in agriculture and one or two of the sciences related thereto; should impart as much reliable information as possible about agricultural pursuits; and do all in their power to inspire their pupils with a love for the simplicity, independence, and healthfulness of farm life.

Realizing the importance of this work and believing that valuable instruction in agriculture may be given by simple lectures to children—conversations on soils, plants and animals—so simple that even the lower classes in a Public School may understand, so attractive as to interest the youngest scholars, and of such a character as to benefit all kinds of pupils, whatever their occupation in after life—the Hon. John Dryden, Minister of Agriculture, with the hearty co-operation of the Minister of Education, has instructed our staff at the Ontario Agricultural College to offer, to the teachers of Ontario, a short summer course of instruction in agriculture and the sciences most closely related thereto.

Object of the Course. To show how agriculture and kindred branches of knowledge may be taught by simple talks to pupils in Rural Schools, and to furnish information that will serve as a basis for such talks, say the last hour of each Friday afternoon—geology and chemistry in the fall, live stock and dairying in the winter, botany and entomology in the spring.

Subjects. Agriculture, Dairying, Agricultural Chemistry, Geology, Botany, and Entomology.

Practical Work. The forenoons will be devoted to lectures; the afternoons and Saturdays, to geological and botanical excursions in charge of a professor, a certain amount of practical work in laboratories, and observation trips in gardens, fields, and experimental plots.

Time. The course will extend throughout the month of July, commencing on Monday, the 3rd, and ending on the 31st.

Expenses, etc. There will be no tuition fee. Teachers to the number of fifty, male or female, will be provided with rooms and board in the College, for which there will be a charge of $12, payable in advance to the Bursar. Washing will be done in the College laundry, and charged extra, at moderate rates. Sheets and towels, four of each, must be provided by applicants for admission.

The surroundings of the College are pleasant, and of such a character that, in addition to the direct instruction gained by attendance upon lectures, much valuable information may be acquired by observation in the different departments of the institution—the farm, dairy, arboretum, gardens, greenhouses, laboratories, etc.

Candidates for admission will please fill out the enclosed application and send it to the President at the earliest date possible.

In response to this circular, we received nearly fifty applications; but only thirty-four of the applicants came. Of these, seventeen were ladies.

Lectures commenced on the 3rd July, and continued till the 31st August. Most of the teachers boarded in the College, and the work of instruction, theoretical and practical, was done by Prof. Panton, Prof. Shuttleworth, Profs. Shaw and Dean, James Millar, Esq, William Houston, M.A., and the President of the College.

The subjects embraced in the course were as follows: (1) The typical animal for the production of flesh; (2) the form and kind of cow likely to be a profitable dairy animal;

(3) the quality and relative values of the different cuts in a side of beef; (4) the testing and handling of milk and cream, the making and marketing of butter, etc.; (5) general and agricultural chemistry; (6) geology, botany, and entomology; (7) the fundamental principles of political economy.

To be more specific, we may say that the work done during the month was as follows:

Department of Geology and Natural History.

Geology. Nine lectures by Prof. Panton, illustrated by diagrams and specimens; and one specially illustrated by the stereopticon.

Botany. Ten lectures, amply illustrated by diagrams, plants, and flowers; and one especially by the stereopticon.

Entomology. Five lectures, illustrated by numerous specimens.

Practical Work. Eight special lectures on botany, with the analysis and identification of twenty-five plants. One day at practical study of botany in College lawn and arboretum. Trip to Elora for study of geology and botany. Trip to Rockwood for study of geology and botany.

Microscopy. Practical lessons on the following topics, one per day: (1) Pollen and pollinia; (2) crystals in plant tissue; (3) starch granules and aleurone grains; (4) hairs and stomata of leaves; (5) cells, cellular and vascular tissue; (6) the parasitic plants causing rust, smut, potato blight, plum knot, gooseberry mildew, and apple spot; (7) unicellular plants.

In the Department of Chemistry.

(1) A course of twenty lectures by Prof. Shuttleworth, illustrated by experiments in the chemical class-room, and embracing the following topics: The plant in relation to water; plant food in the soil obtained by the plant through its roots; physical characteristics and classification of soils; chemistry of the atmosphere and the food taken by plants from the air; the ways in which plants absorb their food from both soil and atmosphere, and the practical lessons to be learned therefrom, etc.

(2) Practical work in chemical laboratory two afternoons in the week; thirty-three experiments by the members of the class to explain the lectures mentioned above; also numerous other experiments with the essential elements of plant food, etc.—each made by every member of the class.

In the Dairy Department.

(1) Lectures by Prof. Dean on the composition of milk; methods of testing milk, butter, and cheese; payment in creameries and cheese factories according to the percentage of fat in the milk; points essential to success in cheese and butter-making, especially the handling of milk and cream and the things necessary to make good butter in the home dairy.

(2) Some practical work in the College dairy in milk-testing, butter-making, and the running of cream separators.

In the Department of Agriculture.

(1) Nine lectures by Prof. Shaw on beef cattle, dairy cattle, fertilizers, varieties of grain, grain-growing, etc., illustrated by animals in the class-room and plots of grain in the experimental fields.

(2) Lectures by President Mills on the ideal animal for the production of flesh, illustrated by specimens of the beef breeds examined and compared in the class-room.

(3) The characteristics and comparative values of the different cuts in the body of an animal, stated and illustrated fully by James Millar, of Guelph, who had his man cut a side of beef into roasts, steak, etc., in presence of the class.

In Economics.

In addition to the work done by the professors of the College, we had four or five clear, suggestive, and practical lectures by Wm. Houston, M.A., on the fundamental principles of political science. These lectures were very instructive, and were of real benefit to those who had the pleasure of hearing them.

In a word, I think I may say that the teachers were very much pleased with the course. They found the professors courteous and attentive, their surroundings at the College pleasant, and the lectures eminently practical and suggestive.

No examination was required, and as a consequence the work was entered into as a kind of recreation.

Farmers' Institutes.

The work of the Farmers' Institutes has greatly increased within the last few years. The first regular institute meetings in Ontario were held in the winter of 1885. In January of that year, we (the professors of the College) assisted in holding twenty-six meetings. From that time to the present there has been a gradual development in the work and usefulness of these important organizations.

Last year, the members of our staff, with the help of a few of our leading farmers, fruit-growers, dairymen, and apiarists, assisted at 119 meetings in the first three weeks of the month of January. In the early part of February, an extra deputation, consisting of John Hannah, Seaforth; D. Z. Gibson, B.S.A., of Haldimand County; and Samuel Howard, of Gorrie, held a number of meetings throughout Muskoka, Parry Sound, and Algoma.

In Appendix VI to this report will be found a list of the meetings to be held in January, 1894, from the 2nd to the 20th inclusive—133 meetings, as arranged for by myself, under instructions from the Minister of Agriculture, and in consultation with T. Lloyd Jones, President of the Central Farmers' Institute. Arrangements will be made for meetings in Muskoka, Parry Sound, and Algoma, at a later date.

Visitors.

During the past year we have had a very large number of visitors from home and abroad.

On the 6th January, the late Governor-General, Lord Stanley of Preston, was with us; and on the 8th April (a very stormy day) the Ontario Legislature paid us a visit. About 12,000 farmers were here in the month of June, and a large number of foreign visitors during the summer and autumn—farmers' delegates from Great Britain, and prominent men from Denmark, Smyrna, Antioch, Beyrout, Bombay, and other places throughout Europe and Asia.

Financial Statement.

For a full statement of the revenue and expenditure for the different departments, see Appendix V at the end of this report.

Conclusion.

In conclusion, I may say that never before were we so well equipped for work in the different departments of the institution as at the present time. We have nearly all the buildings we require, and our class-room and laboratory appliances are sufficient for the number of students now in attendance. It may, before long, be necessary for us to increase our dormitory accommodation; and we shall have to provide a new building for the Experimental department.

JAMES MILLS,
President.

PART II.

REPORT OF THE PROFESSOR OF NATURAL HISTORY AND GEOLOGY

To the President of the Ontario Agricultural College:

SIR,—I have much pleasure in presenting to you my annual report upon the department of Natural History in connection with the Ontario Agricultural College. The work has been engaged in with much more comfort than in any preceding year, on account of the excellent equipment at my disposal and the addition of an assistant to the department. At a time when so much stress is laid upon technical education, too much cannot be done to illustrate lectures by diagrams and objects. This demands much time in preparation, and consequently we had reached a period when help was required. The appointment of an assistant has enabled me to add to our collection of diagrams and specimens and carry on some experiments of service in elucidating the principles of science as related to plant life. For years we have been necessitated to teach Botany, Zoology and Geology theoretically rather than practically, and thus appealed largely to the *ears* of our students; but to-day we are in a position to enlist their attention and impress our remarks by appealing to the *eyes* and even *hands*, and thus make impressions by a threefold application instead of one.

The inauguration of a Summer School at our College for teachers, with a view to prepare them to teach agricultural science in the schools of rural districts, was a new departure in College work, and one that added much work to the department of Natural History; but the labor was entered upon with much pleasure, that was increased by the enthusiastic manner in which those who attended took up the work. We endeavored in this course to keep before us a line of instruction that would supply some of the most important *facts* bearing upon agricultural science and *how* to place them in a clear, simple and attractive manner before the average common school pupil.

The following is a synopsis of the work as it related to the department of Natural History:

Geology. Nine lectures illustrated by diagrams upon canvas; views by a stereoptican and specimens in the museum. In this course a fair outline of the leading principles in geology was given and a general reference made to the geological systems in Ontario, so as to explain how soil has been formed; its composition and the changes it is now undergoing. A consideration of the economic products of Ontario rocks also received some attention.

Botany. Ten lectures chiefly occupied in a study of injurious plants such as cause mildew, blight, smut, rust and "spot" on the apple; the orders in which most of our weeds are found, and those from which we obtain grain, roots, forage and fruit. These lectures were fully illustrated by diagrams, lantern slides and specimens from the herbarium, together with the plants growing in our instructive plot containing upwards of 500 species, labelled and arranged systematically into orders, etc. Plants were brought into the class-room, analysed and identified by the class.

Entomology. Five lectures devoted chiefly to a discussion of the orders in which we find injurious insects, how to secure, mount and arrange insects in a collection; the use of insecticides and how to apply them.

Microscopy. This was followed in the afternoon as practical work, in which examination was made by microscopes of pollen, crystals, starch grains, plant, hairs, stomata, the various modifications of cells in the formation of tissue, smut, rust, plum-knot and mildews.

Field Days. A portion of three days was spent in field work; one trip to Elora, another to Rockwood, and an afternoon to an examination of the plants upon the lawn and in the greenhouses.

1. Museum.

During this year we have added to this room a collection of 100 weeds and their seeds. There has also been made a donation of five cases of insects by Edmund M. Jarvis, a former student. This is one of the best gifts we have as yet received for the museum, and has enabled the writer to arrange a collection of great service to the students in Economic Entomology. The arrangement consists of: 1. A group of characteristic insects in each order, those with biting mouths, sucking mouths and combined mouths being placed together. 2. The characteristic families of injurious and beneficial insects. 3. A miscellaneous grouping of typical forms.

P. R. McRitchie, of Maple Hill, donated specimens of petrified moss, stalactites, bog iron and petrified leaves.

2. Library.

Wonderful strides have been made in this division of work during the past ten years. It is not long since the volumes were among the hundreds, to-day we find they have reached about 6,000. With this rapid increase has come the need to be methodical in its management and the necessity of indexing the valuable reports received from various sources. At present my assistant is engaged upon this work a part of each day, the remainder being occupied in the botanical laboratory. Both officers and students have a much better opportunity now to consult books than formerly. The Library is open from 9 a.m. till 2 p.m. One hundred and fifty-two volumes have been added during the year; these may be grouped as follows:

Reports, chiefly agricultural	45
Botany	4
Geology	1
Agriculture	17
Chemistry	12
Literature	7
History	6
General Science	3
Parliamentary Reports	14
Biography	16
Poultry	3
Horticulture	15
Miscellaneous	9
	152

3. Reading Room.

This large, bright and cheerful room, well heated, equipped with tables, desks, etc., and well furnished with newspapers, journals and magazines, cannot fail to prove a most important factor in the education of our students. Here is placed before them the latest additions to knowledge, as applied to agriculture, and every convenience for its study and acquirement.

The following is a list of papers, journals and magazines which come to the College, and are for the use of the students in attendance:

(a) *Sent free by the Publishers.*

Name.	Where Published.
1. Journal of Commerce	
2. Canadian Baptist	Montreal.
3. Christian Guardian	Toronto.
4. Canada Presbyterian	"
5. Monthly Weather Review	"
6. Presbyterian Review	"
7. Sheep Breeder and Wool Grower	"
8. Manitoba Weekly Free Press	Chicago.
9. Canadian Horticulturist	Winnipeg.
10. Canadian Entomologist	Grimsby.
11. Bee Journal	London, Ont.
12. North York Reformer	Beeton.
13. Acton Free Press	Newmarket.
14. Ontario Evangelist	Acton.
15. Evangelical Churchman	Erin, Ont.
16. Farmers' Review	Toronto.
17. Canadian Independent	Chicago.
18. Rural Home Journal	Toronto.
19. Canadian Churchman	Kentucky.
20. " Independent	Toronto.
21. " Evangelist	"
22. " Bee Journal	"
23. Poultry Journal	Brantford.
24 Farmers' Home	Beeton.
25. Farmers' Review	Ohio.
	Chicago.

(b) *Furnished by the College.*

1. Daily Globe	
2. " Mail	Toronto.
3. " Empire	"
4. " Mercury	"
5. " Herald	Guelph.
6. Rural Canadian	"
7. Grip	Toronto.
8. Poultry Review	"
9. Farmers' Advocate	"
10. Canadian Stock Raisers' Journal	London, Ont.
11. Nor'-West Farmer	Toronto.
12. Breeders' Gazette	Winnipeg.
13. North British Agriculturist	Chicago.
14. American Garden	Edinburgh, Scotland.
15. Cultivator and Country Gentleman	Greenfield, Mass.
16. Scientific American	Albany, N. Y.
17. Live Stock Journal	New York.
18. American Dairyman	England.
19. Botanical Gazette	New York.
20. Agricultural Science	Crawfordsville, Ind.
21. Literary Digest	Geneva, N. Y.
22. Entomological News	Boston.
23. Canadian Agricultural and Home Journal	Philadelphia.
24. Hoard's Dairyman	Peterborough.
25. Maritime Agriculturist	Ft. Atkinson, Wis
26 Science	Sackville, N. B.
27. Garden and Forest	New York.
28. Scientific American Supplement	"

4. Practical Work.

Much attention has been given to the identification of seeds and plants during this year in connection with the preparation of the bulletin on weeds in a subsequent part of this report. A plot was set apart for the purpose of observing the "struggle for existence" among plants; in this 125 species, chiefly weeds were sown and allowed full scope to grow, and will be permitted to do so for a time, in order that we may observe what species succeeds the best under these adverse conditions.

Plots were sown with smutty wheat; wheat dipped in a solution of *blue vitrol* and seed untreated. An examination of the wheat from these plots showed that the treated wheat had escaped injury from the smut, while the untreated was very smutty.

The solution referred to consisted of copper sulphate, 4 oz. dissolved in 6 gals. water, and the seed allowed to remain in it for 13 hours; after this it was put in limewater for 10 minutes. A complete life history of the smut fungus is given by Prof. Fletcher in Bulletin III of the Central Experimental Farm, Ottawa, and by the writer in Bulletin LVI of the Ontario Agricultural College, in the College Report, 1890.

Considerable attention has been directed to the growing of rape of late years. There appears to be several varieties in the market, one of which (*bird rape*) at least is of little use as a forage plant. This is an annual, produces little foliage and runs to seed rapidly. *True rape*, a biennial, is very leafy, and therefore supplies an excellent succulent food in considerable quantity; but a variety much like this in the colour of its foliage has also been sold for *true rape*. This is also an annual with considerable stalk, which deteriorates its value for feeding purposes. It is thought this form is a hybrid between the *bird rape* and the *true rape*. With a view to testing this, we made an attempt to cross these types, but the plants used failing to flower about the same time, our plans were thwarted. In our experiment we had the plants near one another to see if hybridizing would result simply from proximity of the plants (for plants of the order *Cruciferas* cross very readily) and also some plants of both species at a distance for the purpose of artificial fertilization. This experiment will engage our attention again.

In connection with the department of Natural History much more spraying was done than in any former year, and with very satisfactory results.

Besides the general spraying followed in the orchard and garden, special trees were selected and experimented upon for the purpose of trying the efficacy of certain mixtures for specific insects and fungoid diseases.

The mixtures which seem to give the best results are found in the bulletin below, which is slightly changed in some cases from the first issue. The whole question of spraying is comparatively new, and we may expect to see changes in mixtures and methods of application from time to time. At present, experience indicates the following as worthy of application, and we have no doubt if the work is done *carefully* and *thoroughly* good results will follow.

REMEDIES FOR COMMON PLANT AND INSECT FOES.

So numerous have been the applications for Bulletin LXXIII, referring to some of the most common insecticides and fungicides, that it has been found necessary to prepare another bulletin (No. LXXXVIII) upon the subject. Reference will now be made not only to the mixtures commonly used, but also to the way of applying them against specific forms of plant and insect enemies.

Fungicides.

Fungicides may be defined as chemical compounds or mixtures used for the purpose of destroying such injurious forms of plant life as live upon other plants by absorbing their juices, whereby they affect their vitality. The *rusts*, *smuts*, *mildews* and *blights* are examples of such parasitic forms of plant life. Among the most common fungicides are the following :

Bordeaux Mixture. There are various forms of this mixture, the following being most commonly used :

(1) Consists of 5 lb. of copper sulphate, 4 lb. lime and 45 gals. of water. This may be prepared as follows : Dissolve the copper compound in sixteen gals. of water ; slake the lime in 6 gals. of water, and when the latter is cooled pour it into the copper solution and mix thoroughly, and add the remainder of the water. Pulverized copper will dissolve readily. It is an improvement to strain the lime through some kind of coarse material.

(2) A modified form is made by taking 4 lb. of copper sulphate, 4 lb. lime and 50 gals. of water (Green's formula.)

(3) Another form is made by taking 6 lb. of copper sulphate, 4 lb. of lime and 50 gals. of water (Weed's formula.)

These diluted mixtures have been proved to be very successful, and are now commonly used. An advantage is gained by using Bordeaux mixtures, since Paris green may be added so as to combine insecticide and fungicide. So far experience indicates the Bordeaux mixture to be one of the best fungicides known.

Eau Celeste. Consists of 2 lb. of copper sulphate, 1 quart of ammonia and 50 gals. of water. Dissolve the copper sulphate in 2 gals. of hot water ; as soon as cool add the 1 quart ammonia and dilute the 50 gals.

A modified form has been very successful, viz. : 2 lb. copper sulphate dissolved in 2 gals. of water, $2\frac{1}{2}$ lb. of sodium carbonate (washing soda) dissolved in another vessel. Mix these, and when chemical action has ceased, add 1 quart of ammonia and dilute to 50 gals.

Copper Sulphate. 1 lb. copper sulphate in 25 gals. of water ; spray early upon vines, etc., before leaves appear.

Ammoniacal Solution of Copper Carbonate. Dissolve 6 oz. of copper carbonate in 2 quarts of ammonia, and when about to use dilute it to 50 gals.

Potassium Sulphide. Consists of 1 oz. potassium sulphide to 2 gals. of water.

Insecticides.

These are compounds or mixtures used to destroy insects injurious to vegetation.

Paris Green. (Arsenite of copper, containing 50-60 per cent. of arsenic.) This is applied dry or in solution. In the dry form it should be mixed with 50 to 100 parts of plaster, wood-ashes, flour or air-slacked lime, and dusted upon the affected plants. The form in solution is usually 1 lb. of Paris green to 200 gals. of water, but if the foliage is tender 250 to 300 gals. of water may be used. This is the usual strength applied upon the plum and peach. As the green powder does not dissolve it requires to be kept thoroughly mixed by constant stirring. 1 lb. of lime to every 50 gals. will prevent injury to the foliage.

London Purple. This is an arsenite of lime obtained as a by-product in manufacturing dyes. It is largely used instead of Paris green ; but being more soluble in water it is not apt to injure the foliage, and, besides, its composition varies considerably so that when used it is not likely to give as uniform results as Paris green.

These arsenites are excellent against all leaf-eating insects.

Kerosene Emulsion. This is a mixture of coal oil and water. There are three formulas used to a considerable extent :

(1) *Riley-Hubbard Emulsion*. Consists of $\frac{1}{2}$ lb. of hard soap in 1 gal. of water. Boil till dissolved, and then add 2 gal. of coal oil, and mix thoroughly for about five

minutes. When properly mixed it will adhere to glass without oiliness. This can be done by forcing it through the nozzle of a force-pump repeatedly until the mixture appears complete. It will then form a creamy mass which thickens into a jelly-like substance on cooling. In using, dilute with 9 parts of soft water. This form is very commonly used and is easily prepared. If the foliage is very tender the emulsion must be more dilute 15-20 parts water.

(2) *Cook's Emulsion* (soft soap). Take 1 quart of soft soap and 2 quarts of boiling water, and while hot add 1 pint of coal oil; mix thoroughly as above. In using dilute with an equal amount of water, either hard or soft.

(3) *Cook's Emulsion* (hard soap). Take ¼ lb. of hard soap, 2 quarts of hot water and 1 pint of coal oil; thoroughly mix while hot. In using dilute with twice the amount of either hard or soft water.

Emulsions are successful against plant lice and scale insects.

Hellebore. This is the powdered root of a plant (Veratrum album). It may be applied dry, or in solution at the rate of 1 oz. to 3 gals. of water.

Pyrethrum. Made from the powdered flowers of the genus pyrethrum, a plant of the sunflower family. It should be fresh, and hence ought to be kept in closed vessels. It may be used in dry form, 1 part pyrethrum to 5 or 8 parts of flour, or in liquid form in the proportion of 1 oz. in 3 gals. of water.

Carbolic Acid Emulsion. Consists of 1 part carbolic acid to 7 parts of a solution consisting of 1 quart of soft soap or 1 lb. of hard in 2 gals. of water.

Tobacco. The refuse from cigar factories is good, either dusted or in the form of a powder, or used as a solution in the proportion of 1 lb. in 2 gals. of water.

Whale Oil Soap. This may be used in the proportion of 2 oz of soap to 1 gal. of water.

Alkaline Wash. A strong solution of washing soda mixed with soft soap until about as thick as paint.

Carbolized Plaster. Consists of 1 pint of carbolic acid and 50 lb. of land plaster.

Combined Mixtures. By the combination of an insecticide with a fungicide we are able at the same time to cope with injurious insect and plant life. A good example of this can be seen in the application of a combined mixture to potatoes, in which case the beetle may be destroyed and the blight prevented. While combatting the "spot" of the apple the codling moth may also be fought, if a combined mixture be used.

(1) 6 oz. of Paris green added to Bordeaux mixture (No. 1, 2 or 3) makes an excellent combination.

(2) The following is also recommended: 2 oz. of Paris green and 2 oz. of copper carbonate dissolved in 3 pints ammonia, ½ lb. of lime added to 32 gals. of water, and the whole thoroughly mixed. It is necessary to add the lime, or the foliage will be damaged.

Precautions in Spraying.

1. Keep poisons labelled and out of the way of children.
2. Do not spray so far into the season as to affect the fruit.
3. In making emulsions remember the inflammable nature of coal oil.
4. *Never spray trees in bloom.*
5. Try solutions on a small scale if likely to injure foliage, and watch results.
6. Be careful and thorough in your work.

Careful analyses show that there is no ground for alarm regarding the effect of spraying fruit trees with Paris green.

The foregoing mixtures are usually applied by spraying machines which can be procured through any responsible seedsman. As copper compounds act upon tin and iron, it is well to prepare such mixtures in earthen, wooden or brass vessels.

The Bordeaux mixture is rather dirty to work with, and inclined to clog the jet. Nevertheless it is about as effectual a fungicide as has yet been discovered. If used too long in the season it is apt to affect the appearance of the fruit. This can, however, be washed off with a dilute solution of vinegar.

General rules in spraying:

1. Early treatment with copper sulphate, 1 lb. in 25 gals. of water. Apply before buds start.

2. Bourdeaux mixture once before blossom.

3. Again when fruit sets, and two or three times after at intervals of 12-15 days. Much depends upon early applications. All affected material should be destroyed.

Cost of the Mixtures. A fair idea of the cost of the various mixtures may be had upon an examination of the following price list of substances used in the different formulas:

Ammonia,	25c. per lb.	Pyrethrum,	40c. per lb.
Copper carbonate,	60c. per lb.	Copper sulphate,	12c. per lb.
Paris green,	30c. "	Hellebore,	25c. "
London purple,	15c. "	Sodium carbonate,	5c. "

Remedies for Certain Injurious Fungi.

1. *Apple Spot.* (1) Spray with Bordeaux mixture, making first application in spring before the blossoms open. Spray again as soon as the fruit is well formed. Now add 4 oz. of Paris green to the barrel and make three applications at intervals of two weeks. These last applications will destroy insects as well as the spores of the "spot" fungus.

(2) Copper carbonate ammoniacal solution referred to and Eau Celeste are also good remedies. With these the first application should be made previous to blossoming, the second when the fruit is about the size of peas, and the third two or three weeks later.

2. *Brown Rot* of plum, cherry and peach. Use the Bordeaux mixture in the same way as for apple "spot." Burn all affected fruit and leaves in the fall. If "rot" should set in make one or two sprayings with copper carbonate solution.

3. *Pear Leaf Blight*, which appears on both leaves and fruit, giving the leaves a spotted appearance and causing the fruit to crack.

(1) Spray with ammoniacal solution of copper carbonate as soon as the leaves begin to open, and repeat two or three times at intervals of two weeks.

(2) Use Bourdeaux mixture as for apple "spot."

4. *Strawberry Leaf Blight.* Spray during July and August, every two weeks, with the following solution: 4 oz. of copper carbonate and two quarts of ammonia in a barrel of water.

5. *Gooseberry Mildew.* Spray with 1 oz. of potassium sulphide in two gallons of water. Begin as soon as the leaves are opening, and repeat about every three weeks.

6. *Grape Blights.* Spray as follows:

(1) Spray vines before buds start with the copper sulphate solution, 1 lb. to 25 gals. water.

(2) Spray with Bordeaux mixture when shoots are about 6 inches long.

(3) Spray again just before blossom.

(4) Spray again in 15 days after.

(5) Again in 20 days.

These applications will be effective against the various fungoid diseases of the grapes, *Black Rot, Downy Mildew* and *Powdery Mildew.*

Grape Downy Mildew. Spray with Eau Celeste about ten days before blossom; give another application as soon as the berries are set, and a third about three weeks later. No. 6 includes this disease.

8. *Raspberry Anthracnose.* (1) Spray early with copper sulphate, 1 lb. in 25 gals. water.

(2) Spray with Bourdeaux mixture two or three times during the summer.

9. *Potato Blight.* Apply Bourdeaux mixture (No. 2) three or four times, administering the first when the plants are about six inches high. If ½ lb. of Paris green be added to the mixture, beetles may also be destroyed as soon as they appear.

10. *Smut.* (1) Immersing seed in hot water of 135° Fahr., for five minutes, will destroy the spores of smut. 5° above or below that point will likely fail.

(2) Put 1 lb. of copper sulphate in 20 gallons of water and allow the seed to remain in this for about 15 hours; then put the seed for 10 minutes in lime water made by slaking the lime in ten times its weight of water.

11. *Black Knot.* (1) Cut off affected limbs and destroy them.

(2) Cut out knot and paint with a mixture of turpentine and lime. If sulphate of copper solution is applied to the knot before painting, the treatment is more effective.

Remedies for some Common Injurious Insects.

1. All *Leaf eating* insects, such as canker worms, tent caterpillars, grape flea beetle, Tussock moth, fall web-worm, etc., are readily destroyed by spraying with Paris green, 1 lb. to 200 gals. of water.

2. *Borers* of the apple tree trunk and peach can be overcome by applying late in May or early in June to the trunks and large branches the following solution: 1 quart of soft soap or 1 lb. of hard soap in 2 gallons of water; heat to boiling point and add 1 pint of crude carbolic acid. It is well to scrape off the rough bark first, and then rub the mixture well on.

3. *Bark Lice.* Scrape off the bark during the winter and early spring, and rub on a solution made by adding one part of crude carbolic acid to 7 parts of a solution of soft soap 1 quart, or hard soap ¼ lb. in 2 quarts of boiling water. As soon as the young lice are hatched and begin to move (about June) spray the tree with a kerosene emulsion.

4. *Codling Moth*, or apple worm. As soon as the petals have fallen, spray with a solution of 1 lb. of Paris green in 200 gallons of water; ten days later give a second application, and if necessary a third spraying may be given later on.

5. *Plum Curculio.* Spray with 3 oz. of Paris green to 50 gallons of water as soon as the blossoms have fallen, and give two more applications at intervals of about ten days. Jarring the trees and collecting the insects as they fall upon sheets is also much followed.

6. *Bud Moth.* This insect destroys the flower bud of plums, pears and apples. Spray with ordinary Paris green mixture when the buds begin to swell, and again in about ten days, that is, before the blossoms open. Kerosene emulsion is also recommended.

7. *Pear and Cherry Tree Slug.* Spray with either Paris green, hellebore or pyrethrum. Paris green in the proportion of 1 lb. to 250 gallons of water may be used for both broods if the trees are not bearing; otherwise use the Paris green for the second and either of the other remedies for the first brood.

8. *Potato Beetle.* Spray the vines with Paris green, using 6 oz. to 50 gallons of water.

9. *Squash Bug.* The young ones can be destroyed with kerosene emulsion; but those matured require to be hand-picked or caught under pieces of board placed among the plants where the bugs collect at night.

10. *Cucumber Beetle.* Cover the plants with netting so as to keep the beetles off.

11. *Plant Lice.* Use kerosene emulsion.

12. *Pea Weevil.* (1) Sow unaffected peas. (2) Heat affected peas as soon as gathered for 1 hour at a temperature of 145°. (3) Immerse affected seed peas in hot water, adding almost at once cold water, and leave for 24 hours.

13. *Strawberry Slug.* Spray the first brood with pyrethrum and the second with Paris green.

14. *Currant Worm.* Spray with hellebore 1 oz. to 3 gallons of water.

15. *Onion and Cabbage Maggots.* Use kerosene emulsion, and apply it in the vicinity of the plants. Carbolic emulsion has been very successful against the "radish maggot."

16. *Turnip Flea Beetle.* Dust upon the attacked plants while the dew is still on them, 1 part of Paris green and 50 parts of land plaster. Tobacco dust is also effectual.

17. *Ground Cutworms,* etc. (1) Surround the stem of the plant with heavy paper. (2) Sprinkle Paris green upon small bunches of fresh clover, and then scatter them about where the worms are working. They will serve as baits and poison many of the worms.

18. *Common Cabbage Worm.* Spray with a solution of 1 oz. of pyrethrum in 4 gallons of water. Kerosene emulsion may also be used on young plants.

In order to make this bulletin as concise and simple as possible, many remedies have been omitted, and only the most successful noted. No description has been given, and only the common names of injurious plants and insects referred to have been used, as being sufficient for practical purposes. If further information is required, it will be readily given on application to the writer.

WEEDS OF ONTARIO.

For some time past the writer has been collecting information regarding the weeds of Ontario with special reference to their distribution in the Province. Having received replies from over one thousand persons to whom circulars were sent through the medium of the Bureau of Industries asking for the names of the ten worst weeds in the district, he is able to give in this bulletin a summary of the information received.

Weeds of late years have received considerable attention not only from students of botany but also from practical agriculturists, a fact which indicates that farmers are advancing and that they are departing from careless methods of cultivation, and adopting systems in which cleanliness of the field forms an important factor. In fact they are now convinced that weeds must be classed with such enemies as parasitic plants and insects.

Insects, mildews, blights, etc, were early condemned as sources of loss, but farmers have been slow to consider that much loss could be sustained by growing weeds. However, they see now that weeds involve extra labor, smother useful plants, take food from the soil, add impurities to the grain, rob the soil of moisture, afford shelter and food to injurious insects, and give fields an unsightly appearance.

In Bulletin LXXXV the principles which underlie a successful warfare against weeds were thoroughly discussed, and reference was made to the best methods of destroying the following eleven varieties: Canada Thistle, Sow Thistle, Wild Flax, Pigeonweed, Ragweed, Couch Grass, Ox-eye Daisy, Burdock, Blueweed, Mustard and Wild Oat. In this bulletin we give a description of four additional weeds which, though not so common, may soon become pests.

In examining the various lists we find reference made to 92 species, embracing 76 genera and 28 orders. Only a few observers refer to certain forms, but in order to give some idea of the number of plants considered as weeds, a tabulated statement is given which will be useful for showing in a concise form the weeds of Ontario.

So varied are the names given to some weeds that the writer in several cases had to secure the seed and grow the plant or get the plant itself before the local name reported could be understood. Taking the names given in the 1,015 replies we find the 25 following weeds are ranked as the worst, the figures given indicating the number of persons who gave the above in their list of the 10 worst weeds :

Canada Thistle	1,015	Foxtail	152
Mustard	666	Pigweed	126
Wild Oat	472	Black Bindweed	112
Ox-eye Daisy	463	Milkweed	98
Burdock	439	Sorrel	92
Couch Grass	401	Purslane	82
Ragweed	303	Blueweed	79
Wild Peas	288	Mullein	69
Cockle	241	Mayweed	60
Dock	232	Lamb's Quarters	55
Redroot	217	Sow Thistle	50
Bur	212	Bindweed	46
Wild Flax	173		

Wild Carrot.

The Wild Carrot (*Daucus Carota*) is a degraded form of the cultivated carrot and like it, is biennial. It grows about two or three feet high and bears many flower clusters

WILD CARROT (*Daucus Carota*).

CLOT-BUR (*Xanthium Canadense*).

which, as they mature, form a sort of bird-nest structure with each umbel. Being a biennial it cannot survive long where thorough cultivation is carried on, and hence is most frequently found along roadsides, railway tracks, etc. Hand pulling and destroying as fast as it reaches flower will be effective. Spudding a few inches below the surface will kill it, but cutting it at the surface has a tendency to make it increase the number of its branches.

Clot-bur.

Clot-bur (*Xanthium Canadense*) is a large coarse annual reported from the western part of the province. It bears some resemblance to the burdock in having large coarse leaves and the seed in a bur. The bur is oval, about an inch long and covered with stiff hooked prickles. Like Ragweed it has two kinds of flowers—staminate at the summit in spike clusters and pistillate below. The plant is about three feet high. *Xanthium Spinosum*, a very thorny form, is found in the vicinity of Dundas, but it is more confined to the Southern States where it is a very obnoxious weed.

Dodder.

The Dodder (*Cuscuta Trifolii*) is a parasitic plant, an annual which is found twining around the stem of clover. Some specimens were received for identification from the vicinity of Drayton. The seeds of the Dodder are sometimes found among clover seed. When these are sown they germinate and reach the clover plants around which they twine and send out from all parts of their stem rootlets that penetrate the clover stems and absorb sap from them and soon weaken the plants upon which they grow. The Dodder stem as soon as it gets a firm hold of the clover breaks away from the seed from which it started and lives entirely upon the clover as a regular parasite. When found

DODDER (*Cuscuta Trifolii*).

PENNY CRESS (*Thlaspi Arvense*)

attacking clover the plants affected should be removed. It is easily recognized as a yellow, leafless, string-like plant, twining around the clover. Care should be exercised to sow clean clover seed. Dodder seeds though similar to clover seed are smaller and may be screened. In Europe this parasite is often injurious. The specimens which have come under the writer's observation were attached to stems of lucerne in one case and clover in another; the latter were sent from the vicinity of Drayton and it would appear that this weed is being introduced into some parts of the province. Every precaution should be taken by farmers to prevent its distribution.

Penny Cress.

Penny Cress (*Thlaspi Arvense*) is not yet a common weed in our province, but we may reasonably expect to find it get a firm foothold if its approach is not carefully guarded. It is very common in the Red River valley of Manitoba where it is called the French weed, and as much wheat is being imported from that country this plant will certainly come in the seed. Already it has been found in several parts of Ontario. It belongs to the mustard family, and like the other members of it, produces many seeds which are endowed with much vitality. The pods of this plant are very characteristic, being somewhat circular and flat with a distinct notch at the top. The leaves are oblong, arrow shaped at the base, toothed and smooth. It bears very small white flowers. It is an annual, about one foot high and emits a strong somewhat offensive order when bruised. The method followed in destroying mustard may be adopted to get rid of this pest and exercise vigilance to keep it from getting a foothold. The accompanying cut will prove useful in identifying this new-comer.

Tumbling Weed.

Another weed that we may expect from the west is known as Tumbling Weed (*Sisymbrium Sinapistrum*), also a member of the mustard family. It is reported by Prof. Fletcher as common around Indian Head, N. W. T. This annual is about two feet high, bears many pods, each well filled with small round brown-colored seeds. It matures its seed about the same time as mustard. Great care should be taken to prevent the plant getting a foothold in Ontario. It is not a native of the Northwest Territory but seems to have been introduced there. It is a native of Europe.

In the following tabulated list of weeds we find the Mustard family supplies 7; Pink, 6; Bean, 5; Sunflower or Composite, 22; Figwort, 4; Bur, 4; Mint, 3; Buckwheat, 6, and the Grass, 6. The other orders or families are represented by only one or two forms.

A TABULATED LIST OF THE MOST COMMON WEEDS IN ONTARIO.

Order.	Scientific Name.	Common Name.
Ranunculaceæ	Ranunculus acris	Buttercup ..... P
"	Ranunculus scleratus	Cursed Buttercup ..... A
Cruciferæ	Camelina sativa	False Flax ..... A
"	Capsella Bursa-pastoris	Shepherd's purse ..... A
"	Lepidium Virginicum	Pepperwort ..... A
"	Thlaspi arvense	Pennycress ..... A
"	Brassica Sinapistrum	Wild mustard ..... A
"	Sisymbrium officinale	Hedge mustard ..... A
"	Erysimum cheiranthoides	Worm-seed mustard ..... A
Papaveraceæ	Chelidonium majus	Celandine ..... P
Hypericaceæ	Hypericum perforatum	St. John's wort ..... P
Caryophyllaceæ	Lychnis Githago	Corn Cockle ..... A
"	Lychnis vespertina	White Cockle ..... B
"	Silene inflata	Bladder Campion ..... P
"	Cerastium arvense	Field Chickweed ..... P
"	Saponaria officinalis	Bouncing Bet ..... P
"	Stellaria media	Chickweed ..... A
Portulacaceæ	Portulaca oleracea	Purslane ..... A
Malvaceæ	Malva rotundifolia	Mallow ..... P
Anacardiaceæ	Rhus venenata	Poison Sumach ..... P
"	Rhus toxicodendron	Poison Ivy ..... P
"	Rhus radicans	Climbing Ivy ..... P

NOTE.—A is for annual, B for biennial and P for perennial.

Order.	Scientific name.	Common name.
Leguminosæ	Trifolium arvense	Rabbit-foot clover A
"	Vicia Cracca	Wild Tare P
"	Medicago lupulina	Black Medick A
"	Melilotus alba	Sweet clover A
"	Melilotus officinalis	Yellow Melilot A
Umbelliferæ	Daucus carota	Wild Carrot B
"	Conium maculatum	Poison Hemlock B
"	Pastinaca sativa	Wild Parsnip B
Onagraceæ	Œnothera biennis	Evening Primrose B
"	Epilobium angustifolium	Willow-herb P
Crassulaceæ	Sedum acre	Mossy Stone crop P
Dipsaceæ	Dipsacus sylvestris	Teasel B
Compositæ	Senecio vulgaris	Groundsel A
"	Ambrosia artemisiæfolia	Ragweed A
"	Leucanthemum vulgare	Ox-eye Daisy P
"	Achillœa millefolium	Yarrow P
"	Tanacetum vulgare	Tansy P
"	Solidago Canadensis	Golden Rod P
"	Rudbeckia hirta	Cone-Flower B
"	Centaurea Cyanus	Bluebottle A
"	Sonchus oleraceus	Sow Thistle A
"	Sonchus arvensis	Corn Thistle P
"	Erechthitis hieracifolia	Fireweed A
"	Arctium Lappa	Burdock B
"	Cichorium Intybus	Chichory P
"	Taraxacum officinale	Dandelion P
"	Erigeron Canadense	Fleabane A
"	Anthemis Cotula	Mayweed A
"	Anthemis arvensis	Field Chamomile A
"	Cnicus arvensis	Canada Thistle P
"	Cnicus lanceolatus	Bull Thistle B
"	Bidens frondosa	Bur Marigold P
"	Inula Helenium	Elecampane P
"	Xanthium Canadense	Clot-bur A
Scrophulariaceæ	Verbascum Thapsus	Mullein B
"	Veronica arvensis	Speedwell A
"	Veronica peregrina	Neckweed A
"	Linaria vulgaris	Toad Flax P
Verbenaceæ	Verbena hastata	Vervain P
Labiatæ	Leonurus Cardiaca	Motherwort P
"	Nepeta Cataria	Catnip P
"	Brunella Vulgaris	Self-heal P
Borroginaceæ	Echinospermum Lappula	Stickseed B
"	Cynoglossum officinale	Hound's Tongue B
"	Echium vulgare	Blueweed B
"	Lithospermum arvense	Pigeonweed A
Solanaceæ	Datura Stramonium	Thorn Apple A
"	Physalis viscosa	Ground Cherry P
Convolvulaceæ	Convolvulus arvensis	Bindweed P
"	Cuscuta trifolii	Dodder A
Asclepiadaceæ	Asclepias Cornuti	Milkweed P
Plantaginaceæ	Plantago major	Plantain P
"	Plantago lanceolata	Rib-grass P
Chenopodiaceæ	Chenopodium album	Lamb's Quarters A
"	Chenopodium capitatum	Strawberry Blite A
Amarantaceæ	Amarantus retroflexus	Pigweed A
Polygonaceæ	Polygonum aviculare	Goose Grass A
"	Polygonum Convolvulus	Black Bindweed A
"	Polygonum Persicaria	Lady's Thumb A
"	Rumex Acetosella	Sorrel P
"	Rumex crispus	Common Dock P
"	Rumex obtusifolius	Bitter Dock P
Urticaceæ	Urtica dioica	Nettle P
Liliaceæ	Allium tricoceum	Wild Leek P
Gramineæ	Bromus secalinus	Chess A
"	Setaria glauca	Foxtail A
"	Panicum Crus-galli	Barnyard Grass A
"	Panicum capillare	Witch Grass A
"	Avena fatua	Wild Oat A
"	Agropyrum repens	Couch Grass P
28 orders.	76 genera.	92 species.

5. *Meteorology.*

The oversight of this work has been connected with the department of Natural History; but it is hoped some arrangement will be made by which it can by transferred to the Experimental, to which it now more properly belongs.

Observations are regularly taken at the hours of 8 a.m and 8 p.m. daily, and recorded in a book printed for the purpose. The instruments in use are as follows:

Barometer—Showing the atmospheric pressure at the time of observation.

Maximum thermometer—Indicating the highest temperature between times of observation.

Minimum thermometer—Indicating the lowest temperature between times of observation.

Pluviameter—Used in measuring the rainfall.

Thermometer—for observing ordinary temperature.

Besides taking observations from these instruments, the cloudiness of the sky is observed, and general remarks on the weather for the day are recorded in the daily register. At the close of each month a summary of the month's observations is made out. From these summaries the statement of the year's meteorology is made.

I am much indebted to the Minister of Agriculture for the liberality he has shown in furnishing us with the means by which we are able to increase our facilities to make the department of Natural History instructive, attractive and practical.

Your obedient servant,

J. HOYES PANTON,

Professor of Natural History.

ONTARIO AGRICULTURAL COLLEGE,
December 31st, 1893.

PART III.

REPORT OF

THE PROFESSOR OF CHEMISTRY.

GUELPH, December 30th, 1893.

To the President of the Ontario Agricultural College :

SIR,—In submitting to you my report of the department of Chemistry, I beg to thank you for several improvements that have been made in this laboratory. I refer particularly to the slight changes in the heating arrangements by which my office and the smaller analytical room have been made comfortably warm, to the inside shutters put up on the windows of these two rooms, and to the desk and book shelving in the office. The above rooms, which were cold in winter and uncomfortably warm in the summer, are now comfortable during both cold and warm weather. Since fitting up the book-shelving, the chemical library has been increased, and the College and Experiment Station reports and bulletins have been re-arranged and classified.

LECTURES.

Under this heading several changes have been made. The experimental lectures in inorganic chemistry to the first year, will be continued through the fall and winter terms. Instead of taking organic chemistry in the first year, it has been made a second year subject. Practical chemistry, with your approval, will be made a first year subject and taken in the spring term. Lectures in agricultural chemistry will be commenced immediately after the course in organic chemistry closes, and these lectures will be continued through the winter and spring terms. By this arrangement of the subjects, analytical chemistry will be introduced in the first year, and immediately after the course of elementary, experimental lectures closes ; organic chemistry will receive more attention than when it was a first year subject, and agricultural chemistry will be studied in the winter term when students feed and handle stock, and in the spring term when they can observe the crops growing, the effects of manures, etc.

TEXT-BOOKS.

Elementary chemistry by Remsen is the text-book of the first year. I beg to recommend that for the second year the first half of Remsen's "Chemistry of the Carbon Compounds," and for the third year all this book and the "Advanced Course" by the same author be prescribed.

CHEMICALS.

Until this year, third year students have paid a laboratory fee of $15, $5 going for gas and $10 for chemicals. This arrangement was not satisfactory. The students having no inducements to economise, used unneceesarily large quantities of chemicals, and therefore the annual grant for chemicals was frequently insufficient. This year, with your permission, no fee was charged for chemicals, but every student has been required to pay in advance for the chemicals he uses. In this way it costs the laboratory far less to supply chemicals, and it need not cost the students more than has been paid other years. I would, therefore, recommend that, instead of charging a fee, students be required to pay for the chemicals they use.

ANALYSIS OF FODDER CORN.

Testing six promising varieties of corn was one of the twelve experiments conducted by the Agricultural Committee of the Experimental Union during 1892. The seed was distributed from the station by the secretary of the committee, who mailed samples to every farmer expressing a wish to join in that experiment. Twenty out of the number sent in full returns of the results to the secretary. By this arrangement the varieties were tested in a great many different sections of country, including the following counties and districts: Huron, Bruce, Simcoe, Lambton, Grey, Kent, Elgin, Middlesex, Norfolk, Dufferin, Peel, Welland, Lincoln, Dundas, Prince Edward, Frontenac, Grenville, Northumberland, Muskoka and Parry Sound. At this station the same varieties were tested, and the samples grown here were analysed to determine their relative feeding value. Following are the average yields of tests:

Varieties.	Average yield per acre of 20 Ontario returns.	Guelph Experiment Station.	
		Yield.	Maturity.
	tons.	tons.	
Mammoth Southern Sweet (dent)	19.3	22.6	Late.
Thoroughbred White Flint	18.6	19.8	"
True Leaming (dent)	17.3	19.6	Late medium.
Mammoth Cuban (dent)	16.1	19.1	Medium.
Wisconsin Earliest White Dent	15.7	17.8	Medium early.
Compton's Early (flint)	11.8	13.8	Early.

In every variety the station yield is a little more than the average of the twenty Ontario returns, yet by arranging the varieties according to yield, both are in the same order. The relative yield, however, does not necessarily agree with the relative feeding value per acre of the crops. This is determined by amount of crop, degree of maturity of the product, and percentage composition.

Definitions.—*Ash* is the part of the fodder which remains unconsumed by burning to whiteness at the lowest possible red heat. *Crude Protein* is the muscle formers collectively. *Crude Fat* is a mixture of oils, wax, coloring matters, etc.; linseed oil is a common example. *Crude Fibre* is the woody portion of fodder. *Nitrogen-free Extract* is a mixture of substances commonly called carbo-hydrates; starch and sugar are examples. *Nutrient* is any substance that nourishes. Fat, protein, starch, etc., are nutrients.

Every variety was planted May 28th and cut September 17th. It would, therefore, follow that the late maturers, as Mammoth Southern Sweet and Thoroughbred White Flint, had not reached the same degree of maturity at the time of cutting as Compton's Early, an early maturing variety; and since the proportion of water decreases with maturity, a higher per cent. of water would be expected in the later than in the early maturers. Compton's Early contained 73.67 and Thoroughbred White Flint 84.16 per cent. of water. Early maturity and a low proportion of water are found in the same variety, while late maturity and a high per cent. of water occur together. Excepting Mammoth Southern Sweet, these varieties intermediate in maturity are also intermediate in per cent. of water. These facts alone indicate that an early maturing corn is a good ensilage corn. For ensilage purposes, heavy yielders are desirable; but to make sweet, nutritious ensilage, varieties that reach a good degree of maturity in any particular locality must be grown.

The figures in the second column, under fresh material, show a great difference in the amount of crude fat contained. Excepting .29, the average in Compton's Early, and .51, the average in Mammoth Southern Sweet, the higher fat percentages are found in the dryer and earlier maturing varieties.

TABLE OF COMPOSITION.

Varieties.		In Fresh Material.						Calculated to Water-free Substance.				
		Water.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen-free Extract.	Crude Fat.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen-free Extract.	Crude Fat.
Mammoth Southern Sweet	I	...	.80	.75	5.13	.....	.52	4.15	3.92	26.55	.....	2.69
	II	......	.79	.73	5.13	....	.50	4.13	3.81	26.61	.....	2.62
	Average.	80.70	.79	.74	5.13	12.13	.51	4.14	3.86	26.58	62.77	2.65
Thoroughbred White Flint	I	...	.64	.69	4.07	.....	.26	4.03	4.42	25.66	.....	1.63
	II	......	.65	.69	4.06	....	.21	4.14	4.36	25.66	.....	1.85
	Average.	84.16	.64	.69	4.06	10.22	.23	4.08	4.39	25.66	64.13	1.74
Wilson's True Leaming	I	......	.78	.91	4.40	......	.41	4.04	4.72	22.71	.....	2.11
	II	....	.76	.89	4.50	....	.46	3.97	4.60	23.71	.....	2.27
	Average.	80.67	.77	.90	4.45	12.78	.43	4.01	4.66	23.24	65.90	2.19
Mammoth Cuban	I	......	.68	.91	4.38	...	.33	3.62	4.67	23.20	....	1.76
	II	....	.67	.91	4.56	......	.42	3.56	4.67	24.11	....	2.21
	Average.	81.10	.67	.91	4.47	12.48	.37	3.59	4.67	23.65	66.11	1.98
Wisconsin Earliest White Dent	I	.....	.64	.89	3.94	....	.38	3.53	4.71	21.74	.....	2.11
	II	......	.66	.88	4.21	......	.....	3.64	4.67	23.22	.....	.....
	Average.	81.89	.65	.89	4.08	12.11	.38	3.58	4.69	22.48	67.14	2.11
Compton's Early	I	...	.91	1.16	5.07	......	.30	3.46	4.42	19.35	....	1.14
	II	......	.96	1.19	4.92	......	.29	3.65	4.54	18.66	.....	1.11
	Average.	73.67	.93	1.17	5.00	18.94	.29	3.55	4.48	19.01	71.84	1.12
*126 American Analyses	Max	93.60	2.58	4.03	11.40	36.31	1.59	13.8	18.2	39.2	72.9	6.7
	Min	51.50	.55	.54	1.90	3.01	.08	2.9	2.8	11.2	39.4	.6
	Average.	79.33	1 16	1.82	4.98	12.17	.54	5.6	8.8	24.1	58.9	2.6

*Including a great many varieties.

While the proportion of crude fibre is nearly the same in most of the varieties, it is relatively high in Compton's Early and Mammoth Southern Sweet. Probably the high degree of maturity in the former, and the natural deficiency of great leaf growth in the latter, account for the high per cent. of fibre.

Compton's Early, in the fresh condition, is considerably richer in protein than the other varieties. Mammoth Southern Sweet and Thoroughbred White Flint are relatively lower in protein, both in the fresh material and water-free substance.

It is interesting to observe, under the water-free substance, the regular increase in the proportion of nitrogen-free extract (starch and sugar) with the degree of maturity.

NUTRIENTS CALCULATED TO POUNDS PER ACRE.

Varieties.	Protein.	Fibre.	Nitrogen-free Extract.	Fat.
Mammoth Southern Sweet	334.48	2,318.76	5,482.76	230.52
Thoroughbred White Flint	273.24	1,607.76	4,047.12	91.08
True Leaming	253.70	1,748.85	5,022.54	168.99
Mammoth Cuban	347.62	1,707.54	4,767.36	141.34
Wisconsin Earliest White Dent	316.84	1,452.48	4,311.16	135.28
Compton's Early	322.92	1,380 00	5,227.54	80 04

This table gives the number of pounds of the several nutrients contained in the total crop of one acre for the different varieties. The numbers are calculated from the tables of composition and yield.

It is not easy to state, on the basis of composition alone, the relative nutritive value of foods of different compositions. But upon their power to produce heat, the nutritive value of foods can be compared scientifically. Based on this, the following table compares the nutritive value of the total yield per acre of these six varieties of corn. The figures are calculated from the yield and analysis of the samples grown at this station. It must be remembered they refer to their nutritive or feeding value at the time of harvesting. The relative feeding values of the total crop of one acre of each of these varieties, at the time of harvesting, are to one another as these numbers. But made into ensilage, these varieties might not stand in the same order, owing to the influence of the maturity of a corn upon the quality of ensilage that it produced.

1.	Mammoth Southern Sweet	100
2.	True Leaming	87
3.	Mammoth Cuban	82
	Wisconsin Earliest White Dent	82
	Compton's Early	82
6.	Thoroughbred White Flint	70

PRACTICAL POINTS FOR FARMERS.

In the twenty full reports received there are twelve that may be called heavy and eight that may be called light soils.

The previous cropping, that is, the cropping of 1891, was as follows: Two experimenters cropped with fodder corn, one with winter wheat, four with oats, five with potatoes, one with pasture, two with meadow, and one each with beans, millet, alsike and rape.

In four varieties, two following potatoes and two following fodder corn, the highest yield of twenty tests was on light soils, two located in Grenville and two in Elgin. In the other two varieties, one following beans and the other following oats, the highest yield was on heavy soil. In five varieties, four following oats and one following meadow, the lightest yield in twenty tests was on heavy soils, three located in Frontenac, one in Huron and one in Peel. The lightest yield in the sixth variety was on gravelly loam after potatoes, in the county of Dundas.

The results undoubtedly indicate that heavier yields of fodder corn are obtained from light, warm soils than from heavy soils; they also lead to the conclusion that when the land is not specially manured for corn, heavier yields are obtained after such crops as potatoes, roots or even fodder corn than after cereal crops as oats, wheat, etc.

A further examination of the individual reports of the farmers who tested these varieties shows that corn may be grown successfully after pastures, alsike, red clover and rape. Speaking generally, all of these varieties have yielded well, but corn grown for the silo must yield well and mature fairly well, and therefore in selecting a corn for the latter purpose it is very important that a variety be obtained that will mature well in that particular locality.

From the 38 varieties of mangels grown in 1892 by the Experimental department, we analysed four kinds: Carter's Champion Yellow Intermediate, a yellow root of medium length; Steele Bros. Long Red Selected, a dark-red, long root; Carter's Warden Orange, an orange colored, globe shaped root, and Red Globe, a dark red globe shaped root, were the varieties analysed. In that list of 38 varieties, arranged in the order of their yield of roots per acre, these varieties analysed are, respectively, 1st, 4th, 20th and 26th.

Eighteen varieties of fall turnips were also grown during 1892. From this number, Jersey Navet, a white fleshed, long, oval, spongy turnip; Red Globe Norfolk, a white fleshed, round, good root; Greystone Improved, a white fleshed, flat root of medium firmness; Orange Jelly, a yellow fleshed, round, good root; White Stone, a white fleshed, flat root of medium firmness; and Yellow Aberdeen Purple Top, a yellow fleshed, oval shaped, good root, were the six varieties selected for analysis. These kinds stand respectively in the list of eighteen, arranged according to yield of roots per acre, 1st, 3rd, 4th, 10th, 11th, and 14th.

Five kinds of Swede turnips were analysed out of 44 varieties grown in 1892. White Swede, a firm, short necked root; Hartley's Bronze Top, a root having medium length of neck and not firm; Royal Norfolk, a short necked, firm root; Fetticairn Green Top, a long necked root of medium firmness; and Carter's Elephant, a long necked, spongy root, are the varieties analysed out of the list of 44. These kinds stand respectively, 1st, 6th, 22nd, 24th, and 25th in the list.

In the following table of composition, the percentages in every case are the averages of two analyses:

Varieties.	In Fresh Material.						Calculated to Water-free Substance.				
	Water.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen-free Extract.	Crude Fat.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen-free Extract.	Crude Fat.
Mangels.											
Carter's Champion Yellow Intermediate	91.91	0.68	1.00	0.67	5.67	0.07	8.46	12.45	8.33	69.79	0.97
Steele Bros. Long Red Selected	89.19	0.80	1.09	0.88	7.79	0.25	7.44	10.20	8.20	71.91	2.25
Carter's Warden Orange	89.59	0.90	1.91	0.89	6.63	0.08	8.72	18.44	8.66	63.35	0.83
Red Globe	88.36	0.82	1.89	0.91	7.71	0.31	7.06	15.92	7.89	66.54	2.59
Average	89.76	0.80	1.47	0.84	6.95	0.18	7.92	14.25	8.27	67.90	1.66
American average	90.85	1.05	1.39	0.87	5.68	0.16					
Swede Turnips.											
White Swede	85.04	0.69	1.31	1.39	11.43	0.14	5.00	9.89	10.14	73.93	1.03
Hartley's Bronze Top	87.35	0.73	1.61	1.19	9.04	0.08	6.45	14.00	10.58	68.36	0.61
Royal Norfolk	86.88	0.74	1.15	1.38	9.73	0.12	5.67	8.92	10.58	73.89	0.94
Fetticairn Green Top	88.05	0.74	1.51	1.31	7.97	0.42	6.28	12.71	10.80	66.63	3.58
Carter's Elephant	87.19	0.83	1.57	1.43	8.67	0.31	6.49	12.28	11.19	67.62	2.42
Average	86.90	0.94	1.43	1.34	9.39	0.21	5.98	11.56	10.66	70.08	1.72
American Average	88.61	1.15	1.18	1.25	7.66	0.15					
Fall Turnips.											
Jersey Navet	93.54	0.71	0.87	0.98	3.85	0.05	10.97	13.66	14.99	59.48	0.90
Red Globe Norfolk	92.65	0.69	0.84	1.17	4.49	0.16	9.47	11.41	16.0[illegible]	60.95	2.12
Greystone Improved	92.35	0.67	0.80	0.99	5.01	0.18	8.87	10.49	13.0[illegible]	65.26	2.38
Orange Jelly	92.89	0.80	1.37	1.08	3.83	0.03	11.36	19.27	14.9[illegible]	53.85	0.57
White Stone	92.17	0.71	1.37	1.19	4.41	0.15	9.05	17.53	16.21	55.46	1.75
Yellow Aberdeen Purple Top	90.57	0.99	1.71	1.20	5.30	0.23	10.69	17.73	12.96	56.17	2.45
Average	92.36	0.76	1.16	1.10	4.48	0.12	10.07	15.02	14.69	58.53	1.69
American Average	90.46	0.80	1.41	1.15	6.27	0.18					

This table on composition shows that in the different varieties of the three kinds of roots (mangels, Swede turnips, and fall turnips) analysed, there is a variation in composition. Assuming conditions of cultivation are similar, the choice of a variety may mean an actual gain or loss of ten, twenty, or even fifty per cent. in food. The Canadian and American averages are closely identical in the three classes of roots. These averages show that fall turnips contain the highest per cent. of water, and, therefore, the lowest per cent. of dry matter, or food; mangels come intermediate, and Swedes contain the lowest per cent. of water and highest per cent. of dry matter.

Considering the composition of these varieties of roots, as given in the above table, together with their yields, average weight per root, etc. (Annual Report of 1892, pp 87-91), important differences are observable.

Varieties.	Per cent. of dry matter.	Average weight per root.	Yield of roots per acre.	Dry matter per acre.
Mangels.		lb.	tons.	lb.
Carter's Champion Yellow Intermediate	8.09	2.72	25.78	4171.2
Steele Bros.' Long Red Selected	10.81	2.41	21.03	4546.6
Carter's Warden Orange	10.41	1.80	15.15	3154.2
Red Globe	11.64	1.61	12.98	3021.7
Swede Turnips.				
White Swede	14.96	2.51	25.13	7518.8
Hartley's Bronze Top	12.65	1.81	17.96	4543.8
Royal Norfolk	13.12	1.67	13.93	3655.2
Fetticairn Green Top	11.95	1.84	17.10	4086.9
Carter's Elephant	12.81	1.95	15.95	4086.3
Fall Turnips.				
Jersey Navet	6.46	2.08	21.38	2762.2
Red Globe Norfolk	7.35	1.78	17.78	2614.6
Greystone Improved	7.65	1.90	16.20	2478.6
Orange Jelly	7.11	1.32	13.15	1869.9
White Stone	7.83	1.91	15.10	2364.6
Yellow Aberdeen Purple Top	9.43	0.98	8.60	1621.9

Remembering that the dry matter of roots is apparently very thoroughly digested, this table makes it very evident that the yield alone does not determine the relative value of varieties. Carter's Champion Yellow Intermediate Mangel, for example, yields 25.78 tons per acre, while Steele Bros.' Long Red Selected yield 21.03 tons, being four tons less than the former; yet in this latter variety the product of an acre contains nearly 400 pounds more nutriment. This higher food value in the variety yielding a lower number of tons is due to its superior composition. The figures, under per cent. of dry matter, show the number of pounds of dry matter or food in 100 pounds of roots. Beginning with the lowest in each class of roots, these figures tend to occur in the same order as their respective numbers, beginning with the highest in the next column under average weight per root. That is to say, large roots apparently contain a lower per cent. of dry matter or food than smaller ones. A comparison of the figures in the two last columns makes it very evident that the relative yield per acre does not determine the relative feeding value of the product.

These facts contained in the above table lead to the following conclusions:

1. That farmers should not hastily conclude that the heaviest yielder is the most profitable variety to grow.

2. Medium sized varieties of roots may produce less weight but more feed per acre than very large kinds.

3. In choosing a variety, consider composition as well as yield.

4. Of the above varieties, Carter's Champion Yellow Intermediate is the most profitable variety of mangels, White Swede of Swede turnips, and Jersey Navet, Red Globe Norfolk and Greystone Improved, the best varieties of fall turnips.

During 1892 the Experimental department tested the effect, of different distances between the plants in the drill upon the yield of fall turnips, Swedes and mangels. The width between the drills in every case was 27.7 inches. In the case of the mangels and Swedes the distances were, unthinned, 8 inches and 20 inches; and in the case of the fall turnips, 4, 12 and 20 inches apart, respectively. See Annual Report of 1892, pp. 88-92 The roots grown in these experiments have been analysed in the chemical laboratory to determine their relative composition; and the results, which are the average of two analyses, are given in the following table:

—	In Fresh Material.						Calculated to water-free substance.				
	Water.	Ash.	Crude protein.	Crude fibre.	Nitrogen-free extract.	Crude fat.	Ash.	Crude protein.	Crude fibre.	Nitrogen-free extract.	Crude fat.
Mangels.											
1. Unthinned....	78.07	0.61	1.31	1.49	18.11	0.41	2.80	5.98	6.79	82.59	1.84
2. 8 inches....................	86.76	0.79	1.33	1.00	9.87	0.25	5.98	10.04	7.57	74.50	1.91
3. 20 inches	90.77	0.83	1.08	0.77	6.43	0.12	9.01	11.79	8.36	69.55	1.29
Swedes.											
1. Unthinned	83.90	0.97	1.76	1.40	11.88	0.09	6.54	11.83	12.06	68.90	0.67
2. 8 inches....................	87.88	0.76	1.56	1.31	8.22	0.27	6.33	12.89	10.82	67.68	2.28
3. 20 inches	88.36	0.80	2.03	1.52	7.24	0.05	7.59	15.42	11.18	65.44	0.37
Fall Turnips.											
1. 4 inches....................	91.07	0.89	1.04	1.16	5.68	0.16	9.90	11.66	13.40	63.20	1.84
2. 12 inches	91.08	0.82	1.04	0.97	5.96	0.13	9.20	11.63	11.09	66.56	1.52
3. 20 inches	92.16	0.88	1.42	1.04	4.32	0.18	11.35	18.31	13.35	54.63	2.38

Prizes, in the root class at least, awarded by agricultural associations, were usually won, in past years, by exhibitors having the largest roots. But of late years judges have attached considerable importance to evenness of form and smoothness of skin. This appears to be a step in the right direction. The ultimate object in awarding prizes is to encourage increased production. It is not accomplishing the most to encourage increased production of crop regardless of the increase of nutriment. First prize may be given to larger, and second to smaller roots; yet the farmer owning the latter may have produced, from an equal area, more pounds of nutriment. This man should have received the first, and the other the second prize. It does not require much skill to grow a few large roots. Usually, favorable conditions of soil and a little experience are sufficient. But to produce the largest weight of nutriment, or food, requires the application of a knowledge of the science of agriculture, together with experience and favorable soil conditions. Rewarding such a producer would greatly tend to encourage the application of thought in the cultivation of the soil.

The following table, giving the composition of one kind, each, of mangels, Swedes, and fall turnips, grown at different distances apart in the drill, shows a greater variation in the composition of the same variety than was observed in different varieties.

Distances.	Per cent. of dry matter.	Average weight per root.	Yield per acre.	Dry matter per acre.
Mangels.		lb.	tons.	lb.
Unthinned	21.93	0.16	15.45	6776
8 inches	13.24	1.34	19.32	5116
20 "	9.23	1.36	15.01	2771
Swedes.				
Unthinned	16.10	0.20	7.65	2463
8 inches	12.12	1.60	20.54	4979
20 "	11.64	2.44	14.00	3259
Fall turnips.				
4 inches	8.93	1.02	19.61	3502
12 "	8.92	1.59	17.57	3134
20 "	7.84	2.97	13.19	2068

Conclusions.

1. Variation in distance between the plants influences the size, the yield and the composition of the roots.

2. There is a regular decrease in the per cent. of dry matter with an increase in the distance between the plants.

3. There is a regular increase in the average size of the roots with an increase in the distance between the plants.

4. It appears from conclusions 2 and 3 that conditions increasing the average size of roots increase their per cent. of water.

5. Yield increases with an increase in distance between plants in the drill to a certain distance, which appears to be between 8 and 12 inches, and beyond this it decreases.

6. More dry matter is produced by thinning to a distance of eight than twenty inches.

7. Roots tending to lengthen rather than broaden, should be thinned to a distance of 8 or 9 inches apart in the drill, otherwise the distance should be about 10 inches.

In concluding my report, I beg to remind you that the basement of the chemical laboratory is still occupied by the Experimental department. This part of the building, fitted up as an analytical class-room, is greatly needed by the Chemical department.

Very respectfully yours,

A. E. SHUTTLEWORTH.

PART IV.

REPORT OF THE

PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College :

SIR,—I beg to present my first annual report. I received the appointment of Professor of Veterinary Science, on the 31st of December, 1892, and have given professional attention to the stock of the farm since. I am pleased to be able to report comparatively little loss.

Horses. In horses we have had some serious cases of acute indigestion, but no fatal cases of any kind.

Cattle. We had one fatal case of parturient apoplexy in a Jersey grade cow in the dairy stables. There were some serious cases of metritis (inflammation of the womb) and many cases of minor importance, all of which recovered. With the exception of the case mentioned we had no deaths, except those we slaughtered. On December 31st, I was asked to examine two cows that were not doing well. I condemned them as presenting very strong symptoms of tuberculosis, and ordered their isolation. On my return from Institute work, about January 21st, I found one of these animals much worse, and on gaining your permission I slaughtered her and found on holding a *post mortem* that she was very extensively diseased. The other cow was thriving tolerably well and we kept her isolated. She gave birth to twin calves, one of which lived. Under instructions from the Minister of Agriculture, I tested this cow and some more of which I was suspicious, with "Prof. Koch's lymph," or tuberculin. The mode of testing is as follows: A ten per cent. solution of the lymph is made in a one per cent. solution of carbolic acid and injected hypodermically into the animal as follows. The seat of injection, "usually the loose skin just back of the shoulder," is sterilized by, say, a five per cent. solution of creolin, the syringe is also disinfected by the same, and from 3 to 4 cubic centimetres, "50 to 70 drops," is injected. The temperature of the animal is taken before the injection, and every two hours or so after for 15 to 18 hours. A rise of two degrees of temperature is supposed to denote tubercle. In healthy animals the increase of temperature is slight, but in diseased animals it begins to increase in from 4 to 12 or 14 hours, and continues to increase until in some cases it reaches as high as 7 or 8 degrees above normal. The degree of increase of temperature does not in all cases denote the extent to which the disease has reached, but I find as a rule an animal that is extremely diseased shows an increase earlier than one in which the disease is in an incipient or early stage. My experience with the test has been that it can be depended on in all cases. Some animals that it condemned were very slightly affected, but in no case did it condemn an animal that was not diseased. With one exception this has been the experience of all the writers whose views I have read. The exception mentioned is that of Prof. Brown, "an English writer," who says that in about ten per cent. of the cases tested it was wrong—that it indicated disease in some animals that were not diseased and *vice versa.* Even if this be so it is a wonderful aid in diagnosing the disease, and if the government should see fit to class this disease in the contagious disease Act, and endeavor to stamp it out by slaughtering all diseased animals, this test will be of great value. As there is no doubt that the trouble is more common in cattle than is generally supposed, the subject is worthy of the most serious consideration of the government. The slaughter of all affected animals would entail serious loss to individuals, unless remunerated by the government. I do not think there is any danger in using the milk of affected animals, unless the udder or lacteal apparatus be affected, or in using the flesh of diseased animals unless the muscles be diseased, and not then if the flesh be well cooked; but as the disease is infectious we cannot tell where it will stop. It was thought, at first, that the use of tuberculin would cure consumption or tuberculosis in man, but it was a forlorn hope, and it is generally conceded now that it increases rather than decreases its activity. My observation of its use in cattle have lead me to the following conclusions: In healthy animals it has no constitutional effects, beyond possibly exciting a slight fever for a few hours. In animals even slightly diseased, the fever is much better marked, and if a milch cow the secretion of milk is considerably reduced for some time, and in some cases the general thriftiness of the animal is interfered with. If the animal be in calf, especially if a heifer carrying her first calf, she is prone to abort. Further experiments of a more thorough nature in regard to tuberculosis and the use of tuberculin have been undertaken and are now in progress. At the time of writing this (December 1st) the tests are not sufficiently advanced to make a definite report as to results.

Sheep. We lost a couple of ewes from grub in the head, and four ewes from liver disease, the cause of which I could not very well determine, and a ram from injury to the head, in all probability received from fighting. Also two or three lambs from a collection of wool in the stomach, stopping the passage into the intestine, but comparatively speaking our losses in sheep were light. Knowing that for several years the institution had sustained serious loss in lambs by death from tapeworm, I decided to experiment in order to, if possible, prevent the trouble. I treated all the lambs with a decoction of pumpkin seeds every week or ten days, from the middle of May until the middle of August, and I am pleased to state thet we did not have a single case of tapeworm. As one experiment will hardly establish its efficiency, I expect to repeat it next season.

Swine. With the exception of newly-born pigs, we had but one death among the swine, that being a Berkshire barrow that died suddenly, and a *post mortem* revealed rupture of a blood vessel.

Respectfully submitted,

J. HUGO REED, V.S.

PART V.

REPORT OF THE LECTURER ON HORTICULTURE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present herewith my report for the Horticultural department, and as my duties began here only two months ago, it will necessarily be brief.

My work in this department is of a two-fold nature.

1. Class room work, which has so far engaged the most of my attention, in teaching the principles and practice of horticulture.

2. Outside work, connected with the management of different branches of this department.

The outside work may be treated of under three heads:

1. Supplying the College and beautifying the grounds.
2. Conducting the work that it may be an object-lesson for the students.
3. Giving the public the benefit of practical experiments.

1. SUPPLYING THE COLLEGE.

Supplying the College with fruits and vegetables and beautifying the surroundings has so far been the main object of the work in this department; and I think the work done reflects credit on those who have had it in charge.

The kitchen-garden consists of about four acres, and has this year yielded sufficient of most vegetables, with the exception of potatoes, to supply the demands of the College.

This supply from the garden is supplemented during the winter and early spring with radishes, lettuce, tomatoes, etc., grown in the forcing-house.

The fruit supply has been in some respects limited. Of the small fruits—strawberries, raspberries, currants and gooseberries, there is a good sized plantation, and I am told the yield from it the past season was excellent.

Of the larger fruits—apples, pears and grapes—there has been little or none; the apple crop being a failure, and the pear trees and grape vines not yet being of a bearing age. During the past eleven months $535.65 worth of fruit and vegetables have been supplied to the College, and $55 worth have been sold to parties coming for it.

The management of the lawns, green-houses and ornamental clumps has during the past been the heaviest work in this department. The lawn covers an area of about twenty-three acres; and, with its extensive drives, flower-beds and shrubbery clumps, has, it is estimated, between six and seven miles of border, which is kept in trim with the edging-knife. The lawn is gone over regularly with mowers and kept in first-class condition, requiring a good deal of labor in the spring and summer months.

Our new green-houses, in extent and completeness, are probably unequalled by those of any other similar institution on the continent. We have an area of about seven thousand square feet under glass, and the houses are fitted up with all the latest modern improvements. They are well stocked with ornamental plants, a number of which did good service this year in contributing to Ontario's display at the World's Fair.

We have not yet as full a collection of economic plants as we would like, but hope before long to have a more complete list of these for instructive purposes.

Besides, the lawn and green-houses add much to the immediate surroundings of the College, and are a great source of attraction to visitors, there is a good sized arboretum, and a number of forest tree clumps scattered over different parts of the farm. Some of these clumps help much to improve the surrounding landscape, and are useful in hiding unsightly gravel knolls, while others occupy land which, we think, might better be included in the surrounding fields.

A much better plan, we think, of ornamenting our surroundings, and at the same time affording shelter to the adjoining fields, would be to plant forest tree-belts all along the western boundary of the farm. There are in the nursery here between thirteen and fourteen thousand trees which might be used in this way; and as the nursery occupies land which should properly be included in the surrounding field, we would recommend that the trees be taken up and so utilized.

During the past season several hundred elms were planted along the sides of the farm lane, and a large number of pines were set out on the grounds back of the College, which will in a few years add much to the general appearance of the place.

2. Providing an Object-Lesson for Students.

This has not in the past been as prominent a feature of the work as it should have been. We hope to be able to make it more prominent in the future. Students certainly have had excellent opportunities for observation in landscape-gardening and floriculture, and, to a certain extent, in vegetable gardening; but in fruit culture their lessons have not been of the most encouraging nature. In the first place, our vegetable garden is encroached upon by a combination of orchard trees, small fruits and flowers. These objectionable features should be removed as soon as can be reasonably done, and the whole land given up to the growing of vegetables.

In the second place, our orchards are not large enough and do not comprise enough of some of the most important fruits to illustrate their culture. The heavy crop borne this year by the few scattered plum trees in the garden indicates that we might be justified in putting out a good representative orchard of that fruit at least.

It is unfortunate that there is not a field naturally dry enough for an orchard situated sufficiently near that the fruit may be protected from outside depredations. Field No. 13, in which most of the fruit trees now stand, is the most conveniently situated, and as it seems to be the only choice, we would recommend that it be thoroughly underdrained; then a larger portion of it could be planted with the most promising and hardy varieties of such of the larger fruits as apples, pears, plums, cherries, quinces and grapes. A portion of the balance could be devoted to a small nursery for the propagation of the fruit and ornamental trees and bushes required on the place; and the balance of the field, as the orchard trees became older and required all the ground between the rows, could be given entirely to the growing of such small fruits as currants, gooseberries, raspberries, blackberries and strawberries. In that way this portion of the work of this department could be concentrated, instead of being scattered over the farm as at present; and with the orchards and fruit plantations so extended, students could have ample opportunity of becoming thoroughly familiar with the management of the different fruits.

3. Conducting Experiments.

This should be an important feature of our work, and we hope to be able to make it so. At an experiment station of this kind we are expected to aid the farmers and fruit-growers of the province in testing and reporting on new varieties, methods of culture and anything that may be of value in this line of work. The fruit growers of the province have been long asking the Government for an experiment station where such work could be carried on in a more favored section of the country. But as this has never been granted, we trust a liberal appropriation will be made for commencing the work here.

On account of the severity of the climate, we may not be able to succeed with many of the more tender varieties, but it should be gratifying to know that what is hardy enough to succeed here should do well over most other parts of the province. In that respect results obtained here might be a safer guide to fruit growers generally than results from a more favored locality.

Hoping in the near future to be able to report more particularly on what has been done than on what we hope to do, I am,

Respectfully yours,

H. L. HUTT.

Guelph, Dec. 30th, 1893.

PART VI.

REPORT OF THE

LECTURER ON AGRICULTURE.

To the President of the Ontario Agricultural College.

SIR,—I have the honor of submitting herewith a report outlining the work of my department. As I have had charge of this work only since October 1st, my report is, of necessity, a short one.

During the term lectures on live stock, principles of breeding and stable management, have been delivered to the first, second and third year students.

The work covered by the first year comprises lectures on stable management and practical work in judging live stock. Stable management is made to include the construction of farm buildings with regard to economy, convenience, ventilation, etc., coupled with lessons on the management of live stock. In this work the students are taken through the stables, and the many things that characterize good and bad management in feeding, watering, cleaning, etc., are pointed out and discussed; while the excellencies and deficiencies of the different buildings with regard to comfort, convenience, ventilation and general arrangement, are also noticed.

In the first year work in live stock no attempt is made to discriminate breed characteristics, but as many animals as possible are brought into the class-room, and judged solely on the basis of utility.

We also expect to complete a series of lectures on the management and application of farmyard manure, the principles underlying the chief operations of tillage, the cultivation of some of our more important crops, etc.

Second year work comprises the judging of animals as breed representatives, as well as for utility; also a course of lectures on the feeding and management of live stock and some of the simpler principles of breeding.

Third year work comprises a more extended course of lectures on the principles of breeding, coupled with practical drill in judging live stock.

To assist in training students to observe all the points of an animal, and to give him some idea of the relative importance of the various points, a system of score cards has been devised. The idea was obtained from Professor Craig, of the University of Wisconsin, who is one of our graduates. A sample score card is here furnished, being the one used for beef cattle:

ONTARIO AGRICULTURAL COLLEGE.

STUDENTS' SCORE CARD. No. 1.

Scale of Points for Beef Cattle.	Possible Score.	Students' Score.	Corrected.
A. *General Appearance:*			
Estimated weight ... lbs..			
Weight, according to age	5		
Form, deep, broad, low set, with straight top line and underline	8		
Quality, hair, fine; skin, pliable; bone, dense. All parts evenly covered with firm flesh	8		
Style, active and sprightly	1		
Temperament, neither sluggish nor wild	4		
B. *Head and Neck:*			
Muzzle, fine; mouth, large; lips, thin; nostrils, large	1		
Eyes, large, clear and placid	1		
Face, short; expression, quiet	1		
Forehead, broad and full	1		
Ears, medium in size and fine in texture	1		
Neck, thick and short; throat, clean	2		
C. *Fore-quarters:*			
Shoulder vein, full	3		
Shoulders, smooth, well fleshed, compact on top	4		
Brisket, extending well forward; breast, wide	2		
Dewlap, light	1		
Legs, straight and short; arm, full; shank, fine, smooth	3		
D. *Body:*			
Chest, full, deep and wide; girth, large; crops, full	10		
Ribs, long, well arched and thickly fleshed	5		
Back, broad and straight	6		
Loin, thick and broad	5		
Flank, full and even with underline	3		
E. *Hind-quarters:*			
Hips, smooth and proportionately wide	4		
Rump, long, even and wide; tail-head, smooth	5		
Pin bones, smooth and well set apart	3		
Thighs, full	3		
Twist, deep and plump	4		
Purse, full	2		
Legs, straight and short; shank, fine and smooth	3		
Tail, fine	1		
Total	100		

Animal..

Student.. Date..........................

A similar card is used for the dairy type of animal, for mutton sheep and for swine.

Possibly no score card could be devised that would be above criticism. In our score cards an attempt has been made to give only approximately the relative value of the various points. They are used only occasionally, and on these occasions they are used solely for the purpose of training students to notice all the points of the animal, to observe them critically and to distinguish the important from the unimportant. In judging, the score card is never used.

The interest evinced by the students in the different branches of this department is highly encouraging, and we feel confident that the present year will be a profitable one.

Respectfully yours,

G. E. DAY.

GUELPH, December 30th, 1893.

PART VII.

REPORT OF FARM SUPERINTENDENT.

To the President:

SIR,—I have the honor of herewith submitting my report, dating from the first of October last, when I commenced my duties as Farm Superintendent. Mr. J. E. Story was then Farm Foreman.

SILOS.

Dairy Silo: Mr. Story had completed filling the dairy silo. This is a circular building, 24 feet in diameter and 29 feet high; its estimated capacity is 250 tons of ensilage. The cost of filling this silo was given at $187, and the cost of producing the corn $150 making a total of $337. There were 22 acres of corn put in this silo: equal parts of Comptom's Early, Salzer's North Dakota, Wisconsin Early, White Dent and Mammoth Dent.

Farm Silo: The filling of the Farm silo commenced on the twenty-seventh of September, and was completed on the sixth of October. This silo is 14 feet by 17 feet, and 36 feet high. This building was filled with 20 acres of corn (of the same varieties as used for the Dairy silo) and 5 acres of millet.

The Ensilage: The dairy silo was opened on the tenth of November, and they commenced feeding to the cows. It is in good condition.

The Farm silo has not been opened yet.

FIELD CROPS.

The following is a list of the field crops grown during the summer of 1893:

Field No. 1, 20 acres: Lucerne and clover, hay.

Field No. 2, 17 acres: Siberian oats, 10 acres; Bavarian oats, 7 acres.

Field No. 3, 16 acres: Ensilage corn.

Field Nos. 4 and 5, 20 acres; Hay, 10 acres; pasture for the Dairy, 10 acres.

Field No. 6, 20 acres: Barley, 15 acres; mixed experiments, 5 acres.

Field No. 7, 20 acres: Prussian Blue peas, 12 acres; D'Auvergne peas, 5 acres; tall Turkish peas, 1½ acres; tall White Marrowfat peas, 1½ acres.

Field No 8, 20 acres: Joanette oats, 10 acres; Besthorn oats, 5 acres; Poland oats, 1 acre; Danebrog oats, 4 acres.

Field No. 9, 20 acres: The following varieties of spring grain were grown: Blue stem wheat, 1 acre; Pringle's Champion wheat, 1 acre; Red Fern wheat, 1 acre; Herison Bearded wheat, 1 acre; Highland Chief barley, 4 acres; Guyamaloga barley, 1 acre; Mandscheuri barley, 6 acres; Kinna Kulla barley, 2 acres; Hungarian barley, 3 acres.

Field No. 10, 13 acres: Hay, 6 acres; corn and other feed for the Dairy, 7 acres.

Field No. 11, 23 acres: Mandscheuri barley, 8 acres; balance in mixed wheat, oats and barley in equal quantities.

Field No. 12, 17 acres: Timothy hay.

Field No. 13, 15 acres; Ensilage corn, Mammoth Cuban, Wisconsin Early, Early White Dent, Salzer's North Dakota and Comptom's Early, equal quantities.

Field No. 14, 24 acres: Hay, 6 acres; experimental, 18 acres.

Field No. 15, 24 acres: Permanent pasture.

Field No. 16, 26 acres; Fall wheat, 2 acres; rye for pasture, 24 acres (afterwards plowed and sown with millet).

Field Nos. 17 and 18, 33 acres: used by Mr. Zavitz for experimental purposes.

Field No. 19, 30 acres: Fall wheat (4 varieties), 13 acres; sugar beets, 4 acres; mangels, 4 acres; potatoes, 4½ acres; Swede turnips, 4½ acres.

Field No. 21, 12 acres: Lucerne clover meadow.

Potatoes and Root Crops

On the seventh of October we commenced to take up the potatoes in field No. 19. Owing to the drouth the yield was poor.

The mangels, in the same field yielded 54 tons. These were pulled on the tenth and eleventh of October, about a week earlier than is necessary in many parts of Ontario. They were pitted in the field to sweat, and two weeks later were put into the cellar in first-class condition.

The sugar beets, also in the same field, yielded 46 tons. These were treated the same as the mangels.

The Swede turnips, which were also in No. 19, yielded 80 tons. These were pulled and put into the cellar on the 27th, 28th and 30th of October.

Fall Plowing.

As soon as the silos were filled the five teams were kept plowing, with little cessation, until the fifteenth of November, when we finished. We have 194 acres ready for spring crops. About half of this was gang-plowed after harvest, and plowed later with the ordinary plow.

Thistles and Other Weeds.

I understand that very much has been done to eradicate the Canada thistle and other noxious weeds from the farm; but I find that there is a great deal yet to be done in this line before the farm is clean.

Fences.

I hope a liberal grant will be given to renew the fences. The boundaries especially require attention, for the fences have outlived their usefulness.

Repairing Buildings.

Under Mr. McIntosh, the students repaired and painted the carpenter shop and implement buildings this fall. They used a cheap paint. This work was very much needed.

Permanent Improvements.

I have had the public road, which runs north-west of the College grounds, graded from the Brock road to the stream north-east of the College.

It is ready now for the gravel, which I intend to have hauled during the winter. I have also had the students grade and pave the gutters of the drive, from the College north-east to the experimental grounds.

We have removed the large pile of debris consisting of lumber, posts and stones, from the rear of the carpenter shop and implement sheds. The ground has been plowed and is ready for grading in the spring.

Live Stock.

I found the cattle, sheep and pigs not in the healthy condition I expected, considering the food and attention they were receiving. On examination I found them affected, more or less, with lice.

Cattle Lice: The cattle were troubled with what is known as the Short-nosed Ox-louse (*Hæmatopinus eurysternus*). An effectual remedy for this pest was found to be pyrethrum, an insect powder, which was dusted over the animals' backs and rubbed in by hand. Several animals were washed with Little's dip. This did not kill quite all the lice with one application, but very few were to be found a week afterwards; a dusting with the pyrethrum completed the work.

Sheep Lice: A small, pale-red louse, called the sheep louse (*Tricodectes spærocephalus*), affected the sheep. One application of Cooper's dip completely destroyed this parasite and also the common sheep tick.

The Pig Louse: The pigs were badly affected with a louse called *Hæmatopinus suis*. We got rid of them after two applications of Little's dip. One objection I have to this dip is that it leaves a dark scurf on the skin for some time.

Annual Sale.

Under instructions from the Minister of Agriculture, the annual sale of young purebred stock was held at the Victoria Rink, Guelph, on Thursday, the seventh of December, 1893.

The following is a list of animals sold and prices realized:

Cattle.

1 Shorthorn bull, calved March 12th, 1893	$105 00	
1 " " January 13th, 1893	90 00	
1 Hereford " March 15th, 1893	76 00	
1 Aberdeen Angus bull, calved March 20th, 1893	30 00	
1 Galloway bull, calved January 31st, 1893	105 00	
1 Devon " April 7th, 1893	36 00	
		$442 00

Pigs.

2 Berkshire	pigs, farrowed	November 6th, 1892	$ 71 00	
9 Yorkshire	"	March 28th, 1893	162 00	
5 "	"	May 24th, 1893	60 00	
8 "	"	June 2nd, 1893	122 00	
5 "	"	June 30th, 1893	57 00	
7 "	"	September 21st, 1893	68 00	
3 Tamworth	"	April 19th, 1893	40 00	
2 "	"	September 16th, 1893	19 00	
2 "	"	September 20th, 1893	18 00	
				$617 00
				$1,059 00

INVENTORY OF LIVE STOCK.

The live stock at present on the farm represents the following breeds of cattle, sheep and swine. The horses used on the farm are included:

Horses.		
11 horses for farm work, estimated value	$1,050 00	
1 horse for general purposes, estimated value	50 00	
		$1,100 00
Cattle.		
Shorthorns: 1 (imp.) bull	$200 00	
3 cows	400 00	
Herefords: 1 (imp.) bull	100 00	
2 cows	250 00	
1 yearling heifer	60 00	
Galloways: 1 (imp.) bull	175 00	
2 (imp.) cows	300 00	
1 heifer (imp. in dam)	75 00	
Polled Angus: 1 (imp.) bull	200 00	
1 cow	150 00	
1 yearling heifer	75 00	
Sussex: 1 (imp.) bull	125 00	
2 (imp.) cows	250 00	
1 yearling heifer (imp. in dam)	100 00	
Devons: 1 cow	90 00	
1 two-year old heifer	75 00	
Norfolk Red Poll. 1 (imp.) bull	150 00	
Jerseys: 1 bull	100 00	
Holsteins: 1 bull	150 00	
Ayrshires: 1 bull	50 00	
Grade cattle: 11 cows	400 00	
5 yearling steers	125 00	
		$3,600 00
Sheep.		
Dorset Horned: 1 ram	40 00	
9 ewes	225 00	
5 ram lambs	60 00	
3 ewe lambs	30 00	
Southdowns: 1 ram	25 00	
4 ewes	100 00	
3 ram lambs	30 00	
2 ewe lambs	25 00	

Suffolks: 1 ram	15 00	
3 ewes	100 00	
4 ram lambs	45 00	
3 ewe lambs	30 00	
Hampshire downs: 4 ewes	120 00	
5 ram lambs	60 00	
1 ewe lamb	15 00	
Shropshires: 1 ram	75 00	
10 ewes	250 00	
4 ram lambs	50 00	
8 ewe lambs	100 00	
Oxford Downs: 1 ram	75 00	
3 ewes	30 00	
3 ram lambs	18 00	
3 ewe lambs	15 00	
Leicesters: 1 ram	40 00	
3 ewes	60 00	
2 ram lambs	25 00	
2 ewe lambs	20 00	
Cotswolds: 1 ram	40 00	
4 ewes	100 00	
1 ram lamb	8 00	
2 ewe lambs	15 00	
Lincolns: 1 ram	40 00	
4 ewes	125 00	
1 ram lamb	15 00	
Grades: 9 grade ewes	45 00	
54 lambs and ewes	175 00	
		$2,241 00

Swine.

Berkshires: 1 boar	40 00	
3 sows	75 00	
Tamworths: 1 boar	25 00	
2 sows	75 00	
Improved Yorkshires: 2 boars	50 00	
3 sows	150 00	
15 sucking pigs	65 00	
		$480 00
		$7,421 00

Farm Implements.

The total value of farm implements on hand amounts to $1,900.

Your obedient servant,

WM. RENNIE,
Farm Superintendent.

Guelph, December 15, 1893.

REPORT

To the President of th

SIR,—I have the
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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 report of the work conducted in the Experimental department during the year 1893. Although it is over seven years since I first became connected with the experimental work of this institution, I now present my first report since being placed at the the head of the Experimental Department. Prof. Shaw, who was superintendent of experiments for nearly five years, and who sent his resignation to the Minister of Agriculture in September last, was somewhat closely connected with much of the experimental work, especially that part relating to live stock. In 1892, part of the report was prepared in the summer months, and the remainder during November and December, by Prof. Shaw and myself, and the whole of the report was submitted for your approval early in January. During the present year I have had but little help with the report from Prof. Shaw and the time for its preparation has been quite limited. The plot work required close supervision until the end of October, and consequently many of the grains could not be weighed and tested until the month of November. Owing to the limited time for preparing a report of so large an amount of experimental work, I have found it impossible to present many of the results of the tests in the manner which I had intended.

FIELD PLOT EXPERIMENTS.

The most extensive branch of work in connection with the Experimental department is that conducted in the trial grounds. Our experimental plots are becoming more complete, more attractive and more useful year by year. During the past season, there were upwards of 1,600 small plots, covering an area of about fifty acres. These varied from the one hundred and sixteenth of an acre to one acre in size, and were situated in three different fields. A field of twenty acres lying at the rear of the College building, was transferred from the Farm to the Experimental department in 1892. This land was thoroughly underdrained the same year, and then sown with rape, the crop being pastured off by lambs in the following autumn. As early in the spring of 1893, as the ground would admit, the field was very carefully measured out into small plots, of sufficient size for experimental work with grains, roots, etc. The half of the field upon which grains were sown had not received manure for some years, and the other half got a dressing of fifteen tons of farmyard manure per acre just before preparing the land for the roots. The second field contained thirteen acres and was situated at the north of the one mentioned above. It had been used for growing experimental crops for three years previously, and was sown with fodder crops, beans, peas, sunflowers, millets, etc., in the spring of 1893, and with winter wheat in the previous autumn. The third field devoted to experimental work was the one lying east of the farm buildings, which was divided into plots by Prof. Brown in 1883. This field contained experiments with grasses, clovers, fodder corn, potatoes and rape during the present year. Many of the farm fields were divided into sections ot two to five acres, which were sown with choice varities of farm crops, the seed being mostly supplied by the Experimental department. The results of the tests conducted in the experimental fields are given quite fully in this report.

Live Stock Experiments.

There have been six experiments conducted during the year is live stock feeding. Of these three were with lambs, two with steers and one with milch cows. They included one hundred and seventy-one animals in all. The third of a series of experiments in preparing lambs for the British market was completed during the year, and the summary results of the three years' work is presented in this report. The results of the experiment in feeding corn ensilage and straw to steers were prepared for print by Prof. Shaw and myself before his resignation in September last.

Co-operative Experiments in Agriculture.

A very important feature of the Experimental department is its system of co-operative work in agriculture, which has been established over Ontario. Fertilizers and seeds of superior varieties of farm crops are distributed annually among the graduates of the College through their association known as the Agricultural Experimental Union, and also among other interested and progressive farmers throughout the Province. During the present year no less than 322 packages of fertilizers, 894 of fodder seed, 1,230 of root seed, 3,110 of spring grain and 1,650 of winter grain were sent out to Ontario farmers.

This system of co-operative experimenting was started upon its present basis in 1886. In the first year of the work there were only twelve experimenters, in 1887, sixty; in 1888, ninety; and since that date the work has had a steady and substantial growth in accordance with the development of the station and the demands of the Province. There are at present upwards of eleven hundred experimenters with spring and winter crops. Most of the reports of the work for 1893 have been received, and nearly all the experimenters are desirous of continuing the experiments during 1894, there being less than five per cent. of the whole number who do not desire the material for the tests to be sent to them next spring. Not one complaint has been received regarding either impurity or inferiority of seed sent out in connection with the tests. For full particulars regarding the co operative experiments in agriculture the reader is referred to the report of the Agricultural Experimental Union, which can be found in the latter portion of this volume.

Visitors to the Experimental Department.

The thousands of farmers who visited the institution in the month of June, as well as those who came at other times in the year, appeared to take much interest in our experimental work. The plots presented a good appearance during June, but the growth was too small to give the best opportunity for study. The winter wheat varieties, however, were sufficiently well advanced to show their habits of growth quite satisfactorily. The latter part of July is usually the period in which the plots can be studied to the best advantage. The crop on each plot has features of its own, which cannot be well understood at a glance, and the man who visits the experimental fields at the best season of the year, and who has note-book in hand, and time at his dispesal, is the man who is likely to get the greatest good from a trip through the trial grounds. To go through two of the experimental fields and merely read the labels placed at the plots, would require a journey of over four miles. It is impossible for an excursion of farmers to spend a part of a day or even a whole day at this institution, visit the different departments, and at the same time carry home with them much detailed information regarding our experimental work. We are, however, always glad to co-operate with yourself in welcoming the farmers to the institution, even though they come in very large numbers and remain but a very short time, realizing that after seeing the careful and systematic way in which the work is conducted, the report of the experimental results will be read with even more interest and value by those for whom it is prepared. The Minister of Agriculture has no doubt taken a wise course in encouraging the farmers to visit the College and observe for themselves the work which is being done.

Our College Exhibit at the World's Columbian Exposition.

At the request of Mr. N. Awrey, M.P.P., Ontario Commissioner at the World's Columbian Exposition, Hon. John Dryden, Minister of Agriculture, and yourself, an exhibit from our Experimental department was presented at the World's Fair during the past summer. No attempt was made to illustrate the whole of the experimental work which is now being carried on at the College. The exhibit was confined to varieties of barley, peas, spring wheat, winter wheat, oats and fodder corn, all of which had been grown in our trial grounds. The collection contained about 500 varieties, and in the case of many kinds, showed the fourth year's growth from seed originally imported by this station from Germany, Italy, Sweden, Russia, England, and Scotland; from France, Switzerland, Hungary, Greece, and Sicily; from Egypt, Japan, New Zealand, Australia, and the United States. The principal Ontario varieties were, of course, presented in the collection. All the grains were shown in glass sample jars, and most of them were exhibited in the straw as well.

On reaching Chicago on the 21st of March last I found Mr. Awrey had secured a most excellent space for the Ontario exhibits of grain, grasses, etc. This was located in the central part of the magnificient agricultural hall and fronted leading passage-ways along two sides. At the request of Mr. Awrey, I prepared the designs for both the Ontario and the College exhibits in agriculture. Work was at once commenced, and in a short time the Ontario court gave an entirely changed appearance. In the central part, the Agricultural College trophy was erected with its central dome reaching fully twenty-five feet from the main floor, while the smaller domes at the sides extended upwards for a distance of about eighteen feet. There was a a walk of six feet between the College trophy and the Ontario exhibit of grains, grasses, etc., which occupied the outer portions of the court on all sides. Just before the College exhibit had reached completion, the spring opened up, and it was necessary for me to return to Guelph to look after the work on the experimental plots. Mr. Awrey's staff of able assistants, went on with the work, and by the time the Exposition was officially opened, the Agicultural exhibits in the Ontario court were perhaps the nearest to completion of any in the entire building. During the latter part of May, I went back to Chicago and labelled all the samples in the College exhibit. Every variety was properly named, and was also numbered according to the official catalogue.

The following are a few of the many comments made by the public press of Canada and the United States, upon the Ontario Agricultural College exhibit at the World's Columbian Exposition:

"The display made by the Agricultural College of Ontario shows what an Agricultural College can do and it would be a good idea for the trustees of our State Agricultural College to visit the Canadian pavilion, and then ask why we have nothing similar to show for the expenditure of the people's money."—"*Standard*," *Chicago*.

"A prominent feature of the Canadian exhibit is that contributed by the Ontario Agricultural College and Experimental Farm at Guelph, which was arranged by Mr. C. A. Zavitz, a member of the College staff. The pavilion as a whole is artistically trimmed and decorated with grains and grasses."—*Dominion Illustrated Monthly*.

"The Agricultural College of Ontario has employed corn and grain in sheaf and native grasses to form a design that can only be appreciated when seen."—*National Popular Review*.

"Mr. C. A. Zavitz, B.S.A., of the Ontario Agricultural College, may well feel proud of his work in designing the Ontario court, with its inner temple, dedictated as it is to his Alma Mater, for its component parts and the elements from which it is elaborated are from the Guelph College of Agriculture."—*Toronto Daily Mail*.

"The Ontario show of cereals was very carefully selected and the arrangement was the work of the Ontario Agricultural College. In comparsion with the near-by displays made by Ohio, Indiana and other States, Ontario certainly more than holds her own. The quantity, quality, variety and tasteful arrangement are in striking contrast to the exhibits of western cereals."—*The Illustrated Buffalo Express*.

"The Agricultural Building is a truly palatial structure, and the space allotted to Canada is prominent and liberal. Her court is in the south-east corner of the building, Ontario having about 1,500 square feet fronting on two sides. No similar space in the building is more attractive, thanks to the excellent taste displayed in the design. . . . . . . In the interior is undoubtedly the finest trophy in the building, if not the handsomest ever erected for the purpose of the kind. Covering a space of nearly 150 square feet, it rises about 25 feet by a series of terraces, and on it are artistically arranged glass vases filled with grain samples. The name of the Ontario Agricultural College, Guelph, is embroidered, so to speak, on either side of the trophy in cross sections of Indian corn. There are no less than one hundred varieties of oats, one hundred and thirty of wheat, seventy of barley, and others in like proportion, all the produce of the College Farm, which is the pride of every Ontario farmer, and acknowledged to be one of the leading schools of practical Agriculture in the world. Surmounting the whole is an enormous glass jar containing about a bushel of choice peas."—*The Farmers Advocate and Home Magazine, London.*

World's Agricultural Congresses.

The World's Congress Auxiliary of the World's Columbian Exposition, will, perhaps, have more lasting influence upon mankind than even the Great Fair itself. From the first of May until the end of October of the present year a regular series of congresses were held in the Memorial Art Palace, Chicago. The time devoted to the Department of Agriculture extended from the 16th to the 23rd of October, and in some instances no less than eight agricultural congresses were in session at the same hour.

The Association of American Agricultural Colleges and Experiment Stations also met in the Art Palace on the 17th, 18th and 19th of October, and held its sessions in harmony with the section on "Agricultural Education and Experiment," of the World's Congress Auxiliary. Representatives from many foreign countries were present and spoke at the various meetings upon the development of agricultural education and experimentation in their respective lands. Nearly all, if not all, of the American Agricultural Colleges and Experiment Stations, had their delegates at this great parliament of Agriculture, and I wish to thank you most kindly for sending me as the delegate from our own institution. It was my privilege, while there, to attend every session of the section on "Agricultural Education and Experiment" of the World's Congress Auxiliary and also of the Association of American Agricultural Colleges and Experiment Stations. Avenues of thought were there opened up, which, I am sure, will result in much good for the work to which I am devoting the whole of my energies.

Experiments in Growing Grain.

A regular system is followed in growing grain for experimental purposes. All varieties are grown under as nearly the same conditions as can be obtained. The size of plot chiefly used is 100 links long by 10 links wide, thus being exactly $\frac{1}{100}$ of an acre. Great care is exercised to have all plots exactly true to size. Upwards of 400 varieties of grain were grown upon uniform plots during the present year. Some of them had been grown for four years previously, some three, some two, some one and some were grown this year for the first time upon our trial grounds. The leading varieties are being brought together from many parts of the world where grains are grown in a similar manner to the way they are grown in Ontario. Some of the varieties prove very successful while others prove to be total failures in our climate. All 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, has 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 fifteen thousand packages of choice seed have been sent out over the province during the past three years, and some of the varieties are being grown quite extensively. Nearly the whole of the grain grown upon the fields in the Farm proper, during 1893, was from seed supplied by the Experimental department, which was first grown upon the small trial plots, and from that again upon 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 again grown in larger plots, all varieties are grown in single rows with two hundred grains in each row. The rows are two rods long and one foot apart. This gives a grand opportunity to confirm the results of the same varieties upon 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 which varies slightly in character a much better opportunity is afforded to determine which variety is most affected by rust, which possesses the strongest straw, etc. From the single rows the collection is made for the autumn exhibitions at Toronto, London and other places. By this means the plots are left entirely undisturbed, and as the greatest accuracy is practiced in our plot work the results may be considered to be of a very reliable nature.

A considerable amount of work has been done in the selection of seed, and in our experience, up to date, we find that if much care is exercised in the selection of fine plump seed, year by year, the quality of the grain is almost sure to be of a superior class. A number of experiments are now being started to show the exact influence in sowing different grades of seed of various varieties of grain. This will also include different classes of farm crops. The experience of the past has shown that there is a very important work which should be carried out to ascertain to what extent crops can be improved by a very careful selection of seed year after year.

The Summer Rainfall.

During the summer of 1893, the weather was mostly favorable to our field experiments. There were occasional showers during each of the summer months in the vicinity of Guelph, although the total amount of rainfall was 1.78 inches less during the five summer months than the average of the previous six years. The amount of rainfall for May, June, July, August and September, during the last seven years was as follows:

Month.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.
May	1.58	1.08	3.59	2.18	.68	3.67	1.61
June	2.36	2.92	4.25	5.31	1.15	4.50	1.64
July	.61	2.21	2.67	1.44	3.54	3.15	1.89
August	2.71	2.16	1.92	1 74	3.96	3.15	3.83
September	1.52	1.55	1.04	.72	2.62	2.44	1.32
Total	8.78	9.92	13.47	11.39	11.95	16.91	10.29

FIELD PLOT EXPERIMENTS.

Barley, Comparative Test of 73 Varieties.

Seventy-three varieties of barley were tested in 1893. Of this number fifty-two were two-rowed, eleven six-rowed, and ten hulless varieties. Thirty-seven kinds were grown upon the experimental plots for five successive years, fourteen for four years, ten for three years, three for two years, and nine were grown in 1893 for the first time. They were all sown broadcast at the rate of one hundred pounds per acre, upon plots exactly $\frac{1}{100}$ of an acre in size. Equal amounts by weight of seed were sown upon the different plots. Seeding took place on May 6th with all the varieties, except Jarman's Selected Beardless and Jarman's Golden Champion, which were sown on May 10th. The land was a clay loam and had not received any manure for several years. The crop during 1892 was rape which was pastured off by lambs in the autumn. The yields per acre have been estimated from the actual yields of the plots.

YIELDS OF 63 VARIETIES OF SIX-ROWED AND TWO-ROWED BARLEY.

Varieties.	Number of rows per head.	Results for 1893.			Average for number of years grown.		
		Weight per measured bushel.	Straw per acre.	Grain per acre (bush. 48 lbs).	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for five years:		lb.	tons.	bushels.	lb.	tons.	bushels.
1. Mandscheuri	6	50.5	1.53	53.3	50.7	1.75	56.7
2. French Chevalier	2	52.1	1.67	42.8	52.0	1.77	51.8
3. Oderbrucker	6	53.9	1.67	57.2	53 9	1.53	51.4
4. Scotch Improved	6	50.5	2.06	50 5	51.9	1.45	51.1
5. Empress	2	52.6	1.47	39.7	52.2	1.89	50.2
6. Two-Rowed Italian	2	53.0	2.03	65.5	52.6	1.93	49.4
7. Improved Cheyne	2	53.0	1.43	44.7	52.6	1.89	49.2
8. Thanet	2	54.1	1.38	41.7	52.5	1.80	48.7
9. Common Six Rowed	6	52.3	1.61	56.8	52.9	1.36	48.7
10. German Golden Drop	2	53.3	1.86	52.4	53.2	1.97	48.2
11. Improved Golden Melon	2	53.5	1.27	49.2	52.6	1.61	48.1
12. Selected Chevalièr	2	53.3	1.32	36.8	52.2	1.86	48.0
13. Kalina	2	52.0	1.49	39.9	52.5	1.74	47.9
14. Early Black	6	52.3	1.50	58.2	50.4	1.50	47.7
15. Hallett's Pedigree	2	52.0	1.30	39.7	52.6	1.62	47.7
16. Improved Beardless	2	52.6	1.59	45.7	51.9	1.92	47.4
17. Peerless White	2	53.3	1.64	43.2	53.2	1.77	47.2
18. Kinna Kulla	2	54.0	1.77	55.5	51.5	1.79	46.8
19. Phœnix	2	53.3	1.37	41.7	53 1	1.71	46.8
20. Imperial	2	53.3	1.47	38.9	52.6	1.89	46.6
21. English Golden Drop	2	54.9	1.70	52.9	52.6	1.86	46.4
22. English Malting	2	52.9	1.61	45.3	52.6	1.84	44.4
23. Improved Imperial	2	49.6	1.86	43.5	47.2	1.97	43.9
24. Probsteier	2	54.6	1.43	44 5	53.2	1.65	42.7
25. Cheyne	2	52.3	1.58	42.6	52.0	1.68	42.6
26. Golden Melon	2	53.6	1.59	48.5	52.5	1.60	42.6
27. Invel	2	52.9	1.36	41.2	51.6	1.71	41.8
28. Beardless	2	53.2	1.19	46.4	51.9	1.68	41.4
29. Carter's Prize Prolific	2	53.9	1.45	44.7	53.0	1.97	41.4
30. Pfanen	2	52.9	1.23	41.9	51.6	1.61	41.2
31. Two-Rowed Spreading	2	50.3	1.26	34.6	49.9	1.45	40.4
32. Scotch Chevalièr	2	52.6	1.95	28.1	52.8	1.67	39 3
33. Annats	2	52.5	1.09	34.7	51.4	1.66	38.5
34. Scholey's Chevalièr	2	52.0	1.17	37.6	51.0	1.67	38.1
35. Italian Rice	2	50.2	1.11	28.4	50.4	1.50	37.9
36. Emperor	2	51.0	.98	24.9	51.1	1.72	34 6
37. Dutch	2	51.3	.85	28.1	48.4	1.53	33.5
Grown for four years:							
38. Australian	2	54.6	1.49	46 2	52.3	1.80	51.4
39. Early Minting	2	53.0	1.64	47.2	52.1	1.91	50.4
40. Cape	6	49.0	1.16	50 7	47.2	1.34	50.0
41. New Zealand Chevalièr	2	53 6	1.39	43.0	52.8	1 92	49.5
42. Italian	2	51.3	1.44	40.9	54 6	1.86	49.0
43. Mensury	6	52.3	1.26	46.6	51.6	1.29	48.4
44. Diamond	2	51.5	.97	35.5	51 9	1.52	42.2
45. Very Early Lapland	2	48.0	.91	34.4	47.5	1.13	39.6
Grown for three years:							
46. California Brewing	6	47.1	1.05	44.6	45.4	1.48	57.7
47. Imperial Six-Rowed	6	51.5	1.60	58.0	52.2	1.47	56.5
48. Duckbill	2	51.3	1.16	32 9	51.9	1.72	52.0
49. Six-Rowed Baxter's Improved	6	50 2	1.38	39.5	52.1	1.46	52.0
50. Highland Chief	2	52.5	1.20	39.7	51.9	1.73	51.0
51. California Chevalièr	2	51.5	1.20	36.3	51.6	1.87	50.6
52. Salzer's California Prolific	2	51.0	1.45	29.2	52.3	1.68	49.9
53. Carter's Prize Prolific (imp)	2	53.5	1.46	39.3	52.5	1.75	48.7
54. Carter's Goldthorpe	2	52.0	.82	23.2	51.5	1.67	47.4
55. Martin West	2	53.3	1.18	34.1	54.3	1.53	46.8

Yields of 63 Varieties of Six-Rowed and Two-Rowed Barley.

Varieties.	Number of rows per head.	Results for 1893. Weight per measured bushel.	Results for 1893. Straw per acre	Results for 1893. Grain per acre. (bush. 48 lb.)	Average for number of years grown. Weight per measured bushel.	Average for number of years grown. Straw per acre.	Average for number of years grown. Grain per acre.
		lb.	tons.	bush.	lb.	tons.	bush.
Grown for two years :							
56. Gold Foil, Honsfords	2	52.6	1.03	32.6	51.8	1.87	**41.3**
57. Two-Rowed Canadian	2	50.9	.95	28.2	52.1	1.53	**37.3**
58. Selected Canadian Thorpe	2	50.5	1.84	24.2	50.8	1.42	**34.0**
Grown for one year :							
59. Vermont Champion	......	55.0	1.46	46.5	55.0	1.46	**46.5**
60. Four-Rowed	6	52.9	1.15	45.1	52.9	1.15	**45.1**
61. Black	2	52.0	1.31	40.4	52.0	1.31	**40.4**
62. Jarman's Selected Beardless	2	48.3	1.21	27.9	48.3	1.21	**27.9**
63. Jarman's Golden Champion	......	47.9	1.08	21.5	47.9	1.08	**21.5**

In 1893, the barley crop gave an average yield of 41.4 bushels of grain per acre and 1.39 tons of straw. This was somewhat below the average of the past five years, which shows a yield of 45.4 bushels of grain and 1.65 tons of straw per acre. The weight per measured bushel is, however, the reverse to this as the crop of the past year makes the best showing. In 1893 the averaged weight per measured bushel was 52.1 lbs., while that for the last five years was four-tenths of a pound less. Among the varieties tested some were of superior excellence, while others possessed qualities of a very inferior kind. 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. In the notes given below special attention is drawn to some of the best varieties.

Mandscheuri. Among thirty-seven varieties of barley, which have been grown in the comparative tests for the past five years, the Mandscheuri stands at the head of the list in yield of grain per acre. It is not at this station alone that this variety has done so well, but over the Province generally it has made an excellent record. In 1892 it was sent out along with five other kinds and tested in five different localities. Among these varieties it took the lead, and produced upwards of eight bushels per acre more than the next highest yielder. In no single test was it surpassed by any other variety. In the test at this station during the past five years it has given an average yield of eight bushels per acre more than the common six rowed, and 15.3 bushels per acre more than the Carter's Prize Prolific. The Mandscheuri is a six-rowed variety and possesses a straw which usually stands up well. It is a vigorous grower and seems quite well adapted to a variety of soils. The heads are a little more than three inches in length, compact, and produce about 45 grains each. In earliness it is superior to most other varieties, as in 1893, only 84 days elapsed from seeding time until harvest, and the average number of days to complete its growth during the past three years was 97. This variety came from Russia, and was imported by this station in the spring of 1889, with the name spelled as herein given. The grain somewhat resembles the Mensury which we obtained in Ontario four years ago, but it has given an average yield per acre of 14.5 bushels more than this kind in our comparative tests. The Mandscheuri seems to be better adapted for feeding purposes than for malting.

French Chevalier. The French Chevalier heads the list in yield among the two-rowed varieties grown for five years. It gives a weight of 52 lbs. per measured bushel for the number of years grown, which is 1.3 lb. more than the Mandscheuri. The yield per acre in 1893 was 42.8 bush., and during the past five years the average was 51.8 bush. The straw is long but is apt to lodge considerably in unfavorable seasons.

It is just one week later in ripening than the Mandscheuri. The heads are nearly five inches in length and produce an average of about 26 grains each. This variety did not do extra well over Ontario in 1892 in the co-operative tests, as among the six varieties tested the French Chevalier came at the bottom of the list in point of yield, but the results of all the kinds tested were not widely different.

Oderbrucker. This variety, which was imported from Germany in the spring of 1889, has made a good record. Not only has it given an average yield of 51.4 bushels of grain per acre for five years, but it has produced a grain weighing on an average 53.9 lb. per measured bushel. The weight per measured bushel in 1893 exactly corresponds with the average weight for five years. In the tests over Ontario in 1892, this variety stood second in point of yield among the six varieties, the Mandscheuri coming at the head of the list. It is a six-rowed variety and is a few days earlier than the Mandscheuri in reaching maturity. The average number of days during the past three years from seeding to maturity was only 92. Of the 63 varieties which have been grown for the past three years, none have shown themselves to ripen earlier than the Oderbrucker. The straw averages about 36 inches in height and is medium in strength. The heads measure only about 2½ inches in length, but they give an average of over 40 grains each.

Scotch Improved. The Scotch Improved is another six-rowed variety, the seed of which was obtained in Ontario five years ago. The yield of grain is not far different from the Oderbrucker, but the average weight per bushel is less by about two pounds. In 1893 the weight per measured bushel was 2.4 lb. less than that shown by the Oderbrucker. In earliness, it may be classed equal with the Oderbrucker and five days earlier than the Mandscheuri. The straw is usually fairly strong and there is but little tendency to rust.

Empress. This English variety has held its own well in the trial plots, and has produced a grain which has given an average of 52.2 lb. per measured bushel. It stands second in point of yield of grain among the varieties grown for five years, giving an average yield of 50.2 bushels. In maturity it is about two days later than the French Chevalier, occupying on an average 106 days from seeding time until harvest. The straw is usually pretty strong, although in some seasons there seems to be a tendency to lodge.

Two-rowed Italian. This is one of the finest two-rowed barleys which has been grown upon the experimental plots. It was imported from France in 1889, and has greatly improved year by year. In 1893, the yield of grain per acre was 65.5 bushels. This is the highest yield produced among the 63 varieties of six-rowed and two-rowed classes. As the crop stood on the plot, it was certainly very handsome, and the straw remained standing remarkably well until cut. The straw averaged over forty inches in length, and the heads measured 3¾ inches from end to end. The average weight per measured bushel for five years was 52.6 lb., and for 1893 it was 53 lb. It produces a large amount of straw which is usually quite free from rust.

Kinna Kulla. The Kinna Kulla barley is another variety which is making for itself a fine record. It is, perhaps, the strongest strawed barley, which has been grown at this station. It is very seldom that the smallest portion of a crop can be found that is lodged. The straw stands perfectly straight until harvest time, and as it is longer than that of any other sort which has been tested, this variety is usually selected as the finest appearing barley at this station. The average yield per acre for five years was 46.8 bushels of grain and 1.79 tons of straw, while the average weight per measured bushel for the same length of time was 51.5 lb. In 1893, the yield was 55.5 bushels per acre and the weight per measured bushel 54 lb. Among all the varieties grown for two years the two-rowed Italian stands first in point of yield of grain, and the Kinna Kulla comes next. The latter named variety is a two-rowed sort and was imported from Sweden in the spring of 1889.

Australian. This is a two-rowed variety which was imported from Germany in the spring of 1890, and has given an average yield of 51.4 bushels of grain per acre for the past four years. The weight per measured bushel of this variety was 54.6 lb. in 1893 and 52.3 lb. during the past four years. The straw is quite short, being only 31 inches in length in 1893, and it is also somewhat inclined to lodge.

California Brewing. Among ten varieties which were grown upon the Experimental Grounds in 1890 for the first time, the California Brewing has given the largest yield of grain per acre; the average for three years being 57.7 bushels. The quality of the grain, however, has been quite inferior and the variety will likely be but little grown on this account.

Duckbill. This variety has also been grown three years and has proven itself to possess good qualities. The average yield per acre has been 52 bushels of grain, which has given an average weight of 51.9 lb. per measured bushel. The straw is long and usually quite strong. In the comparative tests at this station, the two-rowed Italian and the Kinna Kulla have made much better records than the Duckbill, and the Carter's Prize Prolific has made a showing much inferior to the Duckbill.

YIELDS OF 10 VARIETIES OF HULLESS BARLEY.

Varieties.	Number of rows per head.	Results for 1893.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Straw per acre.	Grain per acre (bush. 60 lb.)	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for four years:		lb.	tons.	bush.	lb.	tons.	bush.
1. Hungarian	6	57.8	1.00	20.0	59.6	1.53	**40.2**
2. Black Hulless	6	60.0	1.55	22.5	63.5	1.59	**37.3**
3. Guymalaya	6	57.0	.96	21.4	58.4	1.16	**37.1**
4. Large Skinned	2	57.9	1.27	24.3	60.0	1.37	**27.8**
5. Skinless	6	60.2	.77	17.6	60.8	1.02	**24.6**
6. Three-rowed	6	59.8	.92	10.2	59.9	1.13	**23.1**
Grown for one year:							
7. Guy Mayle	6	62.5	1.15	43.23	62.5	1.15	**43.2**
8. Winnipeg No. 2	6	59.9	1.79	41.6	59.9	1.79	**41.6**
9. Purple	6	61.9	2.10	40.9	61.9	2.10	**40.9**
10. Smooth Hulless	6	62.0	1.47	39.4	62.0	1.47	**39.4**

During the past four years, six varieties of hulless barley were grown in the trial grounds. These were obtained from Hungary, Sweden, France, Germany, Australia and Ontario. In the spring of 1893, four other varieties were obtained from the Kansas Experiment Station. In working out the yield per acre, 60 lb. has been taken as the standard weight per measured bushel. The yields of the foreign varieties were exceptionally good up to the present year, but the results during 1893 reduced the average yields per acre considerably.

Hungarian. This variety was imported from Hungary, and has done well both at this station and over Ontario. In 1891, it was distributed along with five varieties of the six and two-rowed sorts, and the average results of the tests show the Hungarian to stand second in yield of grain per acre. It has a large light colored grain and a squarely built head of six rows. The straw is, perhaps, the strongest of the hulless varieties, but in unfavorable seasons the crop is apt to lodge considerably.

Black Hulless. The Black Hulless barley is now well known in some parts of Ontario, where it has been grown for some years. It is a good yielder of grain, showing an average of 37.3 bushels per acre for the past four years. The grain weighs heavier per measured bushel than any of the other Hulless varieties. The great weakness of the Black Hulless barley is the tendency of the straw to lodge. It is not uncommon to see he whole crop lying flat on the ground.

Peas, Comparative Test of 81 Varieties.

Eighty-three varieties of peas were grown in the Experimental Grounds during 1893. In 1891, the experiment with peas proved to be a complete failure on account of uneveness of germination. There were only twenty varieties grown in 1890, but thirty-six more were added to this number in 1892, and twenty-five more in 1893.

The grain was all sown with a grain drill made specially for plot work. There were ten tubes in the drill, and the tubes were 1 link (7.92 inches) apart. The quantity of grain used varied from 2 to 4 5 bushels per acre according to the size of the grain and the manner of growth of the various kinds. The soil was a clay loam and almost exactly the same as that used for the barley. The plots used in the tests were each 1-100 of an acre in size. Seeding of all varieties took place on the 6th and 8th of May, with the exception of the Common Grey, Nimble Taylor, Nine Pod, Partridge and Carter's Nimble, which were sown on the 11th of May. The yields per acre have been estimated from the actual yields given by the plots.

Yields of 81 Varieties of Peas.

Varieties.	Days to reach maturity, 1893.	Results for 1893.			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 three years:		lb.	tons.	bush.	lb.	tons.	bush.
1. Early Britain	94	59.0	1.13	35.7	59.5	1.14	**36.2**
2. Prussian Blue	98	61.5	1.86	35.4	62.4	1.34	**35.4**
3. Mummy	95	62.3	1.35	33.3	63.3	1.54	**33.5**
4 White Wonder	93	60.9	1.04	33.8	62.4	1.04	**34.0**
5. Field	87	62.5	1.38	33.9	62.9	1.21	**32.8**
6. Brown	94	59.0	1.48	35.8	58.8	1.56	**32.6**
7. Princess Royal	95	58.1	1.40	38.2	59.8	1.17	**32.5**
8. Black Eyed Marrowfat	96	61.8	1.68	34.0	61.3	1.44	**32.3**
9. White Eyed Marrowfat	96	60.8	1.71	41.2	61.7	1.36	**32.0**
10. Early Racehorse	89	63.0	1.09	26.1	63.3	1.19	**30.3**
11. Multipliers	100	61.3	1.66	30.3	61.6	1.60	**30.1**
12. Blue	......	59.5	.89	28.8	61.9	1.13	**30.0**
13. Sweet Jessie	91	62.5	1.30	28.5	62.3	.99	**25.3**
14. Glory	87	58.3	1.04	27.7	60.8	1.25	**24.8**
15. Perfection White	93	58.0	1.31	30.6	59.6	1.25	**24.7**
16. Selected Maple	77	63.5	.54	25.8	62.8	.64	**24.4**
17. Hero of Reading	87	58.2	1.31	26.4	60.1	1.14	**24.0**
18. Veitche's Perfection	94	55.0	1.15	19.9	55.2	1.14	**18.0**
19. Grass	109	63.8	2.10	25.8	63.5	1.81	**15.3**
20. Earliest of all Blue	80	62.3	.46	20.5	62.5	1.05	**14.1**
Grown for two years:							
21. Crown	98	62.0	......	38.5	61.1	1.55	**35.9**
22. Canadian Beauty (No. 10, Rennie)	96	62.3	1.55	37.4	61.8	1.55	**35.8**
23. Fall White Marrowfat	95	61.3	1.51	33.1	60.9	1.73	**35.4**
24. Canada Cluster	95	62.0	1.61	34.8	61.4	1.87	**35.3**
25. Centennial	102	60.9	1.76	38.8	60.5	1.62	**35.3**
26. Golden Vine	98	61.3	1.70	35.0	61.1	1.68	**33.8**
27. Scotchman	106	62.0	2.03	34.0	61.9	2.06	**33.5**
28. Early June	95	62.0	1.49	31.9	62.1	1.45	**33.5**
29. Royal Dwarf Marrowfat	98	60.5	1.35	30.9	59.9	1.48	**32.6**
30. Cleveland's Advancer	98	61.0	1.22	27.8	60.4	1.41	**31.5**
31. McLean's Advancer	88	52.6	.89	28.6	53.4	.91	**31.3**
32. Champion of England	94	55.3	1.68	32.2	55.0	1.63	**30.3**
33. Early Maple	108	61.5	1.75	27.5	60.8	1.80	**27.9**
34. Sword	97	61.6	1.22	24.4	61.2	1.32	**26.9**
35. Sexton's Alpha	94	54.3	.98	22.4	54.4	1.21	**25.6**
36. Prince Albert	100	61.6	1.15	21.8	61.4	1.55	**25.5**
37. Telephone	93	53.4	1.15	21.8	53.4	1.26	**25.2**
38. Sugar	91	58.9	.89	30.3	58.6	.74	**24.5**
39. Philadelphia Extra Early	79	62.5	.65	22.9	60.8	.68	**24.0**
40. Canada Field	98	60.6	1.07	16.1	60.6	1.34	**23.9**

YIELDS OF 81 VARIETIES OF PEAS.—*Continued.*

Varieties.	Days to reach maturity, 1893.	Results for 1893. Weight per measured bushel.	Results for 1893. Straw per acre.	Results for 1893. 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.
		lb.	tons.	bus	lb.	tons.	bush.
Grown for two years:							
41. Tom Thumb	73	65.3	.55	28.3	63.4	.55	**22.5**
42. Prince of Wales	85	52.5	.75	17.4	52.3	.95	**22.2**
43. Cleveland's Rural New Yorker	75	62.0	.97	21.8	62.3	.83	**21.8**
44. Potter	93	60.8	1.28	27.5	60.5	1.10	**21.7**
45. Oakshott Field Pea	109	53.0	1.30	18.4	53.0	1.35	**21.5**
46. Cleveland's Alaska	76	62.3	.97	21.0	60.9	.79	**20.4**
47. Pride of the North	91	57.5	1.15	20.1	57.8	1.09	**19.8**
48. Telegraph	87	60.9	.80	16.9	59.5	.94	**19.8**
49. British Queen	100	54.0	1.31	23.1	53.3	1.36	**19.5**
50. Striped Wisconsin Blue	100	62.3	.83	15.5	62.0	1.30	**19.2**
51. McLean's Little Gem	87	57.8	......	17.5	55.9	.68	**19.1**
52. Stratagem	92	54.5	.73	17.2	53.8	1.02	**19.0**
53. Anticipation	99	53.0	1.26	24.6	53.4	.92	**18.5**
54. Yorkshire Hero	99	59.0	1.81	21.2	54.8	1.44	**17.0**
55. Blue Peter	89	61.9	.64	13.8	59.4	.58	**11.8**
56. American Wonder	87	60.5	.30	9.8	56.5	.35	**8.5**
Grown for one year:							
57. Egyptian	101	61.3	1.13	35.8	61.3	1.13	**35.**
58. Chancellor	84	62.5	1.48	33.9	62.5	1.48	**33.9**
59. William the First	85	60.8	1.00	33.2	60.8	1.00	**33.2**
60. Nine Pod	98	58.3	1.31	33.0	58.3	1.31	**33.0**
61. Common Grey	96	58.3	1.05	32.7	58.3	1.05	**32.7**
62. Nimble Taylor	96	58.5	1.19	31.2	58.5	1.19	**31.2**
63. White Imperial	94	61.3	1.34	30.3	61.3	1.34	**30.3**
64. Laxton's Supreme	95	54.8	.69	30.2	54.8	.69	**30.2**
65. French Canner	83	59.3	1.05	30.1	59.3	1.05	**30.1**
66. Laxton's Prolific Long Pod	89	61.1	1.06	29.8	61.1	1.06	**29.8**
67. Bruce's Early Conqueror	76	61.6	.63	28.3	61.6	.63	**28.3**
68. Kentish Invicta	80	62.0	.59	27.9	62.0	.59	**27.9**
69. D'Auvergne	92	60.3	1.16	27.9	60.3	1.16	**27.9**
70. Bliss Everbearing	89	58.0	.97	27.8	58.0	.97	**27.8**
71. Ne Plus Ultra	98	52.8	1.24	25.4	52.8	1.24	**25.4**
72. New Giant Podded Marrow	91	58.8	.79	25.4	58.8	.79	**25.4**
73. Carter's Lightning	74	62.3	.51	25.1	62.3	.51	**25.1**
74. Tall Turkish	90	59.3	.95	24.9	59.3	.95	**24.9**
75. Carter's First Crop	74	61.3	.45	23.3	61.3	.45	**23.3**
76. Long Island Mammoth	88	57.8	.82	22.8	57.8	.82	**22.7**
77. Laxton's Evolution	88	57.9	.88	22.2	57.9	.88	**22.2**
78. Carter's Nimble White	106	58.1	3.34	22.1	58.1	3.34	**22.1**
79. Dwarf Sugar Edible Podded	93	60.8	.70	21.6	60.8	.70	**21.6**
80. Hair's Dwarf Blue Mammoth	105	56.0	1.10	16.8	56.0	1.10	**16.8**
81. Partridge	77	63.8	......	11.6	63.8	......	**11.6**

The same varieties which gave high yields of grain per acre in 1892, also made good yields during the past year. The best yield in 1893 was 41.2 bushels per acre, produced by the White Eyed Marrowfat, and the poorest yield was 9.8 bushels per acre, produced by the American Wonder. This shows a variation of 31.4 bushels per acre. Of the 81 varieties grown in 1893 the Tom Thumb was the first to mature and the Grass and Oakshott Field varieties were the last to ripen. The first named variety took 73 days from seeding until harvesting, while the latter required 36 days longer. Notes are given below regarding some of the best varities for field cultivation.

Early Britain. The seed of this variety was first imported from England in 1889 by this station It is a variety which has made a good record since first grown upon our trial plots. The average yield per acre for three years was 36.2 bushels, and the yield for 1893 was 35.7 bushels. It has been quite uniform in yield throughout. The weight per measured bushel was 59 lb. in 1893 and for the three years it was 59.5 lb. on the average. The straw was long and about average in weight of all the varieties tested. The peas were of a brownish color, average size, and of a somewhat uneven surface. The number of days taken to reach muturity in 1893 was 94. The quality of the grain was only medium, but all things considered, the Early Britian has shown itself to be a good field pea.

Prussian Blue. The Prussian Blue pea is now known over many parts of Ontario, where it has been grown for a few years past. It is a good yielding variety, and also possesses a grain of good quality. The average weight per measured bushel for three years was 62.4 lb. It stands second in yield of grain per acre among the twenty varieties grown for three years. The straw is long and quite heavy. In color, the grain is, of course, blue, as indicated by the name. It is usually of good quality and of a plump smooth character. There were about five peas per pod in 1893, and the average length of pod was nearly three inches The Prussian Blue variety was about four days later than the Early Britain in reaching maturity.

Egyptian Mummy. In the western part of Ontario this variety of peas has been grown for several years. By some people it is very highly spoken of, while others speak of this variety with much disfavor. It possesses very peculiar straw, being quite angling in nature and heavy in weight. The average yield of straw for three years was 1.54 tons, and the weight per measured bushel of grain for the same length of time was 63.3 lb. The color of the grain is white and the surface smooth. This variety matures about three days earlier than the Prussian Blue does in some seasons, but usually the two kinds mature about the same time.

White Wonder. The White Wonder pea was imported directly from New Zealand by this station in the spring of 1890, and so far it has made a good record in the comparative tests. In the average of three years it has given a yield of only 2.2 bushels per acre less than the Early Britain, and it has produced a grain which weighed 1.9 lb. more per measured bushel than that of the Early Britain variety. The grain is white, medium size, smooth and plump. The straw is lighter than that of any of the varieties mentioned above, and is of good quality. The White Wonder is slightly earlier in reaching maturity than the Early Britain, Prussian Blue or Mummy.

Crown. No lengthy description need be given of the Crown pea as it is now known over many parts of the Province. It heads our list in point of yield of grain among thirty six varieties grown for two years, giving an average of 35.9 bushels per acre The peas are smooth, white, small and were of rather inferior quality in 1893. The average number of days to reach muturity during the past two years was 105.

Canadian Beauty. This variety was spoken of in the report of 1892 as "Rennie No. 10," and has now been named Canadian Beauty. It is a fine large, white, smooth pea, and stands second in yield per acre of the thirty varieties grown for two years. It produced an average of .110 bushel per acre less than the Crown in the two years. The weight per measured bushel was 61.8 lb. during the same length of time, while that of the Crown was 61.1 lb. Number of days to reach muturity was almost, if not exactly the same as in the case of the Prussian Blue.

Egyptian. The Egyptian is a pea differing very materially from all of the other varieties grown. The stems are quite upright in growth and branched out in the form of a tree. The seed was received from Mr. Hine, of Elgin County, Ont., who stated that it had been brought from Egypt a short time before. There were seldom more than one pea in a pod, but this one was large and plump. The yield of grain per acre was the largest of the twenty-five varieties grown in 1893 for the first time, being 35.8 bushels and the weight per measured bushel was 61.3 lb. It took 101 days to reach muturity. This is certainly a peculiar, and at the same time, a promising variety. Careful experiments will be followed up with this pea from Egypt.

Spring Wheat, Comparative test of 73 Varieties.

No less than seventy-three varieties of Spring Wheat were tested in our Experimental Grounds during 1893. A large number of these varieties were imported from different countries, but all the Ontario kinds that could be obtained were included in the list. Of the seventy-three varieties, which are now in the test, twenty-two were grown for five consecutive years, while the rest have been grown for a shorter length of time namely, twenty-one varieties for four years, nine varieties for three years, ten varieties for two years, and eleven varieties for one year only.

The land upon which these varieties were tested in 1893 was similar to that used for the barley and the peas, except that it was slightly higher in situation. The treatment of the soil was also quite similar in every respect. The grain was sown broadcast at the rate of two bushels per acre, on plots 1-100 of an acre each. The plots were all exactly the same size, and the same quantity by weight of each kind of grain was sown upon its proper plot. Seeding of all varieties took place on April 29th with the exception of the Amythest, Champion Bearded, White, Australian, Early Scotch Bearded, Ruby, Ontario, Canadian Club, and Niagara, which were sown on the 9th of May. The yields per acre have been estimated from the actual yields given by the plots.

Yields of 73 Varieties of Spring Wheat.

Varieties.	Nature of Head.	Results for 1893.			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.
		Lb.	Tons.	Bush.	Lb.	Tons.	Bush.
Grown for five years:							
1 Herison Bearded	Bearded	60.3	2.78	30.7	62.7	2.0	**26.9**
2. Pringle's Champion	"	59.0	2.25	30.2	60.4	1.9	**24.9**
3. Bart Tremenia	"	61.9	2.14	37.0	62.6	1.7	**24.8**
4. Konisburg	"	60.3	1.88	30.5	61.7	1.6	**22.4**
5. Saxonka	"	60.5	2.33	30.1	60.3	1.7	**22.1**
6. Holben's Improved	Bald	56.8	1.96	22.2	58.5	1.8	**22.0**
7. Odessa Ghirka	"	59.0	2.24	28.6	59.7	1.8	**21.9**
8. Summer	Bearded	58.3	1 94	25.2	57.8	1.7	**21.6**
9. Ordinary Bearded March	"	57.8	1.82	24.3	58.0	1.7	**21.1**
10. Dantzic	"	59.5	1.86	27.9	56.7	1.5	**19.7**
11. Nenhert	Bald	57.0	1.71	22.9	55.5	1.6	**19.5**
12. King Bartigen	Bearded	57.3	1.73	23.9	57.6	1.6	**19.5**
13. Bearded Red	"	55.5	1.97	22.7	57.6	1.5	**18.1**
14. April Bearded Red	"	56.3	1.84	20.2	56.4	1.7	**17.4**
15. Red Bearded March	"	53.9	1.75	20.1	56.5	1.5	**17.4**
16. Ordinary March	"	55.3	1.97	20.2	55.5	1.5	**17.3**
17. March Debrie	Bald	54.5	1.70	16.6	55.6	1.8	**16.0**
18. French Summer	"	54 6	1.74	17.8	54.8	1.5	**16.0**
19. Chidham White	"	51.0	1.59	13.8	54.2	1.5	**15.5**
20. Large Flag	"	49.5	1.40	7.5	53.9	1.0	**11.3**
21. Hickling's March White	"	50 9	1.76	11.3	51.1	1.6	**10 9**
22. Lonzella White	"	47.0	1.69	8.8	50.7	1.5	**10.6**
Grown for four years:							
23. Red Fern	Bearded	59.8	2.54	33.8	61.2	2.1	**32.0**
24. White Russian	Bald	58.2	2.29	32.1	59.0	1.9	**29.6**
25. Wild Goose	Bearded	61 3	2.28	37.5	61.1	1.9	**28.1**
26 Red Fyfe	Bald	58 5	2.28	25.3	59.8	1.8	**25.4**
27. White Fyfe	"	56.0	1.96	21 3	61.9	1.5	**25.0**
28. Colorado	Bearded	58.3	2.61	27.0	60.0	1.6	**23.4**
29. Sorentino	"	58 8	2.60	30.8	59.5	1.6	**23.3**
30. Medeah	"	58.5	1.81	31.8	60.9	1.4	**23.2**
31. Mountain	Bald	58.0	2.47	22.6	58.5	1.7	**22.4**
32. Algiers	Bearded	56.0	2.63	29.3	57.7	1.7	**22.1**
33. Triumph	Bald	57.0	2.36	21.3	59.0	1.6	**22.0**

YIELDS OF 73 VARIETIES OF SPRING WHEAT —*Continued.*

Varieties.	Nature of Head.	Results for 1893.			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:		Lbs.	Tons.	Bush.	Lbs.	Tons.	Bush.
34. Grecian	Bearded	57.3	2.27	26.1	57.4	1.7	**21.7**
35. Kubanka	"	61.5	1.80	25.0	....	....	**21.5**
36. Ladoga	"	56.5	1 07	24.2	57.0	1.3	**20.5**
37. Atalank	"	57.9	2.17	21.8	57.5	1.5	**19.6**
38. Paros	"	57.0	1.87	17.8	56.6	1.5	**18.0**
39. Neapel	"	51.1	2.00	17.1	53.5	1.6	**17.3**
40. Veto	"	56.8	2.03	22.5	56.6	1.5	**13.2**
41. March White	Bald	58.0	.....	17.2	56.1	....	**11.6**
42. Square Head	"	54.0	2.42	14.8	53.7	1.5	**9.6**
43. African	"	48.9	1.77	7.8	....	1.1	**5.0**
Grown for three years:							
44. Rio Grande	Bearded	58.0	2.20	26.6	59.7	1.9	**27.8**
45. McCarlin	"	58.3	2.66	23.3	59.4	2.2	**27.6**
46. Okanagan Valley Velvet Chaff	Bald	57.6	2.01	26.3	58.2	1.8	**25.9**
47. Manitoulin	"	57.6	2.10	21.7	59.6	1.6	**25.1**
48. Sakatchewan Red Fyfe	"	57.0	1.97	23.5	59.5	1.7	**24.4**
49. Salzer's Assiniboia Fyfe	"	58.0	1.97	21.8	58.7	1.4	**23.3**
50. Washington	Bearded	59.0	1.86	22.9	59.4	1.5	**22.7**
51. Pringle's Defiance	Bald	57.2	1 65	15 8	58.7	1.4	**20.2**
52. Anglo-Canadian	Bearded	52.3	1.97	11.1	54.5	1.5	**17.6**
Grown for two years:							
53. Wellman Fyfe	Bald	57.3	2 35	30.2	58.6	2 2	**28.5**
54. Lost Nation	"	58.0	2 04	25.4	59.3	2.2	**28.1**
55. Velvet Chaff Blue Stem	"	56.9	1.92	26.9	57.9	1.8	**26.3**
56. Hayne's Blue Stem	"	55.6	1.86	26.3	57.6	1.8	**25.2**
57. The Mars	Bald	57.6	1 85	24.2	58.6	1.7	**23.5**
58. Manitoba Red	"	56.8	1.68	20 4	58.9	1.8	**22.5**
59. New York Spring Wheat	Bearded	57.8	1.61	20.6	58 3	1.7	**22.0**
60. Dakota Mawel	Bald	55.8	1.79	22 0	56.4	1.7	**19.6**
61. Magyar	"	57.0	1.66	20.4	56.5	1.6	**16.9**
62 Campbell's White Chaff	"	51.9	1 64	12.1	52.7	1.4	**12.7**
Grown for one year:							
63. Blue Democrat	Bearded	58.0	1.65	16.7	58.0	1.7	**16.7**
64. Amythest	Bald	56.8	1.29	16.2	56 8	1.3	**16.2**
65 Early Scotch Bearded	Bearded	57.8	1.38	15.7	57.8	1.4	**15.7**
66 Champion Bearded	"	56.5	1 63	14.9	56.5	1.6	**14.9**
67. Ontario	"	56.3	1.19	13.6	56.3	1.2	**13.6**
68. French Imperial	Bald	56.5	1.07	11.0	56.5	1.1	**11.0**
69. Canadian Club	"	55.0	....	10.2	55 0	....	**10.2**
70. Scotch Fyfe	"	56.3	.91	6.1	56.3	.9	**6.1**
71. Niagara	"	49.2	1.04	5.4	49.2	1.0	**5.4**
72. White Australian	"	47.5	3.31	4 8	47.5	3.3	**4.8**
73. Ruby	"	....	.87	2.6	....	.9	**2.6**

The spring wheat crop of 1893 was exceptionally good. The straw was quite free from rust, and the crop on most of the plots stood up well until harvest time. The average yield per acre of the seventy-three varieties was 21.1 bushels of grain and 1.92 tons of straw. The average weight per measured bushel of the grain was 56.5 lb. The greatest yield of grain per acre was produced by the Wild Goose, 37.5 bushels, and the poorest yield was given by the Ruby, 2.6 bushels, thus making a variation of 34.9 bushels per acre. Some of the foreign varieties have made an excellent showing in the comparative tests, both in yield and in quality of grain.

Herison Bearded. The Herison Bearded variety was imported from France in the spring of 1889, and has thus been grown in the trial grounds for the past five years.

During this time it has given an average yield of 26.9 bushels per acre and an average weight per measured bushel of 62.7 lbs. This record shows the Herison Bearded to stand first, both as regards yield of grain per acre and weight of grain per bushel, among the twenty-two varieties grown for the same length of time. It is a bearded sort and has a club-shaped head. The straw is usually stiff and grows to an average of about 40 inches in length. It is seldom affected by rust to any marked degree. The grains are of a deep red color and are quite small in size, but plump. In 1892 this variety was sent out over Ontario along with five other varieties of spring wheat. The reports from thirty-five different experimenters showed the Herison Bearded to come third in the list in point of yield of grain, giving an average of 18.3 bushels per acre.

Pringle's Champion. This German spring wheat has done well on this farm for the past five years. In regard to yield of grain per acre it stands next to the Herison Bearded, but produces a grain which is over two lbs. lighter per measured bushel; it is, nevertheless, above the standard weight per bushel, as the average for five years shows it to be 60.4 lb. It is also a red grained sort. The head is more than twice the length of the Herison Bearded and the grains are also much larger. The number of grains per head is usually large, being upwards of 27 in 1893. It has a straw of good strength, which is comparatively free from rust. It is about one day earlier than the Herison Bearded in reaching maturity.

Bart Tremenia. The Bart Tremenia, which was imported from Greece in 1893, has improved year by year until it now holds third place in point of yield of grains among the twenty-two varieties grown for five years. The average yield of grain per acre has been only one-tenth bushel less than that of the Pringle's Champion, and the average weight per bushel one-tenth of a pound less than the Herison Bearded. It is a strong grower, almost free from rust, and possesses a squarely built bearded head. The grain is very large and rather coarse in character. This variety somewhat resembles the Wild Goose wheat, which has been grown in Ontario for some time.

Red Fern. Among the twenty-one varieties grown on the plots in 1890, for the first time the Red Fern has given the largest average yield of grain per acre. This variety, which is quite well known over Ontario, has certainly done well in our comparative tests. The average yield of grain per acre was 32 bushels, and the average weight per bushel 61.2 lb. It is one of the greatest producers of straw of all the varieties tested, and the straw is of a fairly good quality, being affected but slightly with rust, and usually standing well until harvest time. It has a long bearded head and a fairly large red grain. In earliness of maturity it is about similar to the Herison Bearded, Pringle's Champion and Bart Tremenia, taking 105 days from date of seeding until time of ripening.

Rio Grande. This is a somewhat coarser wheat than the Red Fern, but is, nevertheless pretty generally liked by the millers. It has produced an average of 27.6 bushels per acre for three years, which places it at the head of the list of those grown for that length of time. In quality it is not up to the other varieties mentioned, as in three years the average weight per bushel was only 59.7 lb., and in 1893 it did not exceed 58 lb. It is a strong growing, bearded variety, and is usually fairly free from rust.

Wellman Fyfe. Ten new varieties were grown in the trial plots in 1893 for the first time, the greater number of which were obtained from the United States. The Wellman Fyfe took the lead in production of grain in 1892 and 1893 among these newer sorts, but the weight of grain per bushel has fallen below the standard by 1¼ lbs. It has a bald head with a white velvety chaff. It has been one of the freest from rust of all the varieties grown.

WINTER WHEAT, COMPARATIVE TEST OF 52 CANADIAN AND AMERICAN VARIETIES.

The following report of Winter Wheat was prepared by Prof. Shaw and myself, and was issued in August as Bulletin XC:

The principal object of this bulletin is to furnish information to the farmers in an easily accessible form, which they can turn to good account when determining the varieties of winter wheat to be sown the present season. This information relates to behavior of certain varieties of winter wheat grown at this station for one, two, three and four years respectively and under similar conditions. It furnishes important particulars relating to various characteristics and peculiarities of growth which have important bearing on the adaptability of soils to certain varieties. These particulars are probably of more value than the comparative yields, which are also given in the bulletin.

It has been our aim during recent years to grow all the Canadian and American varieties of any promise, the seed of which we have been able to obtain. The question has in consequence been raised as to the advantage that can accrue from continuing the test with so many varieties, many of which are not likely to come into prominence. We answer that our principal aim is to prevent them from coming into prominence, and by so doing to furnish a safeguard to the farmers. Whenever the attempt is made by designing men to palm off a variety as new and superior, we have a ready means of comparison at hand for detecting the imposture as to name and properties. Could this work have been done years ago the Red Lion wheat swindlers could not have taken such large sums from unsuspecting farmers as they did in certain counties of Ontario. Many farmers at the time paid as high as $15.00 per bushel for the seed. In our experience it has proved one of the least satisfactory of all the varieties grown. If farmers will but heed carefully the work that is being done at the experiment stations in this country, the trade of the seed grain swindler cannot flourish again.

Desirable Qualities. The qualities to be sought in winter wheat include the following: (1) Ability to give good yields; (2) the quality of the grain, including weight per bushel and value for milling purposes; (3) strength of straw; (4) non-ability to rust; (5) earliness in maturing; (6) the presence or absence of beards.

Location and Soil. All the varieties, both native and foreign, were grown side by side in ranges separated only by temporary roads. The plots in these ranges contained each exactly one one-hundredth of an acre. The yield per acre is estimated from the actual yield of the plots. The land may be termed level, and yet it was somewhat elevated, occupying as it did the highest part of a field, the whole of which may be said to be high-lying. The soil may be designated a mild clay loam.

Preparation of the Soil. The soil was prepared on the bare fallow system to secure uniformity of condition. This was the only bare fallow that we had upon the farm except a small portion also under preparation for experimental work. The cultivation given was much the same as is usually put upon bare fallows. Barnyard manure was applied at the rate of 15 tons per acre in the spring of 1890, and a crop of rape was grown and pastured off upon the land the same year. In 1891 a grain crop was grown. No manure has been put upon it since 1890.

Selection of Varieties. In selecting varieties to sow, those kinds should be preferred which have given the most satisfaction during a term of years rather than for one year. Sometimes varieties do well for one year or more, and then cease to do so well thereafter. We are now able to give facts relating to the behavior of a considerable number of varieties for four years, as shown in Table II. The aim should also be to adapt the variety to soil conditions, the more rugged and less refined varieties being better adapted to the less productive soils than the more refined sorts.

The Varieties Grown. There were in all 153 plots grown at the station during the present year, including 70 varieties. Of these, 11 of the leading varieties were grown in triplicate plots. Of the 70 varieties grown, 52 were Canadian and American, and 18 were foreign. The foreign varieties which were imported originally from Germany, England, France and Russia in 1889, are all from last year's seed. As none of these kinds have as yet proved equal to some of the best of the Canadian and American varieties, and as many of them do not ripen sufficiently early to be reported upon in the bulletin with the latter, we do not feel justified as yet in recommending the farmers to grow them. This bulletin, therefore gives the particulars relating to 52 Canadian and American varieties grown under the same conditions.

Manner and Time of Seeding. The seed was sown by hand at the rate of $1\frac{2}{3}$ bushels per acre by weight. The plots were all sown on September 3rd, with the exception of Nos. 45, 46, 48, 50 and 52, which were sown on September 9th.

The Conditions of Season and Weather. The varieties, speaking in general terms, came through the winter exceptionally well. The spring following was cold and backward, insomuch that growth was hindered somewhat seriously for a time. Eventually, however, the growth was rapid and the ripening early rather than late. During the ripening period the best development of the grain was hindered by unduly warm weather.

TABLE I GIVES THE CHARACTERISTICS OF 52 VARIETIES OF WINTER WHEATS:

Varieties.	Nature of head.	Color of		Date of maturity.	Height of plants.	Comparative amount of rust. 0—none. 100 much.	Per cent. of straw lodged at harvest.
		Chaff.	Grain.	July.	Inch.		
1 Surprise	Bald	White	White	22	50.5	30	30
2 Early Red Clawson	"	Red	Red	20	49.0	35	60
3 Golden Drop	"	"	"	20	48.0	35	60
4 Golden Cross or Volunteer	Bearded	"	"	24	51.0	50	10
5 Red Velvet Chaff	Bald	White	Red	23	54.0	25	20
6 Rogers	"	"	"	25	53.5	45	15
7 Hybrid Mediterranean	Bearded	Red	"	22	51.0	55	3
8 Bonnell or Landreth	Bald	White	White	25	53.0	28	10
9 Manchester	"	"	Red	26	51.0	45	5
10 Martin Amber	"	"	White	27	52.5	43	5
11 Standard	"	Red	"	25	50.0	55	10
12 Lancaster	Bearded	"	Red	23	50.0	33	80
13 Seneca or Clawson	Bald	"	White	24	48.5	45	10
14 Red Lion	Bearded	"	Red	24	51.0	40	80
15 New Monarch	Bald	White	"	23	52.0	50	10
16 American Bronze	"	"	"	23	52.5	58	3
17 Egyptian	Bearded	"	"	22	50.5	48	10
18 Jones' Winter Fife	Bald	"	"	21	49.5	33	3
19 Bulgarian	Bearded	"	White	23	48.5	33	3
20 Canadian Velvet Chaff	Bald	"	"	25	48.0	33	0
21 Garfield or Natural Cross	"	"	"	25	53.0	43	3
22 Winter Pearl	"	"	"	27	48.5	35	0
23 Democrat	Bearded	"	"	21	48.0	43	0
24 Dawson's Golden Chaff	Bald	Red	"	23	46.0	60	0
25 Mediterranean	Bearded	White	Red	22	46.0	43	3
26 Reliable	"	"	"	22	45.5	40	0
27 Deitz Longberry	"	"	"	21	47.5	48	0
28 Coryell	Bald	Red	"	20	40.5	48	0
29 Russian Amber	Bearded	White	"	23	42.5	33	0
30 Rutherford	"	Red	"	23	46.0	58	0
31 Red Wonder	"	White	"	22	47.5	45	0
32 Walker's Reliable	"	"	"	22	44.0	63	5
33 Fulcaster	"	"	"	25	45.0	43	0
34 Rumsey	"	"	White	22	45.0	43	0
35 Valley	"	"	Red	22	44.0	40	0
36 Longberry Red	"	Red	"	23	44.5	33	5
37 Fultz	Bald	White	"	21	43.5	53	0
38 Velvet Chaff	Bearded	Red	Red	22	40.0	60	0
39 Genesee	"	White	White	23	46.0	63	0
40 Monette	Bald	"	Red	25	41.5	40	3
41 Hybrid Delhi	"	"	White	26	42.0	50	0
42 Manilla	"	"	"	27	43.5	45	0
43 Scott	"	"	Red	25	44.0	43	0
44 Red Russian	"	Red	"	25	44.0	43	0
45 South Sea	"	"	White	22	45.0	25	0
46 White Leader	"	White	"	24	48.0	68	0
47 Eureka	"	"	"	22	50.5	58	0
48 Soule's	"	"	"	24	49.0	58	0
49 Stewart's Champion	"	"	Red	24	54.0	53	0
50 White Star	Bearded	Red	"	24	48.0	38	0
51 Treadwell	"	White	White	24	49.0	50	0
52 British Columbia	Bald	Red	Red	26	47.0	75	0

It will be observed that of the 52 varieties in the above table the early Red Clawson, Golden Drop and Coryell were the first to mature. Only seven days elapsed between the maturing of the earliest and the latest varieties. The amount of rust, generally speaking, was slightly greater than last year. A majority of the varieties did not lodge to any extent, and yet the Lancaster and Red Lion were badly lodged. The Early Red Clawson and Golden Drop also lodged considerably. The Surprise crinkled down much more than in previous years, and this complaint seems somewhat general the present season, in regard to this variety.

TABLE II GIVES YIELDS OF 15 VARIETIES FOR FOUR YEARS:

Varieties.	Straw per acre (tons.)		Weight per measured bushel (lb.)		Grain per acre (bush. 60 lb.)	
	1893.	Average 4 years, 1890-93.	1893.	Average 4 years, 1890-93.	1893.	Average 4 years, 1890-93.
1 Surprise	2.7	2.72	57.8	59.90	42.6	45.43
2 Early Red Clawson	3.2	2.72	56.5	59 05	40.3	44.36
3 Golden Drop	3.3	2.73	60.5	61.70	42.7	42.66
4 Golden Cross or Volunteer	2.9	2.61	59.3	60.80	41.5	41.81
5 Red Velvet Chaff	3.6	2.77	56.8	59.80	36.3	41.20
6 Rogers	2.8	2.60	59.5	60.70	34.9	41.15
7 Hybrid Mediterranean	3.0	2.78	59.3	60.16	40.6	40.55
8 Bonnell or Landreth	2.6	2.72	56 9	59.75	33.7	39 90
9 Manchester	2.4	2.46	58.5	61.13	34.7	39.55
10 Martin Amber	2.4	2.60	58.3	60.48	33.8	38.50
11 Standard	2.4	2.64	55.7	59.08	31.4	38.30
12 Lancaster	2.6	2.80	60.2	62.00	35.5	38.23
13 Seneca or Clawson	2.3	2.66	57.8	59.60	33.6	37.96
14 Red Lion	2.6	2.75	60.0	61.28	36 7	37.89
15 New Monarch	2.4	2.47	58.1	59.98	30.9	33.21

As the facts given in Table II. relate not only to results of this year's crop, but also to the average obtained for the past four years, they may be regarded as of special importance. The average yield of grain per acre of these fifteen varieties was 30.9 bush. in 1890, 51.6 bush. in 1891, 41 bush. in 1892 and 36.6 bush. in 1893. For the four years the average was 40 bush. The average weight per bush. in 1890 was 60 lb.; in 1891, 63.3 lb.; in 1892, 60 lb., and in 1893, 58 lb. For the four years the average was 60.4 lb. The Surprise again heads the list among 15 varieties grown for four years, and also stands second among the 44 varieties grown in 1893. It will be remembered that this variety is possessed of good milling properties. The Early Red Clawson follows closely with an average yield of 44.4 bush per acre. Its earliness in ripening is a strong point in its favor. The Golden Drop which stands third in the above table gave the highest yield per acre of all the Canadian and American varieties grown in 1893, and in 1892 it stood at the head of the list in point of yield along with Dawson's Golden Chaff, the yields of the two being equal. The Golden Drop, as already stated, is also one of the earliest varieties.

TABLE III GIVES YIELDS OF 8 VARIETIES FOR THREE YEARS:

Varieties.	Straw per acre (tons.)		Weight per measured bushel (lb.)		Grain per acre (bush. 60 lb.)	
	1893.	Average 3 years, 1891-93.	1893.	Average 3 years, 1891-93.	1893.	Average 3 years, 1891-93.
16 American Bronze	3.0	2.85	55.1	59.10	36.0	46.99
17 Egyptian	2.9	2.71	58.6	61.33	38.2	46.33
18 Jones' Winter Fife	2.4	2.23	58.0	60.47	35.9	43 36
19 Bulgarian	2.2	2.28	61.1	62.37	34 7	42.89
20 Canadian Velvet Chaff	2.5	2.42	5[illegible].8	58.13	34.0	41.54
21 Garfield or Natural Cross	2.0	2.46	57.0	59.40	26.6	41.14
22 Winter Pearl	2.1	2.48	59.7	60.37	30.5	40.71
23 Democrat	2.1	2.31	59.5	61.97	29.3	39.36

These varieties have been grown here for three years, and like those of the previous table, under the same conditions. The average yield obtained from them in 1891 was 55.3 bush. per acre; in 1892, 39.9 bush.; in 1893, 33.2 bush.; for the three years, 42.8 bush. The average weight per measured bush in 1891 was 63.2 lb.; in 1892, 59.9 lb.; in 1893, 58.2 lb.; for the three years, 60.4 lb. The American Bronze, although still at the head of the list, does not seem well able to maintain the relative position which it gained in 1891. Its light weight per bushel and its rust tendencies tell somewhat against it, but it is a vigorous grower and stands up well. The Egyptian, though an old variety, has done very fairly. The Jones' Winter Fife which comes third in point of yield stands higher relatively this year than previously. First class milling properties are claimed for it. The Bulgarian, which bears considerable resemblance to the Democrat, yields fairly and weighs well. The Canadian Velvet Chaff gave a fair yield per acre, but the grain was exceptionally light in weight.

TABLE IV GIVES YIELDS OF 21 VARIETIES FOR TWO YEARS.

Varieties.	Straw per acre (tons).		Weight per measured bushel (lb.).		Grain per acre (bush. 60 lb.).	
	1893.	Average 2 years, 1892-93.	1893.	Average 2 years, 1892-93.	1893.	Average 2 years, 1892-93.
24 Dawson's Golden Chaff	2.3	2.90	57.4	58.5	38.1	45.66
25 Mediterranean	3.0	3.19	61.0	61.4	30.4	40.65
26 Reliable	2.1	2.62	60.2	61.2	31.6	39.76
27 Deitz Longberry	1.9	2.63	61.5	61.7	30.2	39.46
28 Coryell	1.7	2.27	62.7	62.1	31.6	38.89
29 Russian Amber	2.0	2.59	60.7	61.2	29.0	37.83
30 Rutherford	1.8	2.73	58.2	59.0	29.1	37.64
31 Red Wonder	1.7	2.94	61.2	62.0	25.7	37.26
32 Walker's Reliable	2.1	2.39	59.6	60.0	31.3	37.08
33 Fulcaster	1.5	2.39	61.2	62.9	23.4	36.94
34 Rumsey	1.8	2.57	59.7	60.6	27.5	36.30
35 Valley	1.8	2.19	58.7	60.1	26.1	34.90
36 Longberry Red	1.7	2.53	60.0	60.5	27.2	34.79
37 Fultz	1.2	2.14	60.9	61.7	20.0	33.72
38 Velvet Chaff	1.5	2.26	60.7	61.9	26.1	33.30
39 Genesee	1.5	2.47	58.5	59.8	22.1	32.94
40 Monette	1.5	2.41	58.0	58.5	22.7	32.38
41 Hybrid Delhi	1.2	2.04	56.1	57.8	19.5	31.17
42 Manilla	1.5	2.54	54.0	56.4	22.1	30.34
43 Scott	1.5	2.08	57.8	59.4	22.9	27.71
44 Red Russian	.8	1.99	56.1	58.8	7.9	24.64

The varieties in Table IV have been grown here for but two years. Considerably more than half the number were imported from the United States. The average yield per acre in 1892 was 44.7 bush.; in 1893, 25.9 bush.; for the two years, 35.3 bush. The average weight per measured bushel was 61.3 lb., and in 1893, 59.8 lb.; for the two years, 60.5 lb. The Dawson's Golden Chaff, originated in 1881, by Robt. Dawson, of Paris, Ont., comes first in point of yield. It is exceptionally strong in the straw, but has some rust tendencies. The average yield per acre for two years has been 5 bush. in advance of the variety next on the list. The old Mediterranean, imported from the United States, comes second in point of yield, showing that it still retains its old time vitality. The Coryell, previously mentioned as one of the three earliest varieties, gave the heaviest weight per measured bushel of the 52 varieties grown in 1893.

TABLE V GIVES YIELDS OF 8 VARIETIES FOR ONE YEAR ONLY.

Varieties.	Straw per acre, 1893 (tons).	Weight per measured bushel, 1893 (lb.).	Grain per acre, 1893 (bush. 60 lb.).
45 South Sea	1.1	60.0	31.0
46 White Leader	1.7	54.6	30.1
47 Eureka	1.9	56.1	27.7
48 Soule's	1.9	54.0	26.2
49 Stewart's Champion	2.5	56.0	25.8
50 White Star	.9	58.8	25.1
51 Treadwell	1.2	57.1	16.5
52 British Columbia	1.5	53.3	15.0

The eight varieties in Table V were grown here this year for the first time in these comparative tests. None of them have given very high yields. The South Sea variety bears a very close resemblance to the Seneca or Clawson, insomuch that they be one and the same sort. The White Leader, very recently introduced, stands second in point of yield. It is one of the lighest weighing wheats in the list of varieties mentioned in the above table. The Soules and Treadwell will be remembered as old standard varieties. The behavior of neither of them was such as to sustain the old time prestige, more especially the Treadwell, with which the yield was very low.

TABLE VI GIVES COMPARATIVE SUMMARY OF RESULTS.

Classes of Grain.	Number of varieties.	Average yield of straw per acre (tons).		Average weight per measured bushel (lb.).		Average yield of grain per acre (bush. 60 lb.).	
		1893.	Average 2 years, 1892-93.	1893.	Average 2 years, 1892-93.	1893	Average 2 years, 1892-93.
Bald	24	2.24	2.77	57.8	58.7	31.0	35.6
Bearded	20	2.14	2.66	60.0	60.8	30.8	38.2
White Chaff	30	2.15	2.66	58.7	59.6	29.9	36.1
Red Chaff	14	2.30	2.83	58.9	59.8	33.0	38.3
White Wheat	15	2.10	2.67	57.8	58.7	30.7	35.3
Red Wheat	29	2.24	2.74	59.3	60.2	31.0	37.5

It will be observed that the average per measured bushel of the 20 bearded varieties for two years was 2.1 lb. more than that of the 24 bald varieties. The 29 varieties of red wheat weighed on an average 1.5 lb. per measured bushel more than the 15 varieties of white wheat. During the two years the bearded varieties gave an average yield of 2.6 bush. per acre more than the bald varieties; the red chaff varieties 2.2 bush per acre more than those with white chaff; and the red wheats 2.2 bush. per acre more than the white wheats. These years have not been really first-class wheat years, and this doubtless has had an important bearing on these results.

TABLE VII GIVES YIELDS OF 4 VARIETIES OF WINTER WHEAT SOWN AT DIFFERENT DATES:

Dates of Seeding.	Weight of grain per measured bushel (lb.).				Yield of grain per acre. (bush. 60 lb.)			
	Dawson's Golden Chaff.	Early Red Clawson.	American Bronze.	Surprise.	Dawson's Golden Chaff.	Early Red Clawson.	American Bronze.	Surprise.
August 26th	57.5	57.3	57.8	57.3	31.1	26.3	24.2	22.3
September 2nd	57.3	56.1	57.5	55.8	28.6	19.4	24.4	15.3
September 9th	55.3	55.8	55.6	54.3	25.8	21.5	20.8	15.1
September 17th	48.8	50.1	47.8	49.8	15.1	14.3	10.9	10.8

In the above table four leading varieties of winter wheat were sown at different dates, to test the effect upon the yields. It will be noticed in almost every instance the first date of seeding, viz.: 26th August, gave the best yields, and that these yields decreased, generally speaking, with each seeding at a later period. These results may have been influenced by the soil, which had grown grain for two years previously. It should also be borne in mind that latitude has much to do in determining the best season at which to sow winter wheat. The varieties in this list have given the following average yields per acre from all the different dates of seeding, viz.: Dawson's Golden Chaff, 25.1 bush.; Early Red Clawson, 20.4 bush.; American Bronze, 20.1 bush.; and Surprise, 15.9 bush. The average yields per acre from the different dates of seeding are as follows: August 26th, 26 bush.; September 2nd, 21.9 bush.; September 9th, 20.8 bush., and September 17th, 13.8 bush. The average weight per measured bushel at the above dates was as follows: August 26th, 57.5 lb.; September 2nd, 56.7 lb.; September 9th, 55.3 lb., and September 17th, 49.1 lb.

Distribution of Seed.

No varieties of winter wheat are kept for sale this year at the Experimental Farm.

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. The seed will be sent out in the order of the applications received so long as the supply lasts.

Two Sets of Winter Wheat for Co-operative Tests.

I.	II.
Dawson's Golden Chaff.	Dawson's Golden Chaff.
Golden Drop.	Surprise.
Early Red Clawson.	Jones' Winter Fife.
Bulgarian.	White Leader.
American Bronze.	Early Genesee Giant.

Each farmer wishing one of these sets will please write to the Secretary, C. A. Zavitz, Experimental Farm, Guelph, *mentioning which set he desires*, when 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.

Conclusions.

The results of the experiments may thus be summarized:

1. That the average yields per acre of the 52 Canadian and American varieties grown in 1893 were straw, 1.9 tons; grain, 30 bush., and weight per measured bushel, 58.2 lb.

2. The five best yielding varieties for 1893 were the following: Golden Drop, 42.7 bush. per acre; Surprise, 42.6 bush.; Golden Cross, 41.5 bush.; Hybrid Mediterranean, 40.6 bush., and Early Red Clawson, 40.3 bush.

3. The five varieties which gave the heaviest weights per measured bushel in 1893 were the Coryell, 62.7 lb.; Deitz Longberry, 61.5 lb.; Fulcaster, 61.2 lb.; Red Wonder, 61.2 lb., and Bulgarian, 61.1 lb.

4. That in our experience of the past four years, the average yields per acre of the white and red wheats have been almost exactly the same.

5. That in our experience of the past three years, we have found that the red wheats average from $1\frac{1}{2}$ to 2 lb. more per measured bushel than the white wheats.

6. That in our experience the past year, in sowing varieties of wheat at different dates, we have found that in every instance the earlier sown plots have given the best results.

Winter Wheat, Comparative test of 17 Foreign Varieties.

All the foreign varieties of winter wheat were grown in 1893 for the fourth time on this Farm. The conditions regarding the quality of land, size of plot, etc., used for the foreign varieties were the same as those given for the Canadian and American varieties. The seeding also took place at the same time. As most of the varieties are later in maturing than the Canadian kinds, they were not included in winter wheat bulletin issued in August last.

Yields of 17 Varieties of Foreign Winter Wheat.

Varieties.	Country obtained from.	Results for 1893.			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 Square Head	Germany	46.3	.49	5.0	54.3	....	**31.1**
2 Dividend	Germany	41.8	.94	3.7	51.8	2.43	**25.5**
3 Spalding Red	England.	59.8	.69	10.5	58.1	1.70	**25.0**
4 Regent	Germany	50.6	2.09	21.6	54.9	....	**24.4**
5 Lamed Hybrid	France..	50.8	.44	3.3	56.0	1.62	**23.8**
6 White Patanelle	France..	47.0	1.29	6.8	54.2	1.89	**23.2**
7 Russian Odessa	Russia...	....	.20	1.3	....	1.56	**22.9**
8 Golden Drop, Red	Russia...	....	.44	1.6	....	1.48	**22.9**
9 Imperial Velvet Chaff	England.	....	.47	1.1	....	....	**22.5**
10 Square Head, Red	England.	....	....	5.0	....	....	**21.8**
11 Herfordshire, White	England.	....	.78	2.3	....	1.55	**20.7**
12 Browick, Red	England.	47.8	.89	5.1	54.6	1.68	**19.4**
13 Lammas, Red	England.	48.3	1.00	4.7	55.1	1.73	**19.0**
14 Saumur	France..	48.0	1.15	8.2	54.6	1.62	**18.9**
15 Red Inversible	France..	52.0	1.50	15.5	56.5	1.65	**18.7**
16 Kessingland, Red	England.	43.0	1.27	6.1	51.3	....	**18.0**
17 Galezian Summer	Germany	52.0	.52	5.9	57.6	1.26	**17.1**

The foreign varieties of winter wheat did very poorly during the past season. Out of the seventeen varieties grown, only three gave a yield of 10 bushels per acre. They were nearly all badly killed during the previous winter. Some of the varieties possess a number of excellent qualities such as freedom from rust, strong straw of good quality, etc. These wheats have been killed out more or less each winter since their importation. It was thought, however, that by growing them for a few years in the Canadian climate they would gradually become more hardy, and in time might prove themselves to be valuable sorts for growing as a general crop. Some of the varieties of barley and some of oats improve year by year. For instance the Italian and two-rowed and the Kinna Kulla barleys only produced moderate yields when they were first introduced, but for the past two years they have surpassed all the other varieties grown, and are becoming of great usefulness.

Oats, Comparative test of 133 Varieties.

There are many varieties of oats in the market at the present time. Some of them of course resemble each other very closely, and might be considered as being the same varieties. There are, nevertheless, a large number of prominent characteristics which go to separate one kind from another. In the list of oats grown upon the trial plots during the present year there are one hundred and thirty-three names. In a few instances the same variety is entered twice or three times as these have been imported from the countries widely separated. When such is the case the names have been used in the lists in the same way as if they were separate varieties, but by referring to the College Report for 1892, the countries can there be found where each lot of oats was obtained from.

Yield of 133 Varieties of Oats.

Varieties.	Color of grain.	Results for 1893. Weight per measured bushel.	Results for 1893. Straw per acre.	Results for 1893. Grain per acre.	Average results for number of years grown on plots. Weight per measured bushel.	Average results for number of years grown on plots. Straw per acre.	Average results for number of years grown on plots. Grain per acre.
Grown for five years:		lb.	tons.	bush.	lb.	tons.	bush.
1 Joanette Black	Black..	36.5	2.5	88.2	36.0	2.7	**84.0**
2 Chenailles Black	"	34.1	3.5	91.1	35.4	2.9	**81.5**
3 Black Etampes	"	34.5	2.8	84.8	35.9	2.6	**80.2**
4 Siberian (Russia)	White.	32.3	2.9	74.5	35.6	2.6	**76.7**
5 Improved Besthorn	Yellow	30.8	2.5	76.6	32.8	2.1	**[illegible]**
6 Danebrog	White..	29.8	2.6	73.5	32.7	2.4	**75.0**
7 Pringle's Progress	"	30.9	2.4	78.2	30.3	2.3	**75.0**
8 Houdan Black	Black..	34.0	2.8	65.4	35.8	2.2	**74.8**
9 Oderbrucker	White..	35.6	2.3	72.9	31.6	2.5	**74.7**
10 Probsteier	"	30.9	2.5	74.2	[illegible]	2.5	**74.4**
11 White Canadian	"	31.5	3.2	76.7	33.6	2.8	**73.6**
12 Poland White	"	33.8	2.7	66.4	37.5	2.4	**72.6**
13 Waterloo	"	28.0	2.8	66.0	30.8	2.6	**72.4**
14 Bavarian	"	29.0	3.0	71.6	30.8	2.7	**71.0**
15 Yellow Gigantic	Yellow	27.0	3.0	68.3	28.8	2.7	**68.7**
16 Georgian	White..	30.0	2.9	54.6	32.6	2.7	**68.0**
17 Egyptian	"	29.4	3.0	58.7	34.7	2.8	**68.0**
18 Siberian (France)	"	38.1	3.1	51.7	38.3	2.3	**66.3**
19 Acclimatized Black Tartarian	Black..	24.0	3.0	52.6	28.4	2.6	**65.4**
20 Black Poland	"	25.3	3.0	58.0	29.4	2.9	**65.2**
21 Black Champion	"	24.3	3.1	64.4	28.9	2.5	**65.0**
22 Black Tartarian	"	28.0	3.3	65.2	32.0	2.8	**64.3**
23 Rosedale	White..	26.5	3.2	64.7	33.3	3.0	**63.7**
24 Victoria White	"	34.1	3.7	61.6	39.1	2.7	**63.5**
25 White Abundance	"	29.8	3.2	65.2	31.9	2.6	**63.1**
26 Improved Waterloo White	"	26.8	3.1	55.6	31.2	2.2	**62.6**
27 Black Hungarian	Black..	24.3	2.9	52.1	29.2	2.8	**62.5**
28 Nubian Black	"	24.8	2.9	52.9	30.2	2.7	**62.4**
29 California White	White..	32.0	3.1	55.3	33.7	2.8	**62.3**
30 Flying Scotchman	"	32.5	3.0	53.9	36.6	2.4	**62.2**
31 American Welcome	"	34.1	3.3	67.9	39.2	2.5	**61.3**
32 Cluster or Triumph	"	32.3	3.6	58.1	37.6	2.5	**61.0**
33 Hopetown (Ontario)	"	28.8	3.2	60.9	33.0	2.5	**60.2**
34 August White	"	38.7	3.1	54.7	38.7	2.9	**59.5**
35 Pedigreed Black Tartarian	Black..	26.6	2.6	59.0	33.1	2.3	**59.0**
36 Early Blossom	White..	34.1	3.1	51.9	38.5	2.4	**58.9**
37 Black Tartarian	Black..	26.3	2.7	54.4	31.0	2.1	**58.2**
38 Flanders White	White..	30.5	....	76.3	28.1	....	**58.1**
39 Prolific Black	Black..	28.5	3.1	75.7	30.3	2.5	**57.9**
40 Dutch Bren	White..	33.5	3.3	52.4	37.5	2.4	**57.4**
41 Yellow August	Yellow	25.8	3.1	25.1	29.9	3.0	**57.4**
42 White (Australia)	White..	33.4	2.6	55.1	38.5	2.2	**57.3**
43 Podelisher	"	34.1	2.8	46.0	38.8	2.6	**57.1**
44 Victoria Prize White	"	35.5	2.8	43.3	38.3	2.2	**56.5**
45 Carter's Prize Cluster	"	32.1	3.4	49.8	38.6	2.4	**56.4**
46 Black Red Crown	Black..	25.8	2.8	39.0	31.0	2.4	**56.3**
47 White Tartarian	White..	26.3	3.3	44.0	31.2	3.2	**56.1**
48 Thurigen	Yellow	28.1	3.3	65.9	29.8	2.9	**56.0**
49 White Poland	White..	34.0	3.1	55.0	34.0	2.7	**55.8**
50 White Hungarian	"	31.2	2.7	52.1	33.3	2.6	**55.8**
51 Welcome	"	36.1	2.9	46.1	38.1	2.3	**55.1**
52 Rennie's Prize White	"	32.5	3.4	51.7	37.3	2.5	**54.5**
53 Racehorse	"	36.4	2.8	55.9	37.6	2.3	**54.1**
54 Yellow Flanders	Yellow	28.0	3.9	64.6	30.3	2.9	**54.0**
55 Colommiers	Black..	26.0	2.8	34.1	30.7	3.0	**53.0**
56 Potato	White..	25.6	2.8	21.6	34.2	2.5	**53.0**
57 Port Adelaide	"	32.3	3.2	57.7	37.7	2.5	**52.4**
58 Early Racehorse	"	31.5	3.3	57.8	38.0	2.2	**52.1**
59 Potato	"	34.8	2.8	57.8	33.7	2.6	**51.6**
60 Round or Branching Black	Black..	27.0	3.5	40.3	30.3	2.7	**51.0**
61 Longfellow	White..	30.8	3.4	44.6	34.2	2.8	**50.5**
62 Australian White	"	37.8	2.5	65.1	38.2	2.3	**50.5**

Yield of 133 Varieties of Oats.—*Continued.*

Varieties.	Color of grain.	Results for 1893. Weight per measured bushel.	Results for 1893. Straw per acre.	Results for 1893. 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.
		lb.	tons.	bush.	lb.	tons.	bush.
Grown for five years:							
63 Brie Black	Black..	25.0	2.7	26.6	30.1	2.9	**50.2**
64 Angus	White..	32.1	2.9	53.3	34.4	2.6	**50.0**
65 Bertram's Prolific	"	28.8	3.2	38.3	32.5	3 0	**49.7**
66 Triumph	"	30.0	3.1	50.5	31.5	2.5	**48.8**
67 Dun	Dun...	29.0	3.6	28.0	31.6	2.7	**48.5**
68 Providence	White..	26.0	3.0	23.3	32.1	2.8	**47.8**
69 Hamilton	"	30.3	3.0	32.3	33.5	2.8	**47.7**
70 Hungarian Black	Black..	29 3	2.6	64.6	29.4	2.1	**47.6**
71 Longfellow	White..	26.8	3.3	35.8	26.8	2.9	**47.3**
72 Birlie	"	32.0	2.8	35.6	35.0	2.6	**45.4**
73 Scotch Potato	"	26.0	2.7	22.3	31.9	2.5	**44.4**
74 Dun	Dun...	25.5	2.3	23.4	30 8	3.1	**44.2**
75 Improved Scotch	White..	32.0	2.4	34.4	33 1	2.6	**44.1**
76 Hopetown (Germany)	"	31.5	2.4	39.4	31.4	2.7	**43.2**
77 Hopetown (Scotland)	"	32.0	2.3	37.3	31.9	2.9	**40.4**
78 Selected Winter	Dun...	29.8	2.5	47.7	32.0	2.3	**39.0**
79 Red Spot	"	21.0	3.8	17.5	25.8	2 8	**33.9**
Grown for three years:							
80 White Schonen	White..	30.0	2.4	79.1	32.0	2.2	**82.2**
81 Magnet	"	27.1	2.9	68.7	30.8	2.4	**80.5**
82 Golden Giant	"	25.9	2.4	62.6	27.7	2.3	**80.2**
83 Vick's American Banner	"	27.3	2.5	67.6	31.0	2.2	**80.1**
84 Wide-awake	"	29.3	2.7	72.8	33.1	2.2	**78.7**
85 White Mane	"	28.6	2.8	65.5	31.5	2.5	**78.0**
86 Holstein Prolific	"	26.8	2.4	54.1	31.6	2.1	**75.4**
87 Danish	"	27.3	2.6	61.2	23.3	2.3	**74.9**
88 Giant Swedish	Yellow	24.3	3.1	60.3	28.0	2.4	**74.4**
89 Early Calder	White..	29.1	2.9	65.0	32.0	2.4	**73.3**
90 Giant Yellow	Yellow	29.5	2.2	49.0	32 9	2.1	**67.7**
91 Early Gothland	White..	28.6	3.1	52.9	34.4	2.4	**67.0**
92 White Belgian	"	32.1	3.0	55.1	35.3	2.5	**65.0**
93 White Swiss	"	28.1	3.0	49.0	33.6	2.4	**64.7**
94 Black Mane	Black..	22.3	3.3	47.0	27.7	2.6	**63.7**
95 Clydesdale	White..	29.8	4.0	54.1	35.3	2.9	**63 6**
96 Steele's New White Cave	"	26.6	2.9	48.1	34.3	2.2	**61.6**
97 Japan	"	31.1	4.2	50.5	36.6	2.7	**61.4**
98 Early Archangel	"	35.8	2.7	44.2	28.0	2.4	**61.0**
99 New Rosedale White	"	28.8	2.5	45.2	34.2	2.2	**59.6**
100 Carter's Early Black	Black..	22.9	2.7	48.1	27.7	....	**59.6**
101 Dakota	White..	31.8	2.6	48.2	37.5	2 8	**58.3**
102 Canadian Triumph	"	33.5	3.1	45.8	38 2	2.2	**57.8**
103 Carter's Royal Cluster	"	35.4	3.0	53.2	36.6	2.4	**56.3**
104 Victoria Prize White	"	34.5	2.4	40.8	38.5	2.1	**54.1**
105 Black Glen Rotnen	Black..	25 0	3.6	22.1	30.3	2.9	**54.0**
106 Rennie's Prize White	White..	32.6	2.5	40.5	37.7	2.0	**52.6**
Grown for two years:							
107 Joanette (new French seed)	Black..	33.5	2.8	70.2	34.2	2.7	**72.5**
108 Baltic White	White..	32.4	2.5	65.6	31.[illegible]	2.5	**68.2**
109 Abyssinian	"	32.0	3.0	60.4	34.3	3.0	**67.4**
110 American Beauty	"	32.8	2.7	51.9	33.8	2.8	**64.3**
111 Wilson's White Prolific	"	28.8	1.7	58.0	27.9	2.2	**58.7**
112 Thousand Fold	"	31.0	2.4	47.2	32.2	2.5	**56.3**
113 Badger Queen	"	36.1	3.0	53.6	35.0	3.0	**53.0**
114 New Wonderful	"	34.3	2.5	45.5	34.3	2.5	**49.7**

YIELD OF 133 VARIETIES OF OATS.—*Continued.*

Varieties.	Color of grain.	Results for 1893. Weight per measured bushel.	Results for 1893. Straw per acre.	Results for 1893. 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 one year:		lb.	tons.	bush.	lb.	tons.	bush.
115 Lincoln	"	31.9	2.5	69.0	31.9	2.5	69.0
116 Black Beauty	Black..	31.3	2.5	67.7	31.3	2.5	67.7
117 High Bred	"	33.8	2.1	64.5	33.8	2.1	64.5
118 Green Mountain	White..	29.0	1.9	64.4	29.0	1.9	64.4
119 New Zealand	"	26.5	2.3	63.9	26.5	2.3	63.9
120 Pringle's No. 6	Dun...	31.5	2.1	62.2	31.5	2.1	62.2
121 Improved American	White..	29.9	2.1	60.9	29.9	2.1	60.9
122 Golden Giant	Yellow	28.8	2.1	58.1	28.8	2.1	58.1
123 New American	White..	28.4	2.1	56.3	28.4	2.1	56.3
124 Challenge	"	34.8	2.7	53.9	34.8	2.7	53.9
125 Jarman's Black Defiance	Black..	27.9	1.8	53.7	27.9	1.8	53.7
126 Rust Proof	White..	29.6	2.3	52.5	29.6	2.3	52.5
127 South Carolina Black	Black..	32.0	3.2	52.4	32.0	3.2	52.4
128 Excelsior	White..	29.3	2.0	47.7	29.3	2.0	47.7
129 White Dutch	"	34.3	2.3	45.1	34.3	2.3	45.1
130 Royal Prize Cluster	"	33.5	2.1	42.0	33.5	2.1	42.0
131 Texas Rust Proof	Dun..	30.6	2.3	39.8	30.6	2.3	39.8
132 Jarman's White Monarch	White..	32.4	1.9	38.0	32.4	1.9	38.0
133 North Star	"	33.3	2.0	28.5	33.3	2.0	28.5

Of the 133 varieties tested in 1893, 79 have been grown upon the experimental plots for five years; 27 for three years, 8 for two years; and 19 were tested during the present season for the first time. The grain was all sown broadcast at the rate of seventy-five pounds to the acre. The plots were all exactly the same size, each being 1-100 of an acre. Equal amounts by weight were sown on the plots. The land was very similar to that used for the barley, peas and spring wheat tests, but was higher in situation than that for the barley and peas, and lower than that used for the spring wheat. The seeding took place in May.

The oat crop on the plots in 1893 was scarcely up to the average of the past five years, except in amount of straw, which was somewhat in advance of former years. The average yield of grain per acre in 1893 was 54.3 bushels, and during the past five years the average was 59.9 bushels per acre. The quality of the grain was also inferior during the past season, as the weight per measured bushel showed a decrease of 2.5 lbs. when compared with the average since 1889. The very hot weather which occurred just as the oats were approaching maturity caused them to ripen very rapidly, and may partly account for the light weights during the past year.

The Experimental department has met with excellent success in introducing new and promising varieties of oats, and some most excellent kinds have been imported. Of the one hundred and thirty-three varieties now in the tests, ninety-five are foreign, and thirty-eight were obtained in Ontario. In the comparative test for five years, with seventy-nine varieties some very interesting results have been obtained. All the best yielding varieties are of foreign origin, and were imported by the Farm in the spring of 1889. The variety known as the Egyptian, which is well-known in nearly all parts of Ontario, where it has been grown for several years, was surpassed in point of yield by no less than sixteen varieties, and the well known Australian white oat was surpassed by fifty varieties. The fourteen varieties of oats at the head of the list in point of yield for five years all possess the open or spreading head, and the three kinds at the head of the same list possess grain of a black color.

Joanette. The Joanette is a black variety of oats, which was imported from France by this Farm in 1889. It heads the list in yield of grain per acre among seventy-nine varieties which have been grown on the plots during the past five years. The average amount of grain per acre during that time was 84 bushels, and in 1893 the yield was 4.2 bushels in excess of this average. In weight per measured bushel it has been quite uniform throughout, the average being 36 lbs., and the weight in 1893 36.5 lb. This is certainly a good showing, and where the land is suitable for this variety, it is certainly one of the most productive kinds that can be found. It is exceedingly short in the straw, as the average height for three years has only been 40.7, and fully one half of the varieties grown gave an average height of over 50 inches. It has a spreading head of good size. The grain has an exceedingly thin hull, and in fact in an examination made of the grain of all the varieties grown, none had a less percentage of hull than the Joanette. The straw usually stands up well, and is much less susceptible to rust than most other varieties. It takes on an average 104 days from seeding time until it reaches maturity.

The Chenailles Black and the Black Etampes varieties were imported from France at the same time as the Joanette. These three varieties are very similar in all characteristics, and may be considered as the same kind. One very interesting feature is the record that each one has made. All three are as near the head of the list as they can get, when the varieties are arranged according to yield of grain per acre. Among one hundred and thirty-three varieties grown in 1893, these three French oats were unsurpassed by any of the other kinds, which certainly speaks well for each of them. They require good strong land, which is apt to grow a large quantity of straw. It is useless to endeavor to grow these French oats on poor land, as the straw is naturally quite short. The Joanette oat is now introduced in nearly every county of Ontario, and where land is suitable it is making a good record for itself.

Siberian. This is an oat which seems well adapted for nearly all kinds of soil. It was imported by this station from Russia five years ago, and has given a much larger yield of grain per acre than any Ontario variety which has been grown on this Farm. Not only has it surpassed all the other varieties of white oats in the comparative tests on the station plots, but in average yield of six varieties of oats sent out over Ontario and tested in 125 different localities, the Siberian took the lead. The average yield per acre of this variety, in these co-operative tests in 1892, was 58.8 bushels, and in the station test for five years, the average yield per acre has been 76.7 bushels. The average weight per measured bushel for five years has been 35.6 lb. It is about the same length of time in reaching maturity as the Joanette, and possesses a straw which grows about ten inches longer. The Siberian is also quite free from rust as compared with many other varieties, and it is usually quite strong in the straw. The head is spreading in nature, and is about nine inches in length, which is about two inches longer than that of the Joanette. There are nearly fifty grains in the average head, and the grains are of good length. The Siberian has also taken the lead of all the white oats grown in large plots at this station.

Improved Besthorn. The Improved Besthorn was imported from Germany, and has taken second place in point of yield per acre of grain among all the light colored varieties of oats grown on the plots for the past five years. The grain of this variety is yellow in color. It is about three days later in reaching maturity than either the Joanette or the Siberian. It grows to almost exactly the same height as the Siberian, but is slightly more affected by rust, and the straw is usually more apt to lodge. It also has a spreading head, which measures about 8 inches in length. About fifty grains is the average number per head. For five years the average weight per measured bushel has been 32.8 lbs., and the average yield per acre for the same length of time is recorded to be 75.1 bushels.

Danebrog. This is another German variety, which has done well on the plots. In many characteristics it resembles the Improved Besthorn, but the grain, instead of being yellow, is white. It, however, possesses better straw than the above-mentioned variety, both as regards strength and freedom from rust. The average yield for five years on the plots has been 75 bushels per acre.

White Schonen. The seed of this variety was obtained in Ontario three years ago, and, among twenty-seven varieties grown for three years, the White Schonen has given the largest average yield of grain per acre. For that time the average yield has been 82.2 bushels per acre, and the average weight per measured bushel 32 lb. It is a white oat with a spreading head; 106 days is the average time taken from seeding until the grain is ready to harvest. Straw grows vigorously and reaches a length of about 50 inches.

Lincoln. Nineteen new varieties of oats were tested on the plots in 1893 for the first time. These varied in yield from 28.5 bushels to 69 bushels of grain per acre. The largest amount of grain was produced by the Lincoln oat, the seed of which was obtained from the United States. This variety had been extensively advertised by the American seedsmen, and so far it has shown itself worthy of much praise. It is an entirely new variety. From seed time till harvest required a period of 94 days. It is a strong grower, the straw reaching a length of 51.5 inches. The weight per measured bushel, however, was only 31.9 lb. during the year 1893.

BEANS, COMPARATIVE TEST OF 17 VARIETIES.

In 1893, 17 varieties of beans were grown on plots side by side. The land contained barley in 1892, and was manured in the spring of 1890. Each plot was one one-hundred and-sixtieth of an acre. The beans were planted in rows 25 inches apart on May 22nd, and were cultivated throughout the season. After reaching maturity they were harvested in the ordinary way, and when dry were thrashed.

Varieties.	Yield per acre.	Varieties.	Yield per acre.
	Bushels.		Bushels.
1. California Pea	28.8	10. Yosemite Mammoth Dwarf Wax	7.2
2. Prolific Dwarf Tree	27.3	11. Marrowfat	5.9
3. Small White Field	24.6	12. Horse (Montreal)	1.7
4. Boston Pea	22.3	13. Heligoland (England)	1.5
5. Yellow Soy	20.4	14. Broad Windsor	0.67
6. Medium or Navy	17.7	15. Selected White Eye	0.61
7. Yellow Eyes, or Boston Favorite	17.3	16. Common Tick	0.35
8. Giant Dwarf Wax	15.8	17. Common Horse	0.24
9. Edamaine	7.6		

The seed of the first four varieties was obtained from Ontario, and that of the Yellow Soy from the United States. It will be noticed that the Horse Beans did very poorly indeed. The stems and leaves turned black before it was time for the beans to ripen, and the production grown was exceedingly small. The seed of 5 varieties of fodder plants was obtained as a gift from the Kansas Experimental Station. Some of these grew luxuriantly, and were they somewhat earlier they would certainly be of great promise. Two of the varieties out of the five reached a sufficient stage of maturity to produce a crop of beans, and are included in this list of numbers, 5 and 9. The other varieties which did not mature their seed were Yamagata, Cha Daidzie, Kiyusuke Daidzie and Black Podded Adyuski. These varieties will, however, be tested another year.

BUCKWHEAT, COMPARATIVE TEST OF THREE VARIETIES.

The buckwheat was sown upon clay loam, which contained barley in 1892 and roots the year previously. The plots were each one one-hundred-and-sixtieth of an acre in size. The grain was sown broadcast on May 12th. The crop of each variety stood up well and gave a good appearance until harvested.

Varieties.	Yield of Straw per acre (tons).	Yield of Grain per acre (bushels).
1. Japanese	5.11	20.30
2. Silver Hull	3.17	13 03
3. Common Grey	3.25	12 93

It will be observed that the Japanese variety gave nearly double the yield of grain per acre of the Common Grey variety. It also gave about two-thirds as much again straw as this variety. It stands up remarkably well and makes a good growth throughout the season. The grain is very large in size.

Grains Sown in Mixtures.

Barley, peas, spring wheat and oats were sown singly and in various combinations in the spring of 1893. No less than eleven different mixtures of two, three or four kinds of grain were used for this experiment. A similar experiment was conducted in 1891 with a less number of mixtures, and in all probability this line of tests will be continued in the future. The single grains and the various mixtures were all sown on duplicate plots. Each plot was exactly one one-hundreth of an acre in size. The grain was sown broadcast. The grains, when used separately, were sown with the same quantity of seed per plot as was used in the variety tests ; but when used in combinations, they were sown as follows : In one set two-thirds the quantity of seed that was used in the separate sowings was used in every instance, and in the second set, when two grains were sown together, one-half the amount of seed of each in the separate sowings was used ; when three grains were used, one-third the amount of seed used in the separate sowings, and when four grains were used, one-fourth the amount of seed was sown. The land was a clay loam, and quite elevated. No manure had been applied for three years previous to 1893. The results of the experiment has been reckoned as follows : In the first place, the crops from the two sets of plots were added, and then the crops from the plots of single grains were averaged to correspond with the grains used in the mixture under consideration. From the results thus obtained, the yields per acre were estimated.

Mixtures.	Yield of Straw per acre.		Yield of Grains per acre.	
	Sown Separately.	Sown in Mixture.	Sown Separately.	Sown in Mixture.
	tons.	tons	lb.	lb.
Barley and peas	1.18	1.61	1058	1055
Peas and wheat	1.25	1.46	965	744
Wheat and oats	1.77	1.82	1428	1747
Barley and oats	1.70	2.05	1521	2216
Wheat and Barley	1.17	1.26	763	638
Peas and oats	1.64	2.16	1698	1925
Barley, peas and wheat	1.24	1.76	936	1070
Peas, wheat and oats	1.55	2.20	1364	1655
Barley, wheat and oats	1.73	2.19	1310	2122
Barley, peas and oats	1.50	2.07	1425	2043
Barley, peas wheat and oats	1.47	2.11	1243	1885

The results show that in eight 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. The greatest yield of grain per acre was from barley and oats sown in combination; the second highest yield of grain was from barley, oats and wheat sown together; and the third highest yield was from barley, oats and peas sown as a mixture. Peas, wheat and oats sown together gave the greatest weight of straw per acre, and the average of the wheat and barley grown separately the least weight of straw per acre. These results are worthy careful study, and it might be mentioned that the results of 1891 were quite similar to those of 1893, the mixed grains producing the greatest yield in every instance.

Selection of Grain for Seed.

A very important feature of experiment station work should be along the line of investigation regarding the relative value of sowing good *versus* poor seed. It seems to be the practice of some people to sell all their choice grain, and then sow the grain which would not bring the top price in the market. The seed might be all true to name and perfectly pure, but of a poorer quality. Is it not true that too often the screenings from grain taken to market is again cleaned and the best of the screenings sown for the purpose of producing the next crop. It is the present intention of this Farm to enter quite extensively upon investigations relating to the quality of seed which should be sown. It is our rule invariably to hand-pick all 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 first been well cleaned. About 5,000 packages of seed grain were very carefully cleaned and hand-picked in the winter of 1892-3.

A few experiments were carried on in the summer of the present year, in selecting seed of barley, peas, spring wheat and oats. The grain was sown broadcast, and at the same rate per acre, by weight, as was used of the grains when sown in the variety tests. Each plot was 1-160 of an acre in size. The land had not received any manure since the spring of 1890, at which time a dressing of fifteen tons per acre was applied. Owing to an exceedingly late spring and several hundred plots of grain to be sown, the seeding did not take place until May. This lateness of seeding no doubt accounts for some of the yields being low. The yields per acre are estimated from the actual yields of the plots.

Yields of barley from different qualities of seed:

Quality of grain.	Yield of straw per acre.	Weight per measured bushel.	Yield of grain per acre. 1892.	1893.	Average 2 years, 1892-93.
	tons.	lb.	bush.	bush.	bush.
Large grains	.59	42.3	27 0	7.2	17.1
Small grains	.52	40.8	18.1	6.8	12.5

It will be observed that in the case of barley a certain quantity of large grains gave a better return in every particular than was produced by the same quantity by weight of small grains. The better sample of seed produced 37 per cent. more grain than the poorer lot. In weight per measured bushel in 1893 the large grain had the advantage by 1.5 lb.

Yields of peas from different qualities of seed :

Quality of grain.	Yield of Straw per Acre.	Weight per measured bushel.	Yield of grain per acre.		
			1892.	1893.	Average 2 years, 1892-93.
	tons.	lb.	bush.	bush.	bush.
Large whole peas	1.01	63	25.9	19.8	22.9
Small whole peas	.99	62½	....	17.8	....
Peas cracked in two by machine	.27	....	12.2	4.4	8.3

The results of the experiment in selecting peas shows that the large whole peas gave the best returns both in 1892 and in 1893. There was an average of nearly three times as much grain from whole peas as from the cracked seed. The difference between the yield from the large as compared with the small peas is not very great, but two bushels per acre with a large crop of peas would make a total of a good many bushels, and consequently a good many dollars and cents. It might be mentioned that the small peas were plump and smooth, simply lacking in size.

Yields of spring wheat from different qualities of seed :

Quality of grain.	Yield of straw per acre.	Weight per measured bushel.	Yield of grain per acre.
	tons.	lb.	bush.
Large plump grain	.77	56.8	7.8
Small plump grain	.57	56.7	5.9
Shrunken grain	.60	55.5	5.3

The shrunken seed gave a yield of 2.5 bushels per acre less than the large plump seed and also produced a grain much inferior in quality. The Herison bearded variety was used in this test. The results of the experiment point in favor of sowing the best quality of seed.

Yields of black oats from different qualities of seed :

Quality of grain.	Yield of straw per acre.	Weight per measured bushel.	Yield of grain per acre.
	tons.	lb.	bush.
Pure black oats	1.96	32.3	45.7
Very pale black oats	1.82	30.3	38.
Oats without hulls	1.44	33.8	34.4

The variety of oats used in this experiment was the Joanette, and much care was exercised in the selection of the seed. The oats mentioned in the third place were all hulled by the machine and selected out from among others. Many of the Joanette oats are very apt to lose their hulls in the threshing, owing to the thinness of the hulls. The results show that there is a yield of over eleven bushels per acre more from the oats with the hull on as against those with the hull off. The weight per measured bushel, however, is greater with the hulless, although in the crop produced no difference could be found in regard to the percentage of hulled oats of the different seed used. The light oats gave both a less yield per acre of grain and a lighter weight per measured bushel than the black plump seed of the same variety.

Grains Grown on Large Plots.

Some of the varieties which have given the best results for two, three or four years have been grown on large plots in both the Experimental and Farm departments. The object of the large plots in the Experimental department is to supply seed for free distribution over Ontario in connection with the Agricultural Experimental Union, and also to supply seed of the choice varieties to the Farm department of this institution. The seed of all the grain crops grown in the Farm department of the College during 1893 was supplied either directly or indirectly from the Experimental department. About ninety acres of grain were grown in the large fields in sections of from one to ten acres of the various varieties. There is no variety of grain now grown at this institution which was not first grown upon our small sized plots of one one-hundredth of an acre, and from this gradually increased as the value of the variety would justify us in so doing.

POTATOES AND ROOTS.

During 1893, 157 varieties of potatoes and 184 of roots were grown on the experimental plots. Besides the variety tests there were 118 plots devoted to experiments in methods of cultivation of both potatoes and roots. The land upon which these were grown might be termed an average clay loam, upon which manure was applied at the rate of 15 tons per acre in the spring of the present year. Rape was grown on the land in 1892, and was pastured off by lambs. The soil was fairly uniform throughout, and the plots for the variety tests were each exactly one one-hundredth of an acre in size. The plots used in the experiments in regard to the methods of cultivation varied in size according to circumstances, as may be noticed in speaking more especially of the detailed results.

Potatoes, Comparative Tests of 157 Varieties.

No less than 157 varieties of potatoes were grown on the trial plots during the past year. These varieties were originally obtained by us from Nova Scotia, Prince Edward Island, Ontario and the United States. Of the above number, 25 were grown this year upon the plots for the fourth time, 16 for the third time, 67 for the second time and 49 were grown at this station in 1893 for the first time. Fifteen pounds of each variety were used. This quantity was divided into 198 pieces in every instance. 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. After the potatoes were planted the ridges were levelled, thus leaving the potatoes from three to four inches below the surface. Planting took place on the 23rd and 24th of May, except Nebula, Seneca Beauty, Pride of Ireland, Bill Nye, Six Weeks, Woodbury White, Howe's Premium, and Pearl of Savoy, which were planted on June 3rd, and Early Harvest and Rochester Rose, which were planted on June 13th. 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 potato digger.

YIELDS OF 157 VARIETIES OF POTATOES.

Varieties.	Results for 1893. Percentage of crop marketable.	Weight of 30 best developed potatoes.	Yield per acre.	Average yield per acre for number of years grown on plots.
Grown for four years:		lb.	bush.	bush.
1 Empire State	94.9	12.8	226.7	**183.1**
2 Summit	90.0	10.8	188.3	**167.5**
3 Thorburn	94.0	11.0	167.5	**152.9**
4 London	89.1	11.0	183.3	**149.3**
5 Clarke's No. 1	89.5	11.0	182.1	**146.3**
6 Early Mane	85.8	9.8	182.5	**144.2**
7 Sweet St. Vernal	91.8	9.0	163.0	**133.7**
8 Rural New Yorker, No. 2	94.6	10.8	153.3	**130.5**
9 Pootaluck	87.8	10.8	177.1	**129.4**
10 Early Puritan	90.9	9.8	174.6	**129.0**
11 Daisy	91.2	9.8	190.0	**128.9**
12 Late Rose	91.2	9.8	146.6	**127.1**
13 Early Sunrise	88.3	10.8	210.4	**126.3**
14 Beauty of Hebron	93.1	10.8	182.5	**119.9**
15 Minister	92.8	7.8	104.2	**111.8**
16 Rural Blush	83.2	8.0	114.1	**109.7**
17 Green Mountain	91.6	9.3	143.7	**108.6**
18 Halton's Seedling	81.4	8.8	157.1	**104.1**
19 Rose's New Invincible	88.6	8.8	142.8	**103.7**
20 White Elephant	87.7	8.8	129.2	**102.4**
21 Early Ohio	85.4	9.8	154.2	**100.6**
22 Crown Jewel	87.7	8.8	162.9	**100.4**
23 Dakota Red	90.4	8.0	134.6	**98.9**
24 Rosy Morn	81.3	7.3	142.5	**92.9**
25 Stray Beauty	78.8	7.0	139.6	**84.1**
Grown for three years:				
26 Tonhocks	81.6	7.0	185.8	**165.3**
27 Convoy	83.1	7.3	123.8	**142.4**
28 Early Oxford	80.3	6.0	128.7	**135.1**
29 Advance	79.9	7.3	126.7	**129.6**
30 Woodbury White	81.5	7.0	144.2	**128.5**
31 Thunderbolt	62.1	5.3	122.1	**127.2**
32 Badger State	75.3	6.0	104.6	**125.7**
33 Early Rochester	79.9	6.3	117.9	**123.8**
34 Hoffman	72.0	6.0	144.2	**123.8**
35 Early Rose	81.0	6.8	118.3	**123.6**
36 Kosh Konong	78.2	6.3	99.6	**118.5**
37 Putnam	50.7	4.3	93.0	**116.4**
38 Early Dominion	77.0	6.3	146.6	**115.6**
39 Silver King	62.1	5.0	103.3	**114.2**
40 Ohio Junior	85.4	6.8	113.8	**104.6**
41 Queen of the Valley	79.8	6.3	86.6	**88.1**
Grown for two years:				
42 King of the Roses	79.7	7.0	157.9	**159.8**
43 Molly Star	77.2	6.3	155.4	**155.0**
44 Early Everett	80.5	6.0	155.9	**154.6**
45 White Star	92.3	10.5	216.6	**153.3**
46 Burbank's Seedling	70.0	5.5	141.7	**152.9**
47 Mammoth Pearl	76.2	6.0	132.9	**152.1**
48 Early Gem	84.0	5.5	150.3	**150.2**
49 Thorburn's Extra Early	66.7	6.5	153.7	**149.4**
50 Polaris	78.2	6.5	150.8	**149.2**
51 Negro	55.6	4.5	135.0	**146.9**
52 Island McDonald	80.0	6.5	125.0	**145.8**
53 Hotel Favorite	78.4	6.8	144.6	**145.4**
54 The Dandy	70.2	6.3	138.3	**142.5**
55 New Queen	56.4	10.0	188.3	**142.1**
56 Munroe Co. Prize	73.4	6.8	103.3	**141.8**

YIELDS OF 157 VARIETIES OF POTATOES.—*Continued.*

Varieties.	Results for 1893. Percentage of crop marketable.	Results for 1893. Weight of 30 best developed potatoes.	Results for 1893. Yield per acre.	Average yield per acre for number of years grown on plots.
Grown for two years:		lb.	bush.	bush.
57 Watson's Seedling	79.4	6.5	137.5	141.3
58 Everett's Seedling	75.7	6.5	144.2	141.3
59 St. Patrick	84.3	7.0	140.4	141.0
60 Burpee's Extra Early	75.7	5.8	164.5	140.8
61 Red Australian	83.6	6.3	127.1	140.6
62 Halo of Dakota	90.6	5.8	124.1	138.7
63 Eureka	67.0	4.8	126.2	135.6
64 N. B. & G. Co's Grand Mogul	95.1	9.3	179.6	135.2
65 Paris Rose	66.3	5.3	138.3	134.6
66 Dempsey's Seedling	83.6	7.0	157.1	133.8
67 Chicago Market	79.8	6.0	131.7	133.4
68 Early Essex	86.9	8.0	177.5	133.1
69 Delaware	83.2	5.8	121.2	130.4
70 Early May Flower	83.6	6.3	152.5	129.2
71 Ohio Junior	88.5	8.3	180.9	129.6
72 State of Maine	89.4	6.8	156.7	128.8
73 Vick's Perfection	97.2	7.8	192.9	128.3
74 The Ideal	75.9	5.5	128.0	127.3
75 Prince Albert	58.5	4.5	98.3	126.9
76 Early Market	92.7	9.5	154.6	125.6
77 Chautauqua	83.3	5.8	99.6	122.5
78 Morning Star	68.8	4.8	125.4	121.9
79 Landreth's Garfield	79.1	6.0	153.7	121.9
80 Sunlit Star	68.3	5.0	110.4	121.0
81 P. E. I. Early Rose	82.3	6.5	103.3	119.4
82 Vick's Champion	84.5	6.8	123.8	119.0
83 Alexander's Prolific	67.6	5.3	115.8	118.7
84 The Rosedale	73.3	5.3	96.7	115.4
85 Mount Carbon	65.8	5.3	100.8	115.0
86 Extra Early Vermont	85.9	7.0	118.3	115.0
87 Landreth's Farmer's Alliance	85.7	5.8	101.6	114.8
88 Snowflake	55.0	4.3	113.8	114.4
89 Chas. Downing	50.4	3.8	111.6	113.3
90 Garnets	89.9	6.8	107.5	108.1
91 Snow Queen	56.9	4.8	99.6	107.3
92 Belle, A. C	70.6	5.5	99.2	106.7
93 Boley's Northern Spy	85.8	7.5	137.9	106.7
94 Harbinger	39.7	3.8	94.5	106.4
95 Mammoth Pearl	87.6	9.0	104.8	104.8
96 Wilson's First Choice	84.5	5.8	134.2	104.0
97 Royal Adelaide	87.7	6.0	115.8	102.8
98 Rose Seedling	89.0	7.3	83.3	100.6
99 Woodbury White	89.7	8.5	165.4	100.6
100 Landreth's State of Maine	47.98	3.3	72.1	96.5
101 McIntyre	75.7	5.8	107.9	95.6
102 Edwards	88.6	6.0	128.0	93.8
103 White Lily	83.0	5.5	115.0	92.3
104 Lady Finger	28.3	3.5	95.9	91.5
105 Hopeful	79.7	6.5	98.4	91.1
106 May's Imperial	90.3	7.5	145.4	85.2
107 Pearce's Prize Winner	74.6	5.0	45.8	67.4
108 Vaughan	90.8	9.3	99.2	59.0
Grown for one year:				
109 Pearl of Savoy	95.3	11.5	195.4	195.4
110 North Pole	76.9	7.0	177.1	177.1
111 American Giant	90.3	9.0	171.6	171.6
112 Early Pontiac	78.1	6.3	168.4	168.4
113 Columbus	88.3	8.5	166.7	166.7
114 Nebula	82.1	6.8	165.4	165.4
115 Woodbury White	90.5	7.5	162.5	162.5

YIELDS OF 157 VARIETIES OF POTATOES.—*Continued.*

Varieties.	Results for 1893. Percentage of crop marketable.	Weight of 30 best developed potatoes.	Yield per acre.	Average yield per acre for number of years grown on plots.
Grown for one year:		lb.	bush.	bush.
116 Burpee's Superior	88.5	6.5	158.8	**158.8**
117 Early Six Weeks	78.1	6.5	153.7	**153.7**
118 Timpes No. 4	84.3	8.3	151.3	**151.3**
119 Early June Eating	82.5	7.5	145.0	**145.0**
120 Seneca Beauty	97.4	15.8	144.6	**144.6**
121 Rochester Rose	90.8	7.8	144.6	**144.6**
122 Van Ooman's Earliest	79.0	6.0	142.5	**142.5**
123 Granger	83.4	6.8	140.4	**140.4**
124 Bruce's White Beauty	78.5	6.5	137.5	**137.5**
125 Steele's Earliest of All	82.6	6.5	136.3	**136.3**
126 Bill Nye	89.8	7.0	131.2	**131.2**
127 The Freeman	78.1	6.3	131.1	**131.1**
128 Early Yorker	83.3	7.5	130.4	**130.4**
129 Browell's Seedling	90.9	8.0	128.0	**128.0**
130 Alexander's Prolific	93.7	6.0	126.3	**126.3**
131 Early Harvest	87.0	6.5	125.4	**125.4**
132 Golden Harvest	77.7	6.3	125.0	**125.0**
133 Improved Rose	83.3	5.5	124.5	**124.5**
134 Six Weeks	88.2	9.5	123.3	**123.3**
135 Early Norther	92.9	8.3	122.5	**122.5**
136 Potentate	78.9	6.5	114.6	**114.6**
137 Arizona	79.1	8.3	111.6	**111.6**
138 Keiser	89.9	7.0	111.6	**111.6**
139 Scotch Regent	68.2	4.0	107.5	**107.5**
140 Beauty of Beauties	78.5	6.0	104.6	**104.6**
141 Pride of Ireland	85.2	8.8	104.2	**104.2**
142 Howe's Premium	87.5	6.3	100.0	**100.0**
143 Parson's Prolific	82.1	7.5	97.9	**97.9**
144 Vick's American Wonder	87.5	6.8	96.7	**96.7**
145 World's Fair	76.7	6.0	96.7	**96.7**
146 Ontario	78.1	6.0	89.6	**89.6**
147 American Wonder	83.5	7.3	88.3	**88.3**
148 Great West	71.3	6.0	87.1	**87.1**
149 Eyeless	54.8	4.5	70.0	**70.0**
150 The People's	82.5	6.8	66.6	**66.6**
151 Montana Wonder	59.6	4.8	62.9	**62.9**
152 Reed's Eighty Six	76.5	6.0	33.8	**33.8**
153 Columbian Peach Blow	51.9	3.0	33.8	**33.8**
154 New Satisfaction	42.7	3.3	31.3	**31.3**
155 General Gordon	94.3	5.0	29.2	**29.2**
156 Maggie Murphy	90.6	6.0	26.7	**26.7**
157 Manitoba Rose	80.0	5.0	25.0	**25.0**

It will be observed that the yield of potatoes for 1893 was light, but the quality throughout was good. There was no rot among any of the varieties, and but very little of the scab made its appearance. The summer was too dry for the growth of the potatoes in the manner to give large yields.

The Empire State, which stands at the head of the list in yield of potatoes per acre among 25 varieties grown on the plots for four years, also stands at the head of the list in yield per acre among the 157 varieties grown during 1893. This variety has not only done exceptionally well on the trial plots on this Farm, but it has made an excellent record for itself in the co-operative experiments carried on over Ontario. In the year 1891, among six varieties grown in eleven different localities over Ontario, it stood second in point of yield, and in 1892 it gave the highest yield per acre among six varieties grown in 121 sections over the province. It is a potato of good quality and requires about 110 days from planting until it reaches maturity.

The Summit variety, which comes second in the list in regard to average yield per acre for four years, also stands high in yield for the past year. It is also a variety which has made an excellent record for itself over the province in the co-operative experiments. In the co-operative tests above mentioned, it came first in point of yield among the varieties used in 1892. It is about one week earlier in reaching maturity than the Empire State. These two varieties have certainly made an excellent showing, and, in our experience, we consider them the two leading varieties of all those which have been tested at this station during the past four years.

The following varieties produced the smallest percentage of little potatoes among the 157 tested during the past year, namely: Seneca Beauty, Vick's Perfection, Pearl of Savoy, N. B. & G. Co.'s Grand Mogul, Empire State, Rural New Yorker and Thorburn. Among the different varieties, the Empire State, Pearl of Savoy, Thorburn, London and Clark's No. 1 varieties were found some of the largest potatoes grown in 1893. The Tonhocks heads the list in yield per acre among the 16 varieties grown for three years; the King of the Roses heads the list among the 67 varieties for two years, and the Pearl of Savoy heads the list among the 49 varieties which were grown on the experimental plots in 1893 for the first time.

Potatoes, Different Depths of Planting Seed Tubers.

An experiment has been conducted during each of the past three years in planting potatoes at 1, 3, 5 and 7 inches below the level. The test each year was carried on in duplicate. Nature of soil and previous cultivation were the same as with the variety experiments. Planting took place on May 25th. The rows were $3\frac{1}{3}$ links apart and the potatoes were planted one foot apart in the row.

Comparative Yields of Potatoes from Different Depths of Planting.

Depth of Planting.	Average yield per acre from duplicate tests.			Average yield per acre for three years. (6 separate tests).
	1891.	1892.	1893.	
	bush.	bush.	bush.	bush.
1 inch	160.7	147.1	117.0	**141.6**
3 inches	188.4	152.1	127.7	**156.1**
5 inches	224.2	153.8	123.0	**167.0**
7 inches	256.1	158.5	123.8	**179.5**

The results of this experiment show that the largest yield of potatoes per acre in 1893 was produced from planting three inches deep and the poorest yield from planting one inch deep. In 1891 and 1892 the comparative yields from the different modes of planting ran in the same order, namely: The poorest yield per acre from planting one inch deep, the next poorest from planting three inches deep, the next poorest from planting five inches deep, and the best from planting seven inches below the surface. The largest percentage of marketable potatoes came from the deepest planting and the largest potatoes were also from the deep planting. The average yield per acre for the duplicate experiments for three years shows an average increase of 37.9 bushels per acre from the deep planting as compared with the shallow planting. The results from planting potatoes at different depths are certainly very interesting, and will, in all probability, be continued for a number of years to come, until more definite conclusions may be drawn from the results.

Potatoes, Preparation of Seed Tubers.

This experiment was carried on in duplicate in 1893, and also in 1892, to ascertain the results from the preparation of seed tubers in different ways and from different modes of planting the same. In each section of the experiment ten plots were used. The quantity of seed per acre was the same as with the variety tests. The preparation of the soil, including manuring, etc., was precisely the same as used for the comparative tests of the different varieties previously mentioned. Planting in 1893 took place on May 25th. The rows were $3\frac{1}{3}$ links (26.4 inches) apart. Great care was exercised in the selection of the seed potatoes for each of the component parts of this experiment.

Yields of Potatoes from Seed Tubers Prepared Differently.

Preparation.	Yield per acre – whole crop. 1893.	Yield per acre – whole crop. Average 2 years, 1892-3.	Yield per acre, less seed used. 1893.	Yield per acre, less seed used. Average 2 years, 1892-3.	Percentage of whole crop marketable. 1893.	Percentage of whole crop marketable. Average 2 years, 1892-3.
	bush.	bush.	bush.	bush.		
Large, whole, 1 foot apart	255.6	247.3	125.6	115.3	81.6	**78.4**
" " 2 feet "	210.0	185.0	135.0	113.5	88.4	**85.2**
" " 3 " "	150.1	138.6	110.1	95.6	90.9	**88.5**
Medium " 1 foot "	227.6	208.3	153.9	144.5	83.2	**83.2**
" " 2 feet "	168.8	139.4	131.3	107.2	87.7	**87.7**
Small " 1 foot "	179.5	136.3	149.5	110.3	89.6	**86.7**
Medium, cut in two, 1 foot apart	94.6	99.8	45.9	63.0	84.2	**83.4**
Medium, two eyes in a piece, 1 foot apart, without seed ends	95.2	86.1	79.0	71.0	90.4	**88.9**
Medium, one eye in a piece, 1 foot apart, without seed ends	50.1	44.6	40.1	36.1	93.6	**87.3**
Medium, seed ends, one foot apart	42.0	37.0	32.0	30.0	86.5	**80.2**

The largest yield per acre was obtained from planting large whole potatoes one foot apart and the next largest yield was obtained from planting medium whole potatoes one foot apart. The amount of seed used for the different plantings would of necessity vary to a large extent. After deducting the amount of seed used in each mode of planting from the total yield, it will be seen that the largest amount of potatoes still remaining was obtained from, first, medium whole potatoes one foot apart and, second, small whole potatoes one foot apart. The average, however, for two years in regard to the yield per acre is in favor of medium whole potatoes one foot apart and large whole potatoes one foot apart. The percentage of marketable potatoes from these two modes of planting is, however, comparatively low. The highest resulting from planting large whole potatoes three feet apart, from medium potatoes cut with two eyes in a piece and the pieces planted one foot apart. All things considered the best average results from the experiments of 1892 and 1893 are from planting medium whole potatoes one foot apart.

Potatoes, Application of Fertilizers.

In this experiment 13 different fertilizers were used in 1893 as in 1892. The potatoes planted on land situated about one quarter of a mile from the other potato experiments, which did not receive any manure or fertilizers for at least six years. The plots were over one-hundredth part of an acre in size. The drills were 3½ links apart and the potatoes were planted one foot apart in the drills as in the case of the other potato experiments. The seed used was covered to the depth of three or four inches. There were three rows in each plot, and one row was left unfertilized between each two plots. The planting was done May 25th and the fertilizers were sown in the drills after the seed had been dropped but before it was covered. The sodium nitrate and muriate of potash were used at the rate of 160 pounds per acre. Wood ashes unleached 800 pounds per acre, and all the other fertilizers at the rate of 325 pounds per acre.

Yields of Potatoes grown by aid of Fertilizers.

Fertilizers.	Percentage of Potatoes marketable.	Weight of 30 best developed potatoes.	Yield of potatoes per acre.		
			1892.	1893.	Average 2 years 1892-3.
		lb.	bush.	bush.	bush.
Royal Canadian	95.6	13¼	208.7	113.3	**161.0**
Potato manure	96.2	12¾	178.3	109.2	**143.8**
Superphosphate (animal)	94.4	11½	159.6	104.2	**131.9**
Bone and potash	95.7	12½	154.2	96.7	**125.5**
Pure bone meal	95.0	11¼	154.6	82.5	**118.6**
Reliance	95.0	10¼	135.0	90.8	**112.9**
Superphosphate (mineral)	93.3	11	147.1	74.6	**110.9**
Sure Growth	94.4	9½	123.8	89.6	**106.7**
Nitrate of soda	94.4	9¾	127.5	82.5	**105.0**
Capelton	95.1	9¼	124.6	84.6	**104.6**
Wood ashes	92.0	10¾	122.1	84.2	**103.2**
Muriate of potash	91.7	9½	116.3	80.0	**98.2**
Victor	88.7	9¾	111.3	77.5	**94.4**
No fertilizer	86.1	9	105.0	72.1	**88.6**

It will be observed from the results of this experiment that the lowest yield of potatoes per acre was from the unfertilized plot in 1893 as well as in 1892. Also that the Royal Canadian fertilizer gave the highest yield per acre in both years. From the unfertilized plot there were only 86.1 per cent. of the potatoes marketable, while from nearly all the plots upon which fertilizer had been applied over 90 per cent. of the potatoes were in a marketable condition. The results of the fertilizers upon the yield of the potatoes in 1892 and in 1893 are certainly quite uniform throughout.

Swede Turnips, Comparative tests of 54 Varieties.

There were 54 varieties of Swede turnips grown on the plots in 1893. Of this number 30 varieties were grown for three years, 8 varieties for two years, and the remaining 16 kinds were grown during the past year for the first time on this Farm. The seed of the different varieties was obtained from the United States, England and Ontario. Each plot consisted of three drills, each four rods long. The rows were 26.4 inches apart and the plants were thinned to an average of 12 inches in the row. The soil was a clay loam, upon which rape had been grown in 1892, and which was pastured off by lambs. Manure was applied at the rate of 15 tons per acre in the spring of the present year. The seed was sown on June 27, with a one-horse seed drill. Light ridges had previously been made with a double mould board plow. Great care was exercised in thinning the roots, and all the roots left of every variety were counted and thinned out to an exact number.

Yields of 54 varieties of Swede turnips :

Varieties.	Average soundness of roots, 2 years.	Results for 1893			Average results for number of years grown on plots.		
		Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for three year		tons	lb.	tons.	tons	b.	tons.
1 Hartley's Bronze Top	medium ..	6.60	2.30	21.60	5.30	1.67	**21.17**
2 Carter's Prize Winner	" ..	7.59	2.23	22.30	5.59	2.22	**20.42**
3 Green Top	good	8.28	2.04	18.20	7.23	2.31	**20.10**
4 Bangholm	....	6.90	1.98	18.30	5.95	2.26	**19.92**
5 Westbury's Improved	med. good	7.65	2.10	19.20	6.85	2.24	**19.91**
6 Sutton's Champion	"	5.08	2.00	17.00	4.83	2.37	**19.86**
7 Our Selected Purple Top	"	4.95	1.98	17.00	4.43	2.32	**19.80**
8 Marshall's Purple Top	med. poor	6.45	2.37	18.90	5.25	2.34	**19.79**
9 Skirving's Swede	medium ..	6.88	2.05	20.00	5.33	2.14	**19.58**
10 P. W. & Co's. Imperial Prize Purple Top	med. poor	6.23	2.08	18.80	6.56	2.33	**19.45**
11 Carter's Imperial Hardy	med. good	6.85	1.99	19.00	5.48	2.20	**19.43**
12 White Swede	medium ..	4.25	1.61	13.20	5.12	2.22	**19.42**
13 Laing's Improved	" ..	7.08	1.95	19.10	5.48	2.10	**19.29**
14 Hazard's Improved	med. poor	4.50	1.83	14.90	4.75	2.41	**19.17**
15 Sharpe's Improved	med. good	5.75	1.99	19.90	4.43	2.07	**19.12**
16 King of Swede's	good	6.28	1.90	18.10	5.56	2.20	**18.82**
17 Knowfield	medium ..	5.45	2.06	19.30	4.63	2.21	**18.81**
18 Highland Prize Purple Top	med. good	5.95	1.99	19.10	5.69	2.20	**18.79**
19 Hall's Westbury	med. poor	4.85	1.89	18.90	4.65	2.06	**18.41**
20 East Lothian	med. good	6.68	2.00	16.90	5.22	2.13	**18.19**
21 Maston's Purple Top	medium ..	5.00	1.77	18.25	5.38	2.00	**18.04**
22 Royal Norfolk Purple Top	" ..	4.85	1.94	17.95	3.93	2.11	**18.00**
23 Carter's Elephant	" ..	4.90	2.00	17.80	4.89	2.17	**17.51**
24 Drummond's Imperial	" ..	5.20	1.90	18.20	5.20	2.11	**17.47**
25 Fettecairn Green Top	med. poor	4.70	2.11	15.50	4.93	2.16	**16.74**
26 Marquis of Lorne Purple Top	med. good	4.58	2.01	18.60	4.62	2.02	**16.65**
27 Budlong's White Ruta Baga	"	4.35	1.73	19.55	3.50	1.76	**16.47**
28 White Rock	medium ..	4.88	1.74	16.80	3.89	1.77	**16.11**
29 White Sweet Russian	med. poor	5.75	1.73	17.45	4.78	1.84	**15.87**
30 Ashcroft's Purple Top	medium ..	4.88	2.15	16.85	4.02	1.96	**15.54**
Grown for two years :							
31 American Purple Top (Novelty Swede No. 2, 1892)	med. good	4.30	2.21	22.50	4.38	2.07	**21.40**
32 Edina (Novelty Swede No. 1, 1892)	"	7.30	2.18	21.05	7.54	2.16	**21.03**
33 Queen of Swedes	medium ..	4.80	2.22	21.40	5.30	2.06	**20.45**
34 Aroostock's Ruta Baga	" ..	4.78	1.77	18.30	5.57	1.85	**18.65**
35 Shamrock Swede	good	4.85	2.08	19.75	4.93	1.94	**18.53**
36 Laidlaw's Improved	medium ..	6.05	1.99	19.25	4.77	1.89	**18.10**
37 Crimson King	med. good	5.60	1.88	17.53	4.88	1.81	**17.39**
38 Rennie's Prize Purple Top	medium ..	5.85	2.07	18.55	4.97	1.93	**16.89**
Grown for one year :							
39 Kangaroo	poor......	4.68	2.16	21.03	4.68	2.16	**21.03**
40 Bloomsdale	good	5.15	2.01	20.00	5.15	2.01	**20.00**
41 Scottish Champion	medium ..	4.50	1.81	19.15	4.50	1.81	**19.15**
42 Hurst's Monarch	" ..	4.38	1.89	18.20	4.38	1.89	**18.20**
43 Improved Long Island Ruta Baga	good	5.00	1.79	18.18	5.00	1.79	**18.18**
44 Golden Globe	medium ..	4.58	1.82	17.85	4.58	1.82	**17.85**
45 Yellow Montgomery	" ..	2.73	1.71	17.85	2.73	1.71	**17.85**
46 Jumbo or Monarch	good	4.63	1.85	17.60	4.63	1.85	**17.60**
47 Geo. Thorpe's Improved	"	4.25	1.77	16.85	4.25	1.77	**16.85**
48 N. B. & G. Co's. Prize Winner	"	4.35	1.92	16.50	4.35	1.92	**16.50**
49 Jarman's Improved King of the West Purple Top	"	3.83	1.85	16.48	3.83	1.85	**16.48**
50 White French	"	6.45	1.70	15.55	6.45	1.70	**15.55**
51 Maule's Heavy Cropping	poor	3.73	1.79	15.48	3.73	1.79	**15.48**
52 Premier	good	4.33	1.61	15.18	4.33	1.61	**15.18**
53 Sweet German Ruta Baga, or Swedish	"	6.25	1.50	14.63	6.25	1.50	**14.63**
54 Improved Yellow Purple Top	poor	3.30	1.58	12.20	3.30	1.58	**12.20**

The American Purple Top, which was mentioned in the 1892 report as Novelty Swede No. 2, has given a yield of 22.5 tons per acre, which is the highest yield for 1893. This is a new variety and one which promises to do well, as it gave very uniform results during the two years which it has been grown on our trial grounds. The Carter's Prize Winner stands second in point of yield among the 6 varieties grown during 1893. This was grown from seed imported from England. It stands second in yield per acre among 30 varieties grown for three years. The Hartley's Bronze Top gave the best average yield among the number grown for that length of time. The Kangaroo, also an English variety, heads the list in point of yield among the varieties grown at this station in 1893 for the first time. It will be remembered that the Hartley's Bronze Top was the variety which gave the best yield per acre among four varieties of Swedes which were tested by farmers in thirteen different localities over Ontario in 1892, giving an average of 783.6 bushels per acre at that time.

Swede Turnips, Thinning Plants in the Drill.

A duplicate experiment was carried on in 1893 in growing Swede turnips at different distances apart in the drill. This was a continuation of a similar test conducted in 1892. The land used for the experiment in 1893 was a clay loam which had been cropped with rape the previous year, and manured at the rate of 15 loads per acre of well rotted farm-yard manure, previous to the preparation of the land for the experiment under consideration. Slight ridges were made with a double mould board plow and the seed was sown June 29 with a hand seed drill. The plants were thinned when about two inches high and left to the distances required for the experiment.

Distance between roots in the drill.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
Unthinned	.34	.27	8.52	6.24	10.47	9.06
4 inches	.79	....	5.99	....	14.63	......
8 "	1.31	1.46	6.06	5.34	14.72	17.63
12 "	1.67	1.72	5.34	4.50	13.47	15.18
16 "	2.35	2.27	5.37	4.33	14.78	15.10
20 "	2.47	2.46	4.71	4.13	12.39	13.20

It will be observed that the highest yield of roots per acre was produced by thinning the plants to 16 inches apart in the drill in 1893. This, therefore, was not the case in the previous year, as the average of the results from 1892 and 1893 show the highest yield per acre to be obtained from the plants which were thinned to 8 inches in the drill. The plants thinned to 8 inches apart have given an average yield of 4.3 tons per acre more than those which were thinned to 20 inches apart in the results of the two years' experiments. The unthinned plot gave the lightest yield of roots per acre of both years.

Swede Turnips, Different Distances Between Drills.

In this experiment Swede turnips were grown upon drills 20, 26 and 32 inches apart. The experiment was conducted in duplicate in 1893, and was similar to the one carried on in duplicate in 1892. Preparation of the land, including manuring, etc., was the same as mentioned in the experiment with thinning plants in the drills. The roots were all thinned to the same distance apart, namely, an average of 12 inches. There were in all six plots in connection with this experiment in 1893, and each plot contained six rows four rods long. Seeding took place on June 29th.

Distance between drills.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
20 inches	1.54	1.49	5.49	4.83	15.15	15.86
26 "	1.82	1.81	5.01	5.05	12.77	15.04
32 "	1.64	1.93	4.64	4.37	10.75	13.82

It would be well when studying the results of this experiment to also observe the results of the experiments previously given in regard to growing Swede turnips with plants thinned to different distances in the row. It was mentioned above that the roots in the rows of this experiment were thinned to 12 inches apart. Where the rows were made 20 inches apart there were almost one-half more roots by weight than where the drills were made 32 inches apart. The largest roots were from the wide drills and the smaller roots from the narrow drills, while the medium sized roots were from the drills a medium distance apart. It will be observed that the tops of the Swede turnips were about one-third as much as the roots themselves.

Swede Turnips, Flat Versus Ridged Cultivation.

An experiment was carried on to show the difference between growing Swede turnips on the flat surface and upon ridged land. Four plots were selected and the experiment was conducted in duplicate. The land was similar to that used for the variety tests for Swedes. The rows were 26.4 inches apart, and the plants were in all instances thinned to 12 inches in the row. The seed was sown on June 28th.

Cultivation.	Average weight per root.	Yield of tops per acre.	Yield of roots per acre.
	lb.	tons.	tons.
Flat	1.5	6.9	12.2
Ridged	1.5	7.6	11.7

The experiment shows that the results are quite similar from both the flat and the ridged cultivation. The average weight per root from each was practically the same. There seems to be a slight increase of the tops per acre from the ridged cultivation. Experiments may be carried on extensively along these lines in the future.

Fall Turnips, Comparative Test of 37 Varieties.

In 1893, 37 varieties of fall turnips were grown. These are sometimes designated white and yellow fleshed turnips. Three rows of each variety four rods long were grown. The drills were 26.4 inches apart, and the plants were thinned to an average of

12 inches apart, thus making 198 plants of each variety, The cultivation of the land, including manuring, etc., was the same as in the case of the Swede turnips previously mentioned. The seeding of all varieties took place on June 28th.

YIELDS OF 37 VARIETIES OF FALL TURNIPS.

Varieties.	Average soundness of roots, 2 years.	Results for 1893.			Average results for number of years grown on plots.		
		Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for three years:		tons	lb.	tons	tons	lb.	tons
1. Jersey Navet	med. spongy	4.08	2.22	20.00	4.22	2.63	**23.21**
2. Early American Purple Top	medium	4 53	2 36	24.65	4.82	2.39	**22.75**
3. Early Purple Top Munnick	"	4.23	2.23	23.73	2.59	2.32	**21.78**
4. Greystone Improved	"	4.50	2 30	19.58	6.34	2.83	**21.69**
5. Red Globe Norfolk	med. good	6 40	2.03	18 50	5.54	2.50	**21.66**
6. Greystone	medium	4 50	2.05	18.28	5 50	2 46	**21.59**
7. Red Top Strap Leaf	spongy	3 90	1.92	20.75	4 13	2.24	**20.91**
8. Purple Top Mammoth	medium	5.00	1.91	15.00	5 79	2.44	**20.14**
9. Pomeranian White Globe	spongy	5.10	1.96	17.18	6 93	2.16	**19.43**
10. White Stone	medium	3.13	1.93	17.00	3 58	2.19	**17.23**
11. Orange Jelly	"	2.20	1.34	10.05	3.05	2.01	**15.74**
12. Golden Ball	good	5.20	1.26	9.78	4.70	1.83	**14.41**
13. Yellow Aberdeen Green Top	"	3.58	1.45	11.93	3.86	1.61	**12.79**
14. Yellow Aberdeen Purple Top	med. to good	4.23	1.51	10.45	4.68	1.57	**12.10**
Grown for two years:							
15. Purple Top Mammoth or Improved Greystone	good	4.90	2.31	21.38	4.80	2.02	**17.88**
16. Imperial Green Globe	"	4.10	2.02	19.78	3.43	1.67	**15.34**
17. Purple Top Hybrid	"	5.53	1.50	11.25	4.09	1.25	**8.73**
Grown for one year:							
18. White Flat Dutch Strap Leaf	"	4.50	2.46	26.78	4.50	2.46	**26.78**
19. Cow Horn	"	3 55	2.31	24.90	3.55	2.31	**24.90**
20. Green Barrel	"	5.90	2.21	22.10	5.90	2.21	**22.10**
21. Jarman's Improved Green Top Yellow Scotch	"	5.25	2.10	21.53	5.25	2.10	**21.53**
22. Jersey Lily	"	6.00	2.25	20.25	6.00	2.25	**20.25**
23. Yellowstone	medium	3.10	1.87	19.38	3.10	1.87	**19 38**
24. Early White Model	good	3.48	1.93	19.25	3.48	1.93	**19.25**
25. American Breadstone	"	6.00	1.76	17.58	6.00	1.76	**17.58**
26. Burpee's Breadstone	medium	7.25	1.74	17.38	7.25	1.74	**17.38**
27. Extra Early Milan	"	1.35	1.73	17.25	1.35	1.73	**17.25**
28. Jarman's Selected Green Globe	good	3 28	1.80	16.88	3.28	1.80	**16.88**
29. Sweet German	medium	5.88	1.55	16.75	5.88	1.55	**16.75**
30. Early Maltese	"	3 15	1.54	15.80	3.15	1.54	**15 80**
31. Fosterton Hybrid	good	6 80	1.47	14.00	6.80	1.47	**14.00**
32. White Six Weeks	medium	3.25	1.80	13.95	3.25	1.80	**13 95**
33. Dale's Hybrid	good	4.50	1.36	13.55	4.50	1.36	**13 55**
34. Sutton's Imperial Green Globe	medium	2.90	1.46	13.55	2.90	1.46	**13.55**
35. Amber Globe	good	4.30	1.41	12.50	4.30	1.41	**12.50**
36. Seven Top	"	6.20	.97	10.05	6.20	.97	**10.05**
37. Carter's Champion Green Top Scotch or Aberdeen Hybrid	medium	3.85	1.24	8.80	3 85	1.24	**8.80**

The Jersey Navet, which stands at the head of the list, gave a yield per acre of 28.23 tons in 1893, 21.38 tons in 1892 and 20.0 tons in 1893, thus making an average of 23.2 tons for the three years. The roots of this variety are medium long and the flesh is white. The Jersey Navet has given a yield of 4.65 bushels per acre more than the average of all the varieties grown for the past three years, and has also given a yield per acre of three tons per acre more than the average of all the varieties for 1893. The seed of this variety was first imported from the United States in the spring of 1890. The Red Globe Norfolk, which was at one time considered to be the best yielding fall turnip now occupies the 5th place in yield per acre among fourteen varieties grown for three years, with a yield of 18.5 tons in 1893. No less than twenty new varieties were introduced and grown during the present year. Among these several very promising varieties seem to be present. The White Flat Dutch Strap Leaf heads the list not only of the new varieties but of the 37 kinds grown upon the plots. It gave a yield of nearly 27 tons per acre. It grows to a large size and almost entirely above the surface of the ground. The roots are flat in nature and the tops are light. In 1893 it gave a yield of 57 per cent. more than the average of all other varieties. It certainly promises well to be a variety which will produce heavily for autumn feeding.

Fall Turnips, Thinning Plants in the Drill.

A duplicate experiment was carried on in 1893 in growing fall turnips at different distances apart in the drill. This was a continuation of a similar test conducted in 1892. The land used for the experiment in 1893 was a clay loam which had been cropped with rape the previous year and manured at the rate of 15 loads per acre of well rotted farm yard manure previous to the preparation of the land for the experiment under consideration. Slight ridges were made with a double mould board plow and the seed was was sown June 29 with a hand seed drill. The plants were thinned when about two inches high and left to the distances required for the experiment.

Distance between roots in the drill.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years 1892-3.	1893.	Average 2 years 1892-3.	1893.	Average 2 years 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
Unthinned	.32	.36	10.02	11.48	14.15	14.20
4 inches	1.07	1.05	6.60	7.33	24.08	21.84
8 "	1.89	1.74	6.81	6.74	23.69	20.63
12 "	2.73	2.44	6.44	5.94	23.34	19.69
16 "	3.49	3.10	6.93	6.01	23.22	19.14
20 "	3.77	3.37	6.48	5.51	21.26	17.23

This experiment shows very nice results throughout, as there seems to be quite a regular system in the yield of roots from the different plots. The plots which had the roots thinned to four inches apart gave the highest yield per acre in both 1892 and 1893. From this there is a gradual decrease in yield until the widest thinning is reached. There was more than twice as great a yield of tops from the unthinned plot as from the plot which contained the roots thinned to 20 inches apart. The turnips which were thinned to 20 inches apart were more than three times the size of those thinned to only four inches.

Mangels, Comparative test of 49 Varieties.

Of the 49 varieties which have been grown upon the experimental plots, 30 kinds have been grown for three years, seven varieties for two years and 12 were grown in 1893 for the first time. The mangel seed was obtained from England, United States, Quebec and Ontario. The plots were 1-100 of an acre in size. The drills were 26.4 inches apart and the rows were thinned to an average of 12 inches. The preparation of the soil, etc., were the same as in the case of the turnips previously mentioned. The seed was sown on the 22nd of May with a one-horse seed drill.

CORRECT YIELDS OF 49 VARIETIES OF MANGELS.

Varieties.	Average length of root.	Results for 1893.			Average results for number of years grown on plots.		
		Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for three years:	in.	tons.	lb.	tons.	tons.	lb.	tons.
1. Carter's Champion Yellow Intermediate	7.6	2.28	1.49	15.15	3.61	2.33	**25.01**
2. Improved Mammoth Prize Long Red	10.5	3.45	1.44	15.10	3.95	2.11	**23.77**
3. Evan's Improved Mammoth Sawlog	10.8	3.23	1.43	15.20	3.76	2 18	**23.52**
4. Steele Bros. Long Red Selected	10.8	3.30	1.47	16 10	3.85	2.16	**23.49**
5. Elvetham Long Red	11.0	3.08	1.34	14.30	4.54	1.83	**22.78**
6. Carter's Mammoth Long Red	10.8	2.65	1.25	12.53	4.45	1.95	**21.84**
7. Norbitan Giant	9.8	3.05	1.23	13.25	3.77	2.05	**21.74**
8. Mammoth Red Intermediate	9.5	1.68	1.09	11.45	3.76	1.87	**21.30**
9. Eiffel Tower	10.3	2.60	1.25	13.00	3.45	1.98	**21.27**
10. Yellow Obendorf	7.9	2.28	1.26	13.25	2.84	1.75	**20.69**
11. New Monarch	6.9	1.10	.89	9.68	3.88	1.73	**20.25**
12. Colossal Long Red	10.9	2.48	1.07	11.33	3.84	1.85	**20.22**
13. Giant Holstein	11.1	2 98	1.19	12.58	3.99	1.87	**20.15**
14. Chirk Castle	10.6	2.18	1.10	11.53	3.09	1.72	**19.72**
15. Oblong Giant Yellow	9.3	2.28	1.15	12.20	2.42	1.83	**.41**
16. May's Mammoth Long Red	10.5	2 65	1.04	10.90	4.64	1.72	**19.08**
17. Yellow Oval-Shaped Giant	7.3	1.38	.80	8.45	1.94	1.66	**17.72**
18. Long Oxhorn	10 5	2.55	1.03	10.25	3.60	1.71	**17.58**
19. Carter's Warden Orange	6.2	1.53	.92	10.33	3.69	1.61	**17.38**
20. Yellow Globe	5.9	1.80	1.01	11.15	3.38	2.07	**15.69**
21. Red Oval-Shaped Giant	7.2	1.50	.76	8.43	2.18	1.64	**15.62**
22. Mammoth Golden Giant	6.8	1.68	.74	8.10	3.13	1.47	**15.05**
23. Red Globe	6.0	2 33	.94	10.15	2.51	1.48	**15.01**
24. Oblong Giant Red	9.0	1.53	.90	6.80	2.16	1.52	**14.98**
25. Golden Tankard	6.1	1.23	.75	8.10	2 07	1.37	**14.83**
26. Clark's Devon Orange Globe	6.4	1.78	.89	9.23	2 01	1.35	**14.58**
27. Fisher Hobb's Orange Globe	6.4	1.98	.88	9.50	1.88	1.40	**14.53**
28. Long Yellow	11.4	2 38	1.06	11.60	2.59	1.57	**14.53**
29. Kniver Yellow Globe	6.3	1.73	.83	8 93	1.81	1.33	**14.00**
30. Red Tankard	6.9	1.38	.88	9.50	1.64	1.32	**13.04**
Grown for two years:							
31. Sutton's Mammoth Long Red	11.2	3.33	1.27	13.63	4.41	1.66	**16.93**
32. Canadian Giant	11.2	2.45	1.14	12.08	3.65	1.39	**14.09**
33. Sutton's Golden Tankard	7.0	1.58	.93	10.00	2.46	1.34	**13.62**
34. Beck's Champion Globe	6.8	1.75	.88	9.38	2.44	1.35	**13.39**
35. Gate Post	11.4	2 85	1.11	11.43	2 93	1.28	**12.48**
36. Berkshire Prize Yellow Globe	6.5	1.58	.99	10.70	1.86	1 19	**11.89**
37. Sutton's Yellow Intermediate	7.1	1.43	1.07	11.18	1.39	1.05	**10.34**
Grown for one year:							
38. Jarman's Giant Long Red	11.8	3.60	1.45	15.83	3.60	1.45	**15.83**
39. Giant Yellow Intermediate	10.8	3 03	1.44	15.33	3.03	1.44	**15 33**
40. Yellow Leviathan	11.1	2.63	1.38	15 00	2 63	1.38	**15.00**
41. New Eschendorf	.73	2.18	1.34	14.70	2.18	1 34	**14.70**
42. Sutton's Yellow Globe	6.6	2.15	1.29	14.20	2.15	1.29	**14.20**
43. Jarman's Model Yellow Globe	6.4	2.00	1.28	14.13	2.00	1.28	**14.13**
44. Jarman's Selected Golden Tankard	7.5	2.30	1.33	13.85	2.30	1.33	**13.85**
45. Jarman's Giant Intermediate	7.2	1.68	1.32	13.75	1.68	1.32	**13.75**
46. Yellow Ovid	9.2	2.88	1.25	13.33	2.88	1.25	**13.33**
47. English Prize	11.6	2.78	1.19	12.95	2.78	1.19	**12.15**
48. Olive-Shaped Red	7.5	1.98	1.07	11.45	1.98	1.07	**11.95**
49. Ward's Oval	8.5	1.65	.92	10.10	1.65	.92	**10.10**

The mangel crop was very light during the past year. The experiment, however, was a good one throughout, and the results are satisfactory, even though the yields are not heavy. The average yield per acre of 49 varieties in 1893 was 12 tons, while the average for the three years was over 16 tons per acre. The weather was too dry to favor a rapid growth of the roots during the past season. The Carter's Champion Yellow Intermediate gave a yield per acre in 1891 of 34.09 tons, in 1892 of 25.78 tons and in 1893 of 15.15 tons. The seed of this variety was imported from England, and a fresh supply was used each season. The flesh is of a pinkish yellow, and the roots are uniform throughout. It will be observed that this intermediate variety has given a larger average yield per acre than any of the long varieties, which have been supposed to be the greatest yielders of all the varieties of mangels. Among the globe varieties the Yellow Obendorf has given the largest yield per acre for three years. It gave an average of 20.69 tons, which places it 10th on the list of 30 varieties grown for that length of time. The Sutton's Mammoth Long Red, which heads the list among seven varieties introduced in 1892, and the Jarman's Giant Long, which heads the list among 12 varieties introduced in 1893, were both from seed imported from England. These varieties gave from two to four tons per acre more than the average of all the kinds grown during 1893.

Mangels, Thinning Plants in the Drills.

An experiment was conducted in duplicate in 1893 similar to the one carried on in 1892, in growing mangels at different distances in the drill. There were none, however, thinned to four inches apart in 1892. In 1893 there were five rows in each plot, and there were twelve plots in the experiment. The rows were 26.4 inches apart, and were four rods long. The land used was a clay loam, which had received a coating of fifteen loads of farmyard manure per acre in the spring of 1893. Rape was grown on the land in the previous year. Seeding took place on May 29, and the plants were thinned to their proper distances when about two inches high.

Distance between roots in the drill.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
Unthinned	.32	.24	4.68	6.27	14.90	**15.18**
4 inches	.60	....	3.03	....	15.93	....
8 "	.99	1.17	2.43	3.78	14.81	**17.07**
12 "	1.42	1.48	2.30	3.02	14.94	**15.26**
16 "	1.63	1.76	2.21	2.93	12.54	**13.66**
20 "	1.75	2.06	1.93	2.82	12.11	**13.56**

Mangels thinned to 8 inches apart in the row gave an average yield of 17.07 tons per acre, while those thinned to 20 inches gave an average of 13.56 tons per acre. This shows an increase of 3.51 tons per acre in favor of leaving roots comparatively thick in the row; but it will be observed that the thinner roots are nearly twice the size of those more thickly grown. The tops as well as the roots diminish in yield per acre as the distance between the roots becomes widened.

Mangels, Different Distances Between Drills.

This experiment was carried on in duplicate form in 1892, and also in 1893. Mangel seed was sown on the 29th of May upon drills made 20, 26 and 32 inches apart. There were six drills in each plot. The land was prepared in the same way as that for the variety tests, and the manuring was also similar.

Distance between drills.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
20 inches	1.24	1.45	2.92	3.46	16.70	**19.71**
26 "	1.60	1.67	2.96	3.89	16.25	**18.17**
32 "	1.83	1.89	3.00	3.66	16.48	**17.19**

The average results of this experiment for two years show that the largest yield per acre for roots was obtained from sowing mangels upon drills 20 inches apart, and the lightest yield per acre was from sowing mangels on drills 32 inches apart. There was a variation of 2.52 tons in favor of narrow drills. The roots, however, from the wide drills gave an average of 1.89 pounds apiece, while those from the narrow drills gave roots with an average of .44 of a pound less. It will be observed that the amount of tops of mangels as indicated is almost exactly one-fifth as much as the weight of the roots themselves.

Carrots, Comparative Test of 34 Varieties.

In 1892, 23 varieties of carrots were grown, and in the spring of the present year 10 new varieties were added to the list. The plots were each one one-hundredth of an acre, and were uniform in shape throughout. There were three rows, four rods long, in each plot; no extra space was allowed between the plots. The land was prepared similarly to that for the turnips and mangels. The seed was sown with a small hand seed drill on the 20th and 22nd of May. The drills were 26.4 inches apart, and the plants were thinned to an average of four inches in the drill, thus making a total of 594 plants of each variety.

We were entirely unsuccessful with our experiments with carrots in the year 1891, owing to irregular germination in the spring on account of lack of moisture. No report, therefore, was given for that year. In 1892 a very successful experiment was carried on with 23 varieties of carrots. In 1893 the same 23 varieties were again grown, and in addition 10 new varieties. The average of the varieties grown for two years is 19.05 tons. There was a variation in yield among the varieties grown in 1893 of 20.5 tons per acre. Some of the smaller varieties, however, are garden carrots, and of course grow to a very small size. The Pearce's Improved Half Long White has given the largest average yield per acre for two years, namely, 23.04 tons. This was followed closely by Steele Bros'. Improved Short White, which gave an average of 22.29 tons per acre. These two varieties are very similar in all characteristics, the average weight per root for 1893 being exactly the same. The Improved Short White was sent out along with four other varieties to be tested by Ontario farmers in 1892. The co-operative results place the Improved Short White at the head of the list, the Large White Vosges coming second in point of yield. The six best yielding varieties in the station experiment for the past two years are all white in color. These are all quite easily removed from the ground, all being short varieties. The yellow variety which gave the largest yield per acre was the Danver's Orange, which gave an average of 25.8 tons per acre for two years, and 21.3 tons per acre in 1893. The Rubicon Half Long gave the largest yield among the new varieties grown in 1893 for the first time at this station. The seed of this variety was imported from the United States.

YIELDS OF 33 VARIETIES OF CARROTS.

Varieties.	Length of roots.	Results for 1893. Yield of tops per acre.	Results for 1893. Average weight per root.	Results for 1893. 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.
Grown for two years:		tons	oz.	tons.	tons	oz.	tons.
1. Pearce's Improved Half Long White	medium	7.80	13.2	29 58	9.00	14.4	**33.04**
2. Steele Bros.' Improved Short White	"	7.33	13 2	28.68	8.77	14 4	**32.29**
3. White Green Top Orthe	"	7.05	11.6	26.25	7.43	13 0	**29.43**
4. Large White Vosges	short med	5.23	10.8	23.63	6.87	12.3	**28.67**
5. Mastodon	medium	6.28	10.0	20.40	7.19	11.7	**27.60**
6. Simmer's Short White Vosges	"	5.28	9.9	20.93	6.34	11.9	**26.62**
7. Danver's Orange	"	4.13	8.9	21.28	4 82	10.7	**25.84**
8. Large White Belgian	long	5.45	8.4	18.98	7.48	11.2	**25.59**
9. P. W. & Co's Improved Giant Wiltshire White	"	5.48	10.1	18.48	8.34	12.5	**24.19**
10. Sutton's Yellow Intermediate	medium long	5.33	8 0	19.90	6.24	10.8	**23.50**
11. Giant Wiltshire	long	6.18	7.6	17.70	8 19	9.7	**23.45**
12. Guerande	short	2.73	6.7	17.40	3.72	8.4	**22.20**
13. Mitchell's Perfected	medium long	3.30	7.4	16.78	3.85	9.0	**21.14**
14. Scarlet Intermediate	medium	3.08	5.7	14.32	4.44	8.4	**20.41**
15. French Intermediate	"	3.80	6.1	15.23	5.25	7.8	**20.37**
16. Half-long Stump-rooted	short med	2.93	6.2	13.85	2.87	7.9	**19.83**
17. Sutton's Improved Intermediate	long	2.88	6.3	14 80	3 89	7.6	**18.40**
18. James' Scarlet Intermediate	medium	3 60	5.5	14.40	3.85	6.9	**18.20**
19. Carter's Orange Giant	medium long	1.55	9.6	8.55	3.38	10.3	**16.88**
20. Long Orange	long	5.03	5.5	12.43	7.17	6.4	**15.22**
21. Yellow Belgian	long	4.15	5.6	12.63	4.78	7.2	**15.17**
22. Long Red Surrey	long	3.75	4.9	12 33	3.63	6.0	**14.72**
23. Improved Large Long Red Altringham	long	2.13	3.9	8.65	5.62	6.00	**14.13**
Grown for one year:							
24. Rubicon Half-long	short	3.38	6.0	16.23	3.38	6.00	**16.23**
25. Nichol's Improved Long Orange	long	3.98	6.3	15.63	3.98	6.30	**15.63**
26. Chantenay	short	2.85	5.4	14.78	2.85	5.40	**14.78**
27. Half-long Scarlet	short	3.33	4.7	14.25	3.33	4.70	**14.25**
28. Long-red St. Vallery	long	3.35	6.1	13.80	3.35	6.10	**13.80**
29. Jarman's Scarlet Green Top	medium	3.00	6.3	12.43	3.00	6.30	**12.43**
30. Red Parisian Forcing	roundish	1.98	4.2	12.25	1.98	4.20	**12.25**
31. New Long Red Coreless	medium	2.38	4.1	11.40	2.38	4.10	**11.40**
32. Nante's Half-long Stump-rooted	short	2.13	6.3	11.00	2.13	6 30	**11 00**
33. Small French Forcing	round	.95	4.2	9.08	.95	4 20	**9.08**

CARROTS, THINNING PLANTS IN THE DRILL.

An experiment was carried on in growing carrots at different distances apart in the drill in 1892, and again in 1893. The experiment each year was conducted in duplicate. The land used in 1893 was a clay loam, coated in the spring with fifteen loads of farmyard manure per acre, and then prepared in the same way as for the variety tests. The crop in 1892 was rape. There were twelve plots in all. Each plot contained one-sixtieth of an acre, and was divided into five rows each four rods long. The seed was sown with a hand seed-drill on the 29th of May, and the plants thinned to their proper distances apart when two inches high.

Distance between roots in the drill.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb	lb	tons.	tons.	tons.	tons.
Unthinned	.32	.20	6.42	7.35	23.76	**19.68**
2 inches	.47	.42	6.18	6.66	24.42	**22.24**
4 "	.76	.65	5.58	5.46	22.38	**18.79**
6 "	.94	.78	5.58	4.85	19.77	**15.94**
8 "	1.16	.92	4.65	4.13	17.88	**13.91**
10 "	1.23	....	4.65	....	15.60	......

In 1892 there was no plot in the experiment in which carrots were thinned to ten inches apart. The results therefore are not given for that part of the experiment. The results are quite uniform in this experiment. Many people claim that one can get larger yields per acre by leaving roots at wide distances apart; this experiment does not point in this direction, as the yields are large on every plot, the lowest being almost 14 tons per acre and the highest being over 24 tons per acre. The plot which contained the carrots thinned to 2 inches apart contained about two-thirds more weight than the plot which had the roots thinned to 10 inches apart. This table is worthy of careful study. The results simply show that the thicker you leave the roots the greater yield per acre is received, and the thinner you leave the roots the larger sized carrots are obtained. This conclusion is drawn when the limits of thinning are 2 and 10 inches.

Carrots, Different Distances Between Drills.

Duplicate experiments were carried on in sewing carrots in drills 20, 26 and 32 inches apart in 1892 and also in 1893. The seed was sown May 29th, and when the plants were about two inches high they were thinned to an average of four inches in the row. The land was prepared for this experiment in the same manner as that for the variety tests with carrots. There were six rows in each plot and the rows were four rods long.

Distance between drills.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb	lb	tons.	tons.	tons.	tons.
20 inches	.63	.58	5.74	6.15	23.68	**23.56**
26 "	.74	.65	4.73	5.79	21.64	**21.60**
32 "	.73	.65	4.14	5.10	17.44	**17.29**

In the experiment with carrots there is quite a marked increase in yield per acre when drills 20 inches apart are used instead of those 32 inches apart, when the plants were thinned as above mentioned. The question is whether the farmer would prefer to have an increase of 36 per cent. in his crop of carrots by having the drills 20 instead of 32 inches apart; but at the same time have carrots which are 12 per cent. smaller in size than those which he could obtain from the wider drills. It will be observed that the roots of the carrots were about $3\frac{2}{3}$ times as much as the tops of the same.

SUGAR BEETS, COMPARATIVE TEST OF 10 VARIETIES.

During the past two years 10 varieties of sugar beets have been grown in the comparative tests on the trial grounds. The plots were the same size as those used for the other kinds of roots. There were three rows, four rods long, sown of each variety. The rows were 26.4 inches apart, and the roots were thinned to an average of 12 inches apart in the row. The preparation of the soil, including the manuring, etc., was exactly the same as for the other roots. The seed was sown on the 23rd of May with a one-horse seed-drill.

YIELDS OF 10 VARIETIES OF SUGAR BEETS.

Varieties.	Shape of root.	Results for 1893.			Average results for 2 years 1892-3.		
		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.
1 White Silesian	Long	2.93	1.30	12.85	4.83	1.57	**15.28**
2 Red Top	Long	2.95	1.20	12.93	4.00	1.49	**15.28**
3 French White	Long	3.98	1.23	12.83	3.41	1.45	**14.54**
4 Vilmorin's Improved White	Long	3.53	1.14	11.88	5.33	1.40	**14.08**
5 Lane's Improved	Long	3.10	1.09	11.35	3.19	1.34	**13.78**
6 Champion	Long	3.13	1.08	11.70	3.98	1.27	**12.82**
7 Austria Electorial Wohanka	Medium	4.03	.95	10.30	4.99	1.12	**11.22**
8 Kleinwanz Lebei	Medium	4.55	1.17	11.75	4.65	1.10	**10.90**
9 Improved Imperial	Medium	2.50	1.59	8.73	3.85	1.33	**9.24**
10 Red Skinned	Long	2.40	.95	9.05	3.37	.92	**8.82**

The ten varieties of sugar beets gave an average of $11\frac{1}{3}$ tons per acre during 1893, and an average of 12.6 tons per acre during 1892. The seed of all the varieties was obtained from Ontario and the United States. The comparative order of the yield per acre of the varieties grown in 1892 and in 1893 was quite similar. The White Silesian variety, which grows comparatively large, and one which has been grown to a certain extent for feeding purposes in Ontario, occupies a high place in the list in regard to yield. In 1892 it gave the largest yield per acre, and in 1893 it was surpassed by only one variety. The roots are rather long in shape, white in color, and rather of a fairly uniform quality. Vilmorin's Improved White, another variety which has been grown in Ontario for stock feeding, stands fourth in point of yield per acre of roots. This variety has produced the largest amount of tops of any of the varieties grown for the past two years. A great objection to growing sugar beets is the difficulty there is in removing them from the land. Owing to their fibrous roots they are difficult to pull. There is not much difference between the various varieties of sugar beets in this respect.

SILAGE AND FODDER CROPS.

The experiments which have been conducted during 1893 with silage and forage crops are mostly included under the following heads: Fodder corn, millet, clover, grasses, mixed grains, rape and sunflower. No less than 240 plots were devoted to experiments with fodder corn during the last year, and the results of this line of work have been quite successful. A review of our experience with grains for the past 12 years is given in the report on that subject.

Fodder Corn, Comparative Tests of 93 Varieties.

Varieties.	Kind of Corn.	Average yield of whole crop per acre, 1893.	Average results for number of years grown on plots.			
			Condition of grain when harvested.	Average weight per ear when harvested.	Yield of ears per acre when harvested.	Yield of whole crop per acre.
Grown for Three Years.		tons.		tons.	oz.	tons.
1. Mammoth White Surprise	White Dent	23.30	Water	3.48	.84	**22.60**
2. Brazilian Flour	"	22.30	"	1.46	.36	**22.07**
3. Chester Co. Mammoth	"	23.70	"	3.30	1.13	**21.80**
4. Cloud's Early Yellow	Yellow Dent	24.70	Late milk.	7.12	3.76	**21.50**
5. Thoro' bred White Flint	White Flint	24.60	Milk	4.43	1.71	**21.43**
6. Mastodon Dent	Yellow Dent	23.25	"	6.55	3.03	**21.05**
7. Mammoth Sweet Fodder	White Sweet	24.90	Early milk.	5.26	2.50	**20.87**
8. Blunt's Prolific	White Dent	22.65	"	3.32	1.15	**20.82**
9. Virginia Horsetooth	"	24.35	Water	2.67	1.02	**19.98**
10. Improved Leaming	Yellow Dent	22.05	Dough	5.47	3.13	**19.85**
11. Golden Beauty	"	22.65	Milk	5.02	2.51	**19.42**
12. Mammoth White Cob Ensilage	White Dent	24.15	Early milk.	3.99	1.65	**19.15**
13. Red Cob ensilage	"	23.35	"	3.65	1.25	**19.12**
14. Giant Prolific S. Ensilage	"	20.05	"	5.23	1.97	**18.95**
15. Horsetooth	Yellow Dent	19.95	Late milk.	5.57	2.98	**18.92**
16. Mammoth Southern Sweet	White Sweet	21.05	Early milk.	4.33	1.76	**18.85**
17. Mammoth Cuban	Yellow Dent	20.25	Dough	6.80	3.76	**18.82**
18. Centennial White	White Dent	21.05	Late milk.	6.17	3.10	**18.55**
19. Hickory King	"	24.00	Early milk.	2.60	.92	**18.30**
20. Salzer's North Dakota	White Flint	19.70	Firm dough	5.10	2.93	**17.43**
21. Sheep's Tooth	White Dent	12.40	Early milk.	5.76	1.34	**17.23**
22. Hickox Sweet	White Sweet	20.40	Milk	5.51	2.68	**17.13**
23. Salzer's Superior Fodder Ensilage	White Dent	19.20	Early milk.	4.74	1.68	**17.00**
24. Evergreen Sweet	White Sweet	19.70	Milk	5.08	2.25	**16.93**
25. Improved Clarage	Yellow Dent	18.55	Late milk.	6.17	3.09	**16.72**
26. Tuscarora	White Flint	19.83	Dough	5.90	2.99	**16.71**
27. Large White Flint	"	19.50	Ripe	5.09	3.09	**16.70**
28. Salzer's South Dakota	Yellow Flint	17.00	"	4.96	3.04	**16.67**
29. Egyptian Sweet	White Sweet	19.85	Milk	3.88	1.75	**16.58**
30. Clarke's County Champion	White Dent	18.10	Late milk.	5.70	2.76	**16.23**
31. Sweet Fodder	White Sweet	20.40	"	4.54	1.07	**16.03**
32. White Flour	White Flint	18.70	"	3.65	1.67	**15.97**
33. Wisconsin Earliest White Dent	White Dent	18.15	Dough	7.32	3.51	**15.95**
34. Stowell's Evergreen Sweet	White Sweet	18.80	Milk	4.56	2.07	**15.63**
35. Compton's Early	Yellow Flint	16.45	Ripe	6.05	3.34	**15.62**
36. Northern White Pearl	White Dent	14.20	Late milk.	6.03	2.52	**15.40**
37. Old Colony	White Sweet	19.50	"	4.52	2.42	**15.30**
38. Longfellow	Yellow Flint	16.85	Ripe	5.09	2.86	**15.22**
39. Queen of the Prairie	Yellow Dent	15.85	"	4.02	3.37	**15.05**
40. Early Butler	"	16.80	Dough	6.69	3.08	**15.00**
41. Angel of Midnight	Yellow Flint	17.55	Ripe	4.99	2.65	**14.82**
42. Early Adams or Burlington	White Dent	15.15	Dough	5.04	2.58	**14.25**
43. Pride of the North	Yellow Dent	16.21	Mature	4.98	2.78	**14.07**
44. Late Mammoth Sweet	White Sweet	16.45	Milk	4.42	1.93	**14.05**
45. Golden Dewdrop	Yellow Flint	15.50	Ripe	5.21	2.91	**13.83**
46. Marblehead Mammoth	White Sweet	15.05	Late milk.	4.75	2.12	**13.78**

FODDER CORN, COMPARATIVE TESTS OF 93 VARIETIES.—*Continued.*

Varieties.	Kind of Corn.	Average yield of whole crop per acre, 1893.	Average results for number of years grown on plots.			
			Condition of grain when harvested.	Average weight per ear when harvested.	Yield of ears per acre when harvested.	Yield of whole crop per acre.
Grown for Three Years.		tons.		tons.	oz.	tons.
47. Wauskakum	Yellow Flint	15.40	Ripe	4.97	2.76	**13.40**
48. Canada Yellow	"	16.10	"	5.50	2.86	**13.40**
49. Dakota Dent	Yellow Dent	14.00	"	5.81	3.19	**13.30**
50. Golden Dent	"	13.95	"	5.10	2.58	**12.98**
51. Early White Flint	White Flint	14.00	"	5.45	2.79	**12.77**
52. Self-Husking	Red Yellow Flint	16.05	"	4.69	2.71	**12.75**
53. 100-day corn	Yellow Flint	16.25	"	4.80	2.67	**12.65**
54. Queen of the North	Yellow Dent	14.55	"	5.00	2.77	**12.35**
55. Minnesota King	"	14.10	"	5.39	2.81	**12.03**
56. Pearce's Prolific	Yellow Flint	16.25	"	4.57	2.04	**11.92**
57. Crosby	White Sweet	15.20	Late milk	4.24	2.69	**11.80**
58. King of the Earlies	Yellow Dent	11.25	Ripe	5.84	2.68	**11.58**
59. Ridout or Mercier	Yellow Flint	13.25	"	5.53	2.74	**11.15**
60. Smutnose	White Pink Flint	13.25	"	5.80	2.99	**11.08**
Grown for Two Years.						
61. Giant Beauty	Yellow Dent	19.50	Milk	7.75	3.68	**22.95**
62. Dr. Woodhull	"	21.20	"	6.88	3.16	**21.50**
63. Pride of Kansas	"	22.45	"	5.43	2.27	**21.43**
64. N. B. & G. Co's. Giant Fodder	White Dent	21.30	Early milk.	4.43	1.54	**20.95**
65. New Leaming	Yellow Dent	17.05	Late milk	6.55	3.31	**19.38**
66. Mammoth	White Sweet	18.10	Early milk.	6.45	2.89	**19.30**
67. True Leaming	Yellow Dent	18.00	Late milk	7.62	3.66	**18.80**
68. Wilson's White Prolific	White Dent	19.15	Milk	6.91	3.31	**18.53**
69. Silver Flint	White Flint	6.60	Ripe	5.24	3.17	**13.45**
Grown for One Year.						
70. Peach Blossom Mammoth Fodder	Pinkish Dent	25.45	Early milk.	6.79	3.08	**25.45**
71. Champion Pearl	White Dent	23.55	Milk	7.30	3.95	**23.55**
72. Evergreen Red Cob	"	21.35	Early milk.	4.74	1.85	**21.35**
73. Mammoth Sweet for Ensilage	White Sweet	21.05	Milk	7.70	3.03	**21.05**
74. Elephant Fodder	Yellow Dent	20.55	"	6.37	3.12	**20.55**
75. Kansas King	White Dent	20.30	Early milk.	4.71	1.81	**20.30**
76. Giant White Southern	"	20.05	"	5.58	2.63	**20.05**
77. Boone County White	"	20.05	"	5.62	2.23	**20.05**
78. Jas. Stewart	Yellow Dent	20.00	Milk	7.38	3.44	**20.00**
79. Red Blazed	Reddish-yellow Dent.	19.70	Ripe	7.06	3.93	**19.70**
80. Geo. Hondeshell	Yellow Dent	19.70	Milk	6.03	2.94	**19.70**
81. Legal Tender	"	19.45	Late milk	5.65	2.83	**19.45**
82. Improved Calico	White Dent	19.30	"	7.07	3.38	**19.30**
83. Big Buckeye	Yellow Dent	18.75	Milk	5.76	2.45	**18.75**
84. Dungan's White Prolific	"	18.60	Early milk.	5.64	2.06	**18.60**
85. Early Snowstorm	White Dent	18.40	"	6.95	2.48	**18.40**
86. Queen of the Field	Yellow Dent	18.05	Dough	8.17	3.98	**18.05**
87. Iowa Gold Mine	"	17.05	Late milk	6.41	3.03	**17.05**
88. N.B. & G. Co's. Rustler White Dent	White Dent	16.85	Dough	8.41	4.13	**16.85**
89. Dakota Queen	Yellow Dent	14.90	Ripe	7.05	4.08	**14.90**
90. Extra Early Huron Dent	"	14.30	"	6.31	3.39	**14.30**
91. Clark's Mastodon	"	10.00	Early milk.	9.68	1.33	**10.00**
92. Zig-Zag Evergreen	White Sweet	9.10	Milk	3.75	.84	**9.10**
93. Farmer's Favorite	Yellow Dent	5.40	Early milk.	9.83	.83	**5.40**

During the past year 93 varieties of fodder corn were grown on duplicate plots in the Experimental department. The seed was mostly obtained from the United States, but some were procured in Ontario. The land upon which the varieties of fodder corn were grown was a fairly uniform strip of clay loam, having a fairly level appearance Rape was on the land in 1892, and was pastured off by lambs. A coating of 15 loads per acre of farmyard manure was applied to the land in the spring of 1893, after which the land was plowed The soil was quite similar for each set of plots which were to be devoted to the testing of these 93 varieties. Each strip received exactly the same attention throughout. The same varieties, when growing in the duplicate plots, would be located about 20 rods apart. The corn was planted in hills 5 links (39.6 inches) apart both ways. Eight grains were placed in each hill, and after the plants were four inches high they were removed, leaving exactly four plants per hill. The planting of one set took place on May 26, and one of the other set May 27, with the exception of the following varieties, namely: Big Buckeye, Hondeshell and Stewart, which were planted on June 3rd. Thorough shallow cultivation was given the corn in both directions throughout the season.

It will be observed from the table, giving the report of 93 varieties of fodder corn, that not only is the yield per acre of the whole crop given for 1893, but the average results for the number of years, that all the varieties have been grown upon the plots, are also mentioned in a very concise way. Sixty of the varieties have been grown in duplicate plots for three years, nine have been grown in duplicate plots for two years and the remaining twenty-four were grown on duplicate plots in 1893 for the first time. The average results given in the table for the number of years which the varieties have been grown have reference to the condition of the grain when harvested, average weight per ear, yield of ears per acre and yield of whole crop per acre. This table gives information regarding a large number of varieties of fodder corn which have been grown in no other place in Canada except on this Farm. Some of these varieties have been grown for the past three years, the results carefully recorded and the reports now show that they are worthy of careful consideration. There has, perhaps, been no summary report on fodder corn given which is of so much value to the Ontario farmer as the one herein contained. We find that the variety which gave the largest total yield per acre in 1893 was the Peach Blossom Mammoth Fodder. The seed of this variety was imported from the United States. It is a dent variety and possesses a large ear. It is, however, rather late for this climate, but in some of the southern counties of Ontario it may do well by reaching a more advanced stage of muturity. Among the sixty varieties grown for three years the Mammoth White Surprise heads the list in total weight of green crop per acre. It gives an average of 22.6 tons. It is, however, very late and not well suited to the conditions of growth in this section of the country. The same may be said of the Brazilian Flour, which comes next in point of yield, and also in regard to the Chester County Mammoth following closely after, with a yield of 21.8 tons per acre. Cloud's Early Yellow is one of the earliest of the very large varieties. It produces large ears and they are very numerous. During the past three years the Cloud's Early Yellow gave an average of 3.76 tons of green ears per acre. This, however, did not go beyond the late milk condition. The Thoroughbred White Flint, of which much has been said in Ontario, is even later with us than the Cloud's Early Yellow. It has also been somewhat deficient in weight of ears. The Improved Leaming, which is tenth in point of yield, has reached the dough stage year by year. It produces a nice ear and the ears are quite numerous on the stocks. This is a good variety when grown in sections when it will reach a sufficient stage of maturity. The Mammoth Cuban, which comes seventeenth on the list, also possesses corn which reaches a dough stage. It produces somewhat greater weight of green ears per acre than the Improved Leaming. This variety has done quite well both on this Farm and the co-operative experiments over Ontario. We consider it one of the best varieties, among the larger kinds. Salzer's North Dakota which stands twentieth on the list gives a somewhat lower total yield per acre; but it reaches a stage nearer to maturity when time approaches for harvesting for the silo. With us this variety is sufficiently ripened when corn is being cut for the silo.

The seed of a few of the varieties did not germinate well in the spring of the present year. It was our aim to leave an average of four per hill of all varieties. With some of the kinds this could not be done. The following list gives the varieties which were deficient in germination, and also the percentage of plants which were lacking in the growing crop : Farmer's Favorite, 90 ; Zig-Zag Evergreen, 81 ; Sheep's Tooth, 77.5 ; Clark's Mastodon, 72.5 ; Northern White Pearl, 72.5 ; Marblehead Mammoth, 54 ; Early Snow-Storm, 37.5 ; Stowell's Evergreen, 36 ; King of the Earlies, 35 ; Salzer's Superior Fodder Ensilage, 35 ; White Flour, 27.5 ; Mammoth Sweet, 26 ; Old Colony, 22.5, and late Mammoth, 21.

The variety which reached the greatest height in 1893 was the Mammoth White Cob Ensilage, the plants being 130 inches in length. The Chester County Mammoth, Cloud's Early Yellow, Mastodon's Dent, Blunt's Pacific, Virginia Horse Tooth, Red Cob Ensilage, Hickory King, N. B. & G. Co's Giant Fodder, Evergreen Red Cob and Mammoth White Cob Ensilage each reached an average height of over 120 inches. The Marblehead Mammoth, Crosby, Smutnose and Silver Flint each reached an average height of less than 80 inches. The longest ears were produced by the Salzer's South Dakota, Red Blazed, Canada Yellow, Self-husking, Thoroughbred White Flint and Salzer's North Dakota, and the shortest ears were produced by the Brazilian Flour, Crosby, Mammoth, Evergreen Red Cob, Big Buckeye, Dakota Queen and Extra Early Huron Dent. The greatest weight of grain per ear was produced by the Early Butler, True Leaming, Compton's Early, Longfellow, Canada Yellow and Smutnose. About forty out of the ninety-three varieties produced grain which was quite hard in character when shelled during November.

Among all the varieties grown for the past three years we might mention the following as among the best for the conditions of Ontario, namely ; Improved Leaming Mammoth Cuban, Salzer's North Dakota and Wisconsin Earliest White Dent.

Fodder Corn, Different Distances Between Drills and Between Plants in Drills.

In this experiment three varieties of corn were grown—an early, a medium and a late variety. Each variety was grown at different distances between the drills, namely,—30, 36 and 42 inches respectively, and the corn in each set of the drills planted at the distances mentioned above, was also planted at different distances, apart in the drill, namely, 4, 8 and 12 inches respectively. 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 three inches high. All the varieties were grown on duplicate plots and each of the test plots comprised five rows. The soil was a light clay loam upon which no manure had been applied for several years. Planting took place on June 3rd.

This experiment shows that in every case the highest total yield was obtained from planting in drills thirty inches apart and thinning to four inches in the drill in 1893 as in 1892. The largest average ear of the Mammoth Southern Sweet was obtained from planting in drills thirty-six inches apart and thinning to twelve inches in the drill. The largest average ear of the Wisconsin Earliest White Dent was obtained from planting in drills forty-two inches apart and thinning to twelve inches in the drill. It will be observed that the thickest seeding of the Compton's Early gave an average of over two tons per acre total weight, and two tons per acre of ears more than the thinnest seeding of the Mammoth Southern Sweet for two years. The greatest total yield per acre for two years was produced by planting the Mammoth Southern Sweet in drills thirty inches apart, and thinning to four inches in the drill, and the greatest yield of green ears per acre for two years was produced by planting Wisconsin Earliest White Dent in rows thirty inches apart and thinning plants to twelve inches in the drills.

YIELD OF FODDER CORN GROWN AT DIFFERENT DISTANCES BETWEEN THE DRILLS AND BETWEEN THE PLANTS IN THE DRILLS.

Distance between drills.	Distance between plants in the drill.	Average weight per ear.		Yield of ears per acre.		Yield of whole crop per acre.	
		1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
		oz.	oz.	tons.	tons.	tons.	tons.
Mammoth Southern Sweet :							
30 inches	4 inches.	2.13	2.89	1.29	1.32	19.07	23.04
	8 "	2.85	3.25	1.17	1.42	17.33	19.99
	12 "	3.07	3.79	1.21	1.59	13.66	17.62
36 inches	4 "	2.17	2.81	.73	.80	16.31	18.54
	8 "	3.16	3.76	1.37	1.60	15.50	18.41
	12 "	3.50	4.55	1.22	1.64	12.79	16.33
42 inches	4 "	1.81	2.86	.56	.96	12.81	17.75
	8 "	2.71	3.63	.91	1.46	12.48	16.91
	12 "	3.01	4.31	.92	1.53	11.25	16.09
Wisconsin Earliest White Dent :							
30 inches	4 "	2.56	3.81	2.58	3.76	14.58	19.78
	8 "	4.38	5.80	3.01	3.75	13.60	16.44
	12 "	5.73	7.94	2.89	3.97	12.89	15.41
36 inches	4 "	2.59	3.79	1.96	2.87	12.75	16.31
	8 "	6.46	7.45	2.86	3.81	13.16	16.06
	12 "	6.43	8.77	2.65	3.55	11.56	14.28
42 inches	4 "	2.96	4.36	2.03	3.36	11.65	16.53
	8 "	5.20	7.08	2.59	3.61	12.43	15.63
	12 "	6.63	9.20	2.49	3.44	10.87	13.43
Comptons' Early :							
30 inches	4 "	2.60	3.69	3.30	3.65	16.23	18.42
	8 "	4.22	5.27	3.25	3.67	14.08	15.60
	12 "	5.16	6.52	2.82	3.45	12.66	14.59
36 inches	4 "	3.07	3.74	3.02	3.24	14.27	15.67
	8 "	4.98	6.06	3.12	3.63	13.19	14.75
	12 "	5.78	7.19	2.69	3.22	11.74	13.65
42 inches	4 "	2.74	3.82	2.37	3.08	10.96	13.66
	8 "	4.91	6.24	2.62	3.34	11.18	13.28
	12 "	5.05	6.87	2.25	3.09	10.90	13.11
Average of the three varieties :							
30 inches	4 "	2.43	3.46	2.39	2.91	16.63	20.41
	8 "	3.82	4.78	2.48	2.95	15.00	17.34
	12 "	4.65	6.08	2.31	3.00	13.07	15.87
36 inches	4 "	2.61	3.45	1.90	2.30	14.44	16.84
	8 "	4.87	5.76	2.45	3.01	13.95	16.41
	12 "	5 24	6.84	2.20	2.80	12.03	14.75
42 inches	4 "	2.50	3.68	1.65	2.47	11.81	15.98
	8 "	4.27	5.65	2.04	2.80	12.03	15.27
	12 "	4.90	6.79	1.89	2.69	11.01	14.21

Millet, Comparative Test of Twelve Varieties.

In 1893, ten varieties of millet were grown. The plots were all one one-hundreth of an acre in size. The land was a clay loam and had not received any manure since the spring of 1890. The seed was sown broadcast at the rate of forty pounds per acre and was harrowed in with a light iron harrow. Another set of millets was sown at the same time for the purpose of harvesting for seed. The early frosts, however, froze some of the late varieties and made the experiment a comparative failure for this year.

Varieties.	Yield of green crop per acre.		
	1892.	1893.	Average for number of years grown.
	tons.	tons.	tons.
1. Salzer's Dakota	7.50	8.70	**8.10**
2. German or Golden	5.93	8.85	**7.39**
3. Golden Wonder	5.56	7.85	**6.71**
4. Common	2.38	8.43	**5.41**
5. White French	3.14	7.40	**5.27**
6. Pearl	4.61	4.40	**4.51**
7. Red French	3.88	5.05	**4.47**
8. Broom Corn	2.66	1.95	**2.31**
9. Western Grown	....	10.78	**10.78**
10. Hungarian Grass	....	7.40	**7.40**
11. African	4.88	....	**4.88**
12. Siberian	3.61	....	**3.61**

The Salzer's Dakota Millet, which heads the list in yield per acre for two years, is certainly an excellent variety. It did not do quite so well comparatively in 1893 as it did in 1892. It is a very strong growing variety and produces a large amount of foliage. It grows to a greater height than any of the other varieties and stands up remarkably well. Of the millets which have been grown on this Farm for two years, Salzer's Dakota has certainly shown itself to be a most desirable variety. The Western Grown did very nicely during the present year, giving a large yield per acre. In three co-operative tests over Ontario in 1892 in which three varieties of millets were grown, the Salzer's Dakota gave an average yield per acre of nearly fifty per cent. over either of the other varieties.

Mixed Grains, Grown for Fodder Purposes.

An experiment was conducted in growing grain in mixture for fodder purposes. Eleven plots were sown with two, three or four kinds of grain on each plot. The experiment was conducted in duplicate. Each plot was one one-hundredth of an acre in size. The soil was a clay loam which had received no manure since the spring of 1890, since which time it has been cropped each year. Seeding took place on May 13th. Besides growing the grain in mixtures each kind was grown by itself. When grown singly the same quantity of seed per acre was used as in the variety tests. When the grains were grown in mixtures, in the case of one set of experiments two-thirds the amount of seed was used of each kind of grain as was used in the variety tests. In the case of the other set, one-half the amount of each kind of grain was used as in the variety tests when two were sown together; one-third as much when three were sown together; and one quarter as much when four were sown together.

The largest yield per acre of green crop produced in 1893 was from growing oats, peas and wheat together; the second largest from growing oats and barley; and the third largest from growing oats and peas. The largest yield for the average of two years, however, was produced from growing a mixture of oats and peas. In the results of 1893, the yield per acre of green fodder from the mixture of grain gave about the same average as from similar grains grown separately. There is an advantage, however, in growing the grains in mixtures for fodder purposes, for in so doing a better balanced ration is thus obtained.

Yields of Grain Crops Grown in Mixtures for Fodder Purposes.

Crops.	Yield of green crop from grains sown separately, 1893.	Average yield of green crop from mixed grains.		
		1892.	1893.	Average two years, 1892-3.
	tons.	tons.	tons.	tons.
1. Peas and Oats	6.04	10.95	6.01	**8.48**
2. Barley, Peas and Oats	5.52	9.95	5.30	**7.63**
3. Peas, Wheat and Oats	5.47	8.20	6 94	**7.57**
4. Barley and Peas	5.07	8.50	5 93	**7.22**
5. Barley, Peas, Wheat and Oats	5.23	9.85	4.01	**6.93**
6. Barley, Wheat and Oats	5.08	8.60	4.77	**6 69**
7. Barley and Oats	5.46	7.08	6.12	**6.60**
8. Wheat and Oats	5.38	7.58	5.28	**6.43**
9. Peas and Wheat	4.99	7.95	4.48	**6.22**
10. Barley, Peas and Wheat	4.82	7.45	3.98	**5.72**
11. Wheat and Barley	4.40	6.15	4.81	**5.48**

Peas and Oats also Vetches and Oats, Sown in Different Quantities for Fodder Purposes.

In this experiment nine plots were sown with oats and peas, and nine plots with vetches and oats, mixed in varying proportions. The plots were each one-eightieth of an acre in size. The land had received no manure for several years. Grape vines were removed in the autumn of 1892 from the soil on which these mixtures were grown. Seed was sown broadcast on May 12th, and was covered by means of an iron harrow.

Mixtures of Grain.	Yield of green crop per acre.			Average yield of green crop per acre from three tests.
	Peas and Oats. 1892.	Peas and Oats. 1893.	Vetches and Oats. 1893.	
	tons.	tons.	tons.	tons.
Oats 2 bush., Peas or Vetches 3 bush. per acre	11.75	6.52	9.16	**9.14**
" 1½ " " 3 "	11.40	5.72	7.88	**8.33**
" 1½ " " 2 "	11.85	5 88	7.12	**8.28**
" 1 " " 3 "	11.35	6.32	6.92	**8.20**
" 2 " " 1 "	11.55	6.28	6.64	**8.16**
" 1 " " 1 "	11.80	4.68	7.04	**7.84**
" 1½ " " 1 "	12.10	4.88	6.52	**7.83**
" 2 " " 2 "	10 10	5.36	7.52	**7.66**
" 1 " " 2 "	10.75	4.18	7.56	**7.50**

In 1892, the greatest yield of green crop was produced from growing a mixture of one and one-half bushels of oats and one bushel of peas. This was upon land which had been manured two years previously. In 1893, the mixtures were grown upon land which had received no manure for a number of years. It was, therefore, of a poor quality, and the yields of green crop were quite small. The greatest yield per acre in 1893 was produced by sowing two bushels of oats and three bushels of peas, or two bushels of oats and three bushels of vetches per acre. It will be observed from these results that a good deal depends upon the state of fertility of the land when determining what quantity of seed should be used for growing crops such as these.

SPECIAL VARIETIES OF GRAIN GROWN IN MIXTURE FOR FODDER PURPOSES.

An experiment was conducted in 1893, in which special varieties were sown in combination for the purpose of producing green crops. The plots upon which these mixtures were grown were each one one-hundredth of an acre in size. The land had received a coating of fifteen loads of farm-yard manure per acre in the spring of 1890. The seed was sown broadcast on May 19th, and the crops were harvested just when the varieties headed out.

Grains used in mixtures.			Remarks.	Yield of green crop per acre.
				tons.
Golden Giant Oats	and	McLean's Advancer Pea	Pea crop a failure	6.78
"	"	Canada Cluster Pea	One of the best	7.33
"	"	Prussian Blue Pea	One of the best	8.03
"	"	Grass Pea	Pea crop smothered out	6.08
Red Spot	"	McLean's Advancer Pea	Pea crop a failure	4.40
"	"	Canada Cluster Pea	Badly lodged	5.18
"	"	Prussian Blue Pea	Badly lodged	4.83
"	"	Grass Pea	Considerably lodged	4.43
Joanette	"	McLean's Advancer Pea	Pea crop a failure	5.38
"	"	Canada Cluster Pea	Good quality of feed	5.28
"	"	Prussian Blue Pea	Good quality of feed	5.98
"	"	Grass Pea	A fair crop	6.03
White Tartarian	"	McLean's Advancer Pea	Pea crop a failure	6.05
"	"	Canada Cluster Pea	Somewhat lodged	5.90
"	"	Prussian Blue Pea	Considerably lodged	5.73
"	"	Grass Pea	Pea crop smothered badly	6.13

The Golden Giant oats and Prussian Blue peas, when sown in combination gave the largest yield of green crop per acre, and the Golden Giant oats and the Canada Cluster peas gave the second highest yield per acre. Both of these mixtures have been found to give good satisfaction, and for general purposes it is perhaps difficult to find a mixture which is more suitable for fodder purposes than the Golden Giant oats and the Prussian Blue peas. If a crop of finer growth is required and one which would perhaps be well suited for curing for sheep feed in the winter, the Joanette oats and the grass pea would perhaps be the best mixture of all those which have been tried.

SUNFLOWER, COMPARATIVE TEST OF TWO VARIETIES.

In 1893 two varieties of sunflower were grown side by side. The seed was planted in rows twenty-five inches apart, on May 22nd. The land was cultivated similar to that upon which corn was grown.

Varieties.	Yield of green sunflower per acre.		
	Heads.	Leaves.	Whole plants.
	tons.	tons.	tons.
Russian Giant	8.80	3.16	19.44
Common	6.00	1.68	13.20

The weight per acre of the whole crop of each variety was estimated from the amount of the total crop produced on each plot. Correct weights of the heads of each variety were also taken, and also those of the leaves. The results show that the Russian Giant sunflower produced a greater total weight than the common variety, and also has greater weights of heads and leaves per acre.

Rape, Comparative Test of 11 Varieties.

Eleven packages of rape seed were presented to us by the Messrs. Steele, Briggs, Marcon Co., seedsmen, Toronto, in the spring of 1893. The seed was sown in single rows, 25 inches apart, and one rod long. The experiment was conducted in duplicate. The seeding of the first set took place on the 26th of May, and the latter one about five weeks after. The ground was kept clean by means of the hoe throughout the season. Notes were taken, and the crop cut on the 13th of October.

Varieties.	Remarks.	Average height of plants.
		Inches.
1. Large Seeded Summer Rape	Long, slender and flowering	35
2. Dutch Rape, Large Seeded	No flowers; leaves somewhat purple	12
3. Russian Summer, Large Seeded	Long, slender, flowering and more leafier than 1	39
4. English Sowing Rape (1892 untrue)	Very long bare stems, flowering	36
5. Umbrella Large Seeded Rape	Close resemblance to Dwarf Essex	15
6. White Flowering Rape	Similar to Dwarf Essex, but of finer growth	12½
7. Yellow Flowering Rape	No flowers; very broad leaves	16½
8. Large Seeded Winter Rape	Resembles Dwarf Essex	17
9. Dwarf Essex	No flowers; abundance of leaves	14½
10. English Sowing Rape	Resembles Dwarf Essex	16⅓
11. Dwarf Hamburg, Large Seeded	Resembles Dwarf Essex	13

It will be observed from the results of this experiment that three of the varieties produced seed during the first year after sowing. The other eight were quite similar in all characteristics, each producing a good growth of leaf, and showing no signs of flowering the first year.

Rape, Different Quantities of Seed per Acre.

An experiment was conducted in duplicate in which different quantities of rape seed were sown per acre. A horse drill was used, and the seed was allowed to run from each of the eleven openings in the seed box. The amount of seed used in each instance was carefully determined. The land upon which the rape was grown was a clay loam, with a considerable amount of vegetable matter. Carrots were grown on the land in 1892. The plants were left unthinned in every instance.

Number of tube on seed drill.	Seed per acre. (lb.)	Yield of rape per acre. (tons.)
1	1.2	18.5
2	2.0	16.3
3	2.3	17.1
4	3.3	17.8
5	5.5	17.1
6	4.1	16.1
7	6.3	16.0
8	8.6	15.4
9	13.1	16.5
10	90.2	14.1
11	186.6	14.4

It will be seen from the results that the largest yield of rape per acre was produced from the thinnest seeding, which was at the rate of $1\frac{1}{5}$ pounds per acre. The plants from this seeding were strong, and of a dark, thrifty appearance. Where the large amount of seed was used the plants were very fine, weak and spindling.

Rape, Yield per Acre when Grown Under Favorable Conditions.

An experiment was conducted on growing rape upon a piece of land which had received manure in the spring of the present year, and upon which no other crop was grown until it was seeded with rape, about the 1st of July. The land was low-lying, and contained a considerable amount of vegetable matter One portion of the soil possessed a perfect matting of the roots of twitch grass. The roots were partly taken from the land before the rape seed was sown. The land was ridged in the ordinary way with a double mould-board plow, and the rape was sown at the rate of about two pounds per acre, in drills 27 inches apart. The land was cultivated every week or ten days, until the rape became a good size. The yield of rape per acre when grown under favorable conditions was 27.7 tons. The rape grew very rapidly, making a complete covering to the ground. It produced a crop of over 27 tons per acre. Some of the plants were fully three feet in length. No signs of twitch grass could be found in the land after the rape was harvested, early in November. This seems a very useful, profitable and successful manner of clearing the land of such a troublesome weed as the twitch or quack.

Permanent Pasture.

The grass crop is by far the most important crop grown in Ontario. The area of cleared lands in the province in 1892 was 11,988,426 acres. The area in pasture the same year was 2,562,040 acres, or a total of 5,077,407 acres in pasture and meadow. No less than 42.35 per cent. of the cleared lands of the province was that year devoted to the growth of grasses. It is of paramount importance, therefore, that much attention should be given to the growth of grasses in the experimental field work carried on at our provincial agricultural experiment stations. And these experiments should not only relate to the introduction of new varieties, but also to the improvement of such varieties as we have, and to finding out the most suitable combination in which the various grasses and clovers may be grown in both meadows and pastures.

The term permanent pastures is much liable to be misunderstood. Strictly speaking it means a pasture that remains unbroken for a shorter or a longer term of years, or which is never plowed up at any time. As commonly used it means a pasture made by sowing certain grasses and clovers in combination, and pasturing these for a term of years of some considerable duration. It is in the sense just expressed that the term is used in this bulletin. But a permanent pasture may consist entirely or almost entirely of one kind of grass. For instance what is ordinarily termed June grass (Poapratensis) forms an excellent permanent pasture in our province even when it grows alone, or with but a slight admixture of other grasses.

Permanent pastures in this country will never probably be possessed of equal relative value with those in Great Britain and some other European countries, owing, first, to the greater coldness of our climate in winter; second, to its greater dryness in summer, and third, to the more limited duration of the pasturing season with us. But there is certainly a place for them in our rotation, and it is an important one. The coldness of our winters and the dryness of our summers will exclude many of the most valuable European forage plants from our permanent pastures, but it is probable that others may be introduced in their stead, and it is our duty to seek for these and to introduce them.

Our object in considering this subject is:

1. To give information gleaned from our experience on this Farm in reference to the question of grasses, but more especially (*a*), as to the behavior of various grasses and clovers when sown singly; (*b*) as to the behavior of various grasses and clovers when sown in certain combinations; (*c*) as to the permanency or non-permanency of certain grasses, both foreign and native, and (*d*) as to the peculiarities of some of the more important individual grasses and clovers grown on the Farm.

2. To furnish information based on our experience and also obtained from other sources: (*a*) as to the soils suitable for permanent pastures; (*b*) as to the mode of preparing the ground for these; (*c*) as to the combination in which to use them, and (*d*) as to the mode of sowing them.

Our Experience in Growing Grasses.

The following are the more important of the experiments conducted in growing grasses at this Farm, viz.:

Grasses Sown Singly.

1883	Grasses	20 varieties.
1892	"	39 "
1892	Clovers	16 "

Grasses Sown in Mixtures.

Spring, 1883	Grasses, 9 varieties	Clovers, 5
" 1884	" 8 "	" 3
" 1885	" 10 "	" 3
Fall, 1886	" 5 "	" 5

Grasses Sown Singly. The varieties enumerated in the table below were sown in plots one-twentieth of an acre in size, on May 15th, 1883. Notes were carefully taken as to their condition in 1890 and also in 1891. These notes for the two years were found to be in substantial agreement, and were published in summary in the report for 1890, p. 181. They are reproduced with some additions as follows:

Names of grasses.	Condition of grasses—Four years.	Condition of grasses—Eight years.
Meadow Foxtail	Holding well	Holding well.
Perennial Rye	A trace	All gone.
Italian Rye	A trace	All gone.
Wood Meadow	Somewhat uneven	Holding well.
Rough Stalked Meadow	Somewhat irregular	Holding well.
Various-leaved Fescue	Holding well, but somewhat uneven.	Holding well, but somewhat uneven.
Sheep's Fescue	Holding well	Holding well.
Hard Fescue	Holding well	Holding well.
Fine-leaved Fescue	Holding well	Holding well.
Large-leaved Fescue	Medium quantity	Nearly gone.
Fall Fescue	Medium quantity	Medium quantity.
Red Fescue	Holding well	Holding well.
Sweet Vernal	All gone	All gone.
Crested Dogstail	All gone	All gone.
Creeping Bent	A trace	All gone.
Red Top	A trace	All gone.
Yellow Oat	All gone	All gone.
Fall Oat	Rather thin	All gone.

The same year that the grasses mentioned in the above table were sown, notes were taken of them in the autumn, which are in substance as follows: Those which had made good growth include Italian Rye, Perennial Rye, Fall Fescue and Fall Oat. Those represented as having made a slow growth include Large-leaved Fescue, Hard Fescue, Red Fescue, Sheep's Fescue, various-leaved Fescue, Meadow Foxtail, Wood Meadow, Rough Stalked Meadow, Yellow Oat and Crested Dogstail, and those spoken of as having made an intermediate growth are Five Leaved Fescue, Sweet Vernal, Creeping Bent and Red Top.

In 1892, 39 varieties of grasses were sown on May 17th in plots one one-hundredth of an acre in size. The condition of these grasses in the spring of 1893, viewed from the standpoint of hardiness and ability to make a strong and quick growth, was as follows: Bromus Ivernus, Rhode Island Bent, Yarrow, Taller Fescue and Woodside Meadow were unusually promising. Those possessed of good, but not more than average promise, include Evergreen Meadow, Tall Oat, Yellow Oat, Timothy, English Blue, Orchard Grass, Meadow Fescue, Hard Fescue, Red Fescue, Rough Stalked Meadow, Smooth Stalked Meadow and Lathyrus Silvestris Wagneri. The Rye Grasses, viz.: the annual, Italian, and perennial varieties, made a good growth the previous season, but very few plants in any of the varieties survived the winter. Other varieties stood the winter well, but their growth was so slow, comparatively, that they are not included in the above lists.

In 1892, 16 varieties of clover were sown on May 9th in plots of one one-hundredth of an acre. Viewed from the standpoint of hardiness and the vigorous appearance of the plants, the condition of the clover in the spring of 1893 was as follows: The varieties of more than average promise include the White Dutch, the Alsike and the Welsh. But it should be remembered that these varieties do not grow so quickly, nor do they produce so large a bulk of fodder as some other clovers. Those possessed of fair promise include Perennial Red, Giant Hybrid, Broad Red, Common Sanfoin, Bokhara, Lucerne and the Kidney Vetch. The latter is apparently of slow growth. The Scarlet or Crimson Clover, of which two plots were grown, was apparently all destroyed in the winter.

In the interval between 1883 and 1892 a number of varieties of grasses and clovers were sown singly, particularly of the latter, but notes regarding them would unduly enlarge this report.

Grasses Sown in Mixtures. In 1883 a mixture of grasses and clovers were sown on May 17th in a plot one-tenth of an acre in size. The names of the grasses and clovers thus sown, the quantities of seed used, and their condition at the end of five yoars, and also at the end of ten years, are given in the subjoined table:

Names of grasses.	Amount of seed sown per acre.	Condition of grasses, fifth year.	Condition of grasses, tenth year.
	lb.		
Timothy	7	Considerable and uniform	Medium quantity.
Orchard Grass	4	Not very prominent	Medium quantity
Italian Rye	2	None	None.
Perennial Rye	2	None	None.
Tall Oat	2	Medium and thrifty	A large quantity.
Red Top	2	Only a trace	None.
Meadow Fescue	3	Considerable, and holding its own well	Medium quantity.
Creeping Bent	1	A trace	None.
Kentucky Blue	2	Considerable	A trace.
Lucerne	4	Plants over the plot	A fair amount.
White Clover	3	A trace	None.
Alsike Clover	1	More than of any other clover	Nearly gone.
Red Clover	1	Very little	A good quantity.
Yellow Clover	1	A trace	Medium quantity.

These grasses were not pastured, but were simply mown once a year and rather late in the season. The experiment, therefore, was a test of the survival of the fittest among the grasses sown, rather than an experiment to determine their value in a permanent pasture. It will be observed that the grasses were sown at the rate of $25\frac{3}{4}$lb. per acre, and the clover at the rate of 10 lb.

In 1884, one acre was sown with a mixture containing eight varieties of grass and three of clover. The fourth season after sowing, a careful examination brought out the facts stated below. It was found that the grasses which had best maintained their hold were Meadow Fescue, Canadian Blue, Timothy, Orchard Grass and Red Top, in the order named. Only a trace of Italian Rye and Perennial Rye could be found, and but a small quantity each of Tall Oat Grass and of Red Clover remained. This plot had been closely pastured each year except the first.

In 1885, four acres were sown with grasses intended for permanent pasture. Of these two acres were broken up in the autumn of 1890. The other two acres remain.

This plot was closely eaten off every year prior to the winter of 1890, except the year in which it was sown. The names of the grasses and clovers sown, the quantities of seed used, and their condition at the end of eight years, are given in the table below :

Names of grasses.	Amount of seed sown per acre.	Condition of grasses, eighth year.
	lb.	
Timothy	1	A small quantity.
Orchard Grass	2	The second leading grass as to quantity.
Red Top	1	All gone.
Tall Oat	3	An average quantity.
Italian Rye	1	All gone.
Perennial Rye	1	All gone.
Meadow Fescue	2	The leading grass as to quantity.
Meadow Foxtail	1	The third leading grass as to quantity.
Canadian Blue	1	A trace.
Hard Fescue	2	More than a trace.
Red Clover	2	Less than an average quantity.
White Clover	2	A trace.
Alsike Clover	3	A large quantity.

It will be observed that the grasses in the mixture given in the above table were sown at the rate of 15 lb. per acre, and the clovers at the rate of 7 lb. The part still unbroken has been divided into a number of plots, and various experiments are now being conducted with these, with a view to their renovation.

In the autumn of 1886 a plot of mixed grasses were sown on September 16th. It contained one-tenth of an acre, and the whole mixture was sown at the rate of 35 lb. per acre. The chief object of this experiment was to determine the suitability of the autumn for sowing grasses found useful as permanent pastures when sown in the spring. The quantities of seed used, the names of the grasses sown, and their condition at the end of one year and six years respectively, are given in the following table :

Names of grasses.	Condition of grasses—One year.	Condition of grasses —Six years.
Meadow Fescue	Considerable, and doing well	A fair amount.
Meadow Foxtail	Equal in quantity to above	A large quantity.
Perennial Rye	Some only at outer edges of plot	None.
Yellow Oat	A very few plants	A large quantity.
Timothy	Nearly as much as of Meadow Foxtail	A goodly quantity.
Lucerne	Not very much	A fair amount.
Alsike Clover	Not very much	A fair amount.
Common Red Clover	Not very much	A trace.
Yellow Clover	Only a trace	A large quantity.
White Clover	Only a trace	None.

The above plot was mowed once every year and somewhat late in the season. A field containing twenty acres was sown for permanent pasture in the spring of 1882. A mixture of grasses and clovers was used. We have not been able to ascertain the exact nature of the mixture or the quantities of seed used. They were sown with a crop of oats. The field was mowed for two years, but since that time it has been pastured every year. It still yields a large amount of pasture, certainly more than can be obtained from an ordinary Canadian Blue grass pasture, and more than is usually furnished by common red clover and timothy of the second and third year's growth respectively. But it should be mentioned here that the soil is well adapted to growing grasses. It is principally composed of clay loam, and contains a large amount of vegetable mould. It has not been renovated in any way since it was sown. The more prominent grasses in this field now are Canadian Blue, Orchard grass, Timothy and White Clover. Of Canadian Blue grass and White Clover there is relatively a large amount, and also a fair amount of Orchard grass. A number of other grasses still linger, but they are not now greatly prominent.

This experiment, and also some or the others previously mentioned, are probably the oldest, if not indeed the oldest that have been conducted in Canada in growing mixed grasses and clovers with a view to test their permanency. Owing to the limited period therefore during which many of them have been grown, we feel that special care should be exercised in drawing definite conclusions in regard to them.

Permanency of certain Grasses. In the aforementioned tests the following grasses, when sown in mixtures, have proved the most permanent amongst the kinds possessed of the highest value as fodder plants, and probably in the order mentioned, viz.: Meadow Fescue, Orchard grass, Meadow Foxtail, Tall Oat and Timothy. Those of less importance include Hard Fescue, Red Fescue, Wood Meadow, Rough Stalked Meadow, Sheep's Fescue, Various-leaved Fescue, Fine-leaved Fescue, Tall Fescue and Long-leaved Fescue, and these probably possess permanency in the order named. Some of these in the list last mentioned have even greater power to endure than those in the list first mentioned.

The varieties which in our experience have not shown much permanence are Italian Rye, Sweet Vernal, Crested Dogstail, Tall Oat, Perennial Rye, Creeping Bent and Red Top, and they have been found wanting in permanency in the order named.

In the tests conducted at this Farm the clovers have been found durable in the following order, viz.: Lucerne, Alsike clover, Yellow clover, White clover and Common Red clover. Yellow clover, like White clover, does not seem able to hold its ground at the first in dense mixed grasses which are cut for hay, but as time goes on and some of the grasses fail, the Yellow clover appears to increase. When White clover is sown in mixtures of permanent grasses, and these are mowed for some years at the first rather than pastured, the clover seems to fail because of the smothering influence exerted by the stronger grasses; but where the grasses are pastured from the first, it seems to have power to increase with the increasing age of the pastures. Red clover is not well adapted for permanent pastures, as ordinarily it is a biennial, and therefore soon dies out. When found in these pastures after they have been eaten off for two years, the plants come from seed lying in the ground.

Peculiarities of Growth. Brief notes are now given regarding peculiarities of growth in some of the grasses which are not commonly grown in Canada by many of the farmers.

Orchard grass (*Dactylis glomerata*) grows both early and late in the season. It comes into head early in June, and if not cut while yet succulent it soon becomes so woody that it is of but little use for hay. It is a strong, vigorous grower and is coarse in the leaf, hence it should be eaten off while young and tender. It has the habit of growing in tufts or bunches, but when sown thickly at first it makes a good grass for a permanent pasture.

Meadow Fescue (*Festuca pratensis*) is a persistent grower. It is later than orchard grass and is much finer in the leaf and stalk. Its long fibrous roots enable it to stand drouth well, and it is able to retain its hold upon the soil for a long time. It is one of the most valuable grasses that can be sown in a permanent pasture.

Tall Oat Grass, (*Avena elation*) is a hardy perennial which bears considerable resemblance to the common oat. It is easily established, grows early and late and produces a large amount of pasture. It is somewhat bitter to the taste; notwithstanding, live stock eat it fairly well.

Meadow Foxtail, (*Alopecurus pratensis*) is a perennial which bears considerable resemblance to Timothy, but is softer in the head and springs up more quickly when pastured or mown. It is one of the earliest of grasses, as it comes into flower towards the end of May. Although hardy it is somewhat slow in becoming established.

Lucerne or Alfalfa, (*Medicago sativa*) is an upright growing and deeply rooting plant of the same family as the clovers. It grows most vigorously in loam soils with a deep, dry porous sub-soil. It is a delicate plant when young, and it is then easily crowded out by other strong-growing plants, but when it has once become established it will continue to grow vigorously for years, and it furnishes pasture throughout the season, but should not be cropped too closely. There is a much wider place for Lucerne in Ontario than has hitherto been given to it, more especially in light soils on which the vegetation is liable to suffer from drouth.

Alsike Clover, (*Trifolium hybridum*) is one of the most suitable clovers for growing in permanent pastures It is best adapted to moist loam soils and is not easily crowded out by other grasses. It produces fine leafy herbage, but does not provide much pasture latter than midsummer.

Red Top, (*Agrostis vulgaris*) is probably somewhat finer in its habit of growth than timothy, and like the latter it is somewhat late in coming into head. It has been recommended for sowing in moist soils, and has been represented as possessed of great powers of endurance, a reputation which has not been sustained in our experience with it on this Farm.

Yellow Oat Grass (*Trisentum flavesceus*) is very fine and leafy in its habit of growth and should therefore make a pasture much relished by stock, but in our experience it cannot be said to have proved really enduring.

Lathyrus Sylvestris Wagneri, the new fodder plant about which much has been said in Europe during recent years, is growing fairly well. In its habit of growth it resembles in appearance the sweet pea of the flower garden. The lower stalks or vines branch out in every direction and are to some extent recumbent at the first rather than upright. It is premature to speak of the value of this fodder plant, but it does not seem to grow quickly enough to give it a foremost place among fodder plants in this country where the summers are relatively short.

Some other grasses sown at this Farm for the first time in 1892, seem possessed of no little promise. Among these may be mentioned Woodside Meadow and Bromus Ivernus The former was 16 inches high on June 5th, and the latter 12 inches. Bromus Ivernus has broad leaves and is a vigorous grower. But it may be found that it will prove so aggressive as to give some trouble in eradicating it in certain soils.

Among the Fescues, Taller Fescues is possessed of no little value. On June 5th it was quite out in head, and was from 20 to 30 inches high. The Fescues, generally speaking, seem well able to stand the cold of our winters, but they are nearly all possessed of slow habits of growth.

The rye grasses in our experience have not proved sufficiently hardy to warrant us in recommending them for sowing in permanent pastures. In no instance have we found them enduring, and this remark applies to the three varieties tested here, viz.—the annual, perennial and Italian.

Scarlet or Crimson Clover (*Trifolium incarnatum*) is lacking in hardiness. During the trials given to it in 1891 and 1892, very few of the plants survived the cold of the winters following.

Past Experiments with Permanent Pasture. The information given in reference to permanent pasture is based principally on our experience with them on this Farm. The materials to be gathered from other sources are limited as yet, but what little has been gleaned is embodied in our remarks, without special reference thereto. Several farmers in Ontario laid down permanent pastures some years ago. In nearly all of these considerable prominence was given to some of the non-enduring rye grasses and the slow-growing Fescues, and disappointment followed. The large quantities of seed sown made the experiments expensive. The expense of their early tests linked with the disappointment from lack of suitability in some of the grasses created a prejudice against the whole question which judicious demonstration alone can overcome, and not until considerable time shall have elapsed. But as has been shown, some grasses have been found well adapted to the uses of permanent pasture and others will doubtless be found to add to them as the years go by.

Adaptability of Soils. Good, rich, easily tillable soils are the most suitable for growing mixed permanent grasses. They should be porous, friable and moist, plentifully supplied with humus and well drained, naturally or artificially. Those well adapted to the growth of a heavy crop of Indian corn will also usually be found well adapted to the growth of permanent pastures.

Soils that are not well adapted to the growth of the more common grasses will certainly prove ill-adapted to the growth of permanent pastures. This means that soils unduly dry or unduly moist will not be suitable. The former will not sustain vigorous growth, and in the latter the superior grasses cannot live, and it means that soils very light or very heavy will also be unsuitable. In the former plant food is lacking, and in the latter the roots cannot ramify sufficiently. Rugged uplands, undrained levels, shallow soils, overlying rock, blow sand areas, impenetrable clays and undrained marsh and fen lands should all be excluded in laying down lands to permanent pastures composed of a number of grasses.

Preparing the Soil. In preparing land for permanent pastures clean tillage and thorough pulverization are the most important essentials. Soils not rich in plant food should be made so, and the food thus supplied should be in a readily available form, so that the young plants be given a vigorous start. If fresh farm-yard manure is the fertilizer applied, it may be well in many instances to apply it with the preceding crop.

Clean tillage is especially important, as, if permanent grasses are sown in fields foul with weeds, the latter materially injure the grasses through crowding and in other ways, before they become well established, and with many forms of weeds the tendency will be to increase rather than decrease. This is especially true of some forms of creeping perennials.

Thorough pulverization is necessary to facilitate the covering of the seeds evenly and uniformly, to exclude the undue access of air and light, to prevent the too rapid escape of moisture, and to afford a foraging ground easily penetrated by the rootlets of the young plants.

Mixture of Permanent Grasses. The most suitable mixture of grasses for a permanent pasture and the respective quantities of each that may be sown, will of necessity vary somewhat with variations in soil and climatic conditions. In the present state of our knowledge it would manifestly be unwise to submit any formula for making these pastures in the belief that it could not be improved upon. We submit the following formula, therefore, in the hope that it may be found useful as a general guide to those who are laying down permanent pastures, and who may at the same time be in some doubt as to the grasses most suitable for them :

Grasses.

	Per acre.
Orchard grass	4 lb.
Meadow Fescue	4 "
Tall Oat Grass	3 "
Timothy	2 "
Meadow Foxtail	2 "
Total, Grasses	15 lb.

Clovers.

Lucerne	5 lb.
Alsike	2 "
White or Dutch	1 "
Yellow or Trefoil	1 "
Total Clovers	9 lb.
Total Grasses and Clovers	24 "

The varieties named and the quantities of seed given in the above formula are based upon our experience at this Farm. In soils possessed of different characteristics, some modification in the varieties would be necessary, and also in the relative amounts of seed to be sown. Future experiments will probably add other varieties to the list. And along with such additions a still further change in the relative amounts of seed of the varieties mentioned may be found necessary. Indeed it is more than probable that it shall be so.

Kentucky Blue grass is not included in the above list, since the Canadian Blue grass which is very similar, appears to be indigenous to our soil, and will therefore soon come in of itself in sufficient quantities. But no real objection can be offered to sowing it other than that mentioned, unless it be the difficulty frequently complained of in procuring good and pure seed Nor is Red Top included, although it is in favor with some seedsmen in preparing mixtures for permanent pastures, and the experience of some of those who have tried it is decidedly in its favor. But in tests at this Farm as previously mentioned, it has not shown so much permanency as several other grasses.

Mode of Sowing. The statement has frequently been made that lands should be summer-fallowed when being prepared for permanent pastures. This plan, though a good one under some circumstances, is by no means a necessity. Any mode of preparation will suffice that will thoroughly clean the land, and this can oftentimes be accomplished by simply growing a hoed crop, but it should be one that would not leave any roots in the soil that would serve as obstacles to the implements of cultivation, as for instance corn. In the spring, as soon as the land is dry enough, thorough and fairly deep surface cultivation should be given. About one bushel of barley per acre may then be sown with the grain drill. The clover seeds and the smaller of the grass seeds after they have been mixed may be sown at the same time and by the same implement. They should fall behind the drill tubes. The larger grass seeds may then be sown by hand, but only when the air is still, owing to the lightness of some of them. The roller may then follow, but in some instances it may be advisable to use a light harrow in advance of the roller. The light seeding of barley furnishes the requisite amount of shade, and it does not smother the plants by its thick growth. Sometimes grasses for permanent pastures are sown alone, but there does not seem any necessity for this when a thin seeding of barley is the surest crop used.

Conclusions.

1. That there is a place for permanent pastures in the agriculture of Ontario, and that this place is one of much importance relatively.

2. That many of the grasses found suitable for permanent pastures in Britain are not suitable for the same in Ontario, owing to the greater coldness of our winters and greater dryness of our summers.

3. That among the foreign grasses hitherto tested at this station, Orchard Grass, Meadow Fescue, Tall Oat Grass, and Meadow Foxtail have been found the most enduring among the more valuable grasses.

4. That the autumn is not so suitable as the spring for sowing permanent pastures.

5. That as Canadian Blue grass appears to be indigenous to the soil, there does not appear to be any great necessity for sowing it when laying down permanent pastures.

6. That in sowing permanent pastures a crop of barley may as well be grown at the time if sown thinly.

LIVE STOCK EXPERIMENTS.

These included experiments with 170 animals conducted during the year as follows:
Steers, two experiments, six animals.
Cows, one experiment, four animals.
Lambs, three experiments, one hundred and sixty animals.
The food in all these experiments was carefully weighed, and the details of each test were carefully recorded throughout.

Corn Ensilage and Straw for Making Beef.

For three years in succession ending with the spring of 1892, experiments had been carried on at this Farm to test the value of corn ensilage and meal for making beef when fed as the sole ration. The results were not in every way satisfactory. In Bulletin LXXXII, p. 7, Conclusion 4, where deductions are drawn from three experiments, the following language is used: "From the behavior of the animals fed ensilage and meal we do not consider this ration a perfectly safe one for furnishing live stock in beef-making, as out of the six animals fed upon it two died and three were occasionally off their food." After the experience just referred to, the question naturally arose as to whether in feeding for beef some other mode or modes for using so valuable a food factor could not be adopted in which the elements of danger would be entirely absent. In the hope of throwing some light on the subject the experiment was undertaken, the details of which are given below.

The chief object of the experiment therefore was to acertain the value of straw as a food factor in making beef when fed along with corn ensilage and meal, (a) with reference to its influence on the health of the animals, and (b) when viewed from the standpoint of economy. But the following objects were also kept prominently in view, viz—(1) Using a cheap ration, and (2) feeding less meal than is usually given along with corn ensilage when feeding for beef.

The Animals Selected. Shorthorn grades were chosen for the experiment. Of the six animals used five were two years old and the sixth was one year older. They were of rather small build and could scarcely be said to possess the most desirable characteristics for highly successful feeding. They were purchased by the farm foreman on Nov. 14th, 1892.

Period of Preparation. From Nov. 14th to Nov. 21st, they were fed on a uniform ration. On Nov. 21st they were given a ration the same in kind as that intended to be used in the experiment. It consisted of a mixture of corn ensilage and straw in the proportions of three of the former and one of the latter. The meal used was composed of equal parts by weight of ground oats, ground barley and ground peas. The object sought was to accustom the animals to the ration before commencing the experiment proper.

Food and Feeding. The experiment proper commenced Dec. 1st, 1892, and ended May 30th, 1893, thus covering a period of 180 days. During the first and second periods of the experiment, which are stated more fully below, the animals were given all the straw and ensilage they would eat up clean and in the proportions named above, but during the third period hay was substituted for straw. Oat straw was the only kind used. The meal, straw and ensilage were mixed just before being fed, and three feeds per day were given. In thus mixing the feed three objects were kept prominently in view: The first was to so distribute the meal that the animals would be induced to eat more of the mixture; the damp ensilage caused the meal to adhere to it so that the distribution was thus easily affected. The second was to secure a more perfect digestion of the meal given through a more perfect rumination; and the third was to so intermix the straw with the ensilage that it would act as a corrective to any tendency toward indigestion that might be caused by feeding a large quantity of ensilage. The meal ration was increased with each successive period.

Food Ratio. The following amounts of food were consumed by the six amimals during each period, and also daily by each individual animal.

The proportion of the straw fed may appear small, but it should be noticed here notwithstanding, that it contained as much dry matter as about thirty-six lb. of corn ensilage, so that to have given each animal daily in the form of ensilage alone as much dry matter as was actually fed in the ensilage and hay or straw given, would have required a daily consumption per head of 61.7 lb ensilage.

Period.	Amount of food consumed				Average daily amount of food consumed per animal.			
	Meal.	Corn ensilage.	Dry fodder.		Meal.	Corn ensilage.	Dry fodder.	
			Straw.	Hay.			Straw.	Hay.
	lb.	lb.	lb.	lb.	lb	lb.	lb.	lb.
First 60 days....	1153	9381	3127	....	3.2	26.1	8.7	....
Second 60 days..	2386	9240	3080	....	6.6	25.7	8.6	....
Third 60 days...	3054	8880	....	2960	8.5	24.7	....	8.2

The average amount of food used per animal per day throughout the whole experiment of 180 days was: meal 6.1 lb, ensilage 25.5 lb, and dry fodder 8.5 lb. In the experiment of 1891-2, the average amount of meal fed to the animals which were given ensilage only in addition was 9.64 lb per head per day, and the ensilage given them was 53.5 lb. The meal ration thus given was 3.54 lb per head per day less in this experiment than in the one of the previous year, and it is possible, if not probable, that the amount of meal used might have been still further reduced during the later stages of the experiment with positive advantage. The size of the animals, however, was somewhat greater in the experiment of 1892 than in that of 1893.

It may be well to mention here, that the six animals were divded into three groups of two each, and different quantities of the meal ration were given to them in every instance and with varying results, but we feel that it would be premature to draw conclusions from these without further experiment.

The Health of the Animals. The health of all the animals was uniformly good throughout the experiment, and this is the more note-worthy since, in the three preceding experiments, the animals fed ensilage and meal only, were troubled with occasional periods of indigestion, to say nothing of the losses incurred by death. These periods were sometimes so prolonged that a temporary change of diet was found necessary to restore the equilibrium.

Weights of the Animals. The animals were weighed at the commencement of the experiment and at the commencement of each period thereafter. The weights in every instance represent the averages obtained from weighing on two consecutive days. The weighing was always done at the same hour of the day.

——	Period I. (60 days.)	Period II. (60 days.)	Period III. (60 days.)
	lb.	lb.	lb.
Weight at commencement of the experiment.......	6249.00	6995.00	7627.00
Weight at close of the experiment..............	6995.00	7627.00	8189.00
Increase in live weight........................	746.00	632.00	562.00
Individual increase............................	124.33	105.33	93.66
Individual daily increase......................	2.07	1.76	1.56

It will be observed that the average gain per day in the first period was 2.07 lb, in the second period 1.76 lb, and in the third period only 1.56 lb. These facts are the more note-worthy when we reflect that the meal ration was materially increased in each successive period. They would seem to indicate that an unnecessarily large amount of meal was used in the second and third periods The excellent results obtained from feeding the light meal ration during the first period may in part be accounted for by the amount of grain in the ensilage, and this fact should certainly receive careful attention from those who use corn ensilage freely in beef-making. In this experiment only the best varieties of corn were used for ensilage.

Estimated Value of the Food. The meal, the straw, and the hay were estimated at the current market values in Guelph, less the cost of marketing from an Ontario farm under average conditions. The home value put upon the oats therefore was 24½ cents, per bushel, barley 38 cents, peas 57 cents, cut straw $2 per ton, and cut hay $6.50. Corn ensilage was valued at $1.75 per ton. The grinding was put at six cents. per 100 lb.

The average cost of the daily ration given during the first period was 6.41 cents, during the second period, 9.35 cents, and during the third period, 12.31 cents. For the whole period of 180 days it was 9.36 cents. In the experiments extending from 1889 to 1892, to which reference has already been made, and in conducting which a heavy meal ration was fed, the average cost per day was 17.59 cents. The average cost of the daily ration, therefore, in this experiment, was 8.32 cents less per day than in the experiments just referred to. The average increase of live weight made per day by the animals in this experiment was 1.80 lb, while in the former it was but 1.75 lb. The difference in the results cannot be attributed to a decrease in the market values of the food rations used, for these were, all things considered, but very slightly different. It is rather to be sought for in the freer use of the cheaper food factors.

In this experiment, the cost of the food required to produce one pound of increase in the live weight during the first period was 3.09 cents, during the second period, 5.31 cents, and during the third period, 7.89 cents. The average for the whole period of 180 days was 5.43 cents. In the three experiments previously conducted since 1889, the average cost for food to produce one pound of increase in live weight was 10.05 cents.

These findings are certainly suggestive, and they emphasize, first, the importance of feeding cheap food factors in making beef when these can be obtained, and, second, the most careful oversight of the quantities of meal to be given, as this is always the most costly of the food factors used.

It will be noticed that while the cost of the food required to produce one pound of increase in the live weight went up from 3.09 cents in the first period to 7.90 cents in the third period, an increase of more than 100 per cent., the increase in the live weight was also greater on the cheaper ration, as during the first period it was 2.07 lb. per day, and during the third period but 1.56 lb. The inference, therefore, is just which would claim that had the less costly ration been more nearly adhered to until the approach of the close of the experiment, the results would have proved even more satisfactory. But we must not overlook the fact that usually somewhat greater gains are obtained in proportion to the food used during the earlier stages of the fattening period, as against the later stages.

It is also worthy of notice that the average cost of food required to produce one pound of increase in the live weight throughout the experiment was 5.43 cents, while the price obtained for the same was 5.25 cents. It is just possible that in the records of live stock experiments in this country, which relate to the fattening of cattle, the above is the nearest approach that has yet been made between the price obtained per pound for the increase in live weight and the cost of the food used in making it.

Financial Summary.

Cost of animals at commencement of test	$200 54
Cost of food	101 01
Cost of attendance	22 50
Total cost	$324 05
Value of animals at close of test	$418 00
Profit (not including manure)	93 95

At the commencement of the experiment the animals were valued at $3\frac{3}{8}$ cents per pound, live weight, as 16 days previously they had been bought for $3\frac{1}{4}$ cents per pound, live weight. They were sold for export to Mr. L. O. Barber for $5\frac{1}{4}$ cents per pound, live weight, at the close of the experiment, but for reasons which relate solely to the purchaser, they were not taken away by him until about four weeks thereafter. Fasted weights were used, and the average shrinkage during a fast of 15 hours was 37.8 lb. per head. The cost of attendance was based on the assumption that one person, at $25 per month, would feed and care for 40 head under ordinary conditions. This was the estimate used in the more recent of the previously conducted feeding experiments.

While the profit in the transaction during the continuance of the experiment was $93.95, without including the manure, if we take the same into the account, the profit would be $142.55. In obtaining these figures, the manure was valued at $1.50 per ton, as in the experiments of the preceding years, and the value of the bedding used was deducted therefrom.

Conclusions.

1. In fattening cattle on a ration of which ensilage made from sufficiently matured corn forms a leading factor, a heavy grain allowance in addition does not seem necessary.
2. While in this experiment, the daily cost of the food ration was 8.32 cents less per animal than the average in the three experiments in fattening cattle which preceded it, the average daily increase in weight was somewhat more.
3. In this experiment the difference in the value per pound, live weight, between store animals and the same when finished was $1\frac{7}{8}$ cents per pound.
4. The average shrinkage from a fast of 15 hours, with liberty in the yard, in prime animals of equal weights with those in the experiment, is about 38 pounds per head.
5. In beef making, a ration composed of 1 part oat straw, 3 parts corn ensilage and a moderate allowance of meal, seems well calculated to maintain uniformly good health in the animals fed upon it.
6. In making beef during the finishing period, when the prices of the food factors used and those obtained for the beef are the same as in the experiment, it is possible to get nearly or quite value for the food used in making the increase in the live weight, to say nothing of the advance in value on the original weight of the animals.

An Experiment to Determine the Amount of Manure Made by a Cattle Beast During the Successive Periods of its Growth.

On the 16th of October 1890, an experiment was commenced to determine the amount of manure which would be produced by a cattle beast during the different stages of growth up to three years of age.

A calf was placed on the experiment from the time of birth and when about three days old was placed in a box stall in a warm stable. The box stall was about 12 feet square and the walls reached to about 5 feet in height. The stall which extends above the walls opens into the the large cattle stable. It possesses a cement floor and a closely made feeding trough. The animal was allowed exercise once a week by leading by the halter in the open air from five to ten minutes. All bedding was carefully weighed when placed in the stall and the manure which was removed weekly was carefully weighed at each time of removal. The various food factors as well as the water were weighed when given to the animal. That amount of food was allowed which the animal would eat up cleanly. Salt was given twice each week.

Food Eaten. Milk was given from the pail during the first six months of the animal's life. Oil-cake was given in a limited quantity during the first two months after birth. Roots, ensilage or green fodder was given to the animal during the whole of the experiment and hay, oats, peas and bran were fed throughout the 3 years with the exception of the first month. The following table gives the amount of food consumed during each six months of the experiment and the total amount consumed during the three years:

——	Amount of liquids consumed.		Amount of concentrated food consumed.				Amount of coarse food consumed.		
	Milk.	Water.	Oats.	Peas.	Bran.	Oil-cake.	Hay.	Fodder.	Roots.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
First six months	3861.5	501.5	62.10	31.05	31.05	31.05	146.0	....	292.0
Second six months	....	9241.5	363.32	266.52	266.52	198.64	1307.0	1591.0	581.0
Third "	....	6141.0	361.35	361.35	361.35	....	1561.0	....	4145.0
Fourth "	....	9480.0	369.01	369.01	369.01	....	1982.0	2989.0	1672.0
Fifth "	....	7900.0	381.33	381.33	381 33	....	1295.0	4168.0	....
Sixth "	....	9185.0	424.00	424.00	424.00	....	1425.0	4493.0	580.0
Whole period of years	3861.5	42449.0	1961.11	1833.26	1833.26	229.69	7716.0	13241.0	7270.0

Estimated Value of the Food. The fodder, grain and roots were estimated at the current market values in Guelph less the cost of marketing from an Ontario farm under average conditions. The home value put upon hay, therefore, when cut, was $6.50 per ton, green fodder $2.00 per ton, the ensilage $1.75 per ton, the oats $24\frac{1}{2}$ cents per bushel, peas 57 cents per bushel, barley 38 cents per bushel, wheat 60 cents per bushel, the roots when sliced 6 cents per bushel, and the bran and oil-cake reckoned as delivered at the average Ontario farm were put at $13.00 and 22.66\frac{2}{3}$ per ton respectively. The following table gives the daily cost of the food, the daily increase in live weight and the average cost of producing 100 lb. of live weight increase.

——	Cost of food per day.	Increase in live weight per day.	Cost of producing 100 pounds live weight increase.
	cents.	lb.	$ c.
First six months	9.8	2.40	4.09
Second six months	8.6	1.89	4.56
Third "	9.8	1.25	7.83
Fourth "	10.9	1.25	8.68
Fifth "	9.5	.96	9.90
Sixth "	10.6	.96	11.17
Average (three years)	9.9	1.45	7.71

From this table it will be observed that the greatest cost of food took place during the last half of the animal's life, although there is but little difference in the average cost of food per day during any part of the 3 years in which the animal was under experiment.

There is however a marked difference in the increase in live weight of the animal as an average of 2.4 lb. per day live weight increase was produced during the first six months of the animal's life and less than 1 lb per day was produced when the animal was between $2\frac{1}{2}$ and 3 years old. The increase in the live weight becomes less as the animal advances in age.

The cost of producing 100 lb. live weight was lowest when the animal was young and gradually increased with each six months that the animal was fed, the greatest cost to produce 100 lb. being the last six months that the animal was under experiment.

Amount of Manure Produced. The following table gives the amount of manure produced by the animal during each period of the experiment.

—	Amount of straw used as bedding.	Total amount of manure produced.	Amount of manure produced, less the straw.
	tons.	tons.	tons.
First six months	.43	1.95	1.53
Second six months	1.01	5.00	3.99
Third "	1.17	5.16	3.99
Fourth "	1.35	6.08	4.73
Fifth "	1.22	5.77	4.55
Sixth "	1.20	5.68	4.49
Whole period (three years)	6.38	29.64	23.28

On December, 23rd, 1892, Prof. Shuttleworth made a careful analysis of the manure which was from the stall but a short time previously. The analysis represents the average of two determinations which were substantial agreements. The analysis is as follows:

	Per cent.
Water	53.51
Nitrogen	.634
Phosphoric acid	.829
Potash (K_2O.)	1.944

These results speak of high quality in the manure. This is what we should look for from a grain-fed beast kept in a box stall. Prof. Shuttleworth gave the following statement in regard to the value of the different constituents:

Organic nitrogen	17 cents per lb.
Phosphoric acid	3 cents per lb.
Muriate of potash	4½ cents per lb.

Reckoning the value of the manure from the analysis made in December, 1892, from the basis of the value given for commercial fertilizers, the value of the manure produced by the steer under experiment for three years would amount to $118.57. The straw used as bedding valued at $1.50 per ton would make a total cost of $9.56. The most important point in connection with this experiment is, however, the quantity of manure produced by the cattle beast, during the different periods of its life. Each person can place such value upon the manure as he deems proper. $1.00 to $1.50 per ton is the amount which is usually considered when estimating the value of the farm-yard manure.

Ground Wheat as a Food Factor for Milch Cows.

This experiment commenced on February 23rd, 1893, and closed on June 22nd, 1893, thus covering a period of 120 days. The objects of this experiment were as follows: (1) to determine the influence of ground wheat upon the flow of milk when fed to milch cows; (2) to determine the relative cost of feeding ground wheat compared with mixture of ground peas, barley, and oats for milk production. Owing to the low price of wheat at the present time, many queries are made as to the advisability of using it as a stock food. In regard to this point there is a great diversity of opinion. Some people very strongly advise the use of wheat as a food for dairy stock while others as strongly condemn the practice as being too expensive. There is certainly a possibility that wheat will command a higher price in the near future than it does at the present time.

The Animals Selected. In this experiment 4 animals were used; 3 of which were purchased for the farm by Mr. J. E. Story a short time before the test commenced. Two of the cows were Shorthorn grades, one had a touch of Jersey blood and the other partook slightly of the Ayrshire breed. All the cows had dropped their calves at least a month prior to the experiment.

Period of Preparation. For 10 days previous to the commencement of the experiment, the cows were all fed the same kind of feed and the treatment of the different animals was the same. At the close of preparation they were divided into two groups, with two animals in each. Each group was tied in a double stall and the experiment proper commenced on February 23rd.

Food and Feeding. The cows in group one were fed hay, straw and ensilage throughout the experiment of 120 days and in addition were fed ground oats, ground peas and ground barley in the proportion of 2, 1 and 1 by weight during the first 60 days, and ground wheat during the second 60 days. The cows in group two were fed the same kind of feed as those in group one with the exception that the ground wheat was fed during the first 60 days and the mixed meal during the last half of the experiment. The hay and the straw were fed together in equal proportions after being cut. The ensilage was of good quality and was made purely from corn. Water was given twice daily and salt twice weekly.

AMOUNT OF FOOD CONSUMED BY THE FOUR ANIMALS THROUGHOUT THE EXPERIMENT.

—	First 60 days.					Second 60 days.				
	Hay.	Straw.	Ensilage.	Mixed meal.	Ground wheat.	Hay.	Straw.	Ensilage.	Mixed meal.	Ground wheat.
	lb.	lb.	lb.	lb.	b.	lb.	lb.	lb.	lb.	lb.
Group I	625	625	4544	1070	......	572	572	4382	......	1080
Group II	624	624	3223	......	1055	592	592	3818	1080	......

Estimated Value of the Food. The hay, straw and grain were estimated at the current market values in Guelph, less cost of marketing from an Ontario farm under average conditions. The home value put upon the hay, therefore, when cut was $6.50 per ton, straw $2.00 per ton, ensilage $1.75 per ton, oats 24½c per bushel, peas 57c per bushel, barley 38c per bushel and the wheat 60c per bushel.

Weights of the Animals. Each cow was carefully weighed at the commencement of the experiment, at the end of the first 60 days, and at the close of the experiment. Weighing was commenced at 2 p.m. in every instance and the cows were weighed in the same order at each weighing.

The following shows the amount of increase in live weight of each group during each period of the experiment:

Group I. Increase in live weight during the first 60 days when fed a mixed meal ration, 27 lb.

Group II. Increase in live weight during the second 60 days when fed a mixed meal ration, 50 lb.

Group II. Increase in live weight during the first 60 days when fed a wheat ration, 5 lb.

Group I. Increase in live weight during the second 60 days when fed a wheat ration, 15 lb.

It will be observed from this table that there was an increase in live weight during the entire experiment, as follows:

Animals receiving mixed meal ration	77 lb.
Animals receiving ground wheat ration	20 lb.

Milk Production. The milking took place at 5.30 a.m. and 5 p.m. daily. The milking was done by the same person throughout, and the milk was carefully weighed during the entire experiment. The following statement shows the quantity of milk produced by each group during each period of the experiment :

Group I. First 60 days mixed meal ration...... $3,555\frac{1}{2}$ lb. of milk.
Group II. Second 60 days mixed meal ration.... $2,865\frac{1}{2}$ lb. of milk.
Group II. First 60 days ground wheat ration .... $2,890\frac{1}{2}$ lb. of milk.
Group I. Second 60 days ground wheat ration.... 2,892 lb. of milk.

This seems to indicate that the mixed meal ration kept up the flow of milk better than the ration of ground wheat. It will be observed that the following total amounts of milk were obtained from the different rations during the entire experiment :

Animals receiving mixed meal ration .... 6,421 lb.
Animals receiving ground wheat ration .... $5,782\frac{1}{2}$ lb.

This shows that the mixed grain ration produced $638\frac{1}{2}$ lb. of milk more than was produced by the ration of ground wheat.

Cost of producing 100 lb. of Milk. When the cost of food of each ration is reckoned up according to the estimated value of the food given in the earlier part of the report of this experiment, it is found that the ration which contained the mixed meal produced 100 lb. of milk at a cost of 46 cents for the food consumed ; and that the ration which contained the ground wheat produced 100 lb. of milk at a cost of 57 cents for the food consumed. It will also be remembered that the ration containing the mixed meal produced nearly four times as much live weight increase of the animal as did the ration containing the ground wheat.

Feeding Lambs on Rape.

Sixty grade lambs were placed upon an acre of rape on the 18th September, 1893. They had the crop eaten and were changed to another portion of the field on October 11th. This shows that 60 lambs were pastured upon an acre of rape for a period of 23 days. It has been found in the past that an acre of rape would pasture on an average about 10 lambs for $2\frac{1}{2}$ months. In the instance in which this was done, however, the rape was the second crop of the land during the same season. In the experiment of the present year it, however, produced about double the amount of rape which is usually produced. This was the only crop this season on the land. The lambs did well when pastured on the rape during the present year.

Experiment on Feeding Lambs on Different Rations.

This experiment is quite similar to one carried on in 1892, in which three groups of lambs were fed different rations. The experiment of the present year, however, relates to the feeding of four groups on different rations. It may be fitly designated as an experiment within an experiment. The lambs used in conducting it were at the same time being fattened for the British market. The experiment treats of 96 lambs which were divided into four groups with 24 animals in each group. On December, 29th, 1892, they were all weighed and the test commenced the following day. It closed April 28th, thus covering a period of 120 days. The leading object of this stock experiment was to ascertain the respective values of the various rations used for fattening lambs.

Conditions Governing the Experiment. The 96 lambs were so divided that those in each of the four groups were nearly equal in quality. They were then put into four equal-sized compartments of the same closed shed, the internal divisions of which were made by feeding racks running across the building. The racks except those at the two ends of the building were double and had a close feeding division down the centre of each, hence the lambs in each division could take their feed on the two opposite sides thereof. At the same time they were thus furnished ample room for feeding without any crowding. Each compartment had a low wide door which was kept open all the time except in the stormiest weather. The yards adjoining the compartments, one for each group, extended out about 16 feet from the shed. All the food given the animals was carefully weighed, and was given in two feeds daily. They were plentifully supplied with water and salt, but the groups which received ensilage and roots did not use much of the former.

Food and Feeding. The lambs in group I received a ration consisting of hay, grain and roots. The grain ration consisted of oats, peas and bran fed in the proportion of 2, 2 and 1. The roots consisted of turnips and mangels sliced. The hay, which was partly timothy and partly clover, was fed whole. Those in group II. were fed mixed grains, similar in quantity and quality to those in group I. In addition they received all the corn ensilage they would eat and also hay. Lambs in group III received the same quantity of whole oats by weight as were given of grain and bran to the lambs in group I and roots and hay also the same in character. Those in group IV received the same quantity of wheat by weight as was given of grain and bran to the lambs in group I. The roots and the hay ration were also the same in character as when given to group I. Nearly the same quantity of roots was given to the lambs in group I, III, and IV, and the hay was given without limit in each instance, that is, they were given all the hay they would eat.

The experiment, therefore, was a test of the comparative value of a mixed grain ration in one case as against oats and wheat in making mutton, and all the value of ensilage as against roots for the same purpose in the other.

The following table gives the comparative cost of the food consumed by the animals of each group and also of the increase of live weight made by them :

——	Group I.	Group II.	Group III.	Group IV.
Total cost of food per group	$55.450	$45.408	$52.013	$59.650
Average cost of food per day per lamb	.019	.016	.018	.021
	lb.	lb.	lb.	lb.
Total live-weight increase per lamb	29.040	25.200	25.320	29.130
Average live weight increase per lamb per day.	.242	.210	.211	.243
	c.	c.	c.	c.
Cost of food to produce 1 lb. increase	.080	.075	.086	.085

Fattening Lambs for the British Market.

This experiment commenced with the arrival of the lambs at the farm on the 14th and the 29th of September, 1892. It closed when the lambs were sold in Liverpool on the 22nd of May, 1893. They left the Farm for the British market on the 6th of May. It was intended to be substantially a repetition of the experiments conducted in 1891 and 1892, particulars of which are given in the Report for 1891, p. 113, and Report for 1892, p. 137. The principal objects of the experiment were to ascertain, (1) whether lambs could be fattened at a profit in the autumn and winter for the English market, and (2) whether the average grade lambs of Ontario are suitable for the purpose.

The Animals Selected. The lambs which were intended for shipment were purchased by Mr. J. E. Story, in the western and central parts of Ontario. There were in all 369 grade lambs; 186 came from western Ontario, and 183 from north-east of Toronto. Each lot of lambs was turned into the rape fields and fed upon the rape until October 10th, when 98 were chosen for the experiment. In selecting, compact, medium-sized animals were chosen, and especially those having dark faces, as far as they could be obtained. The lambs were shorn on October 11th and the few days following. They were then allowed to go together in a closed shed with yards attached until the latter part of December, although while the weather continued suitable they were pastured on rape during the day and fed hay when necessary in the shed. The lambs were divided into four groups and fed on different rations until about a week before their shipment for England. These rations and all prices relating to this experiment will be given in connection with the experiment on feeding lambs on different rations, in a later portion of this report.

Food and Feeding. From the time that the lambs reached the farm, they were kept on rape until they were shorn. They were then allowed access to the rape in fine weather, and were housed at other times as already mentioned. From the close of the sub-experiment until the lambs were shipped, on May 6th, they were all fed upon a mixed grain ration with roots and hay. The grain was all fed unground. The roots consisted of turnips sliced. Hay, which consisted of clover and timothy, was all fed uncut.

*Food consumed by 98 lambs throughout the experiment was as follows:

Oats	6,959.96 lb.
Peas	3,260.14 "
Wheat	3,467.50 "
Bran	1,630.08 "
Roots	45,633.90 "
Hay	15,950.80 "
Ensilage	7,762.50 "

The average daily consumption of food per lamb from September 22nd until May 6th, exclusive of the rape given for a time, was:

Grain	.69 lb.
Roots and ensilage	2.41 "
Hay	.72 "

Estimated Value of Food. The food was estimated at the current values in Guelph, less the cost of marketing from an Ontario farm under average conditions. (See Bulletin LXVIII). The home value put upon the food by this method of reckoning was:

Oats	$ 24½	per bushel.
Peas	57	"
Wheat	60	"
Bran	13 00	per ton.
Roots (sliced)	06	per bushel.
Ensilage	1 75	per ton.
Hay	9 00	"

It will be observed that in all probability the profit has already been made on the marketable food used, providing it has been grown upon a farm, as in this experiment the food was charged at the full market value less the cost of marketing from an average Ontario farm This profit would be represented by the difference between the cost of growing the food and the market value put upon it.

Transportation. The lambs were put on board the cars at Guelph May 6th, *en route* to Liverpool. They left Guelph in charge of the farm foreman, Mr. J. E. Story, who accompanied them as far as Montreal and put them on board the steamship Mongolian along with the food necessary for the voyage, and secured a competent feeder, who cared for them on the way. The whole number sent over was 98, and all stood the voyage well and arrived in Liverpool in good condition.

Disposal of the Lambs. On arrival in Liverpool the lambs were taken in charge by Messrs. Bater & Williamson, live stock salesmen, Liverpool and London. Mr. G. F. Frankland, of Toronto, who was in England at the time when the lambs reached there, went to Liverpool and reported on the sale. The following is taken from Mr. Frankland's report: "Your lambs, numbering 98 head, arrived safe and in good order on

*The record of the food, other than rape, which was consumed by the lambs from the 17th to the 28th of December was unfortunately lost and therefore is not included in the report. The amount, however, would be very small.

Saturday, the 20th of May, and were much admired; but the lamb and mutton trade is dull, and, after standing over them until 5.45 this (Monday) night, they were sold for 46 shillings each. There were many bidders, but their bids were from 43 to 45 shillings, until about 5 o'clock, a man named Robinson, from Manchester, gave 46 shillings. If these lambs had been later the price would have been less. Let me inform you that you have no more faithful agents than Bater & Williamson. They are honest and conscientious in all their work, and they pleased me well this day with your lambs. I came down from East Yorkshire, 125 miles, to see and assist in the sale of these lambs, and I am proud of the sale."

The following letter was received from Bater & Williamson, at Liverpool, May 27th: "Herewith we beg to hand your account of sales of the 98 lambs ex. ss. Mongolian, which we were honored by selling. The lambs were landed in good condition, and we are sorry to say our markets were not so good as last season, but we did our best with them and trust the result will prove satisfactory. We beg to return thanks for your esteemed favors. No doubt Mr. Frankland will have written to Prof. Shaw a full account of their condition, etc."

Values. The value put upon the lambs at the commencement of the experiment was the average price paid for the full number of lambs when let down at the Farm. The cost of shearing was put at 5 cents per animal. The following table gives the financial results of the experiment:

Cost of 98 lambs when landed at Guelph	$395 92
" shearing	4 90
" food	280 85
" attendance	27 31
" shipping to England	291 45
Total cost	$1,000 43
Value of 98 lambs in England	$1,097 66
" wool	59 83
" manure	220 04
Total value	$1,377 53
" gain	377 10
" gain per head	3 85

The cost of attendance was reckoned at the same rate as in the corresponding experiment of the previous year, in which it was assumed that one man would feed and care for 800 lambs when the feed was all prepared. The quantity of manure produced and the value placed upon the same was reckoned in the same way as in the experiment of 1892. In that experiment the average amount made per head was 5.81 lb., which would be worth .993 of a cent, or practically one cent a day. This included bedding also. The wool averaged 4.69 lb. per fleece, and sold for 13 cents per lb. unwashed. The cost of sending lambs to England was $291.45, or $2.91 per head. It was 60 cents per head less than in the corresponding experiment of 1892, and $1.20 per head less than in the corresponding experiment of 1891. The following are the items:

MONTREAL EXPENSES:

J. E. Story, rail and hotel	$18 05	
Railway freight	61 00	
Food during voyage	18 22	
H. & A. Allan, wharfage	1 96	
Stock yard charges	4 04	
		$103 27

LIVERPOOL EXPENSES:

	£	s.	d.
Ship's freight	24	15	0
Market charges	0	10	0
Keep and lairage	1	13	0
Droving	0	12	6
Dock charges	1	12	8
Dues and entry	0	10	0
Gifts	0	5	0
Cartage	0	5	0
Commission	3	13	6
Caretaker's dues	2	0	0
G. Frankland	3	0	0
	38	16	8

$188 18

Total expenses $291 45

The average individual value at the commencement of the experiment was $4.04.

The average price for which they sold in Liverpool was $11.20.

The average advances in value, therefore, was $7.16.

The following table gives the average prices realized for the lambs exported to England during each of the years 1891-2-3, and also the average cost of shipment:

——	1891.	1892.	1893.
Number of lambs exported in each experiment	100 lambs.	99 lambs.	98 lambs.
Weight per lamb before shipment	121.5 lb.	132.2 lb.	138.2 lb.
Selling price per lamb in England	$11.79	$11.53	$11.20
Cost per lamb for shipments and sales	$ 4.17	$ 3.61	$ 2.97
Selling price per lamb in England, less cost of exportation	$ 7.62	$ 7.92	$ 8.23
Price per pound of live weight in England	8.73 cents	8.64 cents	8.10 cents
Cost per pound of live weight for shipments and sales	3.43 cents	2.73 cents	2.15 cents
Price per pound of live weight in England, less cost of exportation	5.30 cents	5.91 cents	5.95 cents

CO-OPERATIVE EXPERIMENTS.

About 100 plots were grown at this Farm in 1893, in conjunction with 7,181 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.

Testing nitrate of soda, superphosphate, muriate of potash, mixture and no manure with oats.

Testing nitrate of soda, superphosphate and no fertilizer with rape.

Ascertaining the relative value of three varieties of millet.

Growing Lucerne as a crop for fodder.

Testing six promising varieties of fodder corn.

Testing five promising varieties of turnips.

Testing five promising varieties of mangels.

Testing five promising varieties of carrots.

Testing six promising varieties of spring wheat.
Testing six promising varieties of barley.
Testing six promising varieties of oats.
Testing four promising varieties of peas.
Testing five promising varieties of winter wheat.

Experimental Building.

During the year 1893, upwards of 1,600 plots were devoted to the experimental work at this Farm, and over 7,000 packages of grains, seeds and fertilizers were distributed among the farmers of Ontario. It is impossible to do this work in a truly satisfactory manner with the present accommodation. About 1,000 distinct lots of grain and potatoes are now stored in the cellars and upper rooms of six of the buildings located on the College grounds. We are compelled to use nearly the whole of the basement of the chemical laboratory for work rooms, and an upper compartment as an office. These are 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 but a poor opportunity of exchanging the various products which have been grown upon the experimental plots during the season.

It is of great importance that an experimental building be erected upon the College grounds where work would 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 close examination and for testing in different ways; where the reports could be prepared with the different products close to hand for reference; where an exhibition of all the varieties of grain both in the straw and in the sample jars could be neatly arranged for the benefit of farmers and others visiting the College; and where a general office, a private office, a dark photographic room, and storage rooms for fertilizers, etc., could be provided.

Conclusion.

In conclusion, allow me to thank you and through you the Minister of Agriculture for the confidence which you have placed in me in putting me at the head of the Experimental department, and also for the able support you have given me in advancing the work of this department.

Respectfully submitted,

C. A. Zavitz,
Experimentalist.

Agricultural College,
Guelph, Dec. 30th, 1893.

PART IX.

REPORT OF THE
PROFESSOR OF DAIRYING.

To the President of the Ontario Agricultural College:

SIR,—In presenting the report of the Dairy Department for the year 1893, I do so feeling that the year's work has been successful. Through the liberality of the Minister of Agriculture, we have been able to make progress along several lines. The dairy school, operated this year for the first time, was so decided a success, that it was felt increased accommodation would be necessary. Consequently, when funds sufficient to build and equip a new dairy building were asked for, the money was granted, and at the present writing the new dairy hall is nearing completion, and will, we expect, be ready for occupation by the class of 1894.

A couple of cottages built this year for the dairyman and cattleman will enable us to do better work and give closer attention than formerly. Previous to this time there has been no one living close to the dairy who was connected with it, and the risk of having all the stock, buildings and implements without some one near was too great.

By being relieved of so much outside work, I feel that better instruction has been given to students. If a lecturer is to do justice to his subject, his class and himself, he must meet them regularly. All lose interest where this is not done. Owing to the fact that I have had so many meetings to attend away from the College during the terms previous to this year, my classes have been neglected. During 1893 this has been largely remedied.

You will find my report under the following heads:

I. TEACHING.

II. DAIRY SCHOOL.

III. DAIRY STOCK.

IV. EXPERIMENTAL WORK OF 1893: Creaming and Churning, Composite Testing, Cheese, Feeding.

V. TRAVELLING DAIRY.

VI. MISCELLANEOUS.

I. TEACHING.

The addition of a lecture room to the dairy building has made it possible for all students to receive their lectures at the dairy, which is a decided improvement on giving them in the class-rooms of the College proper. Illustrated lectures, where possible, are the best in teaching a subject like dairying, and where the utensils and articles referred to may be brought before the classes, such as we are able to do now. It gives students a better insight into the subject, and causes them to take a deeper interest in it. Formerly we had the utensils, etc., for illustration, but it was a difficult matter to take them over a quarter of a mile to the College.

Dairying being a subject which is not inexhaustible, the ground may be covered quite thoroughly in two years. For third-year students we shall in future arrange to make the work nearly all practical. This we can do with our increased and more efficient accommodation.

The teaching during the past year has been not only by lectures, but a good deal of practical work was given to the students—more than has ever been done before in this department. After the special dairy school was over, the regular College students came to the dairy each day for two weeks. We had our special instructors in cheese-making, butter-making, milk testing and running of separators, besides having a large quantity of milk. Thus we were able to give them two weeks of dairy work, which resulted in a better comprehension of the subject from a practical standpoint than has ever been gained by our students. During 1894 the work will be repeated and made even better than this year.

This practical work appears to be what our students ask for, and so far as possible we wish to turn out men who know how to do dairy work, as well as they know the theory of dairying. One difficulty met with last year was the fact that this practical course came on just before the Easter examinations, and students did not devote as much time and thought to it as might have been done. By having the dairy school open two weeks earlier, we hope to overcome this difficulty during next year.

Lectures and practical work were given also to the special course students, of which I shall speak under the head of Dairy School, and to the teachers who were at the College during July. Six lectures on the subject of dairying were given to this class, besides instruction in separating cream, churning, making butter, testing milk with lactometer and Babcock tester.

Thus, so far as teaching is concerend, the year has been a busy one, more lectures having been given on the subject of dairying than during any previous year. The growing importance of this industry to the farmers of the Province warrants special attention, and it is to be hoped, that, through the regular College students who attend each year, through those also who take the special dairy course, the teachers, and the thousands of farmers and others who visit us, that the seed sown may bring forth abundantly, and that the results will show a marked improvement along all dairy lines. To reach the very top is our ambition, and to have all dairymen do the same is the object of the Department. That this end may be accomplished it will be necessary for us to have an opportunity to observe what others are doing, and also that our equipment shall be the very best. So far we have had little reason to complain.

II. DAIRY SCHOOL.

We may justly say that this new venture was a success beyond our highest expectations. Room for 50 students was provided, and some of our friends thought if we got half that number the first year it would be a good beginning. Instead of 50 there were over 100 students who asked permission to enter the school. As a consequence a great many were prevented from coming Those who did not enter this year have been allowed the first privilege for 1894. Long before the course of 1894 will open, the space was all taken, and this without any advertising whatever. By November 1st, 1893, there had been over 130 applications received, and as we have room for but a 100, we are refusing them for lack of room. It is hardly likely that this demand will keep up for many years, but if it does it will be necessary to make provision to meet it. Shall the people of this Province ask to receive instruction in regard to dairying and it not be granted? Judging from the liberal policy of the Government in the past, and the good use our people make of dairy help which is given to them, it would seem that if they ask they shall receive.

During the first year there were altogether 62 students who attended the dairy school, five of whom were ladies. Some of these students staid but a short time, others for a month and some stayed until nearly the close, but as their factories opened about April 1st, they had to leave before the final examinations. There were 31 who passed their examinations successfully, and have been granted certificates. Those who were entitled to certificates and who have been managing cheese factories during the past season, have been visited by a representative of the College, or else we have received reports from reliable persons that they are doing good work. We are indebted to the Western Dairymen's Association for kindly allowing their inspector and instructor, Mr. T. B. Millar, to do this work for us, and also to Mr. Millar for the efficient manner in which he performed his duties, in visiting the dairy students at their factories.

As to the manner of working and teaching during the term, I cannot do better than quote a writer in one of our agricultural journals:

A Day in the Dairy School.

"Canadians are a practical people, and are not inclined to accept theory readily unless accompanied by practical illustrations. Owing to this fact, the methods adopted for imparting instruction in Canadian institutions are becoming daily more practical. In this connection it is gratifying to note that the special dairy school established at Guelph by the Hon. John Dryden, Minister of Agriculture, is fully up to the times.

"For the purpose of letting our readers know what is being done at this school, and also of giving them an idea of the methods adopted in imparting the information given, on the 14th of March we paid the school a visit, and spent the day amongst the students. At half-past eight work commences, and the first hour of the day is spent in attending a lecture. Several of the professors of the Agricultural College give instruction along their own particular line during the term, which lasts for eight weeks. Several lectures are given on each of the following subjects: Chemistry, botany, geology, mathematics, book-keeping, veterinary, agriculture, and dairying. In teaching these subjects the professors deal with them specially as they affect or bear upon dairying generally. At half-past nine the class breaks up into four divisions, one set of students retiring to the testing room, another to the separating room, the third to the butter-making department, and the remaining set to the cheese room. These divisions are changed about so that all students have their turns in the different departments. In the testing room we find the students determining the percentage of butter-fat in samples of cheese, or trying to detect impurities, searching for adulterations in milk, or determining by the Babcock or Beimling test the percentage of butter-fat in cream, whole milk, skim-milk, or buttermilk, or, perhaps, running the oil-test churn, so that the scholars become thoroughly familiar with the operation of all testing appratus of any value that are used in the dairy. Supervising the department is W. J. Palmer, B.S.A., who spent the past summer as manager of one of the travelling dairies. In department No. 2, where the separating is carried on, F. B. Linfield, B.S.A., also a travelling dairy manager, guides the erring minds aright. Here we find the students managing separators and butter extractors. By practical observation they become familiar with all the ins and outs of working these machines, and also learn the advantages and disadvantages of the different methods of getting the butter-fat out of the milk, such as the setting of the milk in shallow pans or Cooley cans, extracting the cream by means of a separator, or at once taking out the butter by means of a butter extractor. Next in turn is the butter-making room, which Mr Rogers, an experienced butter-maker, superintends. Several churns are kept going, and two students are in attendance at each churn. One student is responsible for the quality of the butter made, while the other acts as his assistant. The next day that this division makes butter the positions of the two are reversed, the previous assistant taking charge, while his former manager lends him a helping hand. In this way each is made responsible for the quality of the butter made during the day that he or she has charge of the churn. Here it might be mentioned that the five ladies in attendance have made excellent students, have become proficient butter-makers, and no longer attribute inferiority of product to luck, witches, or the position of the moon, but can give a scientific and common-sense reason for each defect in flavor, grain, or color. These young ladies are deserving of the highest commendation for the step which they have taken, and no doubt, now that these have had the courage to step forward and break the ice, many others will, in another season, follow their noble example. But not to linger here too long, as we have yet to visit the cheese-making room, we proceed, and, entering, we find Mr. Bell, of Tavistock, assisted by Inspector Millar, two of Ontario's best cheese-makers, in charge.

"Set in two rows of three each are six vats; and two students are stationed at each vat, one assisting and the other in charge, as already mentioned in connection with the butter-making. The vats are all lettered, and in the morning a given weight of milk is put into each. An accurate record is kept, so that it is known just how much cheese each student makes out of the milk given him. The cheese made are also marked, so that the student at any time may examine the cheese that he himself has made, and, finding out its defects, learn the causes for the same, and thus be enabled to avoid the errors in his next attempt.

"In the afternoon, when the other work is over, the students assemble in the class-room, which opens upon the cheese-making room, and conduct among themselves an informal discussion, which is usually led by one of the members of the class. Prof. Dean informed us that on Monday afternoons the subject of separating was usually taken up; Tuesday afternoons, milk-testing; Wednesday and Thursday afternoons, cheese-making in general and the difficulties met with during the various seasons; on Friday afternoons samples of cheese are brought out, and the time is spent in the judging of cheese by points; and on Saturday afternoons butter-judging is taken up in the same way. During the afternoons of Tuesday and Friday Prof. Dean also spends some time with the class in the stables, judging dairy cattle.

"From this description our readers, we hope, will be able to form some idea of the work going on at the dairy school, and the visitor cannot but be impressed with the immense practical value of such a course of instruction to one who is in any way connected with dairying. The presence of the ladies, and the clean, tidy appearance of the entire place, enhanced by the spotless white attire of the students, are features which cannot fail to produce a favorable impression upon those who visit this institution.

"The afternoon informal discussions, which, we believe, are a new departure, are of inestimable value. The experience of some thirty or forty of Ontario's most practical cheese and butter makers is given to the class; and thus, by collecting the wisdom of a number, all are made wise. The students unanimously express themselves as specially pleased with this feature of the work. But making all the students actually perform all the different operations in connection with the testing, the separating, the butter making and the cheese-making is the grandest plan of all.

"As we said in the beginning, Canadians are a practical people, and must be taught in a practical way. This principle is admirably carried out, as the students are not simply told how to correctly perform the difficult operations, but are required to actually go through the work themselves. From what we saw and heard during our visit to the school, we feel that it is not hazardous on our part to predict that double the present amount of room will not more than accommodate those that will make application for admission when another session opens. We realize that this school is doing a grand work in the advancement of Canadian dairying; and such institutions will always have our most earnest support and assistance in extending their educating influence throughout the length and breadth of our land."

Some difficulties were met with in conducting the school, and chief among these was a sufficient supply of milk. Owing to the time of the year, we found it no easy task to secure about 4,000 pounds of milk a day for our students to work with. In some cases we had to ship it about 40 miles by rail, besides having two teams on the road collecting from farmers in the vicinity of the College. For this work we made use of the Travelling Dairy teams. The price we had to pay was very high, so that the product when sold did not realize what was paid for the milk, though it brought good prices.

It is with pleasure we record the fact that several of our students were prize-winners in cheese at the chief fairs of the Province; and among those who scored $99\frac{1}{2}$ points in cheese out of a possible 100 at the World's Fair, Chicago, was Mr L. A. Zufelt, of Chesterville, who headed the list on examinations at the close of the term. This is very gratifying to us as well as to himself.

To the young ladies who attended in 1893, three of whom received certificates, we are indebted for the courage shown in making a start towards breaking down prejudices that exist against scientific dairying. The good order which existed during the whole term was no doubt brought about largely through their silent, restraining influences.

We hope that a larger number may be present during 1894. Special inducements are offered to farmers' daughters and farmers who wish to become acquainted with the latest and best methods of home dairying. By devoting a portion of the present building specially for farm dairy work, and employing a competent instructor, who will devote the whole of his time to this branch of the dairy, we hope to benefit a number who could not, or would not, care to take the full course. This work we intend paying special attention to during the coming year, and hope to be able to announce before long that our dairy will be open at any and all times to those who wish to come and stay with us for a short or long period.

III. DAIRY STOCK.

The dairy department has suffered severe losses of cows during the year from tuberculosis. The trouble appears to have originated in a couple of imported cows. At the present time our stock consists of: Cattle—3 Jerseys (2 cows and a heifer); 4 Holsteins (3 cows and a heifer); 3 Ayrshires (2 cows and a heifer); 4 Guernseys (2 cows and 2 heifer calves); 2 Red Polled (a cow and a heifer calf); 6 grades (4 cows, 1 heifer and 1 heifer calf). Besides these, we shall offer in the annual sale 3 Ayrshire calves, 2 Holstein and 2 Jersey calves. One grade cow has been sold for beef, and we are feeding an unprofitable Ayrshire cow and a yearling heifer for the shambles. We have also 21 pigs and a horse.

Our stock of cows is still too small for proper experimental work and for furnishing such a supply of milk as is needed for cheese and butter-making. We should have 30 milking cows to carry on the work properly and to furnish material for students to work with.

During the year we have continued weighing each cow's milk separately night and morning, and taking tests two days of each week for the per cent. of fat. I would again call attention to the fact that more work is needed in this direction. If weighing the milk every day is thought too much labor, weigh once a week and multiply by seven, or once in two weeks and multiply by fourteen. Tests once a week or once in two weeks will give a fair idea of the quality of the milk. This is the only practical way we may arrive at the individual value of the cows of the herd.

RECORD OF DAIRY COWS FROM DEC. 18TH, 1892, TO DEC. 3RD, 1893.

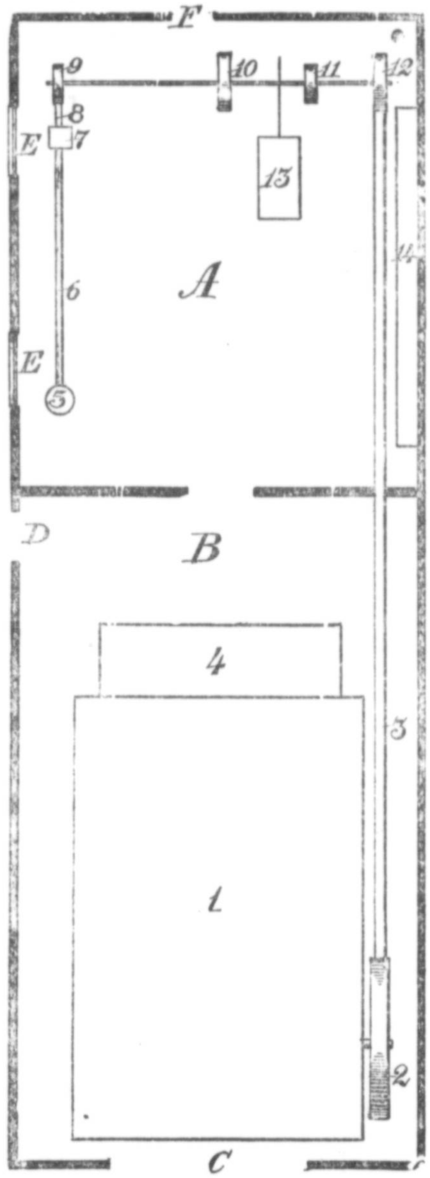
Name of cow.	Weight lb.	No. of days milking	Last calf.	Total lb. milk.	Per cent. of fat			Total lb. fat.	*Total lb. butter.
					Highest	Lowest	Average		
Cherry	1,110	231	Apr. 11, '93	5,356	4.85	3 13	3.85	206.2	226.8
Blue Bell	960	238	Apr. 10, '93	6,404	6.40	3.20	3.95	253.0	278.3
Spot	1,015	298	Jan. 30, '93	8,796	4.35	3.02	3.73	328.1	360.9
Dairy Queen	1,060	273	Feb. 28, '93	8,358	4.20	2.87	3.46	289.2	318.1
Old R	900	294	.. ..	6,531	4.15	2.90	3.49	227.9	250.7
Artis Kassie	1,203	287	April 22	9,662	3.90	2.30	2.90	283.1	311.4
Alvo	1,055	284	Dec. 2, '93	7,289	4.35	2.55	3.29	239.8	263.7
Artis Kassie Queen	900	301	Feb. 4, '93	6,333	3.80	1.90	3.16	200.1	220.1
Lisgar's Rose	892	252	Mar. 30, '93	6,569	6.40	4.22	5.21	342.2	376.4
Duchess	988	294	Dec. 3, '92	3,710	4.75	3.20	4.00	148.4	163.2
Patience	1,078	238	Apr. 3, '93	6,477	4.82	3.30	4.16	269.4	296.4
Nellie	870	210	Mar. 21, '93	4,023	4.30	2.90	3.46	139.2	153.1
Joan	1,015	250	Mar. 9, '93	5,818	5.02	2.95	3.87	225.2	247.7
Sarah	....	65	Sept. 8, '93	1,247	5.35	4.45	4.73	59.0	64.9
Anna	1,020	266	Jan. 19, '93	3,561	5.66	3.35	4.23	150.6	165.7
Lisgara	917	163	Aug. 21, '93	3,002	6.00	3.60	4.65	139.6	153.5

* Butter calculated by adding one-tenth to the fat.

A Cream Separator at the Dairy Barn.

The building is a frame one, joined to the stable. It is boarded up and down on the outside, and battened and painted. The inside of the separator room is lined with matched lumber and paper. The tread power room is unlined.

The accompanying ground floor plan will show how the power and separator are arranged.



A.—Separating room, 11 ft. 4 in. wide, 13 ft. 4 in. long.

B.—Tread power room, 18 ft. x 11 ft. 4 in. Inside measurements in both cases. Ceiling, 8 feet high.

C.—Large doors in front of power.

D.—Door where horse is brought in and taken out.

E.—Windows.

F.—Door into cow stable.

1.—Tread power.

2.—Tread power driving wheel, 4 ft. 4 in. diameter.

3.—4-inch leather belt, 28 ft. long, connecting power with pulley on shaft.

4.—Platform for horse to get on power. (This should be well fastened.)

5.—Separator.

6.—Belt from intermediate to separator.

7.—Intermediate, or jack, distant 7 ft. 3 in. from separator.

8.—2-inch leather belt, 6 ft. long, connecting pulley and intermediate.

9.—Pulley to drive intermediate, 12 in. in diameter.

10.—Pulley to drive cutting-box, 20 in. in diameter.

11.—Pulley to drive pulper in cellar below, 12 in. in diameter.

12.—Pulley, 20 in. in diameter.

13.—Pair spring balances for weighing milk.

14.—Shelf for taking samples of milk.

The separator we use is a No. 3 Alexandra, with a skimming capacity of 1,000 lb. per hour. Our power is one made at St. George, Ont. Both of these work well. The plan adopted is to bring in "Joe" (the horse) when the cows are all milked except one or two, and by the time these are milked the cream from fifteen cows will be in a can ready to go to the dairy, and the skim-milk in another can ready to be fed to calves and pigs.

This method of having the separator at the barn has several advantages, of which we may mention:

(1) It saves carrying the whole milk to the house or dairy and the skim-milk back again to the barn for feeding the calves, thus saving labor.

(2) It saves fuel otherwise necessary to heat the skim-milk for feeding; besides, we think the animal heat of the milk is more valuable than artificial heat.

(3) The skim-milk is in the very best condition for feeding, being warm and *sweet.*

(4) The separator method will produce more butter than the setting methods employed, and, as a rule, it will be better in quality.

As a number of dairymen will be considering the advisability of improving their methods for the winter manufacture of butter, where no factories are within reach, we shall be pleased to answer any questions relating to the above.

FURTHER POINTS—SEPARATION OF MILK AT THE BARN.

From a letter received the other day from a prominent dairyman in Eastern Ontario, I am led to believe that there are some further points in regard to separating milk at the barn. This gentleman says, "I believe that I can use part of my barn for the purpose;" and says further, "I believe that your plan is a first-class one, and that many farmers will adopt it or something like it."

He asks the following questions:

"(1) Do you use a one or a two-horse tread power?"

Our power is a two-horse one, but for separating milk or pulping turnips we use but one. It is easy work for one horse. A pony could do the work very well, or even a bull that could be made to get on to the power. I have seen difficulty in getting some animals on to the power. For cutting feed two horses are necessary, and thus when buying a tread power one should consider all the purposes for which he is likely to use it, and purchase accordingly. For dairy work alone a small power is all that is needed, "and this," a gentleman remarked in my office, "should be built and sold for from $60 to $70." What say the manufacturers to this?

"(2) Where do you get the warm water from to wash the separator, etc.?"

At present we carry the bowl, pans, spouts, pails, etc., to the dairy building, which is about 200 feet away, and wash them there. We could easily take a steam pipe to the separating room, and wash there, but I am afraid to leave the bowl, etc., at the stable for fear that they might become tainted with stable odor. No matter how careful a person may be, there is always risk in leaving utensils about the cow stable. This is especially the case when the building for separating happens to be on the same side of the barn as the cattle yard and the manure shed. In the arrangement of our barn we could not conveniently have it otherwise, but where the room for separating could be built on the opposite side to the yard, and manure, I should not be afraid, not only to separate the milk, but to keep the cream and make the butter in the same building. I would have double doors between the stable and such a dairy, so that no cow-stable odor could penetrate. By having good ventilation there would not be much risk.

Where washing is done at the barn, be careful to see that the bowl of the separator and other utensils are well aired where the atmosphere is pure.

"(4) Do you churn with the tread power?"

We do not use the tread power in churning, for the reason that we have an engine in the dairy which can be used in case of a large churning. For small churnings, such as many of our experimental ones are, the "Armstrong" power, furnished by our good butter-maker, Mr. Rogers, is made use of. Sometimes students are employed at this work. The tread power could be easily attached to a churn, and in cases where the air may be kept pure, in some such way as I have indicated previously, the churning and all the work may be done at this dairy building, connected with the barn.

I may mention, also, that we have been making some trials with a churn constructed and worked on an entirely new principle. It is called the pneumatic churn, and was invented by a New Zealand gentleman. The process of churning is accomplished by forcing air through the cream. The churn is stationary, and there is nothing in the shape of dashers which work in the cream. To stand and watch it at work reminds one of the days when we used to "boil sap," or boil water when killing hogs. The cream is kept in a continual bubble. It is too early to report results.

The circular silo of which a full description was given last year, has worked well. We did not have enough corn in 1892 to fill it much more than half full, yet the product was good. This year it has been filled to the top, and though the corn did not get so well matured as last year, the ensilage so far has been of good quality. Some millet cut into the silo along with the corn did not, apparently, improve either the millet or the corn.

I may say that we still consider corn ensilage the cheapest bulky portion of the ration that we can feed. A ration of 50 lb. corn ensilage, 6 lb. hay, 4 lb. bran, and 4 lb. of ground wheat gave us good results last winter. At the present price of wheat it is about the cheapest grain feed that may be fed to dairy cows.

The dairy, stables and piggery, plans and descriptions of which were given in the last report, have proven very satisfactory.

We are indebted to the Farm Department for the corn which was grown and filled in the dairy silo (about 250 tons). Also, for mangels, sugar beets, straw for bedding, about 12 tons of hay, the growth of fodder and pasture for the dairy stock, and for help at various times during the year.

Leaking Teats.

A dairyman writes to know what appliances may be used to prevent cows leaking their milk, and how much they would cost.

The cause of leaking teats is the very opposite of the cause of hard milking. The reason why a cow is a hard milker is that the sphincter muscle which closes the opening or duct of the teat at the bottom is too tense or hard, and will not yield sufficiently to the gentle pressure of the hand of the milker. Sometimes it is caused by lack of sufficient space in the duct of the teat which leads from the cistern above to the opening below. The leaking, then, is caused by this muscle not being strong enough to withstand the downward pressure of the milk from the ducts above. Sometimes the loss is considerable, and the remedy not very satisfactory. The most common remedy is to place a rubber band around the teat, which closes the opening in much the same way as the muscle. This band should be at least half an inch wide. The objection to the use of the band is that it stops circulation more or less, and is likely to result in damage to the teat if continued too long.

The author of the *Dairyman's Manual* says in reference to this matter: "It is doubtful if any permanent remedy can be found for it. A temporary preventive, and one not at all difficult of application, is to smear the teats of a leaking cow with photographers' collodion as soon as she is milked. A bottle of collodion may be kept in the barn (always well corked, or it will evaporate very soon), and a small quantity may be rubbed over the teat and on the end of it with the finger. The collodion contracts considerably as the chloroform evaporates from it, and practically forms a tight bandage around the teat, which compresses the duct. When, as is sometimes the case, a cow will lose two or three quarts of milk a day, it may pay to use this remedy.

A Precocious Milker.

On March 27th, 1892, one of our best grade cows dropped a heifer calf, sired by a Holstein. This calf has been well fed—not on fattening foods—ever since, and is at the present time a thrifty yearling. Early in the summer I noticed that her udder had developed considerably, and on examination it was found to contain a quantity of fluid matter, resembling milk. On July 7th, we commenced milking this heifer, and since that time have been milking her every day. The quantity of milk given was very small, though it increased slightly. In appearance, it was very watery at first, but kept improving. The most interesting part is the fat contents of this milk-like secretion. The first time she was tested, on the 7th of July, the per cent. of fat was .4 (four-tenths) of one per cent. On July 8th she tested 1.2 per cent., showing a marked increase in this short time. July 12th she again tested 1.2 per cent.

We continued to milk this heifer and noted the following points:

1. The increase in quantity of milk.
2. The increase in per cent. of fat.
3. The effect on the milking ability of this heifer.
4. The effect on the health and growth of the animal.

At the time when we commenced milking her she had not been bred, but in a day or so after she was mated with her sire.

From this trial we should judge that the fat is not secreted as early as the other constituents of the milk, and, judging from the action of the sulphuric acid when added to the milk in making a test, there did not seem to be the normal amount of sugar present, but a greater proportion of the curdy matter.

In this connection we may mention that milk from the injured quarter of a cow's udder tested very low, while the milk from the other three quarters tested 3.40. The milk from the quarter which was hurt by a hook or stick or something else tested but .5 (five-tenths) of one per cent.

The fat of the milk is the most valuable constituent, and its secretion appears to be very easily influenced adversely.

Moral: See that the cows are treated kindly, and not injured in any way that can possibly be avoided, as it means a loss of fat.

At this writing (Nov. 13th), the Holstein grade heifer referred to above is still milking, though the quantity of milk is only about a pint per day. The per cent. of fat, however, has increased very much. November 9th she tested 3.7, and November 10th 3.8 per cent. of fat. So far it has not apparently affected her health or growth. It is too soon yet to see the effect on the milking ability.

Rearing Calves for the Dairy.

It is a mistake to have calves intended for the dairy kept too fat. For beef it is all right to keep them fat from the start, but for the dairy it is not wise. What we want of these calves is milk, not beef, and if they early get into the habit of making beef out of their food instead of milk, it is safe to predict that they will always do this. Keep dairy calves growing and thriving, but *not fat*.

Now is the time to raise the calves intended for future dairy cows. Select those from the best cows that have been bred to males of the milky breeds. We leave the calf with the dam for about one day, and then remove it to a pen by itself; but still continue to feed it the milk of its own dam for from one to three weeks, according to the calf's robustness. We then gradually substitute warm skim-milk, until by the time the calf is two weeks to a month and a half old it is getting skim-milk altogether. If the supply of skim-milk is limited, boil good, clean, well-cured hay, making what is known as "hay tea," and make up the deficiency with this. For a calf two weeks old 1½ gallons twice a day, or a gallon three times a day, would be ample. Increase the ration as the calf grows older.

Into the skim-milk, or milk and tea, put half a teacupful of flaxseed jelly, made by boiling flaxseed. Increase this gradually until the calf is three months old, when it may be fed each day about half a pound of seed made into jelly. In all feeding, the person in charge must exercise judgment. What would be ample for one calf would not be enough for another, as their appetites and capabilities of digesting food vary widely. Some nice clover hay will tempt the calf to nibble at it, and soon it will eat quite a quantity of it. A small box in the stall containing ground oats (sifted), bran, and oil cake, mixed in the proportion of 2, 2, 1, will add to the thriftiness of the calf. There is no danger of its eating too much of the dry meal during the first three months of its life. Oatmeal porridge or oil-cake boiled may be used instead of the flaxseed jelly. Feed what the calf will lick up clean.

If there is skim-milk for the calf, it will do all the better if it gets it till it is six or eight months old; but if this is not available, gradually substitute water after four months, and get it accustomed to taking it at about 60° F. Still continue feeding the hay, and for variety some roots or ensilage may be fed, the latter sparingly if it is very sour. At no time would I feed ensilage in large quantities to very young animals.

If the calf gets too fat, reduce the *ad libitum* meal ration to about a quart per day of bran, oats and oil-cake. This ration is for a calf over four months old.

Calves raised in winter are ready to be turned out by the time grass comes, if thought advisable. Our practice has been to keep them in altogether during the first year, or at most to allow them out for only a short run during the evening, or in fine weather, when it is not too hot, and the flies are not too troublesome.

The calf pen should be kept *clean and dry* at all times.

The requisites for a calf to develop into a good dairy cow, summed up, are:

1. It should be well-bred (not necessarily pure-bred), of healthy stock, dropped between October 1st and February 1st, and a "thriver" from the start. *Raise no others.*

2. It should have its dam's milk for a week at least, and after that warm skim-milk (that from the separator, where it is creamed directly after milking, is best, as it still contains the animal heat of the cow), together with some cheap food to replace the butter or cream taken out of the whole milk. Such feed will produce a good calf. We can't afford to feed 22-cent butter to calves.

3. Regularity, cleanliness, and kindness throughout in the treatment of the animal.

IV. EXPERIMENTS OF 1893.

Creaming Shallow Pan, Deep Pail and Separator.

Commencing in May this year we have, during each month, been setting one-third of the mixed milk from the whole herd in shallow pans, one-third in deep pails and one-third has been run through the hand separator. This was continued long enough each month to get a churning of cream from each method, the time required to collect a churning was from 2 to 4 days, depending upon the quantity of milk at our disposal. In every case the milk was all mixed together before being divided among the three methods for creaming.

The objects of the experiment were:

1. To see what loss of fat there would be in the skim and buttermilk from each system.
2. To see the effect on the quality of the cream and butter by the different methods.
3. To see the effect on the feeding quality of the by-products.
4. To note the labor and expense connected with each.

This work is still being carried on, and we hope to be able to determine what are the actual differences and losses by these most common creaming methods now employed by farmers and dairymen. By conducting the experiments every month throughout the year, we hope to gain knowledge as to the effects of different seasons and different periods of lactation.

Summary. During the six months, from May to October, there was creamed 3,081 pounds of milk—1,027 by each method. This milk contained 115.17 pounds of butter-fat and made 127.58 pounds of butter. The total loss of fat in skim and buttermilk by separator method was .47 pounds; by deep pail, 1.67; and by shallow pan, 3.29 pounds. The per cent. of loss in butter-fat was 1.2 by separator; 4.3 by deep pail; and 8.5 by shallow pan. It will be remembered that all the methods were handled in the very best manner, and that the losses by the latter two methods would be much greater as ordinarily used.

As to the quality of the cream and butter we could see little difference between the deep pail and separator. The separator butter was possibly a little better for a short time after being made, but the deep pail proved somewhat better in keeping quality. The shallow pan butter was inferior to the others in every case, though it was fair in quality and was better in October and November than during hot weather.

The skim-milk was best from the separator, deep pail next and shallow pan poorest. During the hot weather it was sour in most cases when the pans were skimmed.

In reference to labor and expense we would say that in handling small quantities of milk there is least labor with the deep pails, in case everything is handy. Unless a person has sufficient cows to warrant the purchase of a power separator, we are inclined to think that turning a crank for 1 to 2 hours night and morning will grow wearisome and the labor will be greater than with deep pails. The deep pails save much labor as compared with shallow pans.

After the first cost of the machine and power, the difference in running expenses of the three methods will not be very great.

Loss of Fat.

Month.	Method.	Skim milk.		Buttermilk.		Total pounds of fat lost.
		Per cent.	Total lb.	Per cent.	Total.	
May.	Separator	trace.	....	0.20	0.07	0 07
	Deep pail	0.19	0.36	0.10	0.04	0.40
	Shallow pan.	0.40	0.79	0 20	0.07	0.86
June.	Separator.	trace.	....	0.1	0.03	0.03
	Deep pail	0.2	0.30	trace.	....	0.30
	Shallow pan	0.33	0 51	0.1	0 02	0 53
July.	Separator.	0.03	0.04	0.1	0.03	0.07
	Deep pail	0.20	0.26	0.05	0.01	0.27
	Shallow pan	0.43	0.55	0.1	0.03	0.58
August	Separator.	0.03	0.04	....	....	0.04
	Deep pail	0.13	0 17	0.1	0 03	0.20
	Shallow pan	0.31	0.40	0.1	0.03	0.43
September	Separator	0.02	0 03	0 2	0.04	0 07
	Deep pail.	0.22	0.25	0.1	0.03	0.28
	Shallow pan	0.44	0.51	0.2	0.04	0.55
October	Separator	0.08	0 13	0.2	0.06	0.19
	Deep pail	0 13	0.16	0.2	0 06	0.22
	Shallow pan	0.23	0 28	0 2	0.06	0.34

Creaming Quality of Different Cows' Milk.

The losses of fat in skim milk varies not only by the different methods of setting, and different ways of handling these methods, but it also varies according to the individuality of the cow. Some cows' milks cream very much more early than others. In cases where the setting methods are adopted it is well to have cows that not only give rich milk and plenty of it, but also cows which possess good creaming quality in their milk. The following average losses of fat in skim milk from twelve of our cows, the milk from each of which was set separately for a number of times, will illustrate the difference that will be found in a herd: Spot, .18 per cent.; Blue Bell, .11; Artis Kassie, .13; Dairy Queen, .21; Nellie, .57; Patience, .44; Joan, .35; Lisgar's Rose, .0; Cherry, .55; Old R., .66; Artis Kassie's 2, .40; Alvo, .45.

The range is all the way from nothing in the case of Lisgar's Rose to .66 in the case of Old R., a grade cow.

Amounts of Butter Produced by Two Groups of Cows.

Two groups of cows were selected, which varied widely in the per cent. of fat in their milk.

Group I. consisted of two cows, whose average test for the $3\frac{1}{2}$ days during which the milk was set was 4.89 per cent fat. During this time they gave 139 pounds of milk, which made 8.38 pounds of butter. The loss of fat in the skim-milk was a "trace" in every case. The butter was firm and nice.

Group II. (three cows) gave during the same time 199 pounds of milk, with an average of 2.84 per cent. fat. This milk made 6.78 pounds of butter. The loss of fat in skim-milk was .26 per cent.

This shows the importance of having cows tested. The first group produced more butter on much less milk than did the second group. *Quality as well as quantity determines the value of a cow.*

Shallow Pans—24 and 36 Hours.

Experiments were made to determine the length of time for cream to rise on shallow pans, and whether there was any advantage in allowing the milk to stand 36 hours as compared with 24 hours. The following table gives the percentage of fat left in the skim-milk at the end of each period :

—	Oct. 6.	Oct. 7.	Oct. 8.	Oct. 11.	Oct. 12.	Nov. 26.	Average.
24 hours	0.7	0.4	0.4	0.5	0.3	0.4	0.45
36 hours	0.4	0.6	0.3	0.5	0.3	0.5	0.43

There is apparently no gain in creaming by allowing the milk to stand 36 hours as compared with 24. In explanation of the two cases where there was more fat at the end of 36 than 24 hours, we can account for it only by assuming that the skimming was not done so completely. It is somewhat difficult to get *all* the cream off shallow pans, and when the milk from a number of pans was mixed together before taking samples, a little cream on the edge or floating on top of each pan would make the difference noted.

Cream Measurement on Deep Pail after Setting 12, 24, 36 and 48 Hours.

That cream is an unknown quantity it is quite difficult to convince some people. What goes by the name of cream in some places would not pass for much more than good whole milk in others, and still some persist in determining the value of milk by the cream which rises on it. Again, the inadvisability of paying for cream according to inches is seen when we consider that an inch of some kinds of cream will make 50 per cent. more butter than others. As a rule, the colder the temperature at which the cream rises, the less rich in fat will it be ; but it does not follow that poorer results are obtained. The colder the temperature in which milk is set in deep pails the lower will it test, but the more inches of cream will there be on the same quantity of milk, other things being equal. Ten inches of cream testing 80 per cent., is equal to 5 inches testing 160 per cent., and the former will make better butter, other things being equal. Hence we see the folly of patrons of cream-gathering creameries clamoring for a high test, whereas by using plenty of ice water around the cans a thinner cream is obtained, but there will be more of it than where no ice or cold water is used.

Another thing somewhat perplexing to some is that apparently there is less cream on the creamer or deep pail at the end of 24 hours than at 12 hours, and less in 36 than 24. The explanation of this is that the skim-milk settles down out of the cream, and as a consequence the cream becomes more dense. There would be as much butter-fat, or possibly more, at the end of 24 than 12 hours. What this decrease is likely to be may be seen from measurements taken in trials at the dairy. The cans used were the ordinary deep pails, about $8\frac{1}{2}$ inches in diameter, and were skimmed at a temperature varying from 39° to 46°.

Trials.	Inches of cream in.			
	12 hrs.	24 hrs.	36 hrs.	48 hrs.
1st	$3\frac{1}{8}$	$2\frac{7}{8}$	$2\frac{6}{8}$	
2nd	$3\frac{1}{4}$	3	$2\frac{7}{8}$	$2\frac{3}{4}$
3rd	$4\frac{1}{8}$	....	....	
4th	$3\frac{6}{8}$	$3\frac{3}{8}$	....	
5th	$2\frac{3}{8}$	$2\frac{1}{4}$	$2\frac{3}{16}$	
6th	$3\frac{7}{8}$	$3\frac{1}{2}$	$3\frac{3}{8}$	
7th	$2\frac{1}{2}$	$2\frac{3}{8}$	$2\frac{1}{4}$	
8th	$3\frac{1}{2}$	$3\frac{3}{8}$	$3\frac{1}{4}$	
9th	$3\frac{1}{4}$	$3\frac{1}{8}$	....	

The average shrinkage appears to be from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch during the second 12 hours, and about $\frac{1}{8}$ inch for each 12 hours after that up to 48 hours.

Milk Set in Shallow Pans in Warm *vs.* Cool Temperature.

Having been told a number of times while out with the Travelling Dairy, and on other occasions, that as soon as the weather becomes cold it is necessary to bring the pans of milk into a cupboard, or pantry, near the fire, to keep them warm, in order that the cream may rise, and knowing that this is a common impression among those who make butter, we tried a few experiments to see whether this is the case. Though of the opinion that it was not necessary to keep milk warm for the cream to rise on shallow pans, and having expressed myself so several times, yet the knowing ones always said it was wrong. This conclusion was reached by reasoning that if a cold temperature gave best results in deep setting, why would not the same effects produce equally as good results with the shallow setting? I thought it would, and I am more strongly convinced now after the experiments here noted.

The plan of conducting the experiments was to mix the milk and then put one-half in pans, and set them on a rack in the basement of the dairy, where the temperature ranged from 43° to 50°. The other half was put in pans, which were set in the working room of the dairy, where the temperature ranged from 48° to 75°. This room would resemble somewhat the variations in temperature such as occur in a farm pantry or cupboard, being cooled down at night, and the temperature rising during the day. In the basement the temperature was more constant, and is similar to that of a farm cellar or milk house where no artificial heat is used.

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. of fat in skim-milk was .28. Except the first, second, eleventh and twelfth trials the colder temperature gave best results.

Date.	Warm temperature.							Cool temperature.					
	Lb. milk.	Temp. set.	Per cent. of fat in whole milk.	Temp when skimmed.	Per cent. of fat in skim-milk.	Temp. room.	Hours set.	Lb. milk.	Temp. set.	Temp. when skimmed.	Per cent. of fat in skim-milk.	Temp. of room.	Hours set.
		°		°		° °			°	°		°	
Nov. 6, p.m....	15	86	......	56	0.2	57 to 75	36	15	86	47	0.3	47	36
" 7, a.m....	20	88	3.9	60	0.2	60 " 75	36	20	88	48	0.3	47 to 50	36
" 7, p.m....	21	90	3.7	57	0.4	53 " 68	36	21	90	48	0.3	47	36
" 8, a.m....	20	88	3.4	62	0.6	57 " 68	36	20	88	49	0.4	49	36
" 8, p.m....	23	89	3.8	57	0.5	54 " 68	48	23	89	48	0.3	48	36
" 9, a.m....	20	86	.....	52	0.4	50 " 66	48	20	86	43	0.3	43	48
" 9, p.m....	18	89	3.9	52	0.5	52 " 65	36	18	89	43	0.2	43	36
" 10, a.m....	20	84	3.8	56	0.3	52 " 65	48	20	84	46	0.1	46	48
" 16, p.m....	12	85	3.7	52	0.2	48 " 75	36	12	85	47	0.15	46	36
" 17, a.m....	23	84	3.3	60	0.4	48 " 71	36	23	84	46	0.1	46	36
" 17, p.m....	12	90	3.6	54	0.4	50 " 72	36	12	90	45	0.5	46	48
" 18, a.m....	10	81	2.3	60	0.4	50 " 72	36	10	81	45	0.4	45	24
" 18, p.m....	9	89	4.0	50	0.5	50 " 71	36	9	89	44	......	44	36

Composite Tests.

Paying by test, according to the percentage of fat in patron's milk having been adopted by a number of our cheese factories and by most of our creameries which are operated on the separator plan, it becomes a question of great importance how to get the testing done with as little labor as possible, and at the smallest expense possible. With the view of assisting in this matter, we have been conducting composite tests during the past year, and publish the results with a hope that they may be of benefit to factorymen and others.

There are several ways of making the composite test, among which may be mentioned:

1. Measure a small quantity of milk (about 1 fluid ounce) from the patron's can each morning, and put it in a jar or bottle properly labelled with his name. This may be kept from souring by the use of about 10 grains of potassium bi-chromate, mercuric chloride and various other substances, or it may be allowed to sour and afterwards be rendered liquid by using potash or powered lye. Of these three, the bi-chromate is best, there being least risk and work. It should be put in the jar before milk is added.

2 Take a one-third sample (5.9 c. c.). Put directly into a Babcock bottle and test twice a week.

3. Take a one-sixth sample (2.95 c. c.). Put directly into a test bottle and test at the end of a week.

The bi-chromate and the pipettes were compared during the summer with the following results :

Week ending.	Average of daily tests.	Average of tests with 5.9 c. c., pipette.	Average of tests with 2.95 c. c., pipette.	Composite jar, (bichromate.)
May 13	3.43	3.55	3.40	
" 27	3.76	3.82	3.80	
June 5	3.65	3.62	3.60	
July 1	3.84	3.85	3.85	3.75
" 8	3.88	3.77	3.90	4.00
" 15	3.82	3.87	3.75	
" 22	2.96	3.02	2.95	3.70
" 29	2.93	3.05	2.85	3.00
Aug. 5	2.39	2.33	2.35	3.00
" 12	3.16	3.17	3.15	2.40
" 19	3.24	3.20	3.20	3.10
" 26	1.99		2.00	3.10
Sept. 2	2.73	2.72	2.75	1.90
" 9	2.03			2.70
" 16	2.28	2.20	2.10	
" 23	3.33	3.27	3.15	
" 30	2.20	2.20	2.20	
Oct. 8	2.89	2.85	2.90	
" 16	2.45	2.45	2.50	
" 23	3.07	3.01	3.10	
" 30	3.25	3.31	3.30	
Nov. 6	1.32	1.30	1.30	
" 13	3.96	3.95	3.85	
Averages, leaving out the tests of Aug. 26, and Sept. 9	3.073	3.072	3.045	

We found a very close agreement between the average of the daily test for six days and the per cent. of fat as found by using the pipettes, and also the composite jar in those cases where it was compared with the other three methods. It is evident that testing patrons' milk every day cannot be done in a factory where there is so much work for the makers. Of three plans already mentioned, there is less work in using a $\frac{1}{6}$ pipette as at the end of a week the milk is ready to have the acid added—no measuring, or shaking of the milk is necessary. The chief objection to this plan is that the amount of milk taken being so small the liability to error through not obtaining a representative sample, is very much multiplied. The experiments noted indicate that an average reading with the one-sixth pipette is lower than the average of daily samples, or the average of the one-third pipette.

Composite Tests for a Longer Period Than one Week.

Even where testing but once a week is the custom, makers find that on testing day (usually Saturdays) they are very much crowded with work, and it is usual to get some extra help on that day.

To see if this work could not be lessened still more we have been keeping composite samples for a number of weeks and comparing the tests at the end of 1, 2, 3, 4, 5, 6, and 7 weeks, with the average daily samples. If accurate results can be obtained by this method it would save a great deal of labor for the maker and secretary of the factory. In addition it would effect a saving of acid, wear of machine, and risk in breakage of bottles and measures.

To have a check on the work, not one jar but four jars were used, a sample being put into each one and a sample tested each time milk was put into the jars. The results are as follows:

Date.	Jar No. 1.	Jar No. 2.	Jar No. 3.	Jar No. 4.	Average per cent. fat in 4 jars.	Average of daily tests.
1st trial.						
Week ending—						
August 12	3.20	3.20	3.20	3.20	3.20	3.16 for 1 week.
" 19	3.05	3.00	3.00	3.05	3.02	3.20 " 2 weeks.
" 26	2.60	2.70	2.60	2.65	2.64	2.79 " 3 "
September 2	2.70	2.60	2.70	2.60	2.65	2.78 " 4 "
" 9	....	2.50	2.50	2.50	2.50	2.63 " 5 "
" 16	....	2.55	2.30	2.50	2.45	2.57 " 6 "
" 23	....	2.60	2.60	2.60	2.60	2.68 " 7 "
2nd trial.						
Week ending—						
September 30	2.20	2.30	2.20	2.20	2.22	2.20 for 1 week.
October 8	2.60	2.60	2.55	2.55	2.57	2.54 " 2 weeks.
" 5	2.60	2.60	2.55	2.60	2.59	2.51 " 3 "
" 22	2.80	2.75	2.80	2.80	2.79	2.65 " 4 "
" 29	2.90	2.90	2.90	2.85	2.89	2.77 " 5 "
November 5	2.45	2.50	2.50	2.45	2.48	2.53 " 6 "
" 12	2.75	2.75	2.75	2.75	2.75	2.73 " 7 "

It will be noticed that not only do the tests from the four jars compare very closely with each other (duplicate tests in every case) but the average of the four jars compare very closely with the average of the daily tests. These jars were tested at the end of every week and the average of the daily tests taken for the same period for comparison. For instance, on October 22nd, average per cent. of fat found in the four jars was 2.79, milk having been added every day for four weeks previously. The average of the daily samples for the same four weeks was 2.65, a difference of less than two-tenths of one per cent. The widest difference in any week or period of weeks was less than .2 of one per cent.

The samples were kept liquid by the use of bi-chromate of potash. These samples were kept in two quart gem jars sitting on a table in the working room with no extra precaution to keep them sweet. The only thing that was done, was to keep adding a little more of bi-chromate to any sample that had the appearance of turning sour. Usually a little of the preservative was added to each jar at the end of every 8 or 10 days during the four weeks. This was sufficient to keep the samples liquid during the seven weeks of the hot weather.

In making this test for a month, which is about the time for which factories settle with patrons, for milk delivered, the following points need to be observed:

1. See that the jars or bottles are thoroughly cleaned out each time before adding milk.

2. Put in about as much bi-chromate as will lie on a ten-cent piece before any milk is added, then add a small quantity every 8 or 10 days afterwards as a preventive to souring.

3. Take out a *measured* quantity from each patron every morning; (a dipper having a lip and holding about one fluid ounce is suitable).

4. Shake the composite sample each time after adding more milk, in order to mix the cream with the milk. Care is needed that samples are not shaken too much as they will thus be churned, when a proper sample is impossible.

5. In case a sample becomes sour, add a small quantity of powdered lye to render it liquid, test at once, record test, and then empty jar and continue again until test closes. Take the average of the two tests as the per cent. of fat for the month.

6. Before testing, set the jar in warm water (125° F.) for about one minute, which will loosen the cream, then shake and measure with pipette.

7. If the readings are not clear, add water to the neck of the bottle, whirl, then fill up with hot water, and whirl again.

Experiments in Cheese.

So far our experiments in cheese-making have been very few owing to a scarcity of milk, as previously noted. To carry on this work successfully it requires considerable milk. This we have not had except during the dairy school and this is not a favorable time to do experimental work as the students take most of our attention. We did, however, conduct a few experiments, some during the dairy school and some during the summer. Those during March were under the supervision of Mr. A. T. Bell, instructor in cheese-making. He reports as follows:

First to satisfy ourselves as to draining curd. Some advocate leaving considerale moisture in curd and salting heavier. We carried on those experiments for about a week, and the conclusions arrived at are, that the medium is the most desirable, i.e., those curds which were stirred every day and salted light and those which were left moist and salted heavy, were not so good as those between, although one made on the 8th, which was drained very dry and salted light was a very fine cheese. The "sheepskin process" was tried, which I do not condsider any advantage. Then again, we salted some before they were sufficiently matured, and filed up afterwards as some recommend, and I found that on comparing them with others made from same milk in the usual way, deficient in body and texture when examined at the end of March, but a month later there was not that difference. However, I would not advocate that as a plan to pursue."

A cheese made by Mr. L. Patton, one of our dairy students, is somewhat interesting. This was made on March 16 from sweet milk. Rennet was added (10.16 a.m.) at the rate of 3 oz. per 1,000 lb. milk. The curd was dipped sweet, and when ground at 4.30 p.m., the hot-iron test showed about $\frac{1}{8}$ of an inch of acid. It was salted at 5.30, put to press 15 minutes later, pressed for 20 hours, and the 300 pounds of milk made 29 pounds of green cheese. This cheese was kept in the curing room for about $1\frac{1}{2}$ months at a temperature of about 70°, when it was boxed and taken to a cool place. At the present writing, (Nov. 21st) it is a fine eating cheese. It was somewhat tough at first and is only now beginning to "mellow down." A buyer who examined it a few days ago, said this cheese would keep for another year.

Experiments were also made with different quantities of rennet to see the effect on the "curing" of the cheese. Rennet at the rate of 2, 4 and 6 ounces per 1,000 pounds of milk was added, and the other processes of making carried on the same with each cheese.

Experts who examined these cheese at the end of about a month, not knowing how they had been made, declared the cheese, where 6 ounces of rennet was used, a "ripe" cheese, and the others less so as the amount of rennet decreased. In the language of one of them, "this cheese (the 6 oz.) will be rotten before this (the 2 oz.) is ripe"

During the month of July some experiments were made at the dairy by Mr. T. B. Millar, Inspector of Western Dairy Association, to determine the influence of rich, normal milk on the quality and yield of cheese, as compared with poor normal milk. These experiments confirmed those reported by others, that the richer milk gives an increase of cheese. We hope to do more work in this connection when we have an increased supply of milk at our command.

In the months of July and August, I made a number of fancy cheese. These will need to be kept for some time before they can be judged satisfactorily and we refrain from giving details at present.

To show students what skim milk-cheese would be like, I took 300 lb. of skim milk testing three-tenths per cent. of fat and made it into a cheese. Some time ago, a buyer attempted to "bore" this cheese and failed. He said it was the first time he ever was stuck in trying to bore a cheese. This cheese is so hard that it is almost impossible to get a sample from it. Talking on this point a few days ago to a man who buys considerable cheese, he said that a certain factory had a number of skim cheese and wished him to buy them. He went to see them and said he, "The whole lot is not worth ten cents."

Two cheese were made in August which had cream added to whole milk. In one case there was 29 pounds of cream added to 231 pounds of whole milk, which made 27½ pounds of green cheese. There was a loss of .4 of one per cent. of fat in the whey. The milk and cream tested 5.55 per cent. fat. The other cheese was made from 202 pounds of milk and 31 pounds of cream. There were 27¼ pounds of green cheese. Whole milk and cream tested 5.95 per cent, and whey .25. Both of these cheese have been pronounced excellent by persons who have tested them. They are soft, creamy, rich and will spread on bread.

There is room for the sale of a number of fancy cheese in towns and cities of Ontario. I receive inquiries from commission men who wish to handle fancy cheese and for those who will take the trouble to make them of good quality, it will be found to be very remunerative.

Effect of Food on the Per Cent. of Fat in Milk.

This year our experiments have taken a different line from the two years previous. Beginning May 22nd while the cows were still in the stable a composite sample was taken from each cow for a week. On May 29th 15 cows were turned out to pasture, one group (8 cows) receiving practically no meal (except 1 lb. bran each day to induce them to come into their stalls) while the other group (7 cows) received a ration of

1 lb peas,	1 lb wheat,	and	1 lb bran	during	1st week.
2 lb "	2 lb "	"	2 lb	"	2nd "
3 " "	3 "	"	3 "	"	3rd and 4th weeks.

This was continued for four weeks when the ration for group II was changed to:

1 lb cotton-seed meal,	1 lb linseed cake,	and	1 lb bran,	during	1st week.
2 lb " "	2 lb "	" "	2 lb "	"	2nd "
3 " " "	3 "	" "	3 " "	"	3 rd and 4th weeks.

Group I. at the end of four weeks, was fed the peas, wheat and bran ration which group II. had been getting. Beginning July 25th, this group was again changed to a ration of green peas and oats, they being fed all they would eat up clean for two weeks, while group II. still continued to receive the cotton-seed, linseed and bran ration of the 3rd and 4th weeks. The results are seen in the following table:

TABLE showing per cent. of fat in each cow's milk during the several periods.

Group I. Eight cows.

Week ending	Duchess.	Nellie.	Patience.	Anna.	Fort.	Rose.	Joan.	A.K. Queen.	Rations fed during the different periods.		
May 28 (previous to expt)	3.3	3.0	3.4	3.5	3.9	4.8	3.2	3.0	1 bus. roots, 20 lb hay, 4 lb. bran, 4 lb. ground wheat.		
1st period—											
June 4	4.8	3.1	3.95	5.1	4.3	5.85	3.7	3.0	Pasture and one pound bran daily to each cow		
" 11	4.2	3.85	4.25	3.8	4.6	5.40	3.8	3.4			
" 18	3.7	3.1	......	4.3	4.1	4.7	3.0	3.2			
" 25	3.78	3.37	3.63	4.25	4.32	4.98	4.19	3.13			
Average of last 3 weeks.	3.89	3.44	3.94	4.11	4.34	5.02	3.66	3.24			
2nd period—									Bran. lb.	Peas. lb.	Wheat. lb.
July 2	3.2	3.3	3.85	4.05	3.70	4.45	3.25	3.20	1	1	1
" 9	3.7	3.6	3.6	4.0	4.6	4.7	3.5	2.6	2	2	2
" 16	4.0	3.6	3.8	3.9	4.0	4.7	3.6	3.4	3	3	3
" 23	3.6	3.3	3.8	4.5	4.2	4.5	3.4	3.3	3	3	3
Average of last 3 weeks.	3.76	3.5	3.73	4.13	4.26	4.63	3.50	3.1	in addition to pasture.		
3rd period— August 6, last week	3.6	3.4	3.9	4.2	5.6	4.6	3.6	3.2	Pasture, green peas and oats.		

Group II. Seven cows.

Week ending.	Alvo.	A. Kassie.	Cherry.	Spot.	O. R.	D. Queen.	Blue Bell.	Rations.		
May 28 (previous to expt)	2.8	2.7	3.35	4.05	3.2	3.5	3.8	1 bus. roots, 20 lb. hay, 4 lb. bran, 4 lb. ground wheat.		
1st period—								Bran. lb.	Peas. lb.	Wheat. lb.
June 4	3.3	2.85	3.55	4.0	3.8	2.5	3.6	1	1	1
" 11	3.6	2.8	3.6	3.3	3.7	3.0	4.0	2	2	2
" 18	2.9	2.7	3.2	3.5	3.4	2.8	3.3	3	3	3
" 25	2.93	3.05	3.77	3.41	3.18	3.37	3.62	3	3	3
Average of last 3 weeks.	3.14	2.85	3.52	3.40	3.42	3.05	3.64	The above in addition to pasture.		
2nd period—								Bran. lb.	Cotton-seed meal. lb.	Oil cake. lb.
July 2	2.80	2.5	3.2	3.1	3.2	3.4	3.4	1	1	1
" 9	3.3	3.1	3.2	3.5	3.3	3.0	3.4	2	2	2
" 16	3.4	2.8	3.6	3.4	3.5	3.0	3.7	3	3	3
" 23	3.5	2.9	3.8	3.4	3.2	3.2	3.4	3	3	3
Average of last 3 weeks.	3.4	2.93	3.53	3.43	3.33	3.06	3.5	in addition to pasture.		
3rd period— August 6, last week	3.4	2.9	3.6	3.2	3.6	2.8	3.5	Same as in second period.		

Remarks. The reader's attention is called to the fact, that with but two exceptions the cows when turned out to pasture *increased* in the percentage of fat during the first week. In the case of Spot it may be said to be practically the same, and D. Queen received an injury to her udder about this time which no doubt caused the shrinkage in her case. That cows should give richer milk when turned out to grass is contrary to our expectations and the general teaching along this line, but in this case it was true, both for the group which received meal and the one which received it not.

Summary. The average per cent. of fat in group I milk for the week previous to turning out to grass was 3.51, and for the last three weeks of period 1, in which each cow in the group received but one pound of bran a day in addition to pasture, the per cent. of fat was 3.96. Group II for a week previous to being turned out gave milk with an average per cent. of fat of 3.32 leaving out D. Queen's milk, (with hers 3.34) and the average for the three weeks on pasture in which they received in addition peas, wheat and bran, was 3.33—averaging D. Queen's also, it is 3.29.

During the second period when group I received peas, wheat and bran in addition to pasture, the average fat in their milk was 3.83, and Group II, which received pasture, cotton-seed meal, linseed meal and bran, gave milk with an average of 3.31 per cent. We may say that both groups gave milk with practically the same percentage of fat during both periods.

During the last week of the third period, when Group I was changed to green peas and oats in addition to pasture, their milk averaged 4°/$_o$. Group II which had same ration as during the second period averaged 4.07 °/$_o$. This second group appears to have given milk which was more constant in its percentage of fat than Group I.

Added Points. For the week previous to being turned out to pasture Group I gave 1,308 pounds of milk containing 45.9 pounds of fat. The average of one week during the first period on pasture was 1,355 pounds of milk and 54.7 pounds of fat. Group II gave 1,466 pounds of milk and 48.9 pounds of fat in one week previous to being let out to pasture, and the meal and pasture produced from the same cows 1,896 pounds of milk and 62 pounds of fat in one week (average of 4 weeks.) During the second period both groups shrunk in their milk as compared with first period. Dry weather, consequently poor pasture, was the cause.

During the week when both groups received practically the same feed, Group II produced 158 pounds more milk than Group I. During the first period of the experiment, when Gronp II received meal in addition to pasture and Group I had only pasture. Group II gave 541 pounds more milk than Group I. This 383 pounds is probably the extra milk produced from the meal fed. The extra meal fed these cows for a week would cost about $2.25, or the extra milk was made at a cost of about 58 cents per 100 pounds.

The average weight of Group I when let out on May 29th was 962 pounds, at the close of period 1 they averaged 987 pounds. Group II averaged 1.043 at beginning, and 1103 pounds on June 26th. At the close of the second period (July 24th) Group I averaged 981 and Group II averaged 1,111 pounds.

Effect on the Per Cent. of Fat when Cows were Fed Slop.

At various times when the subject of the effect of good on the per cent. of fat was being discussed, I have been told that if you slop the cows, *i. e.* wet the meal until it is is like mortar instead of giving it to them dry, they will give more milk, but it will surely be very poor.

The following six cows were used in the experiment :

Lisgara,	calved Aug. 21st,	1893.
Rose,	" March 30th,	"
Patience,	" April 3rd,	"
Spot,	" Jan. 30th,	"
D. Queen,	" Feb. 28th,	"
Blue Bell,	" Apr. 11th,	"

The experiment commenced Nov. 6th and closed 26th, lasting three weeks. For one week previous to the experiment composite samples were taken of each cow's milk and tested. Weekly composite samples were also taken during the experiment from each one. The first week each cow was given all the bran slop she would eat (about 14 pounds of dry bran each day). The water was cold—the same as the water drank in the stable. The second week the slop was made of 4 pounds of bran and 4 pounds of wheat, cold. The third week same as second except that the bran and wheat were scalded and the slop fed warm. In addition to this they had about 6 pounds of hay and 40 to 50 pounds of corn ensilage each.

TABLE SHOWING PER CENT. OF FAT WITH SIX COWS BEFORE AND AFTER SLOPPING.

Week ending.	Niagara. Per cent. fat	Blue Bell. Per cent. fat	Patience. Per cent. fat	D. Queen. Per cent. fat	Rose. Per cent. fat	Spot. Per cent. fat
Nov. 5th (no slop.)	4.55	4.20	4.50	3.30	5.30	3.90
Nov. 12th (bran slop.)	4.40	3.80	4.50	3.20	5.60	3.40
Nov. 19th, bran and wheat slop (cold.)	4.50	4.30	4.70	3.30	5.75	3.40
Nov. 26th, bran and wheat slop (warm)	5.10	4.25	4.65	3.45	6.05	3.25
Average of last two weeks.	4.80	4.28	4.68	3.38	5.90	3.33

If we take the six cows as a group their milk tested an average of 4.29 for the week previous to the experiment, 4.15 the first week after receiving slop; 4.33 the second week and 4.46 the last or third week during which they were "slopped."

Quantity. The week previous to the experiment these six cows gave 829 pounds of milk. The first week after they shrank to 755. The second week they gave 635 and the last week 615 pounds of milk. We would naturally expect these cows to shrink in their flow of milk as three of them had been milking since spring—one since February, one since January, and one had been milking since August. They shrank more, however, after the slopping commenced than before. For instance, Lisgara for the week ending October 22nd, gave 166 pounds; week ending October 29th, 167; November 5th, 165 (week previous to experiment); November 12th (first week of experiment) 150; November 19th, 132; November 26th, 134 pounds. Blue Bell for the week ending October 22nd gave 140 pounds of milk; October 29th, 158; November 5th, 156; November 12th, 126; November 19th, 110; November 26th, 116 pounds. Take one more—Spot. The week beginning October 22nd she gave 117 pounds; October 29th, 106; November 5th, 104; November 12th, 90; November 19th, 64; November 26th, 55 pounds.

This experiment would indicate that "slopping" is an expensive way to feed cows, and there need be little wonder, when the physiology of a cow is considered By feeding wet food it passes more or less directly to the third and fourth stomachs without being re-masticated as is done when the food is given dry. More experiments are needed to settle the question.

EXPERIMENTS IN FEEDING WHEAT TO MILCH COWS.

The price of wheat having reached a point where it became a question whether to sell or feed wheat the Dairy department bought some ground wheat for feeding purposes. The price, delivered at the dairy, was $20 per ton. We have been feeding quite largely of this grain during the past year and have found it wholesome and cheap food for young pigs, young calves, and milch cows.

On November 22nd, 1892, we commenced feeding a ration of 50 lb. corn ensilage, 6 lb. hay and 8 lb. of ground wheat to Rose and Milne, and the same ration with 2 lb. of wheat and 10 lb. of ensilage extra to Kassie and Alvo. This has continued four weeks.

Rose,	calved	March	31st,	1892.
Milne,	"	July	24th,	1892.
Kassie,	"	May	19th,	1892.
Alvo,	"	Sept.	20th,	1892.

During the four weeks these cows gave 2,523 pounds of milk, containing 86.79 pounds of butter-fat, which would make about 95.5 pounds of butter. At that time we were getting 22 cents per pound for butter, therefore the value of their butter for the four weeks was $21. Their feed for the same time cost $15.93 (ration cost 12.9c. per day for Rose and Milne and 15.55c. for Kassie and Alvo), leaving a profit of $5.07, not very much to be sure, but it will be remembered that three of these cows had been milking for a considerable time.

December 12th, 1892, two fresh cows were fed the same ration as Rose and Milne, viz., 50 lb. ensilage, 6 lb. hay and 8 lb. ground wheat. This was continued for three weeks, during which time these cows gave 1,212 pounds of milk, containing 50.37 pounds of butter-fat, making about 55.5 pounds of butter. (One-tenth added to the fat to calculate the butter made.) This at 22 cents per pound would be $12.21, the value of the butter for the three weeks. Their feed cost $5.42 for the same time, leaving a profit of $6.79, assuming that the manure, skim and buttermilk paid for the labor.

We would recommend dairymen to try a ration of wheat and bran, or wheat and oats during the winter and if it is fed to the right kind of cows and the product handled properly, we feel confident that it will pay better than selling wheat at present prices. Besides this the increase in the value of the manure pile will be no small item. Good feed makes good manure.

At the conclusion of the preceding experiment, the same two cows were fed for four weeks on a ration of 50 lb. ensilage, 6 lb. hay, 4 lb. bran, and 4 lb. ground wheat. The object was to see whether 4 lb. of bran would replace the same number of pounds of wheat. Bran at this time was worth $12 per ton and wheat $20.

During the four weeks these cows gave 1,424 lb. milk, 60.58 lb. butter-fat, which would make about 66.5 pounds of butter. This at 22c. per pound would be $14.63—a profit of $8.30 as the food cost $6.33 for this time, ensilage being valued at $1.25 per ton, hay, $6 and bran and wheat as quoted above.

The first ration (wheat) with these two cows gave a profit of $6.79 for $5.42 worth of feed fed, or $1 in feed gave $1.25 profit; while with a meal ration of half bran and half wheat (coarse fodder being the same in both cases) $6.33 worth of feed gave a profit of $8.30, or $1 in feed gave a profit of $1.31 in butter. At prices quoted a meal ration of half bran and half wheat gave more profit than wheat alone.

To see what error is likely made by adding one-tenth to the fat, in calculating the butter made during any period, the milk from each cow was set separately for one churning during each week of the last experiment, and the cream obtained was churned separately. In the case of Duchess there was set 16.02 pounds of fat which produced by actual churning 17.56 pounds of butter. By adding one-tenth to the fat she would be credited with 17.62 pounds of butter. Of Ontario Pet's milk there was set 19.52 pounds of fat which produced 20.81 pounds of butter. By adding one-tenth to the fat she would have been credited with 21.47 pounds of butter. Taking into consideration the average losses of fat in handling milk we have found this a fair rule for finding the amount of butter which is likely to be made from the butter-fat found in the milk.

V. TRAVELLING DAIRIES.

During this year there have been two dairies on the road. The one working in Eastern and Northern Ontario was in charge of Mr. Carlyle, a graduate of the College. The other, which held meetings in the Western and the the Northwestern part of the province, has been under the supervision of several persons. Mr. Linfield, who was in charge last year, took the work for about a month, when he resigned to take a position in Utah. Mr. George E. Day, a graduate of 1893, then assumed control, but in September he resigned, having been appointed Lecturer in Agriculture at the College. I then took charge for about three weeks, when Mr. Beckett, another graduate of this year, took the work in hand and stayed until the close of the season. For this reason so full a report of this dairy cannot be given as might be expected. I have gathered a few facts from each, which, together with my own experience, must serve as a report for this year.

The Western Dairy commenced the season in Lambton on May 3rd, and held twenty-four meetings in this county, closing at Thedford, June 5th. The attendance averaged about one hundred in the East Riding. A number of cheese factories have been established, and farmers are very anxious to go more largely into the dairy business.

In the County of Huron twenty-six meetings were held. This is a great beef-raising county. There are also a number of creameries and cheese factories. Farmers appear to have made no provision for drouth, and as a consequence there was a great shrinkage in milk during the summer and fall. This is true for most of Western Ontario. The great difference there is in cows was shown at one place, where one man had eight cows which gave twenty-five pounds more milk per day, testing from one-half to one per cent. higher than his neighbor who kept fifteen cows. Parts of Huron were not well advertised—halls not engaged, and in some places no posters. Average attendance about forty.

Bruce had thirty-three meetings. Mr. Dack, the member for Centre Bruce, assisted in arranging the meetings, and also attended several. The attendance averaged forty, but it was a very busy time for farmers from July 25th to September 7th.

In Grey there were thirty-four places visited by the Dairy. Fourteen of these I attended. At most of them the interest was good. In some places little or no provision had been made to insure success. In one the gathering was in a barn, no other suitable place being available.

The County of Grey is noted for its creameries. The land is somewhat rough and rocky in many districts visited by me, but the excellent water and pasture furnish material out of which cows may make milk of the best quality. Cream is gathered for a number of miles in all directions from the creameries. Some are joint-stock, and others managed by private individuals. In nearly every place where farmers sold cream there was complaint about the testing. Unless this can be done in a more satisfactory manner the cream-gathering creamery is bound to lose the confidence of its patrons.

A great deal of the prize creamery butter at the leading fairs comes from this county, and they feel justly proud of it. In most of the parts I should conclude that dairying is the hope of farmers. Grain-growing can never be remunerative.

I found a great deal of interest taken in the testing, but owing to the fact that the samples were not taken properly little can be relied upon the whole milk samples brought to these meetings. On making enquiries as to how the samples were taken, in a number of cases I found that persons would forget all about taking samples at the usual time of milking, and would run out to the field or stable before starting and milk out enough for a test and bring this to the meeting. They might as well, and far better, have left it home, as it was a waste of our time and a waste of materials in testing. Others would try to have a test that would "beat all creation," or at least beat any neighbor's cow, and would bring some of the cream from a cow or else some strippings. Others would bring cream to be tested, and still others would fill a big bottle about one-third or one-half full, drive several miles to the meeting, and by the time it got there it was churned into butter. This was done in spite of explicit directions as to how to take samples. The attendance was about seventy-five in Grey.

From Grey the dairy moved into Dufferin, holding eleven meetings, beginning at Corbetton, October 26th, and closing at Rosemont. November 9th.

South Simcoe was the next point. Eleven places were visited. At Beeton, in this riding, a herd of five cows was tested, which gave per cents. of fat as follows: 1.1, 1.3, 1.8, 2.0 and 2.8, the average of the herd being 1.8. The owner said the samples had been correctly taken. "He had an idea that they were not paying very well." At another place a sample, which was correctly taken, tested 9.3 per cent. fat. These are examples that should show the importance of testing the cows in the herd.

An extra meeting was held at Mount Albert, in York County, November 28th, which closed the season's work. During the time which this dairy was on the road it travelled some 1,750 miles, held 140 meetings, and 1,944 samples of milk were tested. Addresses were given at all these meetings on various dairy topics, but most stress was laid on the importance of having good cows, proper and abundant feed and water, and the various steps in handling milk until it was put up in a neat, attractive form, ready for market, was fully explained. Thousands of "Hints on Butter-making" have been distributed. The work as a whole has been appreciated by those for whose benefit it was established, and no doubt great good will come from it.

The whole province has now been covered except the counties of Peel and Halton. Every farmer has had an opportunity of attending one or more of these daily assemblies, as they were so arranged that all might have the advantage of a practical lesson in butter-making, and hear the main points connected with dairying discussed.

Whether the work is to be continued or not has yet to be decided. With your permission, I would suggest that after the two remaining counties have been visited, the work take a more permanent form, somewhat as follows: Select some half dozen places in a county which would be convenient and central to the whole, and establish a working dairy which would remain for at least two weeks in each place. Where but one meeting in a place is held some persons just begin to hear about it after the dairy has gone away, and suddenly awake to find that they have missed something. The wide-awake people are always to be found at the one meeting, and the very persons who should be there forget the date or have some important business on that day, whereas, if it lasted for two weeks, all could attend, and the benefits would be lasting. Not only would I have churning every day, but also a separator or separators, different kinds of creamers, milk testers —in fact a complete small working dairy. A programme might be arranged each day something like this:

9 to 11 a.m.—Running of separators.
11 to 12 a.m.—Explanations and discussion regarding separators.
2 to 3 p.m.—Lecture on some dairy topic. (In two weeks a clever lecturer would cover a good part of the field of dairying.)
3 to 4 p.m.—Churning.
4 to 5 p.m.—Discussion on care of cream and methods of churning.
5 to 6 p.m.—Methods of setting milk illustrated.

This might be varied to advantage, and I simply give this to illustrate my point. If any place were sufficiently interested to furnish a suitable building and a supply of milk, that place would be selected. In this way I think more permanent good would be accomplished than by short stops in so many places.

Report of Mr. Carlyle.

To Prof. H. H. Dean:

Sir,—I have the honor to submit the following brief report of my work with the travelling dairy for the season of 1893.

In accordance with your advice, as well as that of Dr. Mills, I took the course at the Dairy School last February and March, from which I derived great benefit, and which assisted me very materially with my work during the past season.

After the Dairy School closed I got ready the outfit for both travelling dairies, so that when we left Guelph on the 26th of April to begin our work we had two very creditable outfits, which were practically the same as those used last year. I also had as my assistant and butter-maker Mr. J. A. McTavish, of Seaforth, who had spent the preceding season with the travelling dairy in company with Mr. Palmer. It is with pleasure that I now speak of the invaluable services rendered by this gentlemen. Always giving his work close, careful attention, and going through the different operations in such a skilful, deft manner as always impressed the ladies present with the importance of neatness and cleanliness in their dairy work.

During the year we visited and made a tour through the counties of South Ontario, Durham, Peterborough, Muskoka, Parry Sound, Algoma with Manitoulin and St. Joseph's Islands, Victoria, Haliburton, North Ontario, and Simcoe. We travelled altogether during the season 2,409 miles, held 132 meetings, delivered the same number of lectures, tested 2,350 samples of milk, of which 202 were buttermilk and fifty-one were skim milk. We churned 3,855 pounds of cream which made 987 pounds of butter, or about 3.92 pounds of cream required to make one pound of butter. Two meetings were advertised for but were not held. One was in Peterborough county, at Ennismore, when neither cream nor audience put in an appearance, and the other was at Manitowaning, on Manitoulin Island, where, on account of rough weather on Georgian Bay, we were unable to get in time for the meeting.

The arrangements for the meetings in each riding were all made previous to our visit by an agent sent from the College to consult with the officers of the different farmers' institutes, and with the members of the Ontario Legislature, where there were no institutes organized. This we found very necessary, as without it our route would not have been nearly so well mapped out for us nor would the meetings have been so well advertised.

We left Guelph on the 26th of April and drove to Pickering, in Ontario county, where our first meeting was held on the second day of May. We held twenty-two meetings in this county, being so distributed that one meeting at least was within reach of any farmer who wished to attend. We had an average attendance of about eighty persons, the majority being ladies, and although they often came to the meetings strongly prejudiced against us, it was very gratifying to us to find that in nearly every case the prejudice was due to a mistaken idea of the object and plan of the meetings. There were 382 samples of new milk tested, showing an average of 3.6 per cent. butter-fat; 15 samples of buttermilk with an average of 0.41 per cent. fat, and 8 samples of skimmed milk showing a loss of 0.92 per cent. of the butter-fat: the lowest test for skim-milk in this county being 0.3 per cent. and the highest 3.0 per cent. The farmers of this county have been slow to turn their attention to dairying, many of them expressing the opinion that their land was too good to devote it to such a purpose. Stock-raising and grain-growing has been the almost universal custom. The class of milch cows where such are kept, are those from which highest success in exclusive dairying cannot be expected. I found, however, a growing interest in the dairying industry. Cheese factories and creameries are slowly being established. They also place their main reliance for succulent food in the winter time on turnips instead of corn ensilage, which would be likely to improve the quality of the butter as well as being more profitable.

We next visited Durham county, where 18 meetings were held with an average attendance of about 70, the largest being over 200 and the smallest about 25. There were 312 samples of new milk tested, 6 of skim-milk with an average of 0.75 per cent. of fat lost, the highest being 2.0 per cent. and the lowest a mere trace, also 12 samples of buttermilk containing an average of 0.77 per cent. of fat, the highest being 2.5 and the lowest a trace. The farmers here were in some sections going into cheese factory work quite extensively. We visited the several cheese factories in the county, and found them all proving highly satisfactory where they were receiving the hearty support of the farmers. Durham county we considered one of the best visited for grazing cattle and co-operative dairy work. It is supplied with an abundance of pure fresh water from the spring creeks running through almost every section of the county. The land is rolling and well-adapted to the growth of grasses, clovers, corn, peas and roots. The storekeepers and other dealers in butter in the county complain bitterly of the turnip flavor of the butter made; also the bad flavors derived from musty cellars and other unsuitable places of storing the butter. One mare in our team proving in foal we found it necessary to effect an exchange, which we did, acting under the advice of Dr. Mills.

From Durham we passed into Peterborough county, which has made rapid progress in dairying during the past few years, especially in cheese-making. We held 18 meetings here, with an average of about 60 persons present. Allowance must be made, however, for the fact that most of the farmers were busily engaged with their haying operations or the average would probably have been much larger. One hundred and fifty-six samples of new milk were brought in for testing, 18 of buttermilk with an average of 1.1 per cent., the highest being 7.0 per cent., the result of mixing three different lots of cream in the one churning, two of them being sweet and the other one ripe. Had 7 samples of skim-milk averaging 0.5 per cent. of fat, the highest being 1.0 per cent. and the lowest being 0.3 per cent. At Ennismore was the only instance all summer where a meeting was not held on account of no attendance of farmers. The county we found well adapted for dairying purposes. In the northern part especially it offers greater natural facilities for this than for any other branch of farming. The people of this part of Peterborough, we found, were taking a deep interest in dairy work although laboring under great disadvantages in the form of poor buildings, poor stock and a long distance from a good market. In the southern part of the county we were surprised at the number of acres still devoted to the growing of fall wheat and as a consequence a general feeling of discouragement among the farmers at the hard times.

We next visited Muskoka, leaving our horses and waggon behind in Peterborough, when the horses were turned out to pasture. Our travelling consequently had to be done by railway, steamboat and an occasional livery conveyance. This of course entailed a vast amount of discomfort and night travelling, which, however, was compensated for in the pleasures to be derived from a trip through these "Highlands of Canada" in the summer season. We held 8 meetings in Muskoka district, with an average attendance of about 100. There were 155 samples of new milk tested with an average of 4 25 per cent. of fat, 8 samples of buttermilk with an average of 0.54 per cent. of fat. On several occasions farmers walked 13 miles to the meetings, carrying with them samples of their cows' milk to be tested.

This county, as is well known, is very much broken with rock, but where there is land it is very fertile and is well adapted to private dairying. Co-operative work will never, perhaps, be very successful here as the population will always be scattered and good roads at a premium. The climate in summer, the water, and sweet rich natural grasses leave nothing in these respects to be desired for those wishing to engage in private dairy work.

From Muskoka we proceeded northward along the railway line through Parry Sound district, where we held 12 meetings. These, with one or two exceptions, were very largely attended and a deep interest was manifested. The country was not so rough and rocky as we proceeded northward, and a point of interest perhaps was that the quality of the milk increased perceptibly, chiefly owing, I believe, to the abundant rich succulent pasturage and also to the splendid climate. Two hundred and seventeen samples of new milk were tested, showing an average of 5.54 per cent. of butter fat, the highest test being 7.4 and the lowest 3.0 per cent. We also tested 10 samples of buttermilk, showing an average of .73 per cent. fat, the highest being 2.6 per cent. and the lowest, .2. Six samples of skim-milk tested 0.4 per cent. fat. One of these was from shallow pans left sitting in a good place until sour, showed 0.6 per cent.; 3 were from "Cooley cans" set in cold water 12 hours (no ice used), average per cent. fat 0.6; one sample set in Cooley cans 24 hours with water changed 3 times, 0.1 per cent. fat and one sample from centrifugal separator tested 0.1 per cent. fat.

As in Muskoka, we found these farmers taking a deep interest in dairying, suitable markets being their greatest drawback; they were greatly impressed with the plan of putting the butter up in pound prints and shipping while sweet and fresh to the thriving railroad and mining towns of North Bay and Sudbury, where good prices could always be obtained for a good product.

We noticed a marked improvement in the country lying to the south of Lake Nipissing. Some of the finest grain growing and grazing farms I have ever had the pleasure of visiting are to be found in the South River Valley in the immediate vicinity of the village of Powassan. This land is so remarkably cheap and of such virgin fertility that it offers exceptional advantages to enterprising young men with a little capital. In the Magnetawan River Valley are found some very fine farming lands also.

From Parry Sound harbor we took the boat for Manitowaning, on Manitoulin Island, but on account of rough weather we were unable to make the port in time for the meeting which caused a great deal of disappointment, as some farmers had driven over thirty miles to attend. Only two other meetings were held on the Island, which were largely attended and a lively interest taken. We found abundant evidence of severe drouth here, which was entirely absent just across the channel on the mainland, which can largely be accounted for from the fact that the Island is of limestone formation while the mainland is of granite and seems to hold the moisture obtained from the heavy dews which fall every night.

Five meetings were held on the mainland of Algoma, which were largely attended, as were also the two meeting we held on St. Joseph's Island, where we were greeted with immense crowds and a very prosperous people. From what we saw of this small Island it has exceptional facilities for dairying purposes which the farmers are not slow to take advantage of. While in Algoma we tested 168 samples of new milk, seven samples of buttermilk and three samples of skim-milk with an average of 1.1 per cent. fat lost in it. Several small sections of Algoma we found to consist of excellent farming lands and the people appeared very well-to-do and seemed happy, contented and prosperous

From Echo Bay, near Sault Ste. Marie, we took the train for Omemee, in Victoria county, when we commenced travelling with the team and wagon again. The horses we found in splendid trim after the good rest they had been having, and which did their feet a great deal of good. We found the farmers of Victoria county still putting their main dependence in the growing of grain for sale, in the feeding of beef and also in some sections the growing of immense crops of potatoes for which the soil is especially well adapted. The major portion of the stock kept is of such a character as will never prove highly remunerative for purposes of dairying In this county a person travelling through could scarcely fail to be impressed with the fine farm buildings and stables to be found in the southern part of the county especially. If the farmers there could only be induced to go into winter dairying with a better type of dairy cattle their success would be assured, as their farms and buildings are well adapted for such a purpose. We held sixteen meetings in Victoria which were very well attended, and the people in some places showed quite a desired tendency towards the dairying interests. There were 216 samples of milk brought in to be tested.

In North Ontario the conditions were much similar to those in Victoria county, but the farmers in general evinced a much more lively interest in dairying, which was attributed to the previous visit of the travelling dairy two years ago. The county was perhaps more level than Victoria, and has a heavier soil, especially that portion bordering on Lake Simcoe. Ten meetings were held in this riding which were very largely attended especially in those places where meetings had been held two years ago.

We next passed round Lake Simcoe and into the east riding of Simcoe county by way of Orillia. The meetings had not been well advertised here, nor had they been well managed, so that the results were not nearly as favorable as they might otherwise have been. The average attendance was not above forty-five persons, which was the lowest during the whole season, and only 125 samples of milk were tested. In centre and west Simcoe our meetings were very successful and very well arranged indeed ; the attendance was large and and the interest well sustained. Silos and corn-growing were subjects of great interest among the farmers, and a cheaper production of milk is being sought after.

Plan of the Meetings.

We usually did our driving, which averaged about twelve miles per day, in the forenoon, reaching the place of meeting in time to get utensils unloaded and set up in the hall before dinner. In some places we had great difficulty in finding out where the meeting was to be held, no hall or other building having been provided. We usually went to the hall or school-house, as the case might be, about 1 o'clock and made ready for the churning and milk testing. On only one or two occasions during the whole season were we able to commence the meeting at the time appointed, the people usually being about one-half to three-quarters of an hour late. We usually had a chairman appointed who opened the meeting with a few suitable remarks, after which Mr McTavish proceeded to churn the cream, which had previously been brought to the proper temperature. I found it necessary first of all to explain the nature and the object of our meeting. It was surprising the number of different opinions we heard expressed regarding the nature of our work among the farmers. Some thought the butter was to be made without cream; some that we had some new "patent" process and were trying to sell the right; others that we were advertising the different utensils used, while very few came with a right impression of what our object really was. After correcting these views as much as possible I proceeded to explain each part of the work in connection with the churning as they came up, inviting at the same time any questions that might occur to anyone in the audience. We began churning the cream at a temperature of 62 degrees F. in the spring, always varying it a little as we thought the existing circumstances as to the temperature of room, quality of cream, etc, demanded. In the summer months we churned at about fifty-seven and then gradually rose until in November we churned at sixty-four degrees. We aimed to have the butter break in about twenty-five minutes, but found that the different qualities of cream often demanded a marked change of temperature to bring the butter in in the same conditions in the same length of time in churning. While the churning was proceeding the chief points of interest in the different methods of creaming the milk, the handling of the cream, feeding, watering and general management of cows were touched upon and discussed. When the butter broke the attention of the audience was directed to the method employed in removing all the butter-milk, the salting of the butter, and the importance of using good, pure salt that would be easily dissolved. Then followed the working, packing or printing and marketing of the butter, as they each came up. A small leaflet containing "Hints on Butter Making" was distributed, after which the

Babcock Test

was brought forward, and the manner of making a test fully explained, besides testing any samples of milk that were brought in for that purpose. The men, especially, manifested a deeper interest in this operation than in any other part of the proceedings. The importance of this test and the immense benefit to be derived from the intelligent use of it in private dairy work was seen at once when two bottles showing a wide difference in the percentage of fat were displayed and explained to them. The manner of testing a cow's milk throughout the season was touched upon as well as the importance of disposing of the poor cows at once; also the easy and accurate manner in which they could determine the effect on the milk of the different food rations fed. We also tested the buttermilk every day, and pointed out the importance of occasionally testing the skim and buttermilk so that any serious loss might be detected and the system changed or remedied so as to check such loss at once. If the different samples of skim-milk brought in to be tested were any standard to judge from, then this loss of butter in the skim-milk is a most serious one. We found that taking the average there was over 1.0 per cent. of fat in the milk lost in this way, which makes it a very serious loss when we reflect on the fact that the new milk did not test over 4.0 per cent. on the average. If the Babcock tester did nothing else than to check this loss it would be worth many times its cost price to the farmers af Ontario. The system of paying for milk furnished at cheese factories and creameries on the basis of its fat contents as shown by this test met with universal favor, cheese factory patrons being especially strong in advocating its adoption at once. We found a marked increase in the percentage of fat in the milk as the period of lactation in the cows and the season advanced. In May, the average of all the milk tested was 3.6 per cent., in August it was 4.9, and in November it was about 5.5 per cent.

The greatest need the farmers have was, in our judgment, an increased knowledge of the fundamental principles that underlie permanently profitable dairy work. With this would come at once the revolution that is so much needed in the feeding and management of our dairy cows. Too many farmers are crying for a better breed of cattle, when if the dairy cows of this province could be understood it would be found that nine-tenths of them would be crying in thunder tones, "Give us a better breed of dairymen before you condemn us." Without good feed and good care a good cow will very soon become a very poor one, and a great many of our so-called poor cows would surprise some of their owners were they only to receive a little more liberal treatment. There is a strong tendency in all animal life to either climb up or come down to the level of its environment. It is much more needful in my estimation to get the farmers to improve their methods of feeding and caring for the dairy cows they already have than to induce them to get a better breed. Good breeding is all right, but without good feeding and good management it is useless. From my experience among the farmers of the province I would much prefer a good common cow with no particular breeding and have her properly kept, than to have a cow with the best breeding and the best pedigree in the country without good feed and good care. Get the dairyman right first and he will soon produce the right cow. We did not find one farmer in seventy-five who made any provision whatever for supplemental green food for their cows when the pastures fail, as they most invariably do in the latter part of the summer season. A few acres of green peas and oats followed by a few acres of corn sown every year on every dairyman's farm would soon do much toward lessening the number of unprofitable dairy cows in this province. When a dairy cow once loses the "flow" of her milk it is almost impossible to bring her back to it again.

There is also great need for better buildings both for stabling the cattle and for providing a proper place to manufacture and store the butter as well as proper utensils to manufacture the product with. Without a suitable place for keeping milk and cream, etc., and proper utensils, good butter cannot always be produced no matter how efficient the butter-maker may be. For this reason, and for many others that might be enumerated, I always strongly advised the establishment of creameries or cheese factories, or better still a combination of these, where a sufficient quantity of milk could be obtained within reasonable distance to make the venture successful financially to the operator and proprietor. The centrifugal system of creaming milk was always explained and highly recommended where it could be practiced both in private dairies and in creameries. The advantages of winter creameries were also touched upon and the system advanced as much as possible. I also noticed where successful meetings had been held by you in connection with the travelling dairy of two years ago that we were always greeted with a much more intelligent appreciation of our work and abundant proof of a largely awakened interest in all branches of the dairy business, and in some instances in these places we were almost overwhelmed with questions from those who had benefited by the preceeding visit and were anxious for more light on the subject.

In conclusion I would like to say a word in appreciation of the valuable service rendered by the officers of the different farmers' institutes, members of the Legislature, and others who by their interest and zeal in advertizing the meetings assisted so materially in the success of our work. And on behalf of Mr. McTavish and myself I would like to take this opportunity of expressing our hearty thanks for and deep appreciation of the kindly, whole-souled hospitality extended to us by the farmers of this midland and especially of the northern district which we had the pleasure of visiting. All of which is respectfully submitted.

Your obedient servant,

W. L. CARLYLE.

VI. MISCELLANEOUS.

DAIRY MEETINGS.

Though relieved altogether from the regular farmers' institute work I attended and took part in the annual conventions of the three Dairy Associations of the Province during the month of January. Besides these I have attended a number of extra farmers' and dairy gatherings in various districts throughout Ontario. As a result of these meetings several factories have been started and assistance given in various ways. A number of travelling dairy meetings were attended by me, and addresses given in addition to the regular lecturers. I also took charge of each of the dairies for some time in the absence of the regular men.

CORRESPONDENCE.

During the year a great many letters came to the department, and the task of answering all these is not a small one. In addition to the business correspondence in connection with the Department, a number of queries are given, some of which require considerable time to answer. We are glad, however, to give help in this way, and any who have a *real* difficulty it will be a pleasure to assist. As an example of the foregoing we append the following questions and answers:

Queries Regarding Paying According to Test at Cheese Factories.

Question 1.—"At our annual cheese meeting one of the patrons asked me, if he kept part of his milk at home and sent the cream of it to the factory with the rest of his milk, did it make any difference to the rest of the patrons that were sending? Was it cheating himself or the other patrons by him sending the cream of that pool and keeping the skim milk at home, as he could feed it to calves and hogs? I would be pleased if you would answer the question for me, as I am going to pay according to butter-fat at both my factories."

Answer—At the one factory in the province where they paid by test last year, some of the patrons kept at home the "fore" milk, and some, I understand, skimmed and sent the cream. Now, is this fair and just to all patrons? is a question that has come up at several of the annual cheese meetings. Again, under the present laws could persons so keeping back "fore" milk or skim milk be prosecuted for fraud? My answer to the first question is, No; to the second, Yes. My reasons for the same are:

First Question. Suppose a patron has 200 pounds of three per cent. milk. That would be six pounds of fat. Now, suppose further that he skims the evening's milk, which we will say is 100 pounds of the same quality as his average. Say that he takes off twenty pounds of cream and mixes this with the 100 pounds of morning's milk and feeds the 80 pounds of skim-milk to calves and pigs. The 120 pounds of cream and morning's milk would test about five per cent. (making no allowance for loss of fat in skim-milk, which would be practically nothing if done with the separator), which would be six pounds of fat—the same as if he had sent the 200 pounds of whole milk testing three per cent., and he has the eighty pounds of skim-milk to feed. In other words, by paying according to test he would get just as much pay for his 120 pounds of cream and milk as he would for his 200 pounds of whole milk, and he has 80 pounds of skim-milk for feeding. Would this 120 pounds make as much cheese as the original 200? No, decidedly not; because there is lost about 2.3 pounds of casein (reckoning skim-milk to contain 2.88 per cent. of casein, according to Fleischman) in the skim-milk, which casein or cheese-making material would have added to the quantity of cheese made. Of course we know this richer milk would make more cheese and richer cheese than the same amount of three per cent milk. but would it bring that much higher price as to pay for skimming? We doubt it. This milk, however, will not be made up by itself, but will be mixed in a vat along with others, and some might say that the cream will add to the value of the whole vat of milk enough to warrant the extra pay. This cream would not, although normal rich milk would (if the average of the vat were rather low), because in normal milk there is an increase of the solids not fat with the fat, but in the case mentioned we have an increase in the fat without a corresponding increase in the other solids which are necessary in cheese-making.

In answer to the second question, so far as I am able to judge from the "Act to provide against frauds in the supplying of milk to cheese or butter manufactories," as amended by 55 Vict., Ontario Statutes, and published as an appendix in the Annual Report of the Dairymen's Association of Ontario, 1891, p. 201, this Act provides for nothing to cover the case in point, and should be amended so to do. "An Act respecting the adulteration of Food, Drugs and Agricultural Fertilizers" Dominion Statutes) does, however, offer protection in this case. Section 15 of this Act says :—" If milk is sold, or offered or exposed for sale, *after any valuable constituent of the article has been extracted therefrom*, or if water has been added thereto," etc. Skim-milk and "fore" milk certainly contain a "valuable constituent" for cheese-making, and parties retaining such would be liable to the penalties provided in the Act.

Question 2.—This question was sent by the secretary of one of our joint stock factories: "The question has been raised at our cheese factory, and I find that a difference of opinion exists as to the right of the maker to deduct from a patron's milk when he is aware that the can or cans were exposed to a shower of rain, and when payment is to be made according to the fat as shown by the Babcock tester and the composite test principle in testing once a week. Would you kindly give me your opinion?"

Answer—The following opinion was sent on this question: It will not be necessary for cheese-makers to deduct for rain when paying by test (except to make a "good average"), as water added will not affect the total fat credited to a patron. For instance, say a patron has 100 pounds of whole milk testing 4 per cent. fat, that would be 4 pounds of fat. Suppose further that 10 pounds of rain-water gets into this milk. That will make him 110 pounds of milk and water, which will test about 3.65 per cent., and will still be credited with about 4 pounds of fat. Theoretically this water would affect the composite test, but practically it would not to any great extent. For an explanation of this see the College Report for 1892, Dairy department, under Composite Testing.

Question 3.—"Do you think it will answer as well to take the avergage test for the month and multiply the month's milk thereby as to multiply each week's milk by the weekly test?"

Answer—It will be necessary to multiply each week's milk by the weekly test, as the following example will show:

1st week—300 lb. milk.	Composite test=3.00%=	9 00	lb. fat.
2nd " —500 " "	" " =3.50%=	17.50	" "
3rd " —400 " "	" " =4.00%=	16.00	" "
4th " —600 " "	" " =4.50%=	27.00	" "
Month—1800 lb. milk.	Average test, 3.75%=	69.50	total fat.

$1800 \times 3.75 = 67.50$ lb. fat, which the patron would be credited with by multiplying the total pounds of milk delivered by the average percentage of fat for the month, whereas we see the actual pounds of fat delivered would be 69.50—a difference of two pounds.

If the pounds of milk delivered each week and the weekly test during the month are much the same, do not vary a great deal, then the difference in the two methods would not be so much. The more that the weekly pounds of milk and the weekly test vary, the greater will be the error in multiplying the month's milk by the average of the tests for the month.

Shall I Buy a Cream Separator?

This question has been asked by a number of dairymen who are engaged in the manufacture of butter on the farm. In giving an answer, we should take into consideration the following points:

(1) The increased quantity of butter we may expect to receive by the use of a separator.

If the cows are fresh, and the deep can or the shallow pan are used in the very best manner, our experiments would lead us to conclude that there will not be very much difference in the quantity of cream and butter obtained from the three methods. But if the cows are strippers, or have been milking for six months or more, there will be a decided advantage in favor of the separator, which, if properly managed, skims this kind of milk just about as closely as any other. This was illustrated last winter when a prominent dairyman from Waterloo county brought down some samples of skim-milk to the College dairy to be tested. One sample tested five-tenths of one per cent. of fat, and the other showed one and one-tenth per cent. of fat. When it was explained to him that in the first case he was losing over half a pound of butter in every one hundred pounds of skim-milk, and over one pound in the second case, he said he could not stand that, and went to the city to negotiate for a separator. As to the reason why one sample showed more than double the amount of fat than the other did, we found that the first had been skimmed at a temperature of 40°, and the other at about 50°. This coincides with all our work here, which emphasizes the need of cooling below 45° to get good results with the deep pail system of creaming.

Judging from samples of skim-milk tested in different parts of the province, it would be safe to conclude that, as ordinarily handled on the farm, the separator will give from 20 to 25 per cent. more butter than the setting methods.

(2) Effect on the quality of the cream, butter and skim-milk.

As compared with the deep pail there would not be much difference, but there is an improvement in the use of the separator over the shallow pan. The chief drawbacks to the shallow-pan method are exposure to taints, the cream being too thick, and the skim-milk likely to be sour. I believe that as good butter can be made by the deep pail system as by the separator; but, under average conditions, the chances are in favor of the separator, as it removes all dirt, delivers the cream fresh, and gives the butter-maker a better opportunity to control the cream. The advantages are decidedly in favor of the separator when we consider the effect on the skim-milk. The best time to separate is immediately after milking, while the skim-milk still retains the heat from the cow, and is in the very best condition for feeding to young calves. Some fatty food added to this will raise excellent stock for the dairy.

(3) Cost of the machine.

This is really the drawback to the use of this method. A machine to separate the milk from fifteen or twenty cows in one hour is catalogued at from $150 to $225. Usually, however, those who sell these goods make a liberal discount from catalogue prices for cash. In buying one, I would recommend getting a larger machine than the present requirements of the herd, as you will probably be increasing, rather than decreasing the number of cows kept. For an ordinary sized dairy, I would not recommend buying a machine of less capacity than 500 pounds (50 gallons) per hour. The difference in price between a 250-pound machine and a 500-pound machine is not much, while the saving of time in using the larger machine is considerable.

(4) Cost of running, and expense for repairs.

Power of some kind will be needed. The advocates of hand-power separators may consider that turning the crank of a machine for an hour or two night and morning is easy work, but it is anything but fun. As soon as the novelty wears off, the preference for it will also disappear. The power used must be steady and regular. The tread power appears to be a cheap one, and gives satisfaction.

Oil is the chief item for running expenses, and this should be of good quality and used plentifully. The cost for repairs should be slight. Nearly all the machines now on the market are made durable, and the wearing parts are easily replaced at a small expense. Do not buy a machine which has not these qualities.

(5) Labor involved.

With a small quantity of milk the labor of getting the machine ready, and washing up afterwards, would be greater than with the setting methods; but where 200 pounds of milk or over are handled each day, there would be less labor with the separator. In winter time separating once a day is all that is necessary. This saves a great deal of work, as one washing a day of the machine and its parts is all that is required.

While not wishing to "boom" the separator, it is my opinion that for ten or more *good* cows it will pay a man who knows how to make good butter, and gets a good price for the article when made, to invest in a suitable machine. Every winter creamery should have one, and it would pay most of our summer creameries on the cream-gathering plan to put in a machine to separate the cream for those patrons living near the factory.

What is a Creamery Inch?

As a number of patrons of creameries on the cream-gathering plan might wish to know how the proceeds are divided, it may not be out of place to explain what is meant by a "creamery inch," and also what is meant when the creamery-man says cream tests 100, 120 or 150 per cent.

A creamery inch is one inch in depth of a pail twelve inches in diameter, or about 113 cubic inches. This amount of cream is supposed to make one pound of butter. Two inches in depth of a pail 8½ inches in diameter will give about the same bulk. When creameries first began measuring the cream, each patron was paid according to the *inches* of cream sent; but cream varies a great deal in quality, owing to a difference in the amount of skim-milk present, so it was found necessary not only to measure the cream, but also to test it. This is done by means of what is known as an oil-test churn. This churn differs from the Babcock test in that the oil test gives the *churnable* fat in cream, while the Babcock gives the absolute fat present.

When cream tests 100 per cent., it means that one creamery inch of such cream will make one pound of butter; a 120 per cent. test means 1.2 lb. of butter for each inch; a 150 per cent. test means 1½ lb. of butter for each inch, and so on. The driver measures the inches of cream given by each patron, and takes a test sample. The butter-maker makes the test, and by referring to a chart furnished with most test churns he is quickly able to tell how much butter each patron should be credited with. For instance, ten inches of 100 per cent. cream credits the patron with ten pounds of butter. Ten inches of 120 per cent. cream credits him with twelve pounds of butter.

The test ought not to vary much from day to day, and when it does vary it is likely due to one of the following causes:

Different persons skimming, who leave more or less than usual of skim-milk with the cream.

Careless sampling by the drivers. The cream should be well mixed before the sample is taken, and samples taken from every can or crock of cream.

Inaccurate testing, or measuring of the oil. This work should be carefully done, and done according to directions sent with each churn.

Visitors.

The number of visitors who call on us is increasing. Thousands of our own farmers have been to see us during the past year, and it is gratifying to meet such on my travels and hear them say they are putting into practice some idea which they got while on a visit to the Experimental Dairy of the College. Besides these, a number of foreign visitors have called to see what we are doing in dairying, and generally they express surprise to see the buildings and equipment for teaching this branch of agriculture. These men go back to their own country with new thoughts and new experiences, which they will doubtless add to their past practices, making them more perfect. They carry away some of our best methods, and we shall see the results in an improved product from the countries which these men represent, and it is advisable that we should also follow their example and try to get some of their best ideas and methods of dairy practice. All give and no take will advantage them and disadvantage us. I hope to be allowed an opportunity to visit some of the best dairy centres of Europe during the summer of 1894.

Importance of Good, Pure Milk for Cheese Factories and Creameries.

New competitors from Australia, New Zealand and Africa, to which latter place a travelling dairy has recently been sent from Great Britain, will make it all the more difficult to sell Canadian dairy goods at a profit. Australian grass-fed butter comes into direct competition with Canadian fodder butter, and as a result large quantities of creamery make were returned in 1893 from British ports and sold in Halifax and Montreal. A large exporter told me that about 4,000 packages of Canadian butter had been returned during the season. This butter, he said, if sold in the foreign market would not have netted more than 16 or 17 cents per pound, while it brought from 19 to 21 cents in the Canadian market. What does this teach? Two things, at least. First, that we have been seeking a market a long way off, while we have a better one at home, and will continue to have, for fresh creamery, for some years yet to come. Canadian people want good butter, and are willing and able to pay for it. Butter has brought from 25 to 30 cents per pound most of the winter in our larger towns and cities. Second lesson: All export butter should be of the finest quality; none other should be sent across the water.

At the present time where do we need to direct the improvement forces, that fine cheese and fine butter may be made in Ontario, both for the home and export trade? I say, without hesitation, towards the place where the milk is produced, and at the persons who are responsible for the milk sent to be manufactured. Our cheese and butter-makers, as a class, are well up in their professions. As a rule they are live, energetic men and women, and were every other class who have to do with the dairy industry as well posted and practised, there would be a marked improvement before long. Do not understand me to consider them perfect (for who is so?), but the means now in use, and which are being brought into use, are quite sufficient to educate this class. Why not educate the producer, and have the procession all move together?

What then Needs to be Done?

1. The dairymen of this country need to be impressed with the fact that a cow which produces less than 6,000 pounds of milk or 250 pounds of butter in a year is not worth wasting food and labor on her carcass.

2. Every feeder of cattle should know what foods are cheapest and best for milk production. For summer feeding nothing will equal good grass, with as great a variety as possible. Too many pasture fields lack a variety, and consequently we do not get those fine flavors produced on natural pastures. In addition to this the following might be fed: Bran, cotton-seed meal (not over two pounds a day to a cow), green peas and oats, tares and oats, and clovers, and in early autumn green corn. Winter feed should be cheap and succulent. During the past winter we have fed ground wheat with good results. Bran, the oil meals, peas and oats, corn, clover hay, corn ensilage, mangels, sugar beets and carrots may be profitably fed.

3. It will pay every owner of a factory to send some one around to the patrons at the *beginning*, the middle and the end of the season, and instruct them how to care for milk. We had to do this in connection with our Dairy School, and it would possibly have made us several dollars, have added to our reputation, and saved a great deal of worry and trouble, if we had done this sooner. A marked improvement in the quality of the milk, cream, butter and cheese was noticed after this was done. There are plenty of people who have a very faint idea of how to care for milk properly, and are willing to learn from those who do know. There are some, however, who will not be taught anything in reference to this, and they and their milk should be let alone. Let every owner of a factory send some one to instruct the patrons how to care for milk. (Greater care should be exercised in the selection of this person than in selecting a cow.) Failing this, have a copy of "Hints on the care of milk for cheese factories," which has been published by the Department of Agriculture, Toronto, along with other matter prepared by the dairy students of the O. A. C., sent to each patron of the factory at least twice during the season. It will not cost more than two or three dollars to get these printed, and it may be worth several dollars before the season is over. In the meantime it would be well to emphasize the need of:

1. Food for the cows that has no bad flavor.
2. Water that is pure enough for human beings to drink.
3. Strain and aerate the milk as soon as drawn from the cows. A simple pouring or dipping of the milk will effectually aerate it if continued long enough. If a patent aerator is used, be sure that it is kept absolutely clean. Look around the cracks and odd crevices to see that nothing lurks there. Morning's milk needs aerating as well as the evening's.

4. Keep the milk where there are no bad odors.

5. Leave the milk at the temperature of the atmosphere, except in very hot weather; then it may be cooled slightly.

6. Empty and wash the can as soon as it returns home. Drivers should put a pail of cold water in each can before leaving the factory. This is better than whey.

7. Rinse pails, cans and all milk utensils, first with cold or lukewarm water; second, wash with hot water, and finally scald, allowing the utensils to *dry themselves* in a pure atmosphere. *Never wipe a can or pail.* It gives a dish-cloth flavor.

Elaboration of Milk.

All organized bodies are an aggregation of cells. A cell is the smallest particle into which a plant or animal may be divided. "Cells possess the properties of nutrition, reproduction, growth, development, and, in many cases, their contents are capable of motion and manifesting irritability." The udder of the cow is a gland made up of numerous vesicles (cavities) which consist of a membrane lined with epithelial cells. These cells are the secreting organs or the seat of the changes by which milk is produced. A number of these vesicles gathered together form what is known as a lobule, and lobules united form a lobe which is surrounded by connective tissue, having a common outlet into the milk cistern situated at the upper portion of the teat.

Besides cells, the mammary glands consist of fat, blood, nerves and muscles. There are two glands which lie alongside each other, separated by a fibrous partition. It will be noticed that the cow's udder is divided lengthwise, not across the udder. Each gland has two outlets (on the side), and sometimes three. The whole is covered by the outer skin of the animal.

Exactly how milk is secreted or elaborated we do not know. There are two theories put forth in explanation of the process. The first one, known as the "Transudation Theory," assumes a simple filtering of the constituents of the milk from the blood through the gland, and a turning of them into milk by this process. The objections to this theory are put thus by Armsby: "The milk is not simply secreted from the blood like the urine in the kidneys, or the digestive juices in the stomach and intestines, but is formed in the milk glands from the cells of the gland itself—it is the liquified organ. This is shown even by the composition of its ash, which, like that of all tissues, contains much potash, and phosphate of lime, while the fluids of the animal body are poor in these substances and rich in chloride of sodium (common salt); the ash of milk contains three to five times as much potash as soda, while the ash of blood, on the other hand, contains three to five times as much soda as potash. Was the milk simply a transudate from the blood, it would have a similar composition, and could not serve as the exclusive food of the young animal, since it would not contain all the elements necessary for growth; but since it is a liquified organ, it is exactly adapted to build up other organs."

The second theory, known as the "Metamorphic" (change of form or shape), assumes that the milk is formed in the gland by the decomposition of the cells of that organ. Professor Sheldon says that a combinatian of the two will probably give the most satisfactory explanation, and this is more apparent when we consider the sources of the various constituents of milk. Neither casein or milk-sugar are found in the blood, consequently they could not be filtered from it, but are probably the result of a special cell activity. Fat, though found in the blood, is not there in sufficient quantity to supply the fat of the milk. "The milk-sugar, casein, and fats are all formed by the direct activity of the epithelial cells as a result of the decomposition of their protoplasmic (first formed) contents or their action on the food constituents in the blood. The other constituents of the milk, the water and salts, evidently result from a direct process of transudation from the blood, with the exception that, without doubt, a certain percentage of the potassium salts, and phosphates, like the specific milk constituents, originate in the metamorphosis (change) of the protoplasm (first matter) of the secretory cells."

From the preceding we would judge that the character of the gland has considerable influence on the quantity and quality of milk produced by a cow. Other things, such as food, surroundings, method of handling, period of lactation, frequency and regularity of milking, are all supposed to contribute somewhat towards the quantity and quality of milk.

Quick Churning.

A great many people are anxious to have the churning done in a few minutes. From ten to fifteen minutes exhausts the patience of the average man or woman. I saw an exception to this while out with the travelling dairy in the eastern part of the province in the month of June. As we drove along over the hills and through almost impassable roads, it being the time to do "road work," we passed a log house, and on the shady side was a man and two women. The man was exercising the muscles of his arms in a perpendicular manner, his hands tightly clutching the top end of a dash churn. From appearance I should judge that when the man grew tired churning, first one woman and then the other took a turn at it. They had evidently made up their minds to a half-day job, and did not seem to be at all put out at it. As a rule, however, the churner wants it to "come quick," and have done with it. Some apparently good authorities recommend quick churning, but our experience goes against this, especially in hot weather. The trouble we have had with rapid churning in summer is that the butter is usually soft, and the churning is not so effectually done as when a longer time is taken. In summer we take from forty to fifty minutes to churn, and as a result the butter nearly always comes out of the churn nice and firm and in granular form. This, we think, pays us for the extra time taken, and if we wish it may be salted, worked and printed ready for market at once, which cannot be done if the butter comes out of the churn soft. Another cause of soft butter is allowing the cream to become too warm while it is being collected for churning. It should never be above 65° in hot weather. The time required to churn depends upon:

1. *The Temperature of the Cream.* The warmer the cream to about 70° the more quickly will it churn and the softer will be the butter. The lower the temperature at which the butter will come in from forty to sixty minutes (or less time) the firmer will the butter be. The right temperature for churning each churner must find out for himself. From 56° to 60° in summer will be a fair range for most cream; in summer we churn at about 58.

2. *The Temperature of the Churn and Room.* These have quite a marked influence on the time required to churn. The warmer the room (other things being equal) the more quickly will the cream churn. The same may be said of the temperature of the churn. If it is wished to churn at 58° the churn should be about that temperature when the cream is put in. In nearly every case the temperature rises after churning for some time, due to friction.

3. *The Relation Between the Size of the Churn and the Amount of Cream to be Churned.* The larger the churn, or the smaller amount of cream to be churned, the more quickly will the churning be finished, A box or barrel churn, without dashers of any kind, ought not to be much over one-third full.

4. *The Ripeness of the Cream.* In reference to this latter point we have found that by raising the temperature a few degrees sweet cream may be churned in about the same time as ripe or sour cream. The loss of butter, however, will be considerable, as sweet cream to be effectually churned requires a temperature of from 50° to 55°, and one to one and a-half hours to churn.

5. *The Character of the Cream.* Cream from strippers' milk usually takes a longer time to churn than that from fresh cows.

The lesson to be learned is, that it will pay to take a little more time at the churning and have it completely churned, and the butter firm and granular when lifted from the churn. Quick churning and soft butter nearly always go together.

The Making of Cheese in Spring, Summer and Fall.

This Bulletin (No. LXXXVIII) was prepared by Committees of the Special Dairy School, 1893, at the Ontario Agricultural College, as follows:

Spring Cheese: A. T. Bell, Tavistock, Ont., (Chief Instructor in Cheese-making); W. W. Grant, Lakefield, Ont.; L. A. Zufelt, Morrisburg, Ont.

Summer Cheese: A. T. Bell, Tavistock, Ont., (Chief Instructor in Cheese-making); L. Patton, Oxford Mills, Ont.; J. S. Clark, Warwick, Ont.

Fall Cheese: T. B. Millar, Burgoyne, Ont., (Asst. Instructor in Cheese-making); W. Bothwell, Woodstock, Ont.; C. Stewart, Flesherton, Ont.

Care of Milk for Cheese Factories.

In order to maintain the proud distinction that Canadian cheese has already won in the British markets it is absolutely necessary that the dairymen shall put forth greater efforts than they have in the past to produce a better quality of milk. Progress must be the watchword.

The maximum of profit can be obtained only by the clear thinking, intelligent dairyman, who breeds and feeds to produce the greatest amount of milk of a good quality at the least possible cost.

The faithful and constant observance of the following points will result in a marked improvement in the condition of the milk supplied to the cheese factories, an improvement which is much needed, and the bringing about of which will enable the cheese-maker to produce an article much superior to anything that has been made in the past, and by so doing we can maintain our supremacy in the English market, realize a better price for our goods, and add very materially to the profits of the dairyman.

Nothing but pure milk from healthy cows should be sent to the factory. To secure this, cows should have abundance of wholesome, nutritious food and pure water, with access to salt at all times.

The greatest possible care should be taken to prevent cows drinking stagnant water. Milk from such cows is invariably tainted, and no amount of skill on the part of the cheese-maker can produce from it a really fine cheese.

Immediately after the milk is drawn it should be strained, then aerated by dipping or pouring, which can be done very effectively while the milk is yet in the pails. Be sure that this work is done in a pure atmosphere, with clean surroundings, away from the stables or anything else of an impure nature, for unless this be attended to properly aeration will be a detriment instead of a benefit.

It is not necessary to cool milk at night, unless the weather be extremely hot, in order to have it in the best condition for delivery at the factory in the morning (provided all pails, utensils, strainers, etc., have been thoroughly washed, then scalded with boiling hot water and well aired before using).

It is just as important that the morning's milk should be well aired before sending it to the factory; not only in the summer should milk be aerated, but also in the spring and autumn.

The milk stands should be built in such a way as to exclude the sun and rain, and yet allow a free circulation of air around the cans.

The organisms that produce bitter or tainted milk, or any abnormal change, are to be found only where there is filth and carelessness in handling, so that in all cases when complaint is made of impure milk the remedy must be *extra cleanliness*.

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 84° Fahr. The rennet test should then be used to ascertain the degree of ripeness. To make this test take 8 oz. of milk from the vat, add to it one drachm of rennet extract, stir rapidly for ten seconds. If coagulation takes place in from 17 to 20 seconds the milk is sufficiently matured for the addition of 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.

Great care and watchfulness should be exercised at this season, as milk sours very rapidly during the early period of lactation.

Use sufficient rennet (from 3 oz. to 4 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, then the perpendicular. Begin when the curd is somewhat tender and 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 time 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 five 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 $\frac{1}{8}$ in. or less 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 it to mat. When it has become sufficiently matted cut into convenient strips (about 8 in. wide) and turn. In about 15 minutes they may be turned again and piled two deep. Turn frequently (four or five times an hour) to prevent any whey from 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 flakey appearance on being pulled apart and shows acid to about $\frac{3}{4}$ in. on the hot iron 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 $1\frac{1}{2}$ lb. to 2 lb. of salt per 1,000 lb. of 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 the press about 45 minutes they may be taken out and neatly bandaged; only pure water should be used in bandaging. They should be turned again in the hoops 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 twenty hours before removing to 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. Aeration and cleanliness should have the same careful attention.

When the milk arrives at the factory each can should be subjected to a strict examination by the cheese-maker (do not 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 it 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 $\frac{1}{4}$ in. 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 do not hash or slash the curd. Use the horizontal knife first, finishing with the perpendicular, and if the milk is over-ripe and going to work fast—as is quite often the case in hot weather—then cut the curd considerably finer. By so doing the cooking process is hastened; the cubes of curd being small they are much more easily cooked than if left the ordinary size. When the cutting is finished start to stir very gently at first, or until the curd becomes somewhat firm. Do not apply heat for 10 or 15 minutes after stirring is commenced. Heat gradually up to 96°, taking fully one-half hour to do so, unless in the case of fast working curd, which requires to be heated up as quickly as possible to ensure a thorough cooking. Continue stirring for some time after the desired temperature has been reached to prevent matting and to ensure a more uniform and thorough 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; then by keeping it stirred and airing well the flavor will be very much improved. Draw off all the whey when the curd shows $\frac{1}{4}$ in. 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 15 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 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, 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. Hoop in from 15 to 20 minutes after the salt has been well stirred in.

Apply pressure very gently at first, or until the whey begins to run clear, after which 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 there for the night.

Turn them in the hoops in the morning, paring 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 into the curing-room, which should be kept as cool as possible during 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 the cheese with the date when made, the number of the vat made from, and by so doing a great many difficulties may be overcome.

Fall Cheese.

After getting the milk into the vats heat up slowly to 86° or 88°. Ripen the milk well (a few seconds less than for summeer cheese) before setting, and if the weather be cold better results can be obtained by using a little clean-flavored sour milk for a starter, but do not under any circumstances use thick milk.

Enough rennet should be used to cause perfect coagulation in forty minutes.

Begin cutting with the horizontal knife and finish with the perpendicular, cutting continuously until it is finished.

After the cutting is completed the curd should be stirred slowly and gently for ten or fifteen minutes before any heat is applied, then raise the temperature gradually to 96° or 98°, taking about forty-five minutes to attain the desired temperature. Dip the curd when it shows $\frac{1}{4}$ in. acid by the hot iron test, stir well until the whey has all escaped, then keep the curd warm (about 94°) and allow it to mat. When matted cut or break into convenient strips and turn over occasionally. Do not allow any whey to gather in pools on or around the curd. When it feels mellow or will show $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. acid by the hot iron test it should be put through the curd mill. Stir and air well immediately after grinding. When the curd is well matured and has a silky, buttery appearance, the salt may be applied. Use at the rate of $2\frac{3}{4}$ lb. to $3\frac{1}{4}$ lb. of salt per 1,000 lb. of 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 fifteen to twenty minutes after the salting is done. Apply pressure very slowly at first, and allow the cheese to remain in the press one hour before turning. Only pure warm water should be used when bandaging.

Turn the cheese in the hoops every morning, never allowing a cheese to be placed in the curing room unless it has a perfect finish.

The temperature of the curing room should be kept constantly between 60° and 65°.

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 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 hot 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.

This Bulletin has been copied very largely by the agricultural and dairy press of both the United States and Canada. We have received a very great many inquiries for it, and makers throughout the Province have said it is one of the best publications on the subject of cheese making. When we consider that it is the experience of over 30 cheese makers (some the very best) from both Eastern and Western Ontario, they being represented by the committees, the Bulletin becomes more valuable than if it were the production of one person.

Our Experience With Extractor Butter.

As the Butter Extractor is somewhat new to Canadian dairymen, in fact so far as I know the machine used in the Dairy School this year is the only one in use in the province, it might interest them to know how this machine and its product succeeded with us.

The difference between an extractor and a separator is, that the latter takes the cream from new milk, while the former goes a step further and churns the cream—after separating—into butter all at one operation. The process is quite simple, and when the working of the machine is understood there need be no difficulty. The machine used was a small sized one (No. 4), capacity as an extractor about 300 lb. per hour and as a separator 350 lb. to 400 lb. per hour, made by the Farm Machine Co., Bellows Falls, Vermont. As a separator it works very nicely and also does good work, as an extractor it skims down to a "trace" of fat in the skim or buttermilk as it should be called.

The milk requires to be put through the extractor at a lower temperature (70 to 72 degs.) for extracting than for separating. When the butter comes from the machine it is in small particles about the size of pins' heads and has more or less milk mixed with it. It requires to be washed similarly to ordinary butter and takes more salt to give it the same saltness. After being washed, worked and salted, it tastes something like sweet cream with a little salt in it. Those who like a very mild flavored creamy butter will find in the extractor butter that which suits their taste. It has, however, a somewhat greasy appearance and taste, lacking the grain found in good butter as we understand it. It also lacks the "bouquet" smell which buyers look for in butter of good quality. For two or three days after being made it is quite eatable, but with us it began to go off in flavor after this time, until at the end of a month it was wholly unfit for use.

On going into the refrigerator April 17th, Mr. Rogers, our butter-maker, said to me, "We shall have to get the extractor butter out of this as it will spoil the flavor of all the rest," (most of this butter had been made during March). I said, "Well, what shall we do with it."

"Give it to the pigs," said he.

"No," I said, "I'll tell you what we will do. You are going to churn to-morrow, are you not?"

"Yes."

"Well, save the buttermilk from the churning; take this butter and melt it, then churn it in the fresh buttermilk."

Accordingly on the morrow Mr. Rogers put about 25 pounds of this butter in a deep pail and then set the pail into a can of hot water (about 175 degs.) and melted the whole lot. The churn had the buttermilk in it. Steam was up and he quickly put the mêlted butter into the buttermilk, started the churn and in about ten minutes had as nice granular butter as one would wish to see. The buttermilk was now drawn off and the butter washed with cold water. This was removed and it was again washed with brine water and allowed to drain in the churn. After some time it was put on the worker, salted and worked. Owing to the water being a little too cold the granules were somewhat difficult to press together and they presented a pretty sight as they moved about under the rollers like grains of gold. The writer turned the crank and Mr. R. did the ladling and turning. By-and-by it began to mass and the buttermilk appeared. This was a great surprise as when in the granular form we would have declared there was not a particle of milk in the butter. As it was pressed more, the buttermilk increased until quite a large quantity of milk was taken from what appeared to be a mass containing no milk whatever. In explanation of this we concluded that the extractors must drive into the particles of butter more or less milk, else it does not separate the curdy portion from the fat or butter. This doubtless accounts for the fact that the butter did not keep, as butter will not remain good which contains a high percentage of curdy matter. This causes a great deal of farm butter to spoil quickly. It can be remedied by washing the butter in the granular form.

When this butter, which was wholly unfit for use before treatment, had been put up in neat pound packages and wrapped in parchment butter paper, it would have tempted almost anyone to purchase it. Of course the flavor was not first-class, but it will do very well for cooking, and a great many times during the past winter I have eaten worse butter at hotels and on the tables of persons who pride themselves on knowing how to make good butter. This, then, seems a simple way to improve butter that is off in flavor.

What then are the conclusions to be drawn from our experience with extractor butter?

1. We would not recommend butter-makers to invest much money to manufacture this line of butter as the market for such is very limited at present.

2. It should be shipped to the consumer immediately it is made as we do not find it improve with age.

3. This butter lacks the flavor and aroma which customers generally look for in a first-class article.

4. That the Extractor is not likely to become an important factor in Canadian dairying for some time yet. The use of the cream separator, proper ripening of the cream and the making of fine butter in the old box or barrel churn are three things which butter-makers need to study at present. To our ordinary makers, I would say:

> "Be not the first by whom the new is tried
> Nor yet the last to lay the old aside."

Dairy Frauds.

Last year I referred to a fraud known as the "Black Pepsin" swindle which was "worked" among our dairymen. This year we have encountered two similar ones. The one we have tried and the other we expect to as soon as arrangements can be made.

Early in the year a man visited us who had a "Butter Increaser" that would work wonders in butter-making. (In justice to the man who brought the "increaser" to us for trial, I would say that he was honest in his intentions and, like many more, wished to know if it would do what was claimed for it, and if so he intended to handle the article in Ontario.)

A circular entitled "Are you interested in Butter-making? if so, this circular contains some facts and information which should receive more than a passing notice," sets forth some rather new doctrines in dairying. It commences by stating that "It is commonly supposed that butter-fat exists in cream only in the proportion of two pounds of fat to each gallon of cream, which opinion is, no doubt, based on the fact that this is the highest average yield of butter." This alone is enough to convince anyone who knows a little about dairying that the person who wrote the foregoing is not an expert dairyman.

After "considering the character of milk," giving its chemical composition, the circular goes on to speak of "The Formation of Cream" and its average composition. (A table is given showing percentage composition.) After referring to this table it says, "From it you will learn that each gallon of cream contains, on an average, two and two-thirds pounds of butter, and as the highest average yield is known to be but two pounds, it is thus proven that *from every gallon of cream churned there is two-thirds of a pound of butter left in the buttermilk.*" If every dairy statement rested upon such proof as the foregoing where would we be? It further states that the "Increaser" "takes every particle of butter out of the cream, thereby saving the 20 to 30 per cent. now lost in the buttermilk. We wish it distinctly understood that Chase's Butter Increaser is entirely free from, and foreign to, such articles as the so-called Black Pepsin, etc." It is unnecessary to quote any more. Experiments were made with following results:

	lbs. Cream.	Time reg'd to churn.	lb. butter.	Per cent. of fat in buttermilk.
May 3rd.	31.5 (increaser added)	20 mins.	7.53	0.15
	31.5 (same lot of cream no increaser)	20 "	7.59	0.15
" 4th.	22 (increaser)	14 "	6.91	0.05
	22 (no increaser)	17 "	7.19	0.05

Comment is unnecessary.

I may add that the agent, or would-be agent, went to Chicago after leaving us, to interview the firm and wrote back saying that he was sure if I could only see Mr. —— I would be convinced that it was a good thing. A hearty invitation was extended to the gentleman to visit us and we would do all in our power to make the experiment a success, but so far he has not called. We have still a sample of the liquid, and still invite him to show us how to increase our butter production. We are after light as well as others.

The latest in this line is "Thurston's New Butter Process," which "will make two to three times the amount of butter that can be made by any other method yet invented; no chemicals or extra machinery required." The gain is figured out as follows: "Milk weighs ten pounds per gallon; one cow giving two gallons of milk per day, in one year will average about 550 gallons weighing 5,500 pounds, and by the old method produces 220 pounds of butter. By the new process of 8 pounds per 100 pounds of milk, 440 pounds of butter are produced in one year. A gain by the use of new process over and above the old method of 220 pounds at fiften cents per pound brings $33 per year or an average monthly increase of $2.75 over the old method."

In regard to this I would say that it is impossible to make this increase, if the butter is all taken out by ordinary churning, which can be done. It might be possible to make an increase by incorporating some of the solids not fat of the milk or a large percentage of water and thereby produce a mixture that would not be good butter in the ordinary and proper acceptation of the term.

There are no experiments to report of the "new process" at this date, though the firm has signified its intention to call on us shortly. Before pronouncing definitely about this I would like to have an opportunity to try the "process," but would say here by way of warning that my judgment is that they cannot do honestly what they claim. To the farming public and dairymen specially, I would say: *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 Experiment Farm or our own farm at Guelph, who have a better opportunity to test these things than the ordinary dairyman.* So far as possible we shall be pleased at any time to give dairy utensils, butter processes, cheese methods, or goods used in the dairy and which are likely to be of service to farmers, the fairest and fullest trial.

This much had not been written were it not a fact that a number of farmers and others have been "taken in" by fraudulent methods and even now there is a case before the courts in which a man, who has apparently lost a large sum, is suing the parties for obtaining money under false pretences.

Still another came to my notice this week. It is called "Gastric Sodea," and makes similar claims to those previously mentioned. A leading druggist in Guelph had never heard of such a substance, but has promised to get some for us if it can be obtained.

In conclusion, I wish to express my appreciation of the good work done and the faithful assistance rendered our butter-maker and dairyman. The cattleman has kept the stables in a model condition, and looked after the stock well. To the instructors of the Dairy School I am indebted for their good service during the short course. Great credit is due the persons entrusted with the travelling dairies.

To yourself I am under obligation for counsel and advice at various times during the year, and for the deep interest taken by you in the welfare of the Dairy Department.

All of which is respectfully submitted.

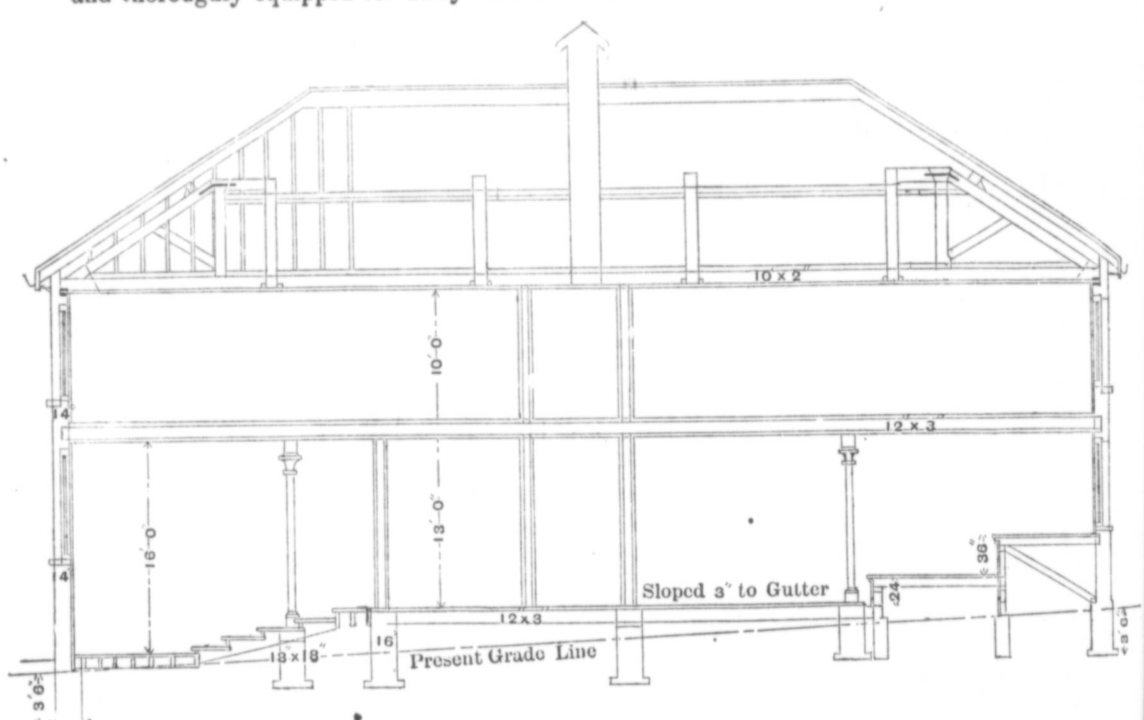
Your obedient servant,

H. H. DEAN,

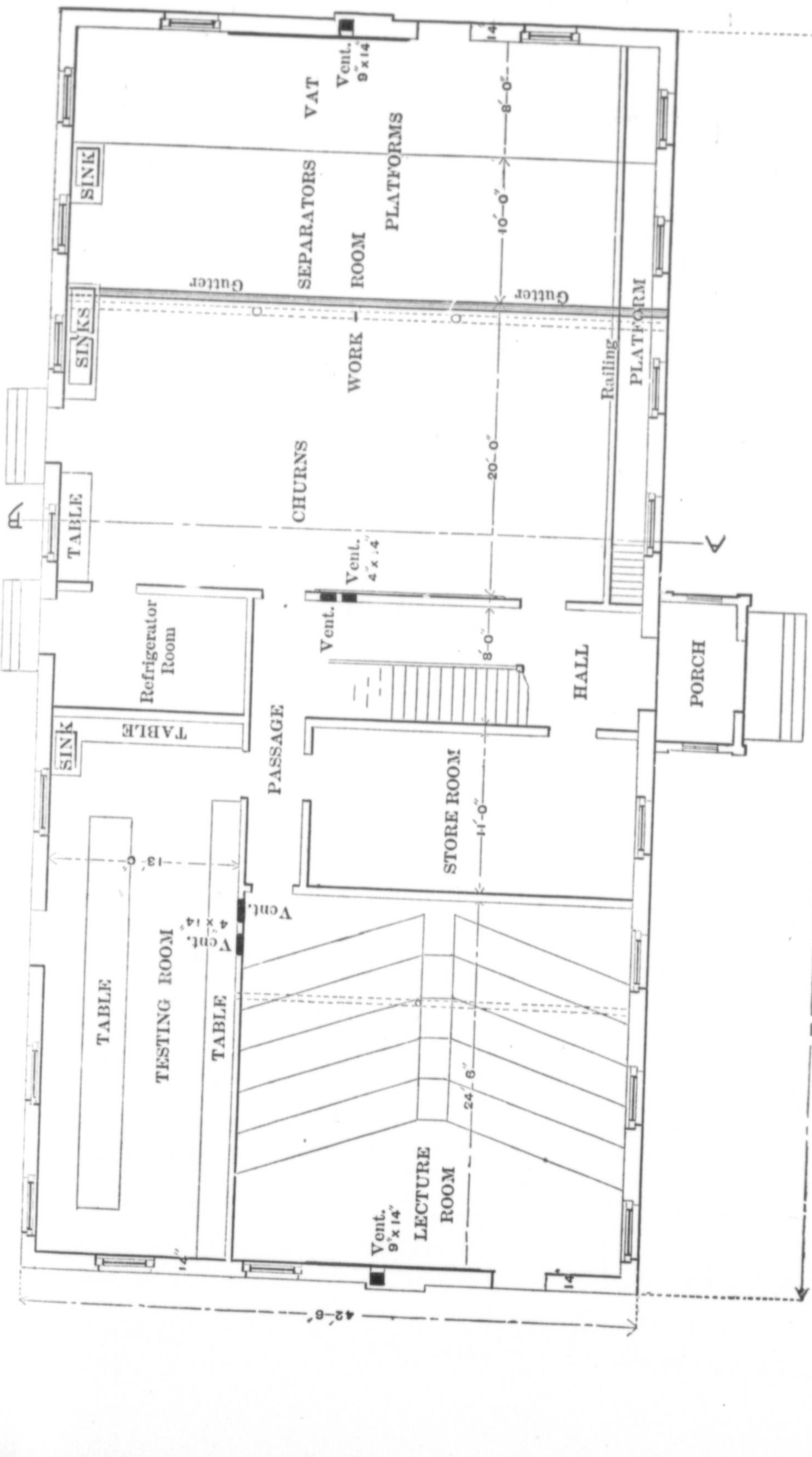
Prof. of Dairying.

NEW DAIRY BUILDING.

The two cuts herewith included represent the ground floor and a longitudinal section of the new dairy building. The building is of red brick, two stories, and as shown on the plan is fitted up for butter-making, etc. The old building is fitted up for cheese making and the work in the "Home dairy course." The separating room contains six separators of different makes, the power being supplied from the old dairy building which stands close by. The two buildings are now complete in every respect and thoroughly equipped for dairy work in all its branches.



LONGITUDINAL SECTION.



PLAN OF GROUND FLOOR OF NEW DAIRY BUILDING AT ONTARIO AGRICULTURAL COLLEGE, GUELPH.

GRA

1. BACHEL

1893—Beckett, H.
1893—Bell, L. G.
1890—Brodie, G. A
1891—Buchanan, D

1892—Carlyle, W. L
1891—Cowan, J. H.
1888—Craig, J. A.
1893—Crealy, J. E
1888—Creelman, G.

1893—Day, G. E.
1890—Dean, H. H.
1893—Dyer, W. D.

1893—Eaton, L. W.

1888—Fee, J. J.
1891—Field, H.

The total number

1888—Austin, A. M.
1880—Anderson, J.
1880—Ash, W. E.
1893—*Atkinson, Jas.
1892—Aylesworth, D.

1881—Ballantyne, 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.
1888—Budd, W.

* Gold Medalist.

APPENDIX I.

GRADUATES, ASSOCIATES, AND COLLEGE ROLL.

1. 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.
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.
1891—Field, H.

1892—Gibson, D. Z.

1889—Harcourt, G.
1892—Harrison, F. C.
1891—Hewgill, E. A., (*ob.*)
1891—Hutt, H. L.
1889—Hutton, J. R.
1892—Hutchinson, J. W.

1889—Lehmann, A.
1891—Linfield, F. B.

1892—Marsh, G. F.
1890—McCallum, W.
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.
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 262, 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.
1888—Budd, W.

1885—‡Butler, G. C.
1884—Black, P. C.
1882—Blanchard, E. L.
1886—Broome, A. H.
1886—‡Brown, C. R.
1888—Brown, S. P.
1893—Brown, W. J.
1892—Burns, J. A. S
1893—Burns, J. H.

1886—Calvert, S
1890—Campbell, C. S.
1877—Campbell, J. A.
1880—Campbell, D. P. L.
1892—Carlaw, W.
1891—Carlyle, W. L.
1884—*Carpenter, P. A., (*ob.*)

1888—Carpenter, W. S.
1892—Carpenter, F. C. S.
1886—Cobb, C.
1880—Chapman, R. K.
1882—Charlton, G. H.
1882—Chase, O.
1879—Clark, J.
1879—Clinton, N. J.
1880—Clutton, A. 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.

* Gold Medalist. † First Silver Medalist. ‡ Second Silver Medalist.

ASSOCIATES.—*Continued.*

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.
1890—Dolsen, W. J.
1887—Donald, G. C.
1887—Donaldson, F. N.
1877—Douglas, J. D.
1877—Dunlop, S.
1892—Dyer, W. D.

1892—Eaton, L. W.
1890—Elliott, R.
1893—Elmes, W. A.
1888—Elton, C. W.
1888—Elton, R. F.
1882—Elworthy, R. H.
1887—Ewing W.

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.
1893—Hay, L.
1888—Heacock, F. W.
1890—Hewgill, E. A., (*ob.*)
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.

1893—Kennedy, P. B.
1888—Knowlton, S. M.

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.
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—Naismith, 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.
1889—Randall, W.
1889—Rennie, E. A.
1883—*Robertson, W.
1879—Robertson, J.

* Gold Medalist. †First Silver Medalist. ‡Second Silver Medalist.
§ Winner of the Governor-General's Medal—the only medal given that year.

ASSOCIATES.—*Continued.*

1881—Robins, W. P.
1879—Robinson, C. B.
1893—Roper-Curzon, A. C. H.
1892—Roper Curzon, S.
1881—Ross, J. G.
1892—Ruthven, W. A.

1884—Saxton, E. A.
1888—Serson, W. E.
1892—*Shaw, R. S.
1888—Sinclair, J. J.
1882—Silverthorne, N.
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.

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.*)

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
1891—White, E. F.
1892—Wiancko, A. T.
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.
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 Medalist. † First Silver Medalist. ‡ Second Silver Medalist.
§ Winner of the Governor-General's Medal—the only medal given that year.

3. College Roll for 1893.

Third Year Students.

Name	P. O. Address.	County, etc.
Aylsworth, D	Bath	Lennox, Ont.
*Beckett, H. L	Hamilton	Wentworth, Ont.
*Bell, L. G	Qu'Appelle Station	Assa., N. W. T.
Brodie, C. J., B.S.A	Bethesda	York, Ont.
†Brown, W. J	Dunboyne	Elgin, Ont
Burns, J. A. S	Halifax	Nova Scotia.
†Burns, J. H	Kirkton	Huron, Ont.
Carpenter, F. C. S	Rat Portage	Rainy River District, Ont.
*Crealy, J. E	Strathroy	Middlesex, Ont.
*Day, G. E	Guelph	Wellington, Ont.
*Dyer, W. D	Columbus	Ontario, Ont.

*Obtained the degree of B.S.A. in June.
†Received an Associate Diploma in June.

3. College Roll for 1893.

Third Year Students.—Continued.

Name.	P. O. Address.	County, etc.
Eaton, L. W	Dartmouth	Nova Scotia.
†Ferguson, J. J	Smith's Falls	Leeds, Ont.
Graham, W. R	Belleville	Hastings, Ont.
Hamilton, C. A. W	Leamington-Hastings	Rugby, England.
†Kennedy, P. B	Sarnia	Lambton, Ont.
†McCallum, Wm	Guelph	Wellington, Ont.
Roper-Curzon, S	London	England.
*Shaw, R. S	Guelph	Wellington, Ont.
Sleightholm, F. J	Brampton	Peel, Ont.
*Soule, A. M	Niagara Falls South	Welland, Ont.
†Spencer, J. B	Brooklin	Ontario, Ont.
Story, H	Picton	Prince Edward, Ont.

Second Year Students.

Atkinson, Jno	Seaforth	Huron, Ont.
Atkinson, Jas	Seaforth	Huron, Ont
Brooks, W. C	Brantford	Brant, Ont.
Buchanan, Jno	Hensall	Huron, Ont.
Caldecott, F	Toronto	York, Ont.
Carrick, C. S	Kincardine	Bruce, Ont.
Christian, A. H	Danforth	York, Ont.
Conn, Joseph	Heathcote	Grey, Ont.
Cook, J. H	Gordonville	Wellington, Ont.
Cooper, W. W	Kippen	Huron, Ont.
Dean, F	Harley	Brant, Ont.
Doherty, W. M	Eglinton	York, Ont.
Duffett, G. P	Adolphustown	Lennox, Ont.
Elliott, Wm	Galt	Waterloo, Ont.
Elmes, W. A	Princeton	Brant, Ont.
Findlay, J. H	Barrie	Simcoe, Ont.
Fitzgerald, J. P	Mount St. Louis	Simcoe, Ont.

* Obtained the degree of B.S.A. in June.

† Received an Associate Diploma in June.

3. College Roll for 1893.

Second Year Students—Continued.

Name.	P. O. Address.	County, etc.
Graesser, F. A	Llangollen	North Wales.
Harvey, T. B	Charing Cross	Kent, Ont.
Hay, L	Ruda Guzowska	Poland.
Henderson, R. H	Rockton	Wentworth, Ont.
Heward, A. D	Toronto	York, Ont.
High, A. M	Beamsville	Lincoln, Ont.
Husband, E. M	Cairngorm	Middlesex, Ont.
James, D. A	Nilestown	Middlesex, Ont.
Kennedy, W. A	Apple Hill	Glengarry, Ont.
Kidd, D. F	Cookstown	Simcoe, Ont.
Lailey, F. T	Toronto	York, Ont.
Laird, J. G	Sarnia	Lambton, Ont.
Lehmann, R. A	Orillia	Simcoe, Ont.
Millichamp, R. W	Toronto	York, Ont.
Maclean, R. R	Stanley House	Parry Sound District, Ont.
McCrimmon, W. D	Glen Roy	Glengarry, Ont.
McKay, W. E	Prince Albert	North West Territory.
McKenzie, W. G	Fairview	Oxford, Ont.
McMordie, R	Kippen	Huron, Ont.
McNaughton, K	Walkerton	Bruce, Ont.
Phin, A. E	Hespeler	Waterloo, Ont.
Reinke, C. E	Ancaster	Wentworth, Ont.
Robertson, G. A	Kingston	Frontenac, Ont.
Roper-Curzon, A	London	England.
Shorey, S. C	Harrowsmith	Addington, Ont.
Simpson, A. E	Hamilton	Prince Edward Island.
Smyth, F. L	Tormore	York, Ont.
Stewart, Jacob	Snake River	Renfrew, Ont.
Thompson, Walter J	Edgar	Simcoe, Ont
Traviss, C. H	Holt	York, Ont.
Vipond, J. M	Donegal	Perth, Ont.
Walker, F	Norwich	Oxford, Ont.
Wheatley, Jno	Blackwell	Lambton, Ont.
Widdifield, J. W	Siloam	Ontario, Ont.
Wilson, E. E	Brampton	Peel, Ont.
Wood, R. S	Walton-on-Thames	Surrey, England.

3. College Roll for 1893.

First Year Students.

Name.	P. O. Address.	County, etc.
Ainley, W	Barrie	Simcoe, Ont.
Aylen, C. S. F	Southsea	England.
Balfour, T. B	Amherstburg	Essex, Ont.
Bard, A. L	Bardsville	Muskoka, Ont.
Bowker, C. G	Bedford	England.
Brent, A. H	Tyrone	Durham, Ont.
Brown, Robt	Hermitage	Dalbeattie, Scotland.
Bruneau, A. E	Montreal	Quebec.
Burdett, A. H	Nr. Bristol	Somerset, England.
Butler, E	Dereham Centre	Oxford, Ont.
Campbell, W. G	Brantford.	Brant, Ont.
Carlyle, S. G	Chesterville	Dundas, Ont.
Cass, L. H	L'Orignal	Prescott, Ont.
Chadsey, G. E	Sumas	British Columbia.
Clark, J. F	Bay View	Prince Edward Island.
Clunn, W. P	Prestwich	Manchester, England.
Clunn, H. E	Prestwich	Manchester, England.
Comfort, J. H	Tintern	Lincoln, Ont.
Cowieson, W. R	Queensville	York, Ont.
Day, A. H	Guelph	Wellington, Ont.
DeHart, E. F. R	Whitby	Ontario, Ont.
DeHart, R. A	Creighton	Simcoe, Ont.
Dunn, E	Plover Mills	Middlesex, Ont.
Edelsten, E. J. M	London	England.
Elmes, J. H	Princeton	Brant, Ont.
Emigh, G. C	Holbrook	Oxford, Ont.
Evans, A. R	Newmarket	York, Ont.
Fee, F. W	Toronto	York, Ont.
Garbutt, R. A	Peterboro'	Peterboro', Ont.
Gilleland, H. C	St. Catharines.	Lincoln, Ont.
Gillespie, C. A	Toronto	York, Ont.
Gouin, B	Ilderton	Middlesex, Ont.
Grantham, H. V	Mohawk	Brant, Ont.
Hallett, F. T	Weymouth	Dorset, England.
Harvard, H. F	Parkdale	York, Ont.
Hovell, D. B	Elstree	Herts, England.
Humphry, G. F	Sussex	England.
Hunter, H. E	Pembroke	Renfrew, Ont.
Jardine, J. E. A	Prince Albert	North West Territory.
Kennedy, W. D	Vernon	Dundas, Ont.
Kewley, H. D	Sarnia	Lambton, Ont.

3. College Roll for 1893.

First Year Students—Continued.

Name.	P. O. Address.	County, etc.
King, A. A	Johnston's Crossing	Nova Scotia.
King, W. A	Decewsville	Haldimand, Ont.
Kipp, A	Chilliwack	British Columbia.
Kippen, N	Underwood	Bruce, Ont.
Knight, Joshua	Elginburg	Frontenac, Ont
Lang, L. W	St. Marys	Perth, Ont.
Leonard, S. E	Woodford	Grey, Ont.
Lewis, George	Ballymote	Middlesex, Ont.
Logie, A. W	Montreal	Quebec.
Merritt, L. A	St. Catharines	Lincoln, Ont.
Mey, W. B	Leipsig	Germany.
Miller, R. C	Burlington	Halton, Ont.
Millson, A	Solina	Durham, Ont.
Mitchell, S	Brampton	Peel, Ont.
More, Jas	Kirkton	Perth, Ont.
McCallan, E. A	St. Davids	Bermuda.
McCullough	Nantye	Simcoe, Ont.
Maconachie, G. R. B	Gurdaspur	Punjab, India.
Macdonald, W. A	Tracadie	Prince Edward Island.
Macdonald, A. N	Toronto	York, Ont.
McDonald, R	Alexandria	Glengarry, Ont.
McDonald, N	Russell	Russell, Ont.
McDougall, D. H	Martintown	Glengarry, Ont.
Macfie, C. M	Appin	Middlesex, Ont.
McGillivray, J. W	Sumas	British Columbia.
McKay, Robt	Braemar	Oxford, Ont.
McKenzie, R. V	Lucknow	Bruce, Ont.
McKinley, W. W	Seeley's Bay	Leeds, Ont.
Maclennan, J. F	Hoath Head	Grey, Ont.
McMillan, G. D	Greenbank	Ontario, Ont.
McPhail, J. D	Vernon	Carleton, Ont.
McPherson, D. J	Lancaster	Ontario, Ont.
Nelles, N. C	Grimsby	Lincoln, Ont.
Newman, W. M	Gilbert's Mills	Prince Edward, Ont.
Payne, G. Y	Peterboro	Peterboro, Ont.
Patterson, T. F	Lucknow	Bruce, Ont.
Pettit, F. E	Burgessville	Oxford, Ont.
Ponting, E	Moweaqua	Illinois, U. S. A.
Pullin, J. H	Sweaborg	Oxford, Ont.
Rathwell, W	Ferguson's Falls	Lanark, Ont.
Rice, T. L	Toronto	York, Ont.
Rive, E	Guelph	Wellington, Ont.
Robinson, H. G	Delgany	Wicklow, Ireland.
Ross, T. E	Barrie	Simcoe, Ont.

3. College Roll for 1893.

First Year Students—Continued.

Name.	P. O. Address.	County, etc.
Scott, W. F	Milton	Halton, Ont.
Shotwell, W. M	Poplar Hill	Middlesex, Ont.
Silcox, C. P	Embro	Oxford, Ont.
Smith, P. B	Hamilton	Bermuda.
Smith, C. F	Shirley	Southampton, Eng.
Snider, P. A	Bloomingdale	Waterloo, Ont.
Struthers, J. B	Underwood	Bruce, Ont.
Summerby, W. L	Russell	Russell, Ont.
Taylor, W. H	Peterboro	Peterboro, Ont.
Thom, W. F	Morrisburg	Dundas, Ont.
Thompson, Wm. J	Barrie	Simcoe, Ont.
Thompson, J. A	Thornton	Simcoe, Ont.
Thomson, B. T	Colinton	Scotland.
Thomson, E. D	Barrie	Simcoe, Ont.
Turnbull, W. J. E	Atwood	Perth, Ont.
Tye, C. W	Haysville	Ontario, Ont.
Wallbridge, J. S	Belleville	Hastings, Ont.
Watson, J. H	Brampton	Peel, Ont.
Werry, M. J	Tyrone	Durham, Ont.
Westover, M	Frelighsburg	Quebec.
Wilson, A. C	Greenway	Huron, Ont.
Wilson, N. F	Rockland	Russell, Ont.
Wilson, G. H	Toronto	York, Ont.
Woolley, D. M	Simcoe	Norfolk, Ont.
Woolverton, T. N	Grimsby	Lincoln, Ont.

APPENDIX II.

SYLLABUS OF LECTURES.

Lectures began as usual on the 1st October, 1892, and continued with the omission of the Christmas vacation, until the 30th June, 1893, which latter date was the end of the scholastic year 1892-93.

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 sub-kingdom, 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 Tennyson.

MATHEMATICS.

Arithmetic. Review of subject, with special reference to farm accounts. Interest, discount, stocks, and partnership.

Mental Arithmetic. Calculations in simple rules.

Book-keeping. 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 and uses of sulphuric acid ; phosphorous ; phosphoric acid and its importance in agriculture ; chlorine—its bleaching properties ; bromide ; iodine ; silicon ; potassium ; calcium ; magnesium ; iron, etc.

Organic Chemistry. Constitutions of organic compounds ; alcohols ; aldehydes, acids and their derivatives ; formic, acetic, oxalic, tartaric, citric, lactic, malic, uric, and tannic acids. Constitution of oils and fats—saponification ; sugars, starch, cellulose ; albuminoids, or flesh formers, and their allies ; essential oils ; alkaloids—morphine and quinine ; classification of organic compounds.

Zoology (Continued). Sub-kingdoms further described ; detailed account of some injurious parasites, such as "liver-fluke," "tape-worm," "trichina," etc. ; insects—their influence on plant life ; corals and mollusks as agents in the formation of soil ; vertebrates, with special reference to those of importance in the economy of the farm.

Lectures illustrated by specimens and diagrams.

VETERINARY SCIENCE.

Veterinary Anatomy. Anatomy and physiology of the horse, ox, sheep and pig—digestive system, circulatory system, respiratory system, urinary system, nervous system, sensitive system, generative system, tegumental system.

ENGLISH.

Composition. Exercises continued; letter writing, etc.

English Classics. Critical study of selections from Tennyson.

MATHEMATICS AND BOOK-KEEPING.

Arithmetic. Equation of payments; percentage; profit and loss; stocks; partnership; exchange.

Book-keeping. Business forms and correspondence; general farm accounts; dairy, field and garden accounts.

Spring Term.—17th April to 30th June.

AGRICULTURE.

Preparation of Soil. Modes of preparation for different crops, and various kinds of soil.

Seeds and Sowing. Testing the quality of seed; changing seed; quantity per acre; and methods of sowing.

The Crops of the Farm. Their growth and management—hay, rye, wheat, barley oats, peas, buckwheat, potatoes, turnips, mangels, sugar beets, rape, etc.

Pastures. Growth and management of pastures; temporary and permanent pastures.

Feeding of Live Stock. General outline of the principles of feeding different kinds of stock.

NATURAL SCIENCE.

Geology. Connection between geology and agriculture; classification of rocks—their origin and mode of formation, changes which they have undergone after decomposition; fossils—their origin and importance; geological periods and characteristics of each.

Geology of Canada, with special reference to the nature and economic value of the rock deposits; glacial period and its influence on the formation of soil.

Lectures illustrated by numerous specimens and designs.

Botany. Full description of seed, roots, stem, leaves, and flower. Plants brought into the lecture-room and analyzed before the class, so as to render students familiar with the different organs and their use in the 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 Wordsworth.

MATHEMATICS.

Mensuration. Mensuration of 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. Ontario as a fruit growing country; the natural divisions into which it may be divided for growing fruit; detailed account of the operations, layering, grafting, budding, pruning, etc.; laying out and cultivation of an orchard; list of fruits best suited for general purposes, with best methods for their cultivation; remarks on gardening as a source of profit; plants best adapted to bedding and potting.

Lectures illustrated by practical work in the garden, and specimens in the classroom.

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."

MATHEMATICS.

Dynamics. Motion, forces producing motion, momentum; work, the simple machines, etc.

Winter Term—22nd January to 16th April.

AGRICULTURE.

Sheep. Origin and history of the leading breeds of sheep in Britain and America; coarse, medium and fine wooled sheep—their leading characteristics and principal points; practical handling and judging of sheep.

Swine. Origin and history of the leading breeds of swine in Britain and America; large and small breeds of swine—their leading characteristics and principal points; practical handling and judging of swine.

NATURAL SCIENCE.

Agricultural Chemistry. Continuation of the subject from preceding term, as follows: Composition of plants in relation to the soils upon which they grow; rotation of crops; the classification of fodders according to their chemical composition and a general treatment of the science of cattle feeding; relation of feeding to manure; chemistry of the dairy.

Economic Entomology. Anatomy, classification, and metamorphosis of insects principal insects injurious to vegetation; their habits, and the best methods of checking and preventing their ravages; insecticides, and the best methods of applying them; beneficial insects referred to. Course illustrated by a good collection of beneficial and injurious and of insectivorous birds.

Meteorology. Relation of meteorology to agriculture; composition and movements of the atmosphere; description of the barometer; different kinds of thermometers; pluviameter and anemometer, and how to read them; temperature, its influence on agriculture; the elements which are to be considered in the discussion of climate; the principles considered in forecasting the weather.

Lectures illustrated by instruments referred to.

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, stringhalt, 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 "King Lear."

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.

Mathematics.

Statics. Theory of equilibrium; composition and resolution of forces; parallelogram of forces; moments; centre of gravity, etc.

Hydrostatics. Transmission of pressure; the hydraulic press; specific gravity; density; pumps, siphons, etc.

Book-keeping. Review of previous work.

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.

Determinations 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.

Green-house Plants. Special study of all plants grown in our green-houses, 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."

Mathematics.

Surveying and Levelling. Fields surveyed with chain and cross-staff; measurements of heights.

Road making. Determination of proper slopes; shape of road bed; drainage of roads; friction on different roads; various road coverings; the maintenance of roads; cost, etc.

THIRD YEAR.

Fixed Work.

Chemistry. The work in this department comes under four heads, each of which forms the basis of a separate examination.

General Chemistry, Organic and Inorganic. Roscoe's "Lessons in Elementary Chemistry" (1886 edition), with a course of lectures. Most stress laid on those elements and compounds which have an agricultural bearing; laws and theories of chemistry discussed.

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, 9, 10, 11 and 12; Vol. II, Chapters, 5, 6, 7, 8, 9, 10, 15, 17, 18 and 19.

Animal Chemistry and Cattle Feeding. "Manual of Cattle Feeding" (Armsby), with lectures.

Analytical Chemistry. Qualitative and Quantitative Analysis of soils, fertilizers, agricultural products, etc.

Natural History. Four examinations, as follows:

Zoology. Differences between plants and animals; parasitic animals, especially those injurious to farm animals; animals which have assisted in the formation of soil; insectivorous birds, etc.

Economic Entomology. Classification of insects; characters of orders into which insects are divided; 75 insects injurious to vegetation, and the best means of destroying them; insecticides—their uses and modes of application.

Structural and Physiological Botany. Cells and tissues of plants; reproduction, assimilation, absorption, and metabolism of plants; processes of fertilization and hybridization; plants in relation to soil; classification of plants and study of the most important orders; analysis of plants; examination of specimens in herbarium, and illustrations by magic lantern.

Economic Botany. Special reference to injurious fungi and weeds.

Microscopy. Manipulation of microscope; methods of mounting specimens; drawing and measuring objects under microscope; microscopic study of the structure of plants and other objects. Hillhouse pp. 1-35, and appendix IV.

Drawing. Freehand and mechanical drawing, especially the drawing and construction of farm houses, barns, stables, etc.,—ground plans, elevations, sections, and construction.

English. (1) Grammar (High School Grammar). (2) Composition and Rhetoric (Bain). (3) Outlines of English Literature (Lectures with Spalding and Craik). (4) Themes. (5) Critical reading of the following selections:

Shakespeare—Richard II.

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 this department, it is necessary, above everything else, that the candidate know how to spell correctly and be able to write good English.

Options.

Three of the following subjects must also be taken, in addition to the fixed work prescribed above.

1. *Agriculture.* (1) Principles and practice of general agriculture; "Agriculture in some of its relations with Chemistry" (Storer), Vol. I., Chapters 5, 6, 13, 14, 15, 16, 18, and Vol. II., Chapters 1, 2, 3, 4, 11, 12, 13, 14, 16, 20, 21, 22; (2) Characteristic points of the most valuable breeds of horses, cattle, sheep, and pigs; "History of Polled Aberdeen or Angus Cattle" (Macdonald and Sinclair), Chapters I—V; "History of Hereford Cattle" (Macdonald and Sinclair), Chapters I and X; (3) Construction and arrangement of farm buildings with a view of cheapness, economy of space, and convenience.

2. *Dairying.* (1) "Dairy Farming" (Sheldon), Chapters 1-6, 11-15, 19, 33, 34; (2) "American Dairying" (Arnold); (3) "Scientific Dairy Practice" (Lynch); (4) Milch Cows" (Flint); (5) "Dairyman's Manual" (Stewart); (6) "Reports of Dairy Associations of Ontario," 1887, pp 21-63, 66-68, 99-107, 125-146, 156-174, 177-205, 213-249; 1888, pp. 7-11, 15-17, 21-24, 51-59, 114-128, 143-156, also subsequent reports to date; (6) "Analysis of Foods" (Blyth), pp. 194-218, 228-246, 251-280, 283-293, 305-313.

3. *Geology.* A general review of the subjects; special reference to the various systems and formations found in Canada, particularly the Geology of Ontario, New Brunswick, Nova Scotia, Manitoba and the Northwest; economic products in Canadian rocks; chief agents in the disintegration of rocks; a thorough study of the origin and formation of soil.

4. *Algebra.* Through quadratic equations.

5. *Euclid.* Books I and II, with simple deductions.

6. *Latin.* Principia Latina, part I, I—XXXIII, with a view to learn the pronunciation of scientific terms, and those Latin roots from which a large number of English words are derived.

Books of Reference in Botany, etc. Entomology (Comstock); Injurious Insects (Saunders); Bound Reports Entomological Society; Structural Botany (Gray), Physiological (Vines); Systematic (Gray's Manual and Spotton, part II.); Injurious Fungi (Smith); Weeds (Stock Journal '88); Practical Botany (Hillhouse); Microscope (Phin); Microscope and Botany (Behrens).

APPENDIX III.

EXAMINATION PAPERS.

I. Papers set at Easter Examinations, 1893.

FIRST YEAR.

Agriculture.

I. State the chief of the influences which affect the quality of farmyard manure.

II. State the chief of the advantages to be derived from growing green manures. Name the crops that may be grown as green manures in Canada in the order of their value.

III. Name the principal sources from which the nitrogen in commercial fertilizers is derived. At what season of the year may it be best applied?

IV. What is meant by superphosphate? Give the chief of the rules which should govern the application of superphosphate.

V. Show wherein the rotation of crops improves the texture of the soil. Give a rotation adapted to stiff clays.

VI. Show wherein soiling effects a saving in food. What combination of spring grains do you consider the most suitable to grow as a soiling crop, and how would you manage such a crop.

VII. Mention the soils most suitable for growing rye. Where would you place rye in the rotation?

VIII. State briefly what you know as to the origin of the pea, and give the mode or modes of preparing the soil for a crop of peas.

IX. When would you sow wheat, rye, barley, oats, peas? Mention the quantities of seed to be used per acre.

X. How are the different varieties of turnips distinguished? Give your mode of preparing the land for a crop of mangels.

Chemistry.

I. (*a*) Express by a chemical equation the decomposition which Potassium Chlorate undergoes when mixed with Manganese Dioxide and heated.

(*b*) What weight of Oxygen may be obtained from 21 grams of $KClO_3$, ($K=39$, $Cl=35.5$, $O=16$)?

II. Lead exposed to the air and heated, melts, changes to powder, and increases in weight. Lead melted in the absence of air does not change or increase in weight. Draw conclusions regarding the composition of the air from these facts.

III. What is meant by a natural law? Such a law is illustrated by the five oxides of nitrogen. Name this particular law and explain the illustration.

IV. How may Chlorine gas be obtained from common salt?

V. Define the following: Acid, base, salt, metal, non-metal, normal salt, acid salt, and acid hydrogen.

VI. A mixture of CuO and C is heated; express by an equation the chemical change which occurs, giving experimental evidence.

VII. Finish the equations:

$NH_4Cl + KOH =$
$2NH_4Cl + Ca(OH)_2 =$
$2HNO_3 + Cu =$
$2HNO_3 + 6H =$

VIII. Flask (*a*) contains copper and dilute nitric acid, (*b*) copper and concentrated sulphuric acid, and (*c*) contains water; (*b*) and (*c*) are warmed gently; and the products of (*a*), (*b*), and (*c*) together with a current of air, are conducted into flask (*d*).

(1) Explain by equations the chemical changes occurring in flasks (*a*), (*b*), and (*d*).

(2) By what means can it be shown that sulphuric acid has been prepared?

IX. (*a*) Name the natural sources of phosphoric acid.

(*b*) Express by an equation the action of sulphuric acid upon ground apatite in the preparation of superphosphate of lime.

X. (*a*) Give the formulas of the alcohols, aldehydes and acids corresponding to methane propane, hexane, and decane.

(*b*) What is the action of potassium hydroxide upon palmitic acid?

Zoology.

I. "Some animals have exerted considerable influence in the formation of soil." To what extent is this true, and what animals are likely referred to?

II. What characters are observed in forming a classification of animals? Classify rat, oyster, emu, duck, bat, trilobite, whale, dog, frog and tape-worm.

III. Name some of the organs of defence in the animal kingdom, and explain the terms mimicry, hybernation and alternation of host.

IV. Describe the breathing organs of a beaver, fish, and butterfly.

V. Name some of the most common parasites which affect animals, and state how their evil effects to some extent may be prevented.

VI. Illustrate what is meant by distribution in space and time by referring to the class; birds, fishes and elephants.

VII. Outline the metamorphosis of an insect, and give diagrams in illustration.

VIII. Describe a sea urchin.

Anatomy.

I. Name the functional processes of digestion.

II. State the number, kinds and arrangement of teeth you would expect in a horse three years old.

III. Describe the trachea.

IV. Name the urinary organs in the female.

V. State the functions of the kidneys.

VI. Describe the wall of the hoof.

VII. State the functions of the liver and the manner in which its secretion enters the intestine.

VIII. Trace the urine from the kidneys until it is expelled from the body in the male.

English Grammar.

I. "Where he was born cannot be ascertained." Analyze and parse this sentence.

II. Give the plural of *beau*, *criterion*, *deer*, *larva*, and *canto*.

III. How do we form the possessive case of nouns and the comparative degree of adjectives in English?
 (*a*) Compare *least*, *worst*, and *happy*.
 (*b*) Distinguish the *Saxon* and *Norman* possessives, and state the use of the former in modern English.

IV. How would you draw special attention to a word or phrase in a sentence? Give an example.

V. What is meant by a participle? How many participles has an English verb, and what are the uses of each?

VI. Name the *auxiliary verbs* and state briefly the uses of each?

VII. Give the principal parts of *knit*, *durst*, *sought*, *bid*, *gone*, *hung*, *swim*, and *bear*.

VIII. Quote the rules for the uses of the *colon* and the *semi-colon*.

IX. Correct any errors which you may find in the following sentences, giving reasons:
 (1) Them hats hadn't ought to be laying there.
 (2) He has went without his mits and I am afraid his hands will be froze.
 (3) If this continues, I will lose all my property.
 (4) Will I bring you the axe?
 (5) Give every word and syllable their proper sound.
 (6) Neither of us are willing to give up our claim.
 (7) Let you and I go, Tom can stop here.
 (8) Was you there last night. Me and Jennie were.

Literature.

I. Write notes upon Wordsworth's power of describing scenery. 15.

II. From any of the poems read, quote two passages of at least five lines each. 10.

III. Explain fully (and note the connection of) the following:
 (*a*) " . . . blood cries out for blood."
 (*b*) " . . . fears and fancies thick upon me came."
 (*c*) " . . . . a huge recess ;
 That keeps till June, December's snow."
 (*d*) "Not in entire forgetfulness"
 "And not in utter nakedness."
 (*e*) "Whither is fled the visionary gleam?"
 "Where is it now, the glory and the dream?" 10.

IV. Explain the connection between the title "Resolution and Independence," and the matter of the story." 5.

V. Explain fully the following:
 "She leaves those objects to a slow decay
 That what we are, and have been, may be known;
 But, at the coming of the milder day,
 These monuments shall all be overgrown." 10.

VI. Write explanatory notes on
 (*a*) " . . . . doth a leaping fish
 Send through the tarn a lonely cheer."
 (*b*) "The crags repeat the raven's croak
 In symphony austere."
 (*c*) "The heavens laugh with you in your jubilee."
 (*d*) "The sleepless soul that perished in his pride." 10.

VII. Wherein lies the beauty or want of beauty (from a poetic standpoint) in:

(*a*) "As a huge stone is sometimes seen to lie
Crouched on the bald top of an eminence."

(*b*) "And with her feet she from the plashy earth
Raises a mist; that, glittering in the sun
Runs with her all the way . . ."

(*c*) " . . . . the man perceives it die away,
And fade into the light of common day." 20.

VIII. What were Wordsworth's ideas about a life previous to this one? Upon what did he base his opinions?

IX. Explain (1) Transferred Epithet. (2) Simile. (3) Prosy style. (4) Rhyme. 10.

Arithmetic.

I. What sum in 2 yrs. 6 mos. at $4\frac{1}{2}$ per cent. will amount to $849.95?

II. Find the L.C.M. of 5 square links and 2 square feet.

III. What is the difference in cubic feet between .062 of a cord and 1-17 of 2,164 cubic inches. 1-54 of half a cubic foot?

IV. In Nov., 1890, I had 424 bushels of wheat. Had I sold then I could have got 84c. per bushel. I could have put the proceeds out at 4 per cent. interest. I kept the wheat and sold six months later for 87c. Did I lose or gain by holding it, and how much?

V. A walks 4 miles per hour; B $3\frac{1}{2}$. They are 100 yards apart and walk towards each other. How far has B gone when they meet?

VI. In a hundred yards, A can give B four yards start and C five yards, and all finish together. If B gave C one yard start in 100, which would win? Show your reasons for answer.

VII. Reduce 1-21,000 of a ton to oz.

(*b*) If 25 quarts equal 1 cubic foot, express 1 pint in cubic yards.

(*c*) How many square yards in one acre?

(*d*) How many pounds in a bushel of oats? of peas? of barley?

VIII. Two persons, starting from the same place and travelling in opposite directions, are forty miles apart at end of two hours, but travelling in same direction they are nine miles apart at end of one and a half hours. Find the rate per hour at which each travels.

Mensuration.

I. Define (*a*) Quadrilateral. (*b*) Right-angled Triangle. (*c*) Rhombus. (*d*) Cone. (*e*) Cylinder. (*f*) Parallelopipedon.

II. A cow is tied to a fence, by a rope. She has access to $\frac{1}{4}$ of an acre. How long is the rope?

III. A piece of plate-glass is 9 x 7 feet and $\frac{1}{3}$ inch thick. How many panes (18 x 13 inches and 1-10 inch thick) will contain the same bulk of glass?

IV. A triangular field has a perimeter of 918 yards. The sides are in the ratio of 2, 3 and 4. Find area of the field in acres.

V. A cylinder has a circumference of 132 feet, and a height of 19 feet. Find the volume of a *cone* half the height. (The cone has same area of base as the cylinder.)

VI. State rules for finding (*a*) Volume of a pyramid. (*b*) The hypothenuse of a right-angled triangle, if the sides be given. (*c*) Surface of a cylinder, ends included.

VII. In computing the capacity of the dairy silo, what measurements would you require?

VIII. State the surface of board fencing in a close-boarded fence six feet high (1) Around a square enclosure of 1,849 sq. yards. (2) Around a circular enclosure of 41 feet diameter.

IX. If three sides of a plot of ground be in the position of three sides of a rectangle, and the fourth side be a curve, show a method of determining the area.

X. Find the amount of gravel on a path around the outside of a rectangular lot 90 yards by 36 yards. The path is 4 feet wide and gravelled $2\frac{1}{2}$ feet deep.

Book-Keeping (Set at Christmas).

I. Define the terms "Day Book;" "Ledger Account;" "Trial Balance;" "Bills Receivable;" "Loss and Gain Account."

II. In a set of farm accounts, enter the following items in the Day Book: Jan, 8, Had repairs made to plow, \$2.80; Jan. 9, Bought groceries, \$10.40; Exchanged butter and eggs, \$4.10, and paid balance in cash; Feb. 14, Bought a horse, value \$120. Gave in exchange a plow (valued at \$10), cash \$60, balance in a note at 3 months; Feb. 26, Sold 40 bush. oats a 45c per bush.; Bought a new mower, paying cash, \$14.

III. Journalize the same entries.

IV. Your "Bills Payable" account in the Ledger stands thus: Dr. side—May 7, To bank, \$87; May 24, To bank, \$28; June 8, To cash, \$14. Cr. side—May 9, By live stock, \$147; June 17, By farm implements, \$104; By expense, \$21.20. Write down the account as it stands, and show what addition would be made when it is closed. Into what account if "Bills Payable" closed?

V. Into what accounts are the following closed: Bank, Cash, Household Furniture, Produce and Feed, Expense, Labor, Field No. 5.

VI. I open my farm accounts. My first Ledger entry shows Live Stock debited and Cash credited. How will this item stand in the Journal? Make a Day Book item to correspond.

VII. What does the difference between the Dr. and Cr. sides of the capital indicate when the books are closed? Into what account in the Ledger does the Loss and Gain go at closing?

VIII. John Smith sells Thomas Jones a cow for \$40. Write for the transaction (1) A promissory note at six months, (2) an accepted draft, (3) a cheque (payable to self or order) on Dominion Bank.

SECOND YEAR.

Agriculture.

I. Compare the middle-wooled breeds of sheep imported into America (1) in regard to quality of fleece as coarse or fine, (2) with reference to the quantity of the wool clip, and (3) as to the weight of the carcase.

II. Define what is meant by the term "fibre" in wool. Why is it important that the fibre should be strong? Name the chief of the influences that affect the strength of the fibre?

III. Give the chief of the distinguishing properties of Southdown sheep.

IV. Compare the three principal coarse-wooled breeds of sheep in America with reference (1) to general outline, (2) to color, and (3) wool clip.

V. Would it be desirable to have Dorset Horned sheep breed twice a year in Canada? Give the reasons for your view. What part should they play in crossing upon other breeds?

VI. In which portions of the earth have swine been found in a wild state? What is the relation between wild and domesticated swine? Give the reasons.

VII. Trace the origin of the middle and Small Yorkshire breeds respectively. What obstacles stand in the way of the former being more generally diffused at the present time?

VIII. Sketch the history of Cheshire swine.

Practical Cattle.

I. Mention the points in which you consider the cow Laundress=16206 is strong, and also those in which you consider her weak when viewed from the standpoint of a pure Shorthorn.

II. Give your opinion as to the value of the yearling steer Travertine for producing beef.

III. Compare the cows Sarah, No. 3,721, and Ontario Pet, (1), as Guernseys and (2), as dairy cows.

Practical Sheep.

I. Compare the merits of the two wethers "Donald," ear No. 1824, and "Duncan," ear No. 1849, as mutton sheep.

II. Give the strong and weak points as to physical conformation of the ram "Duke of Tuddenham 4th, 1864," viewed, (1), as a representative of the Dorset Horned breed, (2), as a mutton sheep.

III. Indicate the most objectionable points of physical form in the Leicester ram "Whitesmith," received as a representative of the breed.

Dairying.

I. Name five breeds of dairy cattle found in Ontario.
   (*a*) Which do you prefer? Give reasons.
   (*b*) How many of these breeds have an "advanced registry?" Do you consider this registry desirable; if so, why?

II. Give in the order of their importance the most essential requirements for successful dairying in Ontario.

III. What are the causes of impure milk? How may these be remedied? What practical bearing has the subject of pure milk on the dairy industry? How may the dairymen know whether the taint is caused by food or by ferment?

IV. Define fermentation. Distinguish lactic and rennet fermentation.

V. The ultimate sources of bacteria are what? How may they get into milk? Are they of any value to the cheese and butter-maker; if so, what?

VI. Name the "conditions favorable for cream raising."

VII. What are the points of merit in a cream separator? Is the separator likely to come into general use?

VIII. Describe the rennet test. Of what use is it to the cheese-maker?

IX. Name four marked improvements in the process of manufacturing Cheddar cheese in the Province.

X. The lactometer reads 30; the temperature is 64°F.; the per cent. of fat is 4.00. Find the per cent. of water, total solids, and solids not fat in the sample of milk.

Agricultural Chemistry.

I. Give your reasons why we should grow green crops rather than use the bare fallow.

II. To what extent should the average farmer use special manures; and what is the most appropriate manuring for barley, mangels, turnips, potatoes, clover, and meadow hay?

III. Give the chemical composition of fats, carbohydrates, and albuminoids; what are their particular functions in the body? and name some common Canadian fodders in which each predominates.

IV. Explain the following: Digestion co-efficient, nutritive ratio, feeding standard, ptyalin, peptones, amides.

V. What circumstances influence the proportion of food digested? And show why liberal feeding within certain limits is the most economical.

VI. Which of the common farm animals produces meat most economically and why? What per cent. of the fasted live weight of this animal when fat will be butcher's carcass?

VII. Which is the most wasteful, a ration too rich in albuminoids, or one having an excess of carbohydrates? Give reasons for your answer.

VIII. Given a fodder of the following composition: Water, 16.0; nitrogenous substances, 12.3; fat, 2.2; soluble carbohydrates, 38.2; fibre, 26; ash, 5.3; albuminoids, 10.2.

According to experiment the following proportion of the different nutriments of above fodder are digested: Nitrogenous substances, 55; fat, 52; soluble carbohydrates, 65; fibre, 45.

Determine albuminoid ratio of the fodder.

IX. Compare the relative manure value of bran, barley straw, linseed cake, peas, clover hay, mangels, oats; and how are the ash constituents distributed in the solid excrement and urine?

Entomology.

I. Give a list of the "borers" injurious to trees and shrubs, and describe a general remedy.

II. What are the characters of the sphingidae? Name some of the most injurious members of the family and the plants they attack.

III. Some insects are injurious in the larval condition; some as pupæ; some as the perfect insect, and some in all the stages of development. Give examples.

IV. Compare the following and give points of difference: Cut worm, cabbage worm, wire worm, and currant worm, and name the orders to which they belong.

V. Sketch figures showing the difference between an anthomyian fly and a saw-fly. What plants do they affect?

VI. Give notes upon the insecticides Paris green, pyrethrum, and carbolic emulsion, referring to their preparation and use.

VII. Outline the life history of the "bark louse" and give a remedy. Name some beneficial insects and the orders to which they belong.

VIII. Some minute beetles are very destructive to plants. Name them and the plants they affect, and show how they may be overcome.

IX. Give brief notes on the various methods that are followed in destroying insect enemies.

X. Identify the specimens before you.

Pathology.

I. Give causes, symptoms and treatment of acute laminitis.
II. Treatment for scratches.
III. Treatment for acute indigestion in the horse.
IV. Treatment for tympanitis in the ox.
V. Symptoms of azoturia.
VI. Treatment for regular strangles.
VII. Symptoms and treatment of simple ophthalmia.
VIII. Treatment for lymphangitis.
IX. Symptoms and treatment of choking in the ox.

Literature.—Shakespeare's King Lear.

I. Give your opinion of the character and conduct of King Lear himself in the play giving quotations and references.

II. Show that there are two tragedies in the play, and point out the poet's skill in blending and contrasting them.

III. Trace the characters of Kent and Edgar, showing the functions of each in his tragedy and in the play. Quote or refer to a passage uttered by each "out of his dialect."

IV. Tell the speaker and the position of each of the following, and explain the underlined parts :

(*a*) And well are worth the *want* that you have *wanted*.
(*b*) Wherefore should I
Stand in the *plague of custom* ; and permit
The *curiosity* of nations to *deprive* me.
(*c*) All *cruels else subscribed*.
(*d*) *Subscribed* his power ?
Confined to exhibition !
(*e*) *Renage*, affirm, and *turn their halcyon backs*.
(*f*) To bandy hasty words, to *scant my sizes*.

V. Quote what you can of the following passages :

(*a*) King Lear disowning Cordelia or banishing Kent.
(*b*) France choosing Cordelia.
(*c*) Lear when deprived of his train of followers.
(*d*) Lear and the fool on the heath in the storm.

VI. The gods are just, and of our pleasant vices
Make instruments to plague us.

(*a*) Tell the speaker and the place of this passage.
(*b*) Show to what extent this sentiment is the key-note of the play.

Political Economy.

(Two hours and a half allowed for this paper.)

I. What is Political Economy ? Give a classification of the departments into which it is divided, and show the necessity of studying each in order that the whole may be understood.

II. What is Capital ? Are any of the following capital : Virtue, Land, Labor, Education ? Give your reasons.

III. Explain the terms "value in use" and "value in exchange," and show the relations between them.

IV. "The produce of work is divided into four shares which may be thus shown: Produce = wages + rent + interest + taxes." How do you determine how much should go to wages?

V. What is money? What are the chief circumstances which render the notes of Canadian banks a stable currency?

VI. What is a market? What are the causes which determine the areas of a market?

VII. If there were a specific duty of 30 cents a pound levied on all wool imported into Canada, in what state of the Canadian wool market would the Canadian consumer of wool be obliged to pay the duty, and in what state of market would the foreign producer of wool be obliged to pay the duty?

VIII. "The ordinary rent of a farm will usually include interest upon the capital spent on the farm buildings, roads, gates, fences, drains, and other improvements."

(a) State the laws which determine the amount which will be paid for what Jevons calls the "true rent" of a farm.

(b) State the laws which determine the rate of interest in any given community.

(c) Which of these two sets of laws determine the additional amount of money that will be paid by a tenant for the use of a farm with these improvements as compared with what will be paid for a farm equally good, except that it has not these improvements?

IX. Define taxes. What rules should be observed in laying on taxes?

Agriculture.

I. Mention the soils best adapted to the growth of the carrot; the more important particulars which relate to sowing it; the mode of harvesting to be adopted.

II. How would you manage when pasturing off a field of rape with sheep? Under which conditions would it be advisable to sow rape as a catch-crop?

III. Give some notes regarding the influence of climate on the growth of the sugar beet. How would you prepare the ground for growing a crop of the same? Mention some influences that increase the percentage of sugar in the beets.

IV. Describe how you would harvest timothy (phleum pratense) and the common red clover (trifolium pratense).

V. Give notes regarding the history and characteristics of scarlet clover (trifolium incarnatum).

VI. How would you prepare the land for growing a crop of corn? How far apart should the drills be, and also the plants in the line of the drills?

VII. Mention the leading characteristics of millet. Where may it be placed in the rotation? How much seed should be sown per acre?

VIII. Give the leading characteristics of meadow foxtail (alopecurus pratensis), of tall oat grass (avena elatior), of meadow fescue (festuca pratensis).

II. Papers Set at Midsummer Examinations, 1893.

FIRST YEAR.

Dairying.

I. Given a sample of milk, how would you proceed to determine its composition? What compounds would you likely find present, and what elements go to make up the different compounds? In what form are they found in milk?

II. Name the sources of the different parts of milk.

III. What is the most valuable and variable component of milk? Give the cause of its variation.

IV. Describe the method of testing milk with a Babcock tester.

V. Find the amounts of money each of the following patrons of a factory would receive, first by bulk plan, and, secondly, by quality plan, when

A sends 5000 lb., 2.50 per cent. milk.
B " 4500 lb., 3.00 " "
C " 2000 lb., 4.00 " "

The quantity of cheese made is 1100 lb.
Selling price, 10 cents per pound of cheese.
Cost of manufacturing, $1\frac{1}{2}$ cents per pound.

VI. What method does the cheese-maker adopt to separate the water from the solid portion of milk?

VII. Give a list of the utensils that would be required in a dairy of ten cows to make butter on a farm?

VIII. What are the causes of "white specks" in butter? How may they be remedied?

IX. At what temperature would you churn sweet cream to obtain an exhaustive churning? What is the best temperature for churning ripened cream (1) in summer, (2) in winter?

X. What are the objections to
(1) The metamorphic theory of the secretion of milk?
(2) The transudation theory of the secretion of milk?

Botany.

I. Distinguish between annual and biennial roots, and name plants that have such.

II. Compare the order Rosaceæ with the Labiatæ, and name four plants in each.

III. Draw diagrams indicating the position of the stamens in relation to the pistil.

IV. Describe fully the process of fertilization, and name the agencies through which it is effected.

V. Distinguish between artificial and natural classification, and illustrate by referring to the following plants:

Cabbage, spiraen, turnip, hepatica, strawberry, buttercup, and mustard.

VI. What are the functions of the root and leaves?

VII. Explain the terms adhesion, silique, legume, key, ligulate, pome, anther, carpel, and give examples.

VIII. Give the characters of the orders Cruciferæ and Compositæ, and name three weeds found in each.

Geology.

I. Name the geological systems from which valuable economic products are obtained, and give a list of seven minerals that have contributed most of the valuable constituents in soil.

II. Illustrate the effect of air and rain upon rock masses in the formation of soil.

III. What systems are absent from Ontario, and how is this accounted for?

IV. Give the proofs advanced for believing that the interior of the earth is in a heated condition, and state how mountains are formed.

V. State at what periods in the earth's history great physical changes took place, and with what results.

VI. Describe the general appearance of things during the Devonian and Jurassic periods, referring both to life in the sea and upon the land.

VII. Give an account of the Silurian rocks of Ontario, their kind and distribution, and some of their chief fossils.

Materia Medica.

I. How do medicines act on the animal economy?

II. Define and give examples of (*a*) Disinfectant, (*b*) Antiseptic, (*c*) Tonic, (*d*) Astringent, (*e*) Purgative, (*f*) Dieuretic.

III. Name and give the doses of the principal purgatives for (*a*) the horse, (*b*) cow, (*c*) dog.

IV. What is aloes? Name the principal variety used in veterinary practice. Give its properties, actions, and uses.

V. Give actions and uses of Carbolic Acid.

VI. As a tonic, why is gentian preferable to cinchona?

VII. Give actions, uses and doses of Nitrate of Potash.

VIII. Give a prescription for a good blister (ointment).

IX. What are the indications for the use of nux vomica?

X. When is opium contra indicated?

English Grammar.

I. Analyze and parse the following sentence:
"Correct, where necessary, the following, giving the reason in each case."

II. Correct the following sentences, where necessary, giving reasons:
(1) Agreeable to his promise he came this p.m.
(2) Give every word and syllable their proper sound.
(3) We got into the barn and laid there all night.
(4) It is necessary to fully state the nature of the case.
(5) Hoping to hear from you soon, beiieve me yours truly.
(6) Toronto has a larger population than any city in Ontario.
(7) I am sure it wasn't me.
(8) This grammar contains a great quantity of exercises.

III. Give the principal parts of *shone*, *hung*, *wet* and *learn*.

IV. State fully the uses of *have*, *be* and *do*, as auxiliaries, and give an example of each.

V. Explain what is meant by *verbs of incomplete predication*, and give an example of each kind.

VI. Quote the rules for the different uses of the *period*, the *coma* and the *apostrophe*.

VII. Give the plural of *salmon*, *phenomenon*, *cloth* and *bean*.

VIII. "The Bishop of Niagara's charge."
Parse the words *Bishop*, *of* and *Niagara's*.

Literature.—Scott's "Lay of the Last Minstrel."

I. Mr. Wetherell (p. 38) says :—"A poem, especially a romantic poem, is a sustained hyperbole."
Explain this statement with reference to "The Lay."

II. Explain fully :
(*a*) Vengeance, deep-brooding o'er the slain,
Had locked the source of softer woe ;
(*b*) Merry elves their morris pacing,
To aërial minstrelsy,
(*c*) Moonless midnight or matin prime ;
(*d*) For he was barded from counter to tail.
(*e*) . . . . that wild harp, whose magic tone
Is wakened by the winds alone.

III. Point out three rhetorical figures in the above five extracts (in question II.).

IV. "With torch in hand, and feet unshod,
And noiseless step the path he trod ;
The arched cloister, far and wide,
Rang to the warrior's clanking stride."
(*a*) Divide these lines into metrical feet. (*b*) Mark the accented syllables.
(*c*) What is the prevailing kind of foot ?

V. Re-write in correct prose :
(*a*) "Red and bright the streamers light
Were dancing in the glowing north ;
So had he seen, in fair Castile,
The youth in glittering squadrons start ;
Sudden the flying jennet wheel
And hurl the unexpected dart."
(*b*) "For threescore years in penance spent,
My knees these flinty stones have worn."

VI. Tell the connection in which the following occur, and the meaning of underlined parts :
(*a*) Whose ponderous *grate* and massy bar
Had oft rolled back *the tide of war*.
(*b*) . . . . the streets of his *dunedin*
Saw lances gleam, and *falchions* redden.
(*c*) . . . . *the screened altar's pale ;*
(*d*) Nine and twenty *squires of name*.
(*e*) . . . . Earl Walter, *rest him, God !*

VII. (*a*) Why are the Spirits of the Flood and the Fell introduced ?
(*b*) Apart from the poem, tell very briefly what you know of *Michael Scott* and *St. Michael*

Arithmetic.

I. Find the cost, at $4.30 per cubic yard, of a stone foundation for a barn 42 feet by 28 feet (outside measurement) ; wall 9 feet high and 2 feet thick. (Take no account of doors or windows.)

II. (*a*) Find the simple interest on $280 at $4\frac{1}{7}$ per cent. for $3\frac{1}{2}$ years.
(*b*) The compound interest on $280 at 3 per cent. for 2 years.

III. Find the cost of painting (at 15 cents per square yard) the outside of a fence (5 feet 6 inches high) around a square field containing 120 square yards less than 3 acres.

IV. In multiplication of decimals, state the rule for placing the decimal point in the product.

V. An agent asks $120 for a binder. He gives me 15 and 8 off. How much less do I pay him than if he had given me a single discount of 20 per cent.?

VI. How much is 1 per cent. of 1 per cent. of 1 per cent. of $10,000?

VII. If 100 lb. barley be worth $1.50, how much are 72 bushels worth?

VIII. If $4 be discount off $424 for 2 months, what is the rate per cent.?

IX. Oats are worth 40 cents and wheat 76 cents per bushel. A man exchanges a load of wheat for the same weight of oats and $1.84 in cash. How many bushels of oats did he get?

SECOND YEAR.

Live Stock and Arboriculture.

I. Name and define the chief of the principles or laws which govern breeding.

II. What is the distinction between cross breeding and grading? What prominence should be given to each in the practice of the Canadian farmer?

III. Give the leading indications of nerve power in a dairy cow, the food rations suitable for a dairy cow in milk in winter.

IV. State (1) the effects of early castration on lambs, (2) the winter rations suitable for fattening lambs when coming one year old.

V. Contrast the wool and mutton-producing breeds of sheep (1) as to size, (2) as to form and (3) as to hardihood.

VI. Give notes regarding the gathering and preserving of forest seeds.

VII. How would you prepare a nursery seed bed suitable for growing forest seeds? How would you proceed in sowing the seeds?

VIII. Give notes regarding the planting of windbreaks.

Dairying.

I. Describe a short method of determining the per cent. of fat in (1) cream, (2) condensed milk and (3) cheese.

II. What are the essentials of a popular milk tester? Distinguish the lactoscope and lactometer. What practical use may be made of the latter?

III. A and B are shareholders in a cheese factory; C and D are non-shareholders.
A sends 3,500 lb. of 3 per per cent. milk.
B sends 4,000 lb. of 3.50 per cent. milk.
C sends 5,500 lb. of 4 per cent. milk.
D sends 6,000 lb. of 4.50 per cent. milk.
The quantity of cheese made is 1,900 lb.; selling price, 9 cents per lb. Cost of manufacturing to shareholders $1\frac{1}{4}$ cents, to non-shareholders $1\frac{1}{2}$ cents per lb. of cheese. Find the amount of money each should receive on "relative value" plan.

IV. On what principle does "paying according to fat" in cheese-making depend? Is it a just method? Give reasons for your answer.

V. Outline five methods of making a composite test. Which do you consider best' giving reasons for your answer?

VI. Write short notes on condensed milk, oleomargarine, stearin, paluntin and olein.

VII. Give a brief outline of the method of manufacturing spring cheese. In what particular points does it differ from the method of making fall cheese?

VIII. Does food influence the percentage of fat in milk to any great extent? Cite any opinions or experiments bearing on the point. Does food affect the characteristics of the butter-fat? If so, in what way? Explain what is meant by the "Iodine equivalent" and the "Melting point" of butter. Are they of any practical value?

IX. Draw the ground floor plan of a centrifugal creamery (capacity 500 cows), giving size of rooms and locating the utensils and machines that would be required.

X. Select two samples of milk from those in the room, and determine whether they are adulterated or not. If adulterated, in what way?

Practical Chemistry.

I. Light the gas burner.

II. Determine the groups present in mixture No. 1.

III. In mixture No. 2, determine one base in each group present.

IV. Does mixture No. 3 contain phosphoric acid?

V. How may zinc be separated from manganese?

VI. What is the action of BaCO3 upon chlorides of Cr, Al, Fe, Zn and Mn in solution?

VII. Marks may be added or deducted for the student's manner of working.

Botany.

I. Distinguish *stems* according to the nature of their growth, the mode in which they support themselves and the nature of their clasping organs.

II. (*a*) Describe the *functions* of *leaves.*
(*b*) What is the cause of their fall in autumn?

III. State clearly the *functions* of the *flower*, its *origin* and its *essential and accessory parts.*

IV. Refer each of the following plants to its proper order. Mention in each case the chief characters exhibited by the plant by means of which you are able to refer its order:
Chickweed, False Flax, Wild Columbine, Black Medick, Yarrow, Common Elder.

V. Distinguish clearly the Saxifragaceæ from the Rosaceæ. Give six examples from each order.

VI. What characters in a plant would lead you to consider it a *weed*? Name five orders, a large number of whose representatives are weeds. Give examples in each order.

VII. Name the different forms of smut, and give the life-history of two, together with remedies for the prevention of smut in wheat.

VIII. What is the chief distinction between Potato Blight and Plum Knot in regard to their spore formation?

Practical Horticulture.

I. Give notes on the Canadian wild flowers of April, May and June.

II. Give the method you would follow in the cultivation of shrubs, referring to their selection, planting and care.

III. Describe how the geranium, coleus, and currant may be propagated

IV. Arrange the following plants in the form of carpet and ribbon bedding: Alternanthera, Coleus, Alyssum, Stock Cerastium, Geranium and Nasturtium.

V. Give notes on the potting of plants, and draw a diagram illustrating cleft grafting. State what precautions should be observed in performing the operation.

VI. Give notes on the following shrubs: Syringa, Crataegus, Colutea, Spiraea and Caragana.

Veterinary Obstetrics and the Laws of Breeding.

I. Define (*a*) Parturition, (*b*) Immature birth, (*c*) Premature birth.

II. Give the symptoms and treatment of infectious or contagious abortion and the best measures to adopt in order to exterminate the disease from a herd.

III. In a case of normal parturition in a mare, what treatment should dam and offspring receive?

IV. In a case of breach presentation with the hind legs of the fœtus deviated downwards and forwards, how would you proceed to deliver?

V. Name and explain the arrangement of the fœtal membranes.

VI. Give symptoms and treatment of pervious urachus in a foal.

VII. Define (in breeding animals) (*a*) the law of heredity, (*b*) the law of atavism, (*c*) the influence of a previous impregnation; and state the lessons we are taught by these laws.

VIII. Define the term pedigree, and state its importance in breeding animals.

IX. Give your individual idea of the most profitable horse to breed for the present market, and state how to produce him.

Literature.—L'Allegro and Il Pensoroso.

I. What is the real theme of each of these poems? Explain the plan of the poems.

II. Describe the versification. How does the poet give it variety? Quote a passage of some ten lines and point out in detail its metrical peculiarities and merits.

III. Explain the meaning of the following words as employed in the poems:

rebeck, dight, pied, cynosure, decent, bout, yarish, philomel, civil-suited, embowed.

IV. Supposing the following passages express the real feeling of the writer, tell fully in simple language what he was actually wishing for:

(*a*) And may at last my weary age
Find out the peaceful hermitage,
The hairy gown and mossy cell,
Where I may sit and rightly spell
Of every star that heaven doth shew,
And every herb that sips the dew,
Till old experience do attain
To something like prophetic strain.

(*b*) And ever, against eating cares,
Lap me in soft Lydian airs,
Married to immortal verse.

(*c*) Where I may oft outwatch the bear,
With thrice great Hermes or unsphere
The spirit of Plato.

V. What is the character of the descriptions of nature in these poems? Quote specimens.

VI. Tell frankly what sort of pleasure, if any, these poems give you, and what feelings they awaken.

Hydrostatics and Road-making.

I. Show that the pressure at any point within a heavy inelastic fluid (not exposed to external pressure) is proportional to the depth of the point below the surface

II. What must be the weight of a body (12 cu. inches) which weighed in water, loses 1·9 of its weight?

III. Describe (with diagram):
   (1) A hydraulic ram.
   (2) A force pump with air-chamber.

IV. A receiver contains 24 cubic inches. Find density of air in it after
   (a) two strokes of an air pump whose barrel contains 4 cubic inches.
   (b) six strokes of a condenser whose barrel contains 2 cubic inches.

V. Find (in pounds) the pressure of water on the sides and bottom of a vessel 4 feet square (inside), the water being 3 feet deep.

VI. Four cubic inches of sea water (s. g. 1.025) are mixed with three cubic inches of a fluid (s. g. .910). Find s. g. of resulting fluid.

VII. How would you lay a "centre drain" in a road?

VIII. State general rules for:
   (1) Slopes of roads.
   (2) Materials to be used in repairs.

Steam Engine.

I. If you found a blister plate, what would you do?

II. If the safety valve were stuck, would you relieve the pressure on the boiler if the steam were up and could not escape?

III. If the water is suffered to get too low, what will be the consequence?

IV. What is steam?

V. What is a vacuum?

VI. Name all connections for a boiler outside of shell.

VII. How would you set an engine if it were not running true?

VIII. What is the relative proportion of a steam pump plunger to the size of steam cylinder?

IX. What causes a pump to work and feed a boiler against its own pressure?

X. Which will give the more power and better results, two 10-inch cylinders or one 20-inch cylinder, and why?

XI. Why is a boiler braced?

XII. What is a steam gauge for?

XIII. What is a safety valve for?

XIV. Give the different causes for boiler explosions.

Theoretical Mechanics.

I. Lay a steel square on the face of a board, having the 7″ mark of the blade on the edge and the 5″ mark on the tongue. The blade of the square will then be at an angle of 65°. With this sign as a given angle, construct a diagram that will obtain the several cuts for hopper or splayed work, and give the name of each angle respectively.

II. State in what order bench planes are used, and also the proper angles both for grinding and whetting.

III. Describe a well-trimmed saw. Give the shape of the teeth, both for ripping and also for cross-cutting.

Practical Mechanics.

Directions for making equal-sided hopper, similar to pattern. (Time allowed, $1\frac{1}{2}$ hours.):

The given angle is 54°. Rip a piece of 1″ board $7\frac{1}{8}$″ wide and three feet long. Dress both sides and shoot both edges to 7″. See that the bevels are right, then mark and cut the several angles required. Nail up with 2″ brads.

APPENDIX IV.

CLASS LISTS—EASTER EXAMINATIONS, 1893—FIRST YEAR.

Agriculture.

Class I.

1 Macfie, C. M.
  Comfort, J. H.
3 Watson, J. H.
4 King, W. A.
5 Newman, W. M.
6 Buchanan, John.
7 Werry, M. J.
8 Atkinson, John.
  Cook, J. H.
10 Brown, Robt.
  Kidd, D. F.

Class II.

1 Brent, A. H.
  Simpson, A. E.
3 Jardine, J. E. A.
  Woolverton, T. N.
5 Christian, A. H.
  Wheatley, Jno.
  Reinke, C. E.
8 Kennedy, W. A.
  Butler, E.
10 Robertson, G. A.
  Vipond, J. M.
12 Gilleland, H. C.
13 Doherty, W. M.
14 Henderson, R.
  McKenzie, R. V.
  Thompson, W. J.
17 Pettit, F. E.
18 Shorey, S. C.
  Fitzgerald, J. P.
20 McCullough, H. A.
  High, A.
  James, D. A.
23 Elliott, Wm.
  Elmes, J. H.
  Westover, M.
26 Wilson, E. E.
  Traviss, C. H.
  Carrick, C.
  Duffett, G. P.
30 Smyth, F. L.
  Payne, G. Y.

Class III.

1 Rowe, G. F.
2 Mitchell, S.
  Laird, J. G.
4 Clunn, W. P.
5 Wood, R. S.
6 Ross, T. E.
  Caldecott, F.
8 Lailey, F. T.
9 McKay, W. E.
  Graesser, F. A.
11 Millichamp, R. W.
12 McDonald, W. A.
13 McDonald, N.

Logie, A.
Fee, F. W.
Burdett, A. H.

Inorganic Chemistry.

Class I.

1 Macfie.
2 Robertson.
3 Atkinson.
  Wheatley.
5 Watson.
6 Cook.
7 Comfort.
8 Rowe.
9 King.
10 Graesser.
11 Butler.
  Jardine.
13 Wood.

Class II.

1 High.
2 Newman.
  Kennedy.
4 Werry.
5 Christian.
  Simpson.
  Reinke.
8 Duffett.
9 Emigh.
10 Pettit.

Class III.

1 Laird.
2 Woolverton.
3 Doherty.
4 Lailey.
5 Kidd.
  Gilleland.
7 Buchanan.
8 Ross.
9 Traviss.
10 Wilson.
  Vipond.
12 Henderson.
  Westover.
14 McCullough.
15 Shorey.
16 Elliott.
17 Thompson.
  McKay.
  James.

Brent.
Caldecott.
Payne.
Smyth.
Elmes.
Mitchell.
Carrick.
Fitzgerald.
McKenzie.
Logie.
Millichamp.
Burdett.
Clunn.
Fee.
McDonald, W. A.
McDonald, N.

Zoology.

Class I.

1 Macfie.
2 King.
3 Robertson.
4 Rowe.
5 Watson.
  Comfort.
7 Atkinson.

Class II.

1 Kennedy.
2 Buchanan.
3 Wood.
4 Wheatley.
5 McKenzie.
6 Cook.
7 Ross.
8 Caldecott.
  Henderson.
10 Butler.
11 Werry.
  Pettit.
13 Laird.
14 Kidd.
  Lailey.
16 Newman.

Class III.

1 Emigh.
  Jardine.
3 Vipond.
4 Smyth.
5 High.
  Simpson.
7 Woolverton.
  Burdett.
9 Elliott.
10 McKay.
11 Brent.
  Reinke.
13 Christian.
  Elmes.
15 Graesser.
16 Duffett.
17 Doherty.
18 Gilleland.
  James.
20 Traviss.
21 McCullough.
22 Westover.
23 Logie.
  Mitchell.
25 Payne.
26 Wilson.
27 Millichamp.
  Shorey.
29 Fitzgerald.
30 Carrick.
  Thompson.
32 Fee.
33 McDonald, W. A.

Clunn.
McDonald, N.

Veterinary Anatomy.

Class I.

1 Watson.
2 Macfie.
3 Reinke.
4 Robertson.
  Westover.
6 Buchanan.
  Jardine.
8 Newman.
9 King.
10 Pettit.
  Laird.
12 Butler.
  Kennedy.
  Atkinson.
15 High.
16 Werry.
17 McCullough.
  Wood.
19 Wilson, E. E.
20 Christian.
  Traviss.
  Comfort.
23 Wheatley.

Class II.

1 Cook.
2 Gilleland.
3 Carrick.
4 Henderson.
5 Elmes.
  Simpson.
7 Smyth.
8 Vipond.
  Brent.
10 Ross.
  Kidd.
  Lailey.
  McKenzie.

Class III.

1 James.
2 McKay.
  Woolverton.
4 Doherty.
  Rowe.
6 Duffett.
7 Payne.
8 Fitzgerald.
  Elliott.
10 Thompson.
  Millichamp.
12 Graesser.
13 Shorey.
14 Mitchell.
  Hunter.
16 Burdett.

Caldecott.
McDonald, W. A.
Logie.
Clunn.
Fee.
McDonald, N.

CLASS LISTS—EASTER EXAMINATIONS, 1893 (*Continued*)—FIRST YEAR.

English Grammar.

Class I.

1 Macfie.
2 Comfort.
3 Watson.
4 { Kennedy.
King.
6 Werry.

Class II.

1 { Gilleland.
McCullough.
3 Newman.
4 { Wheatley.
Wood.
6 Lailey.
7 Robertson.
8 { Caldecott.
Jardine.
10 Rowe.
11 Cook.

Class III.

1 Traviss.
2 { Reinke.
Brent.
4 Atkinson.
5 Wilson.
6 { Payne.
Woolverton.
8 Kidd.
9 { Buchanan.
Henderson.
11 James.
12 McKay.
13 { Doherty.
Pettit.
15 { High.
Hunter.
17 { Graesser.
Carrick.
Logie.
20 Duffett.
21 Christian.
22 Millichamp.
23 { Butler.
Fitzgerald.
25 Vipond.
26 Shorey.
27 Burdett.
28 Westover.
29 { Elliott.
Laird.
Simpson.
Ross.

Fee.
{ Smyth.
McKenzie.
Elmes, J. H.
Thompson.
Mitchell.
McDonald, W. A.
Clunn.
McDonald, N.

Literature.

Class I.

1 Macfie.
2 Comfort.
3 Robertson.
4 Werry.
5 Wood.
6 Watson.

Class II.

1 Newman.
2 Atkinson.
3 King.
4 Simpson.
5 Lailey.
6 Wheatley.
7 Brent.
8 Rowe.
9 High.
10 { McKenzie.
Millichamp.

Class III.

1 Kennedy.
2 Jardine.
3 Buchanan.
4 Kidd.
5 Graesser.
6 { Butler.
Cook.
Doherty.
9 { Caldecott.
Reinke.
Vipond.
12 Pettit.
13 Smyth.
14 Laird.
15 Christian.
16 { McCullough.
Woolverton.
18 Elliott.
19 { Gilleland.
Shorey.
21 Ross.
22 Payne.
23 { Duffett.
James.
25 Henderson.
26 { Carrick.
Westover.
28 Traviss.
29 McKay.
30 Thompson.
31 { Elmes.
Fitzgerald.
Wilson.

McDonald, W. A.
Logie.
Mitchell.
Burdett.
Clunn.
Fee.
McDonald, N.

Arithmetic.

Class I.

1 { Macfie.
Werry.
3 Comfort.
4 Robertson.
5 Reinke.
6 Wheatley.
7 Kennedy.
8 King.
9 Buchanan.
10 Wilson.
11 Brent.
12 Christian.

Class II.

1 High.
2 { Fitzgerald.
Newman.
4 McCullough.
5 Ross.
6 Cook.
7 Woolverton.
8 Kidd.
9 Butler.
10 Gilleland.
11 { Doherty.
James.
13 Jardine.
14 Atkinson.

Class III.

1 Smyth.
2 Rowe.
3 Henderson.
4 McKay.
5 Vipond.
6 Watson.
7 Traviss.
8 { Duffett.
Pettit.
10 { McKenzie.
Millichamp.
12 Westover.
13 Elliott.
14 Simpson.
15 Lailey.
16 Graesser.
17 Caldecott.
18 Logie.
19 Wood.
20 McDonald, W.A.
21 Payne.

Carrick.
Laird.
Shorey.
Elmes.
Thompson.
Fee.
McDonald, N.
Burdett.
Mitchell.
Clunn.

Mensuration.

Class I.

1 { King.
Macfie.
3 McCullough.
4 Watson.
5 Woolverton.
6 Robertson.
7 Gilleland.
8 Comfort.
9 Reinke.
10 Wilson.
11 Wheatley.
12 Butler.
13 Atkinson.
14 Newman.
15 { Christian.
Werry.
17 Kennedy.
18 Pettit.
19 Westover.
20 { Cook.
Rowe.

Class II.

1 Traviss.
2 Ross.
3 { Brent.
Caldecott.
Wood.
6 Graesser.
7 Fitzgerald.
8 { Henderson.
James.
10 Buchanan.
11 High.
12 Kidd.
13 Vipond.
14 Lailey.

Class III.

1 Elliott.
2 Doherty.
3 McKenzie.
4 Jardine.
5 Carrick.
6 Logie.
7 Thompson.
8 Simpson.
9 Duffett.
10 McKay.
11 Smyth.
12 Laird.
13 { Elmes.
Payne.
15 Millichamp.

Fee.
Shorey.
McDonald, W.A.
Mitchell.
Burdett.
Clunn.
McDonald, N.

Proficiency.

1 Macfie.
2 Comfort.
3 King.
4 Watson.
5 Robertson.
6 Werry.
7 Wheatley.
8 Kennedy.
9 Newman.
10 Atkinson.
11 Reinke.
12 Cook.
13 Buchanan.
14 Wood.
15 Butler.
16 Rowe.
17 Jardine.
18 High.
19 McCullough.
20 Gilleland.
21 Christian.
22 Pettit.
23 Woolverton.
24 Kidd.
25 Wilson.
26 Lailey.
27 Henderson.
28 Traviss.
29 Simpson.
30 Ross.
31 Vipond.
32 Doherty.
33 Westover.
34 Graesser.
35 James.
36 Duffett.
37 Elliott.
38 McKay.

CLASS LISTS—EASTER EXAMINATIONS, 1893—SECOND YEAR.*

Agriculture.

Class I.

1 Ferguson, J. J.
2 Atkinson, James.
3 Spencer, J. B.
4 McCallum, Wm.
5 McKenzie, W. G.
6 McNaughton, K.

Class II.

1 Kennedy, P. B.
2 McMordie, R.
3 Brown, W. J.
4 McCrimmon, W D
5 Cooper, W. W.
6 Husband, H. M.
7 Phin, A. E
8 Conn, Joseph.
9 Stewart, J.
10 Dean, F.
11 Hay, L.

Class III.

1 Elmes, W. A.
2 Brooks, W. C.
3 Burns, J. H.
4 Hamilton, C. A. W
5 Lehmann, R. A.

Findlay, J. H.

Practical Cattle.

Class I.

1 Ferguson.
2 McKenzie.
3 Atkinson.
4 Stewart.
5 Spencer.
6 Phin.
7 Husband.
8 Hay.
9 McCallum.

Class II.

1 Conn.
2 Brown.
3 Hamilton.
4 Burns.
5 McNaughton.
6 McMordie.
7 Cooper.
8 McCrimmon.
9 Elmes.
10 Findlay.
11 Dean.
12 Kennedy.
13 { Lehmann.
{ Brooks.

Practical Sheep.

Class I.

1 Spencer.
2 Atkinson.
3 Stewart.
4 Phin.
5 Brown.
6 Conn.
7 { Ferguson.
{ McMordie.
9 { McKenzie.
{ Cooper.
11 McCrimmon.
12 McCallum.

Class II.

1 McNaughton.
2 Husband.
3 { Findlay.
{ Dean.
5 Elmes.
6 Hamilton.
7 Hay.
8 Kennedy.
9 Brooks.
10 Burns.

Class III.

1 Lehmann.

Dairying.

Class I.

1 Ferguson.
2 McCrimmon.
3 Atkinson.
4 Husband.

Class II.

1 Stewart.
2 McCallum.
3 Spencer.
4 Conn.
5 Brown.
6 Kennedy.
7 McMordie.
8 McKenzie.
9 Elmes.
10 Lehmann.
11 Dean.

Class III.

1 Brooks.
2 Phin.
3 Hamilton.
4 Cooper.
5 Hay.
6 McNaughton.
7 Findlay.
8 Burns.

Agricultural Chemistry.

Class I.

1 McKenzie.
2 McCallum.
3 Ferguson.
4 Spencer.

Class II.

1 Atkinson.
2 McMordie.
3 { Kennedy.
{ McCrimmon.

Class III.

1 Dean.
2 Husband.
3 Cooper.
4 Stewart.
5 Lehmann.
6 McNaughton.
7 Burns.
8 Phin.
9 Elmes.
10 Brooks.
11 Conn.
12 Brown.
13 Hamilton.
14 Hay.

Findlay.

Entomology

Class I.

1 Atkinson.
2 Ferguson.
3 Kennedy.
4 McKenzie.
5 McCallum.
6 Spencer.

Class II.

1 Brown.
2 { McMordie.
{ McCrimmon.
4 Lehmann.
5 Dean.
6 Brooks.
7 Husband.

Class III.

1 Stewart.
2 Phin.
3 Cooper.
4 McNaughton.
5 Conn.
6 Hay.
7 Elmes.
8 Hamilton.
9 Burns.

Findlay.

Diseases of Domestic Animals.

Class I.

1 McMordie.
2 Ferguson.
3 { McKenzie.
{ Kennedy.
5 Atkinson.
6 Spencer.
7 McCallum.
8 Conn.

Class II.

1 Dean.
2 Elmes.
3 { Husband.
{ Stewart.
5 Hamilton.
6 { McCrimmon.
{ Burns.
8 Hay.
9 McNaughton.
10 Cooper.
11 Phin.

Class III.

1 Brown.
2 Lehmann.
3 Brooks.
4 Findlay.

Practical Horse.

Class I.

1 McCrimmon.
2 Kennedy.
3 Hamilton.
4 { Husband.
{ Lehmann.
6 { Hay.
{ Ferguson.
{ Cooper.

Class II.

1 { Stewart.
{ Spencer.
{ McKenzie.
4 { Phin.
{ McCallum.
{ Burns.
7 Elmes.
8 { Atkinson.
{ Brooks.
{ Conn.
{ McNaughton.

Class III.

1 McMordie.
2 { Brown.
{ Dean.
4 Findlay.

Literature.

Class I.

1 Husband.
2 Kennedy.
3 Ferguson.

Class II.

1 Atkinson.
2 McCallum.
3 McMordie.
4 Dean.
5 McKenzie.

Class III.

1 Spencer.
2 Conn.
3 { Curzon, A. R.
{ Stewart.
5 Elmes.
6 { Burns.
{ Brooks.
8 { Phin.
{ Hay.
10 Brown.
11 McNaughton.
12 { Cooper.
{ Hamilton.

Lehmann.
McCrimmon.
Findlay.

Political Economy.

Class I.

1 Kennedy.
2 Atkinson.
3 { Ferguson.
{ McKenzie.

Class II.

1 McCallum.
2 Brown.
3 Stewart.
4 { Curzon, A. R.
{ Husband.

Class III.

1 McMordie.
2 Spencer.
3 Cooper.
4 { Brooks.
{ McCrimmon.
6 { Hamilton.
{ Elmes.
8 Burns.
9 { McNaughton.
{ Conn.
11 Phin.
12 Findlay.
13 Hay.
14 { Dean.
{ Lehmann.

* For general proficiency list see page 214.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1893 (*Continued*)—FIRST YEAR.

Agriculture.

Class I.

1 Macfie, C. M.
2 Comfort, J. H.
3 King, W. A.; Robertson, G. A.
5 Henderson, R.
6 Buchanan, Jno.
7 Werry, M. J.
8 Atkinson, Jno.
9 Kennedy, W. A.
10 Newman, W. M.
11 Butler, E.
12 Cook, J. H.; Wheatley, Jno.
14 Gilleland, H. C.

Class II

1 Christian, A. H.
2 Reinke, C. E.
3 High, A.
4 McCullough.
5 Shorey, S. C.; Laird, J. G.
7 Simpson, A. E.; Carrick, C.
9 Wilson, E. E.
10 James, D. A.
11 Thompson, W. J.
12 Fitzgerald, J. P.; Pettit, F. E.

Class III.

1 McKenzie, R. V.
2 Rowe, G. F.
3 Doherty, W. M.
4 DeHart, R. A.
5 Smyth, F. L.; Elliott, Wm.
7 Traviss, C. H.
8 Duffett, G. P.
9 Vipond, J. M.
10 Mitchell, S.
11 Logie, A.; Lailey, F. T.; McDonald, N.
14 Kidd, D. F.; Millichamp, R. W.
16 Millson, A.; Clunn, W. P.; Caldecott, F.; Graesser, F. A.

Wood, R. S.
McKay, W. E.
McDonald, W. A.
Aylen, C. S. F.
Fee, F. W.

Dairying.

Class I.

1 Macfie.
2 Comfort.
3 Kennedy.
4 King.
5 Butler.
6 Wheatley.
7 Cook.
8 Werry.
9 Robertson.
10 McCullough.
11 Reinke.

Class II.

1 Pettit.
2 Buchanan.
3 Christian.; James.
5 Elliott.; Atkinson.
7 Lailey.
8 Duffett.
9 Thompson.
10 Rowe.; McKenzie.
12 Doherty.
13 Wood.

Class III.

1 High.
2 Kidd.
3 Millson.; Laird.
5 Henderson.
6 Newman.
7 Fitzgerald.
8 Smyth.
9 Simpson.
10 Shorey.
11 Carrick.
12 Graesser.
13 Vipond.
14 DeHart.
15 Logie.
16 Millichamp.
17 Gilleland.
18 McDonald, N.
19 McDonald, W. A.; Mitchell.; Traviss.; Caldecott.

McKay.
Aylen.
Clunn.
Fee.

Materia Medica.

Class I.

1 Macfie.
2 Atkinson.
3 Cook.
4 Rowe.

Class II.

1 Robertson.
2 Butler.
3 King.; Doherty.
5 Comfort.; Kennedy.; Wood.

Class III.

1 High.; Werry.; Duffett.; Simpson.
5 Buchanan.
6 Fitzgerald.; Millichamp.; Smyth.
9 Kidd.
10 Thompson.; Gilleland.
12 Vipond.; Graesser.
14 McKenzie.; Pettit.; Newman.
17 Reinke.
18 Laird.; DeHart.; Wilson.
21 Wheatley.; Christian.
23 Caldecott.; Henderson.; James.; Elliott.
27 Traviss.; Carrick.
29 Shorey.; McCullough.
31 McDonald, W. A.

Mitchell.
Emigh.
Aylen.
Lailey.
Logie.
McKay.
McDonald, N.
Clunn.
Fee.

Botany.

Class I.

1 Macfie.
2 King.
3 Kennedy.
4 Atkinson.
5 Comfort.
6 Robertson.
7 Buchanan.
8 Henderson.
9 Wheatley.

Class II.

1 Werry.
2 Traviss.
3 Cook.
4 Rowe.
5 McCullough.
6 Reinke.; Elliott.
8 Pettit.
9 High.; Wood.
11 Butler.
12 Laird.
13 James.

Class III.

1 McKenzie.
2 Wilson.; Shorey.
4 Gilleland.; Newman.
6 Emigh.
7 Christian.
8 Duffett.
9 Doherty.
10 Fitzgerald.
11 Carrick.; Smyth.
13 Simpson.
14 Mitchell.
15 Caldecott.
16 Vipond.
17 Lailey.
18 Thompson.
19 Millichamp.
20 McKay.
21 Kidd.; Logie.
23 Graesser.

DeHart.
McDonald, W. A.
Aylen.
McDonald, N.
Fee.
Millson.
Clunn.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1893 (*Continued*)—FIRST YEAR.

Geology.

Class I.

1 Macfie.
2 King.
3 Atkinson.
4 Buchanan.
5 Comfort.
6 Robertson.
7 Kennedy.

Class II.

1 Reinke.
2 { Werry. / Duffett.
4 { Henderson. / James.
6 McKenzie.
7 Cook.
8 { Smyth. / Wheatley.
10 Elliott.
11 { Laird. / Rowe.
13 Simpson.

Class III.

1 High.
2 { Pettit. / Wood.
4 { Carrick. / Mitchell.
6 Caldecott.
7 { Gilleland. / Newman.
9 Butler.
10 Wilson.
11 Doherty.
12 { Lailey. / McCullough.
14 Christian.
15 Fitzgerald.
16 { Traviss. / Millson.
18 Vipond.
19 Kidd.
20 { Millichamp. / Shorey.
22 Graesser.
23 { Thompson. / DeHart.
25 Logie.

McDonald, W.A.
Aylen.
McKay.
McDonald, N.
Clunn.
Fee.

Literature.

Class I.

1 Macfie.
2 Rowe.
3 Comfort.
4 Werry.
5 Caldecott.
6 Wheatley.
7 Wood.
8 Kennedy.
9 Simpson.

Class II.

1 Robertson.
2 Lailey.
3 McKenzie.
4 Doherty.
5 McCullough.
6 Millichamp.
7 Buchanan.
8 Duffett.
9 Atkinson.
10 King.
11 { Cook. / High.

Class III.

1 Shorey.
2 Newman.
3 { Gilleland. / Reinke.
5 Christian.
6 Pettit.
7 Elliott.
8 { Traviss. / Kidd.
10 Graesser.
11 Henderson.
12 Vipond.
13 DeHart.
14 Butler.
15 { James. / Laird. / Wilson.
18 { Aylen. / Carrick. / Logie.
21 { Fitzgerald. / McKay. / Smyth. / Thompson.

McDonald, N.
Mitchell.
Clunn.
McDonald, W.A.
Fee.

English Grammar.

Class I.

1 Macfie.
2 Comfort.
3 Robertson.
4 Werry.

Class II.

1 Atkinson.
2 McCullough.
3 Rowe.
4 { Caldecott. / King.

Class III.

1 { Duffett. / Kennedy. / Gilleland.
4 Lailey.
5 Cook.
6 Wheatley.
7 Henderson.
8 { High. / McKay.
10 Wood.
11 Newman.
12 Pettit.
13 { Buchanan. / Graesser. / Traviss.
16 { Fitzgerald. / James. / Simpson.
19 Shorey.
20 Doherty.
21 Butler.
24 { Kidd. / Reinke. / Christian. / Emigh. / Vipond.
27 Laird.
28 Wilson.
29 { Carrick. / Millichamp. / Thompson. / Elliott. / McKenzie.

DeHart.
Logie.
Smyth.
McDonald, N.
McDonald, W. A.
Mitchell.
Aylen.
Clunn.

Arithmetic.

Class I.

1 { Comfort. / Doherty. / Kennedy. / Macfie. / Werry.
6 { Newman. / Pettit.
8 Wheatley.
9 Reinke.
10 Robertson.
11 James.
12 Butler.
13 Atkinson.
14 High.
15 Wilson.

Class II.

1 { Buchanan. / Traviss.
3 Rowe.
4 { Henderson. / McCullough.
6 Duffett.
7 { King. / Wood.
9 { Christian. / McKenzie.
11 Logie.
12 Lailey.
13 Kidd.
14 Graesser.
15 Fitzgerald.

Class III.

1 McKay.
2 Dehart.
3 Caldecott.
4 Laird.
5 Vipond.
6 Gilleland.
7 Cook.
8 Carrick.
9 Elliott.
10 Simpson.
11 Shorey.
12 Smyth.
13 Thompson.
14 { McDonald, N. / Millichamp.

McDonald, W.A.
Aylen.
Mitchell.
Fee.
Clunn.

General Proficiency.

1 Macfie.
2 Comfort.
3 Robertson.
4 Kennedy.
5 Werry.
6 Atkinson.
7 King.
8 Wheatley.
9 Buchanan.
10 Rowe.
11 Cook.
12 Reinke.
13 Butler.
14 McCullough.
15 High.
16 Doherty.
17 { Henderson. / Pettit.
19 Duffett.
20 Newman.
21 McKenzie.
22 James.
23 Simpson.
24 Christian.
25 Gilleland.
26 { Wilson. / Elliott.
28 Laird.
29 { Fitzgerald. / Caldecott.
31 Traviss.
32 Shorey.
33 Carrick.
34 Kidd.
35 Thompson.
36 Graesser.
37 Vipond.
38 Millichamp.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1893 (*Continued*)—SECOND YEAR.

Agriculture and Arboriculture.

Class 1.

1 Ferguson, J. J.
2 Atkinson, Jas.
3 McCallum, Wm.
4 McKenzie, W.G.

Class II.

1 McMordie, R.
2 { Husband, E. M. / McCrimmon, W.D. }
4 Spencer, J. B.
5 Dean, F.
6 { Conn, Joseph. / Elmes, W.A. / Kennedy, P. B. }
9 Hay, L.
10 Brown, W. J.
11 Brooks, W. C.
12 Stewart, J.
13 McNaughton, K.

Class III.

1 Cooper, W. W.
2 Lehmann, R. A.
3 Burns, J. H.
4 Phin, A. E.
5 Hamilton, C.A.W.
6 Findlay, J. H.

Dairying.

Class I.

1 McCallum.
2 Atkinson.

Class II.

1 Ferguson.
2 McKenzie.
3 Dean.
4 Hay.

Class III.

1 Spencer.
2 McMordie.
3 Husband.
4 Brown.
5 Burns.
6 McNaughton.
7 McCrimmon.
8 Stewart.
9 Brooks.
10 { Elmes. / Cooper. }
12 Phin.
13 Kennedy.
14 { Conn. / Hamilton. / Lehmann. }

Findlay.

Analytical Chemistry.

Class I.

1 McCallum.
2 Atkinson.
3 Cooper.
4 Ferguson.
5 Phin.

Class II.

1 { McKenzie. / Stewart. / Conn. / McCrimmon. }
5 { Elmes. / Hay. }
7 Brown.
8 { Brooks. / Burns. / McNaughton. }
11 { Husband. / Kennedy. }
13 { Hamilton. / McMordie. }
15 { Spencer. / Dean. }

Findlay.
Lehmann.

Botany.

Class I.

1 McCallum.
2 Ferguson.
3 { Atkinson. / Kennedy. }

Class II.

1 McKenzie.
2 Husband.
3 Spencer.
4 Phin.

Class III.

1 Conn.
2 Cooper.
3 McMordie.
4 Stewart.
5 McCrimmon.
6 Brown.
7 Dean.
8 Hay.
9 McNaughton.
10 Lehmann.
11 Elmes.
12 Brooks.
13 Hamilton.
14 Burns.

Findlay.

Practical Horticulture.

Class I.

1 Kennedy.
2 Ferguson.
3 Atkinson.
4 { McKenzie. / McCallum. }

Class II.

1 Spencer.
2 Cooper.
3 McMordie.
4 McCrimmon.
5 Phin.

Class III.

1 Brown.
2 Lehmann.
3 Husband.
4 Conn
5 Burns.
6 Findlay.
7 { Stewart. / Elmes. }
9 Hamilton.
10 Dean.
11 Brooks.
12 Hay.
13 McNaughton.

Breeds of Horses and Obstetrics.

Class I.

1 McKenzie.
2 Spence.
3 Atkinson.
4 McMordie.
5 McCallum.
6 Ferguson.
7 Dean.

Class II

1 { Lehmann. / McNaughton. }
3 Kennedy.
4 McCrimmon.
5 Stewart.
6 Brooks.
7 Cooper.
8 { Phin. / Elmes. }
10 { Hay. / Conn. }

Class III.

1 Burns.
2 Husband.
3 Brown.
4 Hamilton.
5 Findlay.

Literature.

Class I.

1 Ferguson.
2 Husband.

Class II.

1 McCallum.
2 McMordie.
3 Atkinson.

Class III.

1 Spencer.
2 Kennedy.
3 Curzon, A. R.
4 Cooper.
5 Brown.
6 Dean.
7 Burns.
8 McCrimmon.
9 Stewart.
10 Elmes.
11 { Conn. / Phin. }
13 { McKenzie. / McNaughton. }
15 { Hamilton. / Lehmann. }

Brooks.

Hydrostatics and Road-making.

Class I.

1 Ferguson.
2 { McCallum. / Phin. }
4 McKenzie.

Class II.

1 Lehmann.
2 Atkinson.
3 Brooks.
4 Husband.

Class III.

1 McMordie.
2 Brown.
3 Cooper.
4 McCrimmon.
5 Kennedy.
6 Hamilton.
7 Spencer.
8 Elmes.
9 Stewart.
10 { Dean. / Findlay. }
12 McNaughton.
13 Conn.
14 { Burns. / Hay. }

General Proficiency.

Midsummer.	*Easter.*
1 McCallum.	1 Ferguson.
2 Atkinson.	2 Atkinson.
3 Ferguson.	3 McKenzie.
4 McKenzie.	4 McCallum.
5 McMordie.	5 Spencer.
6 Kennedy.	6 Kennedy.
7 Spencer.	7 McMordie.
8 Husband.	8 Husband.
9 Cooper.	9 Stewart.
10 McCrimmon.	10 Dean.
11 Phin.	11 Conn.
12 Dean.	12 Brown.
13 Brown.	13 Cooper.
14 Stewart.	14 McNaughton.
15 Conn.	15 Phin.
16 McNaughton.	16 Elmes.
17 Elmes.	17 Burns.
18 Burns.	18 Hay.
19 Hamilton.	19 Brooks.
	20 Hamilton.

APPENDIX V.

FINANCIAL STATEMENT FOR 1893.

I. College Expenditure.

(a) College Maintenance.

1. *Salaries and Wages*		$15,582 38
2. *Summer Course for Teachers*		500 00
3. *Food—*		
Meat, fish and fowl		3,339 66
Bread and biscuits, etc		608 92
Groceries, butter, and fruit		4,205 50
4. *Household Expenses—*		
Laundry, soap, and cleaning		379 70
Women servants' wages—cooks, laundresses, housemaids, etc		1,899 05
5. *Business Department—*		
Advertising, printing, postage, and stationery		1,166 94
6. *Miscellaneous—*		
Chemicals, apparatus, etc., used in laboratories		493 34
Library and reading-room—books, papers, and periodicals		371 82
Medals		66 20
Unenumerated		635 71
		$29,249 22
(b) Maintenance and Repairs of Government Buildings.		
Furniture and furnishings	$ 845 78	
Repairs and alterations	1,065 89	
Fuel	3,723 28	
Light	829 84	
Water	650 00	
Sewage disposal	141 60	
		$7,256 39
		$36,505 61
College Revenue.		
Tuition fees	$1,949 00	
Laboratory fees for gas and chemicals	79 00	
Fees for supplemental examinations	26 00	
Balances paid for board after deducting allowances for work in outside departments	5,141 66	
Contingencies—breakage, etc	55 85	
Bones and drippings	7 95	
Sundries	9 65	
		$7,269 11
Net expenditure		$29,236 50

The net sum voted by the Legislature for the College and the maintenance and repairs of Government buildings (see Estimates for 1893, pp. 35 and 39) was $31,632. Hence the unexpended balance for the year is $2,395.50.

II. Farm Expenditure.

(a) Farm Proper.

1. *Permanent Improvements—*

Fencing, underdraining, material for sidewalks, grading and paving driveways, etc	$846 24

2. *Farm Maintenance*—

Salaries and wages	$4,372 98	
Live stock	1,055 70	
Maintenance of stock	1,880 71	
Seed	230 25	
Binding twine	51 88	
Repairs and alterations	516 80	
Furniture and furnishings, etc	412 85	
Tools and implements	184 35	
Advertising, printing, postage, and stationery	229 87	
Fuel, light, etc	95 49	
Contingencies	232 07	
		$9,262 95
		$10,109 19

Farm Revenue.

Sale of cattle	$1,520 15	
" sheep	920 48	
" swine	834 24	
" wheat	7 23	
" oats	356 15	
" peas	35 10	
" barley	85 00	
" rye	22 72	
" rape seed	3 70	
" milk	22 84	
" hides and pelts	9 05	
" wool	73 82	
Service of animals	155 00	
Keep of animals	129 80	
For road work	15 00	
		$4,190 28
Net expenditure of farm proper		$5,918 91

Unexpended balance for the year, $663.09.

(*b*) *Experiments.*

Salaries and wages—	
Experimentalist	$1,300 00
Foreman, teamster, and feeders	774 35
Laborers	2,269 02
	4,343 37
Seeds	372 95
Manure and special fertilizers	180 40
Stock for feeding	6 69
Furniture, furnishings, and repairs	227 43
Printing, postage, and stationery	107 69
Implements	192 25
Feed and fodder	10 30
Exhibitions	4 00
Contingencies	75 09
	$5,520 17

Unexpended balance for the year, $1,061.83.

III. Dairy.

(*a*) *Experimental Dairy.*

Salaries and wages—		
Dairyman	$600 00	
Laborers—milking, feeding stock, etc	601 03	
	1,201 03	
Purchase of stock—cows, pigs, etc	720 27	
Feed and fodder	512 22	
Furniture, furnishings, and repairs	538 83	
Advertising, printing, postage, and stationery	96 09	
Fuel	230 65	
Contingencies	125 86	
		$3,424 95

(b) Dairy School.

Wages of Instructors	$362 11	
Purchase of milk	3,161 45	
Dairy appliances	1,481 74	
		5,005 30

(c) Travelling Dairy.

Two dairies travelling for seven months		4,688 12
		$13,118 37

Dairy Revenue.

Sales of butter	$1,080 31	
Milk	118 35	
Cheese	1,091 78	
Pigs	611 58	
Cattle	330 76	
Turnips	7 20	
Sundries	30	
Fees	285 00	
		3,525 28
Net expenditure of Dairy in all departments		$9,593 09

Unexpended balance for the year, $3,006.91.

V. Garden, Lawn, etc.

Salaries and wages—		
Lecturer on Horticulture	$562 25	
Gardener	550 00	
Assistant gardener	500 00	
Second assistant	380 00	
Teamster	333 96	
Laborers	1,188 98	
	$3,515 19	
Manure	59 05	
Trees, seeds, bulbs, etc	110 62	
Furniture and furnishings, tools, flower pots, repairs, etc	400 38	
Fuel, light, etc	860 80	
Contingencies	35 58	
	3,981 62	
Less revenue—sales of produce	50 00	
Net expenditure for the year	$3,931 62	

Unexpended balance for the year, $1,284.38.

VI. Mechanical Department.

Salary of foreman	$700 00
Extra carpenter for erection of buildings, etc	600 00
Tools, etc	45 11
Fuel and light	28 88
Expenditure for year	$1,373 99

Uxexpended balance for the year, $2.01.

Total net expenditure for maintenance in all departments in 1893—	
College	$29,236 50
Farm proper	5,918 91
Experiments	5,520 17
Experimental and travelling dairies and dairy school	9,593 89
Garden, lawn, etc	3,931 62
Mechanical department	1,373 99
	$55,574 28

Total of unexpended balances on the year's operations in all departments, $8,413.72.

The amonnt paid by the College to students for labor in the outside departments was $3,788.80. This was done by crediting on board bills the sums allowed to students from week to week by the foreman under whom they worked.

Without giving a formal statement of account, I may say that the Farm furnished feed and bedding for the College horses, put in ice for College and Dairy, supplied the College with milk, potatoes, turnips, etc., and provided the hay, straw, pasture, and ensilage used by the Dairy Department.

The Garden also supplied the College with a large quantity of fruit and vegetables.

JAMES MILLS,
President.

Durham ....
Kenilworth ......
Damascus ....
Hanover ....
Tara ....
Port Elgin ......
Paisley ....
Edengrove ....
Mildmay ....
Clifford ....
Listowel ....
Milverton ....
Brussels ....
Ripley ....
Kintail ....

C. A

Parkhill ....
Forest ....
Brigden ....
Petrolea ....
Appin ....
Glanworth ....
Brucefield ....
Exeter ....
Coldstream ....
St. Marys ....
New Hamburg ....

Professor S

Ingersoll ....
Chatham ....
Dresden ....
Comber ....

APPENDIX VI.

MEETINGS OF FARMERS' INSTITUTES.

1894.

Division 1.

William Rennie, A. Elliott and D. Z. Fraser.

Durham	S. Grey	Jan. 2nd, 10.30 a.m.
Kenilworth	E. Wellington	" 3rd, 10.30 a.m.
Damascus	E. Wellington	" 4th, 10.30 a.m.
Hanover	S. Grey	" 5th, 10.30 a.m.
Tara	N. Bruce	" 6th, 10.30 a.m.
Port Elgin	N. Bruce	" 8th, 10.30 a.m.
Paisley	C. Bruce	" 9th, 10.30 a.m.
Edengrove	S. Bruce	" 10th, 10.30 a.m.
Mildmay	S Bruce	" 11th, 10.30 a.m.
Clifford	W. Wellington	" 12th, 10.30 a.m.
Listowel	N. Perth	" 13th, 10.30 a.m.
Milverton	N. Perth	" 15th, 10.30 a.m.
Brussels	E. Huron	" 16th and 17th, 1 p.m on 16th.
Ripley	C. Bruce	" 18th, 10.30 a.m.
Kintail	W. Huron	" 19th and 20th, 1 p.m. on 19th.

Division 2.

C. A. Zavitz, B.S.A., L. Pattton and D. W. Beadle.

Parkhill	N. Middlesex	Jan. 2nd, 10 30 a.m.
Forest	E. Lambton	" 3rd and 4th, 10.30 a.m. on 3rd.
Brigden	W. Lambton	" 5th, 10.30 a.m.
Petrolea	W. Lambton	" 6th, 10.30 a.m.
Appin	W. Middlesex	" 8th and 9th, 10.30 a.m. on 8th.
Glanworth	E. Middlesex	" 10th and 11th, 1 p.m. on 10th.
Brucefield	S. Huron	" 12th, 10.30 a.m.
Exeter	S. Huron	" 13th, 10.30 a.m.
Coldstream	N. Middlesex	" 15th and 16th, 1 p.m. on 15th.
St. Marys	S. Perth	" 17th and 18th, 10.30 a.m. on 17th.
New Hamburg	S. Waterloo	" 19th and 20th, 10.30 a.m. on 19th.

Division 3.

Professor Shuttleworth, H. L. Hutt, B.S.A., and W. S. Fraser.

Ingersoll	S. Oxford	Jan. 2nd, 10.30 a.m.
Chatham	W. Kent	" 3rd, 10.30 a.m.
Dresden	E. Kent	" 4th, 10.30 a.m.
Comber	N. Essex	" 5th, 10.30 a.m.

Windsor	N. Essex	Jan. 6th, 10.30 a.m.
Leamington	S. Essex	" 8th and 9th, 10.30 a.m. on 8th.
Merlin	W. Kent	" 10th, 10.30 a.m.
Highgate	E. Kent	" 11th, 10.30 a.m.
Dutton	W. Elgin	" 12th, 10.30 a.m.
Shedden	W. Elgin	" 13th, 10.30 a.m.
Aylmer	E Elgin	" 15th and 16th, 10.30 a.m. on 15th.
Delhi	N. Norfolk	" 17th, 10.30 a.m.
Port Rowan	S. Norfolk	" 18th, 1 p.m.
Vittoria	S. Norfolk	" 19th, 10.30 a.m.
Waterford	N. Norfolk	" 20th, 10.30 a.m.

Division 4.

D. McCrae, Thomas Mason and A. H. Pettit.

Burford	S. Brant	Jan. 2nd and 3rd, 1 p.m. on 2nd.
Tilsonburg	S. Oxford	" 4th, 10.30 a.m.
Selkirk	Haldimand	" 5th and 6th, 1 p.m. on 5th.
Marshville	Monck	" 8th, 10 a.m. Evening meeting on 6th.
Stevensville	Welland	" 9th, 10 a.m.
Dunnville	Monck	" 10th, 1 p.m.
Port Robinson	Welland	" 12th, 10.30 a.m.
Grimsby	Lincoln	" 13th, 10.30 a.m.
Smithville	Lincoln	" 15th, 10.30 a.m.
Stony Creek	S. Wentworth	" 16th, 10.30 a.m.
Waterdown	N. Wentworth	" 17th, 10.30 a.m.
Ancaster	S. Wentworth	" 18th, 10.30 a.m.
St. George	N. Brant	" 19th and 20th, 1 p.m. on 19th.

Division 5.

Hon. Charles Drury, Simpson Rennie, *John J. Lenton and †L. G. Jarvis.

*Embro	N. Oxford	Jan. 2nd, 10.30 a.m.
*Drumbo	N. Oxford	" 3rd, 10.30 a.m.
*Freelton	N. Wentworth	" 4th, 10.30 a.m.
*Milton	Halton	" 5th, 10.30 a.m.
*Georgetown	Halton	" 6th, 10.30 a.m.
†Waterloo	N. Waterloo	" 8th and 9th, 1 p.m. on 8th.
†Guelph	S. Wellington	" 10th and 11th, 10.30 a.m. on 10th.
†Drayton	W. Wellington	" 12th, 10 30 a.m.
†Arthur	W. Wellington	" 13th, 10.30 a.m.
†Elora	C. Wellington	" 15th, 10.30 a.m.
†Belwood	C. Wellington	" 16th, 10.30 a.m.
†Orangeville	Dufferin	" 17th, 10.30 a.m.
†Shelburne	Dufferin	" 18th, 10.30 a.m.
†Malton	Peel	" 19th, 1 p.m.
†Brampton	Peel	" 20th, 10 30 a.m.

Division 6.

Professor Reed, T. G. Raynor. B.S.A., and W. H. McNish.

Flesherton	C. Grey	Jan. 2nd, 10.30 a.m.
Owen Sound	N. Grey	" 3rd, 10.30 a.m.
Meaford	N. Grey	" 4th, 10 30 a.m.

Thornbury	C. Grey	Jan. 5th, 10.30 a.m.
Stayner	W. Simcoe	" 6th, 10.30 a.m.
New Lowell	C. Simcoe	" 8th, 10.30 a.m.
Cookstown	S. Simcoe	" 9th, 10.30 a.m.
Alliston	W. Simcoe	" 10th, 10.30 a.m.
Penetanguishene	C. Simcoe	" 11th and 12th, 1.30 p.m. on 11th.
Coldwater	E. Simcoe	" 13th, 10 a.m. (Evening meeting on 12th.)
Orillia	E. Simcoe	" 15th, 10.30 a.m.
Churchill	S. Simcoe	" 16th, 10.30 a.m.
Newmarket	N. York	" 17th and 18th, 1 p.m. on 17th.
Woodbridge	W. York	" 19th, 10.30 a.m.
Weston	W. York	" 20th, 10.30 a.m.

Division 7.

Professor Panton, Joseph Yuill and John Jackson.

Little York	E. York	Jan. 2nd and 3rd, 10.30 a.m. on 2nd.
Uxbridge	N. Ontario	" 4th, 10.30 a.m.
Beaverton	N. Ontario	" 5th, 10,30 a.m.
Little Britain	W. Victoria	" 6th, 10.30 a.m.
Lindsay	W. Victoria	" 8th, 10.30 a.m.
Bobcaygeon	E. Victoria	" 9th, 10.30 a.m.
Fenelon Falls	E. Victoria	" 10th, 10.30 a.m.
Peterborough	W. Peterborough	" 11th, 10.30 a.m.
Warkworth	E. Northumberland.	" 12th and 13th, 1 p.m. on 12th.
Keene	E. Peterborough	" 15th, 10.30 a.m.
Lakefield	W. Peterborough	" 16th, 10.30 a.m.
Norwood	E. Peterborough	" 17th, 10.30 a.m.
Claremont	S. Ontario	" 18th, 10.30 a.m.
Whitby	S. Ontario	" 19th, 10.30 a.m.

Division 8.

Richard Gibson, H. L. Beckett, B.S.A., and Henry Arkell.

Newburg	Addington	Jan. 2nd, 10.30 a.m.
Stella	Lennox	" 3rd, 10.30 a.m.
Napanee	Lennox	" 4th, 10.30 a.m.
Shannonville	E. Hastings	" 5th, 10 30 a.m.
Bloomfield	Prince Edward	" 6th, 10.30 a.m.
Demorestville	Prince Edward	" 8th, 10.30 a.m.
Fenella	W. Northumberl'd	" 10th, 10.30 a.m.
Baltimore	W. Northumberl'd	" 11th, 10.30 a.m.
Orono	W. Durham	" 12th, 10.30 a.m.
Bowmanville	W. Durham	" 13th, 10 30 a.m. (No evening meeting.)

Division 9.

John McMillan, M.P., Captain G. Farewell and I. W. Steinhoff.

South Finch	Stormont	Jan. 2nd and 3rd, 10.30 a.m. on 2nd.
Mountain Station	Dundas	" 4th, 10.30 a.m.
Merrickville	N. Grenville	" 5th and 6th, 10.30 a.m. on 5th.
Spencerville	S. Grenville	" 8th, 10.30 a.m.

Iroquois	Dundas	Jan. 9th, 10.30 a.m.
Cornwall Centre	Cornwall	" 10th and 11th, 1.30 p.m on 10th.
Lyn	Brockville	" 12th, 10.30 a.m.
Mallorytown	Brockville	" 13th, 10.30 a.m.
Lansdowne	S. Leeds	" 15th, 10.30 a.m.
Delta	S. Leeds	" 16th, 10.30 a.m.
Kingston	Frontenac	" 17th and 18th, 1 p.m. on 17th.
Centreville	Addington	" 19th, 10.30 a.m.

DIVISION 10.

John I. Hobson, G. E. Day, B.S.A., and R. F. Holtermann.

Tweed	E. Hastings	Jan. 2nd, 10.30 a.m.
Lanark Village	N. Lanark	" 3rd, 10.30 a.m.
McDonald's Corners	N. Lanark	" 4th, 10 30 a.m.
Perth	S. Lanark	" 5th, 10 30 a.m.
Smith's Falls	S. Lanark	" 6th, 10 30 a.m.
Cobden	N. Renfrew	" 8th, 10.30 a.m.
Pembroke	N. Renfrew	" 9th, 10 30 a.m.
Renfrew	S. Renfrew	" 10th and 11th, 1 p.m. on 10th.
Manotick	Carleton	" 12th and 13th, 10.30 a.m. on 12th.
Alexandria	Glengarry	" 15th, 10.30 a.m.
St. Raphael	Glengarry	" 16th, 10 30 a.m.
Vankleek Hill	Prescott	" 17th and 18th, 1 p.m. on 17th.
Rockland	Russell	" 19th and 20th, 10.30 a.m. on 19th.

DIVISION 11.

D. McCrae, I. W. Steinhoff and Jonathan Sissons.

Bracebridge	Muskoka	Feb. 12th.
Port Carling	Muskoka	" 13th.
Utterson	Muskoka	" 14th.
Emsdale	E. Parry Sound	" 15th.
Edgington	W. Parry Sound	" 16th.
Parry Sound	W. Parry Sound	" 17th.
McKellar, Dunchurch	W. Parry Sound	" 19th.
Magnetawan	E. Parry Sound	" 20th.
Sundridge	E. Parry Sound	" 21st.
Powassan	E. Parry Sound	" 22nd.
Thessalon	E. Algoma	" 24th.
Bar River	C. Algoma	" 26th.
Richard's Landing	St. Joseph's Island	" 27th, 28th.
Marksville	St. Joseph's Island	March 1st.
Bruce Mines, McLennan	E. Algoma	" 2nd.
Iron Bridge	E. Algoma	" 3rd.
Gore Bay, Manitowaning	Manitoulin Island	" 5th, 6th.
Little Current	Manitoulin Island	" 7th, 8th.

APPENDIX VII.

FIFTEENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

The fifteenth annual meeting of the Ontario Agricultural and Experimental Union was held at the Agricultural College, Guelph, on December 21st and 22nd, 1893, commencing at at 10 a.m., on the 21st.

The President, A. G. McKenzie, Fairview, Ont., occupied the chair.

REPORT OF COMMITTEES.

Mr. C. A. Zavitz : The committee composed of Mr. E. Lick and myself, who were appointed to wait upon the Minister of Agriculture for the purpose of securing an increased grant for the Association, beg to report the appointment fulfilled. We interviewed the Hon. Mr. Dryden early in January and, after presenting the claims of the Association, asked that the "Union" grant be increased from $400 to $700 per year. We were very kindly received by Mr. Dryden, who spoke very favorably of the work being done by the Association and also increased the grant to $650.

The report was accepted.

PRESIDENT'S ADDRESS.

The President, Mr. A. G. McKenzie, then delivered the following address :

Gentlemen :—In the first place, I desire to thank you, the members of the Experimental Union, for electing me to this office, which I think is a very important one. The Union is now looked upon throughout the country as an important organization ; and as the President's office is the highest office in the gift of that organization, I consider myself highly honored.

We have endeavored to carry on some experimental work throughout the year that we thought would be profitable to ourselves and beneficial to others. The Union was organized about fifteen years ago—this is the fifteenth annual meeting. The idea first originated among the students and officers of this institution. The experimental work at first was not very extensive,—there being only about a dozen experiments, I think, carried on the first year. This continued to grow throughout the years, and rather slowly for seven or eight years, but during the last four or five years it has made rapid strides, and we have been getting considerable grants from the Government. This year we have $650, last year and the year before about $400. During the last year our Secretary of the Agricultural committee has sent out about 1,400 different sets of experiments to about 1,200 experimenters ; and has also sent out over 7,000 packages. You understand that this means considerable labor ; and so much distributed throughout this Province should be of great interest to us.

Our Union has been difficult to manage in more ways than one. We have had no organization to look back upon and from which to get hints. We claim that we are the largest co-operative society in America ; and consequently we think ourselves of no mean importance. One great principle with us is to feel our way as we go along cautiously—do not undertake work that we would be likely to fail in. You will notice that the most important branch of our work has been most successfully developed, that is, agricultural work, pure and simple. The other committees have been feeling their way as it were. The Committee on Entomology, for instance, was formed only last year, and the report of this year will be the first report; and their work is no doubt important. Then we have the Committee on Horticulture. They do not spend nearly so much money as the Committee on Agriculture, but yet their work is important and they are improving in method year by year. I refer to these, but will not enlarge, as we shall have reports from each of them. Then we have a Committee on Bee-keeping, to use a common term, and that committee has difficulties to overtake, and they are feeling their way.

Now, the difficulties of the work are very considerable. I may speak in the first place about the difficulties in connection with agricultural experiments, and I think probably that is the easiest part of the work. We on the farm know that if we are to make any success of farming in Ontario we must be very close at home—it is not to be got for nothing. Very often the hired man makes a tool of the employer, and the employer in many cases cannot trust to leave the hired man in charge of the work, should he go away to post himself well in scientific agriculture. It is hard for us even to come here for a couple of days. Again, we have to contend against difficulties more than that directly in connection with the work. We know, too, the work needs a lot of attention in seeding and harvest time, and that is the time the Agricultural Union puts work upon us. We have to take care that these plots are laid out properly, that the seed is sown properly, and that it is harvested, threshed, accounts kept, etc. That means no little amount of work if it is done properly, and taken out of the harvest time it is considerable.

Does it pay us to take up this Union work? Directly speaking, we cannot say that it will—we cannot make money out of the plots that we sow; but indirectly I think it it is profitable to us to carry on the work. In the first place, we have taken a course at this College, and have spent considerable time in gaining education here. How are we going to keep up this education? In the universities they talk about the university extension movement. I think we have the best plan of extension that can be followed—the co-operative experiment system. And then each re-union year after year tends to freshen and invigorate us in our farm work. We come back to meet our old associates, to meet the best scientists of the day and other important men, to get a new stimulus for the year that is coming; and in order to be good members of the Union we must keep ourselves more or less educated or we cannot expect to take an active part in our meeting. Every member should be willing to take his part of the work; and as President I would like to impress this upon you, do not leave all the work for the officers. Your place is important, and let every member realize this.

Then, what is our aim in connection with the Agricultural Union? Our aim is, I think, principally scientific work. A great many of our neighbors have not had the privilege of knowing what our Union has done, and it is those people who are down on reforms. Hence we find difficulty. Last spring when I would be going to the office for seed, etc., they would say, "Are you going to sow the whole of your farm with garden seeds?" They would look aghast when I explained. Visitors would be passing my fields, and seeing the road between the lots would wonder what insane fellow was doing this. A man who works hard in College will work hard when he leaves. Those who fail to take up work after getting an education, are the men who spend the time idling while at College. Of course there is something antagonistic between the two. As the dairymen say, there is an antagonistic principle between beef and dairying—that you cannot get the very best milk cow to be the very best beef cow. So possibly the very best student in science will not be the very best worker on the farm.

Our Union should be of a scientific nature. We should all be very careful and correct with our experimental work, so that as time goes on we may leave a record in our reports which may be looked up to by scientists.

There are perhaps one or two suggestions that I might make directly; and, first, some of our members find it difficult to take up the practical and actual work of experimenting. Now, the idea struck me that if some arrangement could be made among all the committees to have the regulations sent out from the one address, as it were. As it is, the Agricultural Committee will print their forms and send them out, the Committee on Entomology will print their forms and send them out; and this, I think, causes more expense than is really necessary. If by some method all these forms could be got out together, so that the exp rimenters could get them all in time, and they can choose what work they can take up. Again, let information be asked from all the members in a general way. You see, those of us who are in different localities are successful perhaps in some lines, and we have trouble in some certain lines. Now, we are anxious that we get deliverance from these troubles; and if we had a place in connection with the Union to make known these difficulties where we find the science of agriculture hard to work with the practice, and *vice versa*? Thus the Secretary could so collect these means of of information that he might be able to give something useful. As the work goes on we will see our way more clearly, and I hope that every student of the College will become a member of the Union—that everything will be done to promote it in those ways that are healthy. It has come to that point now when we are not so much anxious to have members increased as to have quality in the Union.

REPORT ON HORTICULTURAL EXPERIMENTS.

The following report was presented by ELMER LICK, Oshawa, Ont.: The Horticultural Committee, after consultation, decided to continue experiments with varieties of potatoes, also introducing experiments with varieties of strawberries and raspberries. Unexpected difficulty was met in securing the varieties of potatoes desired, which fact delayed the sending out of seed early in the season. One gratifying feature was the fact that Mr. Anson Groh desired us to test a new variety of his own growing.

A circular was sent to those desiring to experiment with potatoes, and to experimenters of last year who had reported results. Owing to the lateness of the planting season, with dry weather following, the variations in yield are not as great as was the case in previous years. We have only seven full reports which can be tabulated and averaged. However, these are apparently reliable, and will speak for themselves.

SHOWING AVERAGE WEIGHT OF EACH VARIETY AND ESTIMATED YIELD PER ACRE.

Experimenters.	Rural No. 2.		Empire State.		Summit.		Burpee's Extra Early.		Kaiser.		Puritan.		Distance apart of rows.	Soil.	Date of planting.
	Total weight.	Small.	Total weight.	Small.	Total weight.	Small.	Total weight.	Small.	Total weight.	Small.	Total weight.	Small.			
	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb			
Anson Groh.....	25	2	29	4	31	4	37½	7½	34	2	29½	5	27in.	Sandy loam.	June 2.
Wm. Cartwright.	85	2	85	3	80	2	60	3	68	3	82	2	24in.	Clay	May 22.
Orlando White ..	38	2½	43	3	43	6½	40	15	35	2½	51	9	42in.	Sand	May 16.
Hugh Collins....	58	2¼	62	2½	36	2¾	61	4	.....	...	43	5¼	24in.	Clay	May 30.
J. W. McBain...	101	3	95	4	88	5	85	5	90	4	80	6	30in.	Clay loam..	May 18.
Jas. Burns	62	...	49	...	67	...	57	...	65	...	54	...	36in.	....	July 4.
J. M. Hartman .	82	0	61	6	51	13	57	14	63	0	59	9	30in.	Clay loam ..	May 29.
Average yield (1 row 6 rods long)	64.4	1.7	60.6	3.2	56.6	4.7	56.7	7.0	59.1	1.9	56.9	5.2	... ..	....	....
Yield per acre ...	188.9	bu.	177.7	bu.	165.9	bu.	166.2	bu.	173.3	bu.	165.9	bu.	... ..	....	....

The following table shows the yield per 99 feet of row of the other varieties grown by the experimenters as a result of request to grow best yielder of their own varieties.

Experimenter.	Varieties.	Total weight.	Small.
		lb	lb
Nelson Monteith	Empire State	120	42
	Summit	144	36
	Toronto Queen	135	39
	Rural No. 2	123	30
	Harbinger	72	48
	Kaiser	126	33
	White Elephant	138	39
	Burpee E. Early	132	42
F. B. Hutt	Kaiser	147½	32½
	Rural No. 2	160	25
	Empire State	185	32½
	Beauty Hebron	167½	35
Geo. G. Shirreff	Puritan	140	15
	Burpee's E. Early	150	0
	Toronto Queen	100	12½
	Kaiser	125	20
Benjamin Shirreff	Kaiser	140	7½
	Empire State	140	5
	Bell	130	5
	Summit	125	10
W. H. Foster	Harbinger	76	15
	Summit	51	10
	Rural No. 2	71	9
	Burpee's Extra Early	61	11
	Toronto Queen	57	17
Thomas Steadman	Crown Jewel	78	5
	Burpee's Extra Early	77	6
	Thoroughborne	81	7
	Summit	70	5
	Harbinger	54	10
	Rural No. 2	68	2
	Bella	67	4
	Hebron	74	7
	Elephant	78	4
	Kaiser	90	10
Jas. Watson	Harbinger	36½	18
	Empire State	102	6
	Rural No. 2	81	3¼
	Burpee's Extra Early	63¼	6
	Summit	80½	8
	Toronto Queen	84	11½
	Kaiser	63	3
	Everett's Seedling	81	7½
D. K. Erb	Kaiser	67½	2½
	Summit	67½	15
	Burpee's Extra Early	112½	7½
	Harbinger	50	7½
	Rural No. 2	100	2½
	Empire State	90	12
	Toronto Queen	77½	7½
Robt. Willis	Summit	48	5
	Puritan	55	8
	Rural No. 2	74	2
	Empire State	68	3
	Grange	59	6
J. W. McBain	Daisy	75	7
Orlando White	Van Oram's Early	58	13
	Burpee's Extra Early	57½	12
	White Elephant	46	9
Anson Groh	Crown Jewel	35	6
	Elephant	32	4
	Kummer's Seedling	30½	2

Table Showing the Reported Mealiness and Quality

—		Rural No. 2.	Empire State.	Summit.	Burpee's E. Early.	Kaiser.	Puritan.
Mealiness	Good	5	7	5	7	3	7
	Medium	2		2		4	
	Bad						
Quality	Good	5	6	4	6	4	5
	Medium	2	1	3	1	3	2
	Bad						

Remarks of Experimenters.

ANSON GROH, Preston, Waterloo Co.: The season here was so severely dry that the order and date of ripening could not be fixed with any precision, as they simply dried up at the same time.

JAMES BURNS, Greenbank, Ontario Co.: Those potatoes which were sent to me on the 3rd of May did not reach me until the 4th of July. They are barely ripe.

J. W. HARTMAN, Elmhedge, Grey Co.: The potatoes were planted on clay loam sod, which had received a dressing of manure before they were planted. The season was very dry. Rural No. 2 and Kaiser grew very large. Their tops were green when dug October 10th.

GEORGE G. SHIRREFF, Clarence, Russell Co.: I find Burpee's an excellent potato, a fine yielder, and ripens so early that the blight does not seem to affect it. Puritan, although not as good as Burpee's, keeps its rank ahead of the varieties sent out in 1891, except in cooking properties. Kaiser is a very good yielder of mealy tubers, but small comparatively.

BENJAMIN SHIRREFF, Allenford, Bruce Co.: These are four good varieties of potatoes for a general crop. They have all done remarkably well considering the very dry season we have had. I prefer the Summit for use; it is, indeed, a very fine table potato. The Kaiser is not quite up to the others in mealiness.

W. H. FOSTER, Leamington, Essex Co.: The Empire State was a failure from the black heart in the spring. I would recommend the Harbinger for late, the Summit for medium late, and Burpee's Extra Early for family use.

THOS. STEADMAN, Wyoming, Lambton Co.: I am well satisfied with Crown Jewel, Burpee's Extra Early and Thoroughborne. They are good potatoes, smooth and saleable. The season in this section of the country was not good for potatoes—too dry—but I had a very good crop.

JAS. WATSON, Sonya, Durham Co.: On account of the dry summer none of the varieties were up to last year in yield. All the varieties were good except Harbinger. Crop was entirely free from blight.

Conclusions.

1. Rural No. 2 heads the list in yield. This year has been a very favorable one for this variety; no blight to injure the tops before ripening. The estimated yield is 188.9 bushels per acre.
2. Empire State occupies second place in yield.
3. Kaiser, a new variety, gives great promise, and is one deserving further trial under a more favorable season.
4. The Puritan, Burpee's Early, and Summit are all practically grouped as to yield.

MR. HILBORN: I have not made very many experiments with potatoes, but there was one thing that impressed me while listening to my friend, and that was that some of the variations we noticed between the two years might possibly be caused by sowing seed that in one case was better than it was in the other. I am a strong advocate of selecting seed. I made one experiment that quite convinced me of the point just spoken of. When I first went to the Central Experimental Farm I purchased a load of Early Rose potatoes, and from this load I selected about a bushel of the most perfect ones that I could find—not the large ones, but good, even-sized potatoes. I had them cut and planted the same day as the rest of the load, and in the hurry of the work and the great amount that was to be done, I had forgotten about the experiment until we came to dig them. I told the men who were digging them that they were all of the same variety, but they informed me that their must be two varieties, because there was such a difference in the potatoes. I went to the patch and clearly saw the difference, and remembered that the better potatoes were from the selected seed. I believe that it would pay any grower of potatoes to have a small plantation just for growing seed. Mark the best ones in the plot, and take the best potatoes from these marked hills, and if we continued doing that, I do not think there would be any danger of our varieties running out.

E. LICK: How would you select potatoes for seed—what standard?

Mr. HILBORN: I would select medium-sized ones and the most perfect of their type.

G. F. MARSH: Would you go over the field while they were growing?

Mr. HILBORN: Yes; and in growing early potatoes I would select the earliest ones and the ones with the strongest stalks.

E. LICK: Do you think that changing from one soil to another is advantageous?

Mr. HILBORN: Yes, it helps to a great extent, but I think the selection has more to do with it than the change of seed.

Dr. MILLS: Would you go farther north or farther south in selecting seed?

Mr. HILBORN: I would rather, I think, go farther north, although within our own province I do not think it matters a great deal. We imported 240 varieties from Germany and tested them at the Experimental Farm, but we found that the imported varieties did not succeed as well as our American choice.

Prof. SHUTTLEWORTH: Did you decide after one year's experiment?

Mr. HILTON: We had only tested them for two years when I left, and the conclusion then was that the imported varieties did not succeed so well as the American choice.

S. HUNTER: Does it hurt potatoes for seed to have them frozen?

Mr. HILBORN: I have known potatoes to remain out all winter and still grow. I think that depends somewhat upon whether the tubers have been thoroughly ripened in the fall.

Hon. JOHN DRYDEN: I would like to emphasize what Mr. Hilborn has just said. I think he has given us sound doctrine when he speaks about the proper selection of seed; and, further, the doctrine is just as sound, that the seed ought to be properly cared for during the winter. I have a little experiment on my own farm in this way: I give the married men the privilege of growing their potatoes—they furnish the seed, and I give the ground and do all the cultivation. My seed is kept out in the pit during the winter, and it comes out as fresh in the spring as it was in the fall. The men, however, plant their small potatoes kept in the cellar, and for my own seed I make some selection, not very minute. I have seen as a consequence of this, year after year, a wonderful difference. With exactly the same treatment you will find a great difference. This principle holds good in almost everything: in the different kinds of grain, I believe, you would find the same results. Our varieties of wheat and potatoes run out, and I believe it is largely due to our own making.

J. S. PEARCE: There cannot be too much stress laid upon the point mentioned. In the experimental work that you carry on here, there should be a great deal of attention paid to the selection of seed, and not only for one year, but year after year. I forgot to ask Mr. Lick whether the seed used this year was from the experiments of last year. (Mr. Lick replied that it was fresh seed.) A part of your results is therefore lost. I have been watching this matter for a great many years, and I am fully satisfied that if a large class of our young men and farmers would make a selection of the old standard varieties and follow it up for three or four years, they would surprise themselves and surprise the country.

Dr. MILLS: I heard a reliable farmer at Port Perry say that he sowed a small part of a field with tailings, and got a better crop from that part of the field than from that which was sown with cleaned seed.

Hon. Mr. DRYDEN: There is evidently something wrong about that. There is no doubt what that man called tailings were not tailings at all. If the sieve is a little small the best of the wheat goes over. Certainly we cannot believe that to sow what is considered as tailings would give good grain.

WM. RENNIE: I will give you my experience in growing potatoes for exhibition purposes. We have settled the question thoroughly with regard to flat culture. We could not grow them half the size when drilled up. We selected typical potatoes of the variety sown and put one in each hill whole. We have tried all methods—small ones, large ones, cut, etc.,—but the best results were from one large potato put in each hill and fertilized with different things—ashes, bone dust, salt, etc., beyond the addition of manure. We thoroughly sub-soiled the ground before planting, and after the potatoes had started to grow, we spaded the ground quite deep with the spade fork.

H. L. HUTT: I fully agree with what has been said regarding the selection of seed. I tried the experiment of preparing seed before planting. Potatoes that are brought from the cellar and have not sprouted are considered the best for planting. I took some potatoes out of the cellar about a month before planting time, so that they had short green sprouts upon them. Along by the side of these I planted some of the same variety, same size, sowed the same day, all conditions similar, only that they were brought direct from the cellar. Of those which were brought up a month early and which had sprouts on them every hill grew, while those which were brought direct from the cellar did not grow nearly so well. I got some very marked results in bringing the seed up and having it ready at once.

DR. MILLS: Do you advise flat culture for the ordinary growth of potatoes on the farm?

MR. RENNIE: Certainly. It is advisable to ridge them a little with a cultivator, but not enough to run the rain off.

T. H. MASON: Drilling is practically unknown in Elgin; we practice flat cultivation altogether. We plant about 4 inches deep on the sandy soil; shallower on the heavier parts.

Prof. T. F. HUNT, Columbus, Ohio: I have been very much interested in this discussion *re* shallow or deep cultivation for any crop after it has been planted, and I would like to suggest one or two fundamental facts with regard to it. Why do we cultivate ground after the crop is planted? We do it for two reasons—to kill the weeds and to stir the soil. In stirring the soil it is not necessary to kill the weeds, although the two things generally go together. Why do weeds do any harm? In the first place, they take plant food out of the soil. It has been estimated that a ton of pigweed would take out about as much phosphoric acid, about twice as much nitrogen, and five times as much potash as a crop of wheat. If you put on one hundred times as much fertility as the wheat needs, you will easily see that the weeds do something else than take out the fertility. In the second place, they shade the ground, and we know such crops as potatoes and corn want clear sunshine and plenty of heat. On the Ohio State farm, with two varieties, they raised 50 bushels more per acre where they put on straw manure than where they put better manure on and worked it into the ground. In the farm department we raised three-quarters of an acre of corn which was mulched with manure and produced more corn in that way than in any other. So that shading the ground cannot be the only harm. We know that weeds take much water; and it has been determined by experiment that for each pound of dry matter produced in wheat, corn, potatoes, oats, etc., there are 300 pounds evaporated through the plant. Now, if that is true, when we raise an acre of timothy we have transferred into the atmosphere 600 tons of water, and when we raise 4 tons of corn for fodder we have transferred into the atmosphere 1,200 tons of water; and this is the true reason why we kill weeds—to control this supply of water. One year I grew about 25 varieties of corn and got about 30 bushels of dry shelled corn per acre. I took the precaution to send to the same growers the same year and to get the same seed, and I put the same variety on the same plot, and the second year treated, as near as human ingenuity could treat it, the same way as the previous year and got 90 bushels of dry shelled corn per acre. Why? During the first year we had 12 inches of rain, during the second 21, and that 9 inches of rain had given the 60 bushels of corn.

Now, why do we cultivate soil at all? In the first place we cultivate it to make it loose, so that the roots can go in among it. In the second place, we cultivate to increase its fertility. You know that if you take Glauber's salt and put it in water it takes some time for it to dissolve; you also know that if you take this salt and put it into a mortar first it dissolves at once. That is just why you cultivate soil, in my estimation. It is to make the ground even. Only that which is soluble in the soil is plant food. In all these crops, such as potatoes, and I can speak specially for corn, if you cultivate the ground deep, you destroy the roots, and you do far more injury to the roots than any possible richness you can add from cultivation. You cannot expect to accomplish any special good in stirring the soil to increase its fertility after the corn and potatoes are planted; that must be done previously. During three years hand running I raised 77 bushels of shelled corn per acre on land that was never cultivated from the time it was planted until the corn was harvested. Now, we had three other plots that we cultivated the ordinary depth of 4 inches, and on these plots we got 74 bushels, a difference of 3 bushels in favor of that not cultivated. I have experimented in this line since and have found out substantially the same thing every time. I can raise more corn this way than if I stirred the ground deep, because I break off the roots in deep cultivation. I have determined that we break off about two-thirds of the roots if we cultivate deep; and that by cutting off the roots around the plant we actually decrease the yield from 10, 15, to 20 per cent.

We always have found, however, that some surface cultivation is better than no cultivation, but that no cultivation is better than deep cultivation. Now, why? We find that if we put a lot of cut straw on the ground we decrease the evaporation from the soil. We tried shallow, deep, and every other kind of cultivation, but the plots that were mulched did the best, because the evaporation was stopped. Now, then, if we stir the soil loosely we may also stop the evaporation. We may make a mulch out of the soil instead of using straw. There comes a hard rain in July and August and you need that for your corn and potatoes, and the ground is hard and level; does it not run off? would not almost all of it run off? Now, to my mind, that is the reason why we stir soil. In one experiment we plowed two plots twelve or thirteen times, and two others four or five times each, but we did not get a bit more corn from the former than from the latter. All you want to do, in my estimation, to raise corn or potatoes is to give it that cultivation which will keep it free of weeds, and to cultivate as little as possible and not any deeper than is necessary to kill these weeds.

REPORT OF APICULTURAL COMMITTEE.

The following report was presented by Mr. R. F. HOLTERMANN: Last year, you will remember, we had work in connection with foul brood, and that work was to have been carried on during the present year. You are also aware that Mr. McKenzie very kindly gave us his time and experience free of charges, and promised to do what he could during the present year. I may say that I saw Mr. McKenzie, once in Toronto, and was in the city at two other times and tried to see him, but it appears that he has been so busy this year on other work that the work in connection with foul brood has not been carried on, but is at a standstill. Mr. McKenzie still has some wax belonging to the Union. During the past year or more, a new invention has attracted the attention of bee-keepers throughout the world. The invention was a contrivance to be used for hiving swarms. The method of working was as follows:

The self-hiving appliance was placed under the brood chamber, and used instead of a bottom board, the lower brood chamber and supers were raised and a new hive with combs placed underneath with a true bottom board under this new hive. The bees before swarming passed in and out through the self-hiver and partly through the new hive. By means of perforated metal and other constructions, the mother bees could pass back and forth at will, but the queen could only pass from the old hive into the new and then could neither return to the old or leave the new.

The result would be that when the swarm issued they would pass in their accustomed way through the self-hiver, through the new hive and out. The queen would attempt to follow and pass from the old hive and be trapped in the new. The bees when upon the wing would find the queen absent and return to the old entrance on their way, through the new, to the old hive and in passing through the new hive they would find the queen and remain there. The old brood chamber could then, when convenient, be placed on a new stand and become a distinct colony. The watching for and hiving of swarms, has been up to the present a great drawback to the farmer; many swarms have been lost and with that the season's profits have often disappeared Under these circumstances your Committee considered an experiment with these self-hivers particularly appropriate.

The self-hivers were supplied to G. A. Deadman, N. Monteith, E. M. Husband, M. B. Smith, J. N. Whally, Myers Bros., J. Clark, E. Shaver, Goold, Shopley & Muir Co., (Limited), R. F. Holtermann, D. McCormack, Wm. Bayless, in numbers varying from one to three. There were also thirteen others whose names we secured, but who purchased the self-hivers on their own account.

The great rush of work, owing to the peculiar nature of the season, prevented some from making a careful test, but eleven self-hivers were used.

In every case the swarm issued as expected and the queen was trapped in the new hive. In all but two cases the bees before swarming went down to the new hive and stored honey in the empty combs put there for the new swarms. If combs were removed the bees build comb of their own and stored honey therein. By some the means of communication was reduced in hope that this would prevent the bees going down but without avail. This would be no disadvantage in running for extracted honey, but it would be a decided disadvantage for comb.

Again, in a large apiary, the bees on the wing without a queen would sometimes unite with other swarms which would issue at the same time. Again they would cluster and remain out for a considerable time before returning to their hive, increasing the danger of uniting with other swarms. For any one having only a few swarms the danger from this source is not great and this difficulty is no great disadvantage even should two swarms unite.

Another careful test will be made next season. Up to date, the results go to show, for extracted honey, the self-hiver will be a great advantage to the farmer keeping a few colonies. For comb honey the results are unfavorable.

Signed, { R. F. Holtermann.
S. N. Monteith.
E. M. Husband.

REPORT ON DAIRYING.

The following oral report on Dairying was submitted by Prof. Dean:

I have been very busy during this last year; in fact, I have had more work than I could attend to. The other members of the Committee have not done anything. At the time of the last meeting of the Union, Mr. S. P. Brown, who was proposed to take up the work in regard to practical farm dairying experiments, promised to outline a set of experiments and send them to me, and I was to send them out to the farmers, but for some reason, however, he did not do so. Mr. Palmer was working in a cheese factory and promised to work up some experiments, but I did not receive any word from Mr. Palmer at all. Therefore no experiments have been undertaken.

In regard to myself, I did try to get two lines of work undertaken. During this past summer, Mr. Rogers, my assistant, and myself have been carrying on a serie of experiments to find out whether it would be possible to keep composite samples o milk over a week. This past season has been an interesting one among factorymen from the fact that a number of our factories are paying by test—that is, according to the per cent. of fat in the milk. That means that the samples had to be taken every day and the milk tested once a week. That has been the common practice; and I thought it would be possible to make these samples continue for a month. At the present time, factorymen test four times during the month. The secretary has to multiply the average per cent. of fat by the number of pounds sent to the factory every week, making up his totals of fat in thi. way; but if he can keep these samples for a month, that means that he will have to test the samples but once a month, which means to multiply the per cent. of fat by the total number of pounds for the month. As far as our experiments go, the details of which you will find in the College report, I am fully convinced that it possible to keep them for a month—in fact, we kept them for seven weeks and found them to give very close results compared with samples tested every day. I asked two factories to undertake this work, but only one replied; and they I understand tried it for two weeks and found it to work very well.

Another line of work that I have been working on myself and which I have tried to get others to undertake, but so far have not been able to, is the effect of food on the per cent. of fat in milk. We had that discussed here last year. Some say if you feed the cows rich food the milk will be rich. Of course that looks reasonable, and I have had a great deal of correspondence along this line. One man said he thought he would not believe that food had any effect on milk; but until a man can show me that he has done actual experimental work in this line I cannot put any confidence in his statements—his opinion is worth no more than mine. We had a very strong letter from a man who supplies milk in the city of Toronto. He said "when we slop cows with a meal got from brewers the customers find fault with the milk." I asked him to undertake an experiment—You take samples and send them to us and we will pay express charges and test them if you will do the work." I never heard any more from him. Our own experiments have gone to show that the cows give just as good milk when given slop as when fed on other foods.

So far as our experiments have gone they indicate that the food has very little if any effect on the per cent. of fat in the milk. I did not mention that it is a common impression that when cows are turned out in the spring the milk gets poorer. In some places in the United States they consider that the milk is poorer in May and June, and therefore they allow a lower standard. We found in every case instead of the milk getting poorer it was richer if anything. We had samples from the cows when they were on the regular meal ration; and when they were turned out to pasture there was an increase in the per cent. of fat; but there are so many other things that come in on this point that it is a very difficult matter to settle.

BEE-KEEPING IN ONTARIO AND HOW TO SUCCEED.

Following is a paper by R. F. HOLTERMANN, Brantford: When we speak of bee-keeping and the production of honey in Ontario, we speak of a branch of agriculture which can live and thrive irrespective of protective duties.

The province, whenever the opportunity offered, has carried off the highest laurels for the quality of its product. At the Philadelphia Centennial, Wm. McEvoy, an Ontario bee-keeper, carried of the sweepstakes prize. At the Indian and Colonial Exposition, Ontario's honey exhibit attracted the attention of the world. At the World's Fair, Chicago, Ontario has distinguished herself, not only in the number of her awards on honey, but by the high score taken by exhibitors, the United States Bee Journals admitting that our Ontario honey is unsurpassed. The quality is the best, and we can also secure honey in Ontario in paying quantities.

As in all other agricultural products, the standard of perfection which is reached nds upon that which is under the control of man and that which we have given us among the many blessings of a Divine Providence. That Providence, gentlemen, has richly endowed this province, yea, this Dominion, no one within its borders will wish to deny, and no one without its borders dare dispute, after the magnificent record she has left upon the pages of the world's history through the recent Exposition. Ontario, owing to the undulating character of its physical surface, the variety in the nature of its soil, flora and climate, can produce honey of the very best quality and in quantities sufficiently large to make it possible to engage in this branch of agriculture with success, and these varieties of conditions over a large area will give Ontario a crop with reasonable certainty every year—an item of great value in exporting. All then, that lies *without* the power of man is given to us more lavishly than any other land I know of. What about that portion which does lie within our power—how has it been developed?

We, that is the Ontario Bee-keepers' Association, receive an annual grant of $500 from the Ontario Government, and this is used mostly for paying the travelling expenses and hotel bills of the officers. The balance, after paying the other expenses in connection with the Association, is spent in paying the expenses in connection with county associations and their lecturers and bee literature. Then we have from the Ontario Government the services of a foul brood inspector, whose duty it is to keep down a disease known as foul brood, and this is to be done according to an Act passed by the Ontario Government. We have also an Act to prevent the spraying of fruit trees while in blossom. This Act is as great a benefit to fruit-growers as to bee-keepers.

The Ontario Government has also paid a portion of the expenses in connection with the Indian and Colonial Exposition and the late exhibition at Chicago. The Dominion Government has rendered some assistance at the Colonial and Chicago Exhibitions. That I believe is all. From no source have we received further assistance to enable us to produce a better article and in larger quantities.

The many questions which arise in this new industry, and under such varying conditions, have had to be solved thus far by individual effort. The solution must largely be left to those specially employed for this purpose, and this is particularly the case because the bee-keepers' harvest comes with a rush, and at that time of the year he is unable, owing to pressure of time, to make a careful test of results under different methods of management. What success has been achieved has been gained through individual efforts. The press of our country, and public men generally, have considered the subject as too trifling to be worthy of attention, when it has a right, which is more manifest every day, to rank among the very first in importance in the broad field of agriculture. Our press will occasionally cull some extracts upon bee keeping from a United States writer, when our own are in no sense unworthy of such honor. This inattention has had advantages in that it has endowed us with greater strength and determination to overcome difficulties, but it has hindered the spreading of useful information and has greatly lessened the consumption of honey within our province. Great Britain annually imports about ten million pounds of honey; lack of assurance has delayed the development of a foreign market, when we find assurance has been given in this direction to so many other branches of agriculture.

This state of affairs has meant a loss to bee-keepers, and therefore a loss to the province of a large sum of money per annum. Aside from this, there has been a loss to the province of hundreds of thousands of dollars. Owing to the peculiar position of the bee-keeping industry, it has been made the instrument for the extortion of money from the innocent and the credulous. It is forever human nature to want to get something for nothing, and those who have looked for the gains of a moment, irrespective of the means adopted, have taken advantage of this; they have also taken advantage of the large profits which have been made under proper management, and with these instruments of destruction they have gone forth to their deadly work. In every part of the province men and women bought bees, under the supposition that all that was necessary was to buy the appliances, and without *knowledge*, *care*, or *labor*, the ten-dollar bills would roll up in proportion to the number of colonies kept. The result was, in 95 cases out of 100, the loss of the money invested and the hindering of the development of bee-keeping. In this, as in every case, the honorable, the honest, and the just course is the one which is the best for all. To-day we are producing sufficient honey for our home market, and we are beginning to feel that we need more of a consuming public, be that at home or abroad. The price by many is considered low, but in bee-keeping, as in everything else, there are men making money at the business and men losing money at it.

I was struck by the statements of two men, farmers and bee-keepers in different parts of the province, who said they would sooner produce a pound of honey than a pound of pork. This was when pork was worth about $4.65 per hundred. Having defined the position of bee-keeping and viewing it, I trust, carefully and dispassionately, I find bee-keeping may, under proper conditions, be engaged in with success in Ontario. The cost of production can also be greatly reduced by better methods, some known, others as yet uncertain. Bee-keeping is, in some respects, like every other branch of agriculture, and, in other respects, unlike. Like every other branch of agriculture, the less the chance of a failure of crop owing to surrounding circumstances the better.

To succeed in it to the utmost, we must concentrate our energies and abilities upon our work. We must learn to know ourselves, let that knowledge emanate from pleasant channels or otherwise. Too many have the idea that labor should be avoided and only engaged in as being a necessary evil. Happy is the man who can enter into his labors looking through them for more than an earthly reward, and happy is he who throws his energies into life's employment, in which the making of mere dollars and cents is a side issue. Under such a stimulus the wear and tear of nerve and body is reduced to a minimum.

There is too much of an idea abroad that with supper, or at least twilight, labor should cease. Especially is this true during long winter evenings. The idea also prevails too much that recreation means to spend our time without profit. A swarm of bees weighing 5 lb. will perhaps gain nothing in weight per day; one weighing 6 lb. will gain 5 lb. per day; one weighing 7 lb. gain 10 lb. So it is with ourselves. In average time, with average ability, we will be able to gain nothing on the men who work under the same conditions; it is just to the extent to which we exceed the average that we will excel.

Next, to succeed in bee-keeping, theory and practical experience must go largely hand-in-hand. You may read with profit before beginning, but theory cannot long go without the hand of practice. Be open to learn from others, but be careful to distinguish between fine-spun dreamy theories and sound information.

Go to conventions, they are very valuable. Do not exercise false economy in the direction of literature upon the subject you are interested in. In purchasing bees and appliances, get the best for your purpose; this may not be those at least cost; on the other hand, they may not be the most expensive.

Bee-keeping is unlike every other branch of agriculture, in that it is perhaps the least developed; we have few, if any, what we might call official experiments to look to. It displaces no other department and no other crop on the farm, unless to the extent that the farmer too often gives equal attention to too many branches and excels in none.

Then it becomes a question as to which one it will pay him best to drop. Bees, aside from the honey they gather, will pay to act as fertilizing agents in the orchard and clover field. We have in Ontario an artificial condition in plant life. The honey-bee is not a native of Ontario. Aside from the female, (the queen,) large numbers of worker bees are wintered who are ready for work as soon as the first warm winds blow. This gives us an artificial condition in insect life. The honey crop takes nothing from the fertility of the soil. Owing to the price of honey per lb., it does not take much hauling to take $100 worth to market—this in a new country and over rough roads is quite an item. One can, if they possess the information, engage in bee-keeping with success in many newly settled districts when not an acre of land is cleared. This is an important item for a struggling settler.

In closing let me say, let us use fully the information we possess and look for more. What has been said would appear to lead anyone in the direction of aiming at merely worldly success. Such is not the intention. The higher and nobler aims should run through and above all else. The man who makes the greatest success of life may be the one who is never heard of outside of his own community.

> The noblest lives are those to duty wed,
> Whose deeds, both great and small,
> Are close-knit strands on an unbroken thread
> Where love ennobles all.
> The world may sound no triumphs, ring no bells ;
> The Book of Life the shining record tells.

A. PICKET : The paper that we have listened to has impressed us with the fact that the writer has had something besides theory in his mind It would also impress us with the fact that he knows by actual labor what it means to be a successful bee-keeper. It seems to me that he knows full well that it requires diligent care, a great amount of labor, and a constant watch to make a success of bee-keeping. Like all other pursuits, there is one way and one road to success, and there are many ways to failure. The road to success, simply means, in the first place, that a man must have the interests of the work at heart, or in other words that he is an enthusiast ; it means a man must have some pluck to face any difficulty and not retreat under any circumstances. From my own personal experience, I know that a young man who is careful and who will give the care and attention that is necessary to success in any other pursuit in life may make a success of bee culture ; but that is wherein it lies—in the small things, which we are so apt to overlook We may work never so hard, spend so many hours in the apiary, and we may do our level best in many ways to secure a crop, and be disappointed in the end from the fact that we have overlooked some very trivial thing We must keep bees of the best strain, but that is not the most important part. In my experience I have found that the most important part is to have the right man in the right place. The bees will gather the honey, provided they are attended to, cared for and protected as they should be. With the necessary care which can be bestowed upon it and which can be gained by the literature of the day and by the experience which may be gained, and is so easily obtained now to what it was years ago, a person may make a success of the business and gain a livelihood ; but that the road to success is easy I cannot say.

DR. MILLS : What has the undulating country to do with the honey ?

MR. PICKET : In my experience I have found that on the higher lands we get the lightest colored honey. Some of us have had the opportunity of seeing honey that has been produced in some of the lower lying lands in different places ; and we found that the lower the land the darker and the stronger the honey. At the Fair in Chicago, I think that is one of the items that has won so largely, the color of our honey.

R. F. HOLTERMANN : Unless the land is too low, a variety of elevation has this effect : on the higher lands the blossoms will come out earlier and on the sandy soil also, and on the clay and lower land we have it coming out later ; and in that way we extend our honey flow and are able to secure larger yields from the same flower. Sometimes a colony will gain 15 pounds in a day. You can imagine then what the gain would be in weight by the bloom coming out on the lower land four or five days later. Close to the lake they come out later than farther inland. If you get about four miles away from the lake your fruit blossoms are earlier than near the lake.

DR. MILLS : It would not affect the quality ?

MR. HOLTERMANN : I always consider that our flora has much to do with the advantageous circumstances in Ontario. We are likely to get better honey from the same flower than they get in the Northern States.

DR. MILLS : What plants produce the best honey ?

MR. HOLTERMANN : The Canadian thistle, clover, basswood, etc.

MR. PICKET : Have you ever known a better class of honey than we have had this season ?

Mr. HOLTERMANN: No, it is very fine this year, and it is mostly from clover.

E. M. HUSBAND: After what you have heard, I think you will all agree with me that bee-keeping requires push, pluck, and perseverance. I have had two years' experience in bee-keeping and also some ups and downs. I was going to believe all that I read in the papers. I found, however, that these statements may be true in certain cases, but did not hold true in average years. In bee-keeping, like other occupations, you cannot count upon a large thing every year. One of my first mistakes in it was in choosing a wrong hive—too large a hive, and one that is not now in common use. If a person has a large hive, perhaps in another year he concludes that it would be better to produce some comb honey; and having a large hive that is not suitable for comb honey, and finding that he has made a mistake, he will have to go to the expense of changing. There are questions which none of our writers can give decisive answers upon. Hence the necessity for the experiments that we are carrying on. Swarming is one of the most difficult troubles we have to face, and it is so especially with the farmer. He is called away to other work, the bees swarm, the women folks are busy and the swarm is lost. It would be a great gain to have a self-hiver, and Mr. Holtermann has shown that a certain device will answer this to some extent, if not altogether.

Dr. MILLS: It would appear from what has been said that the prizes for honey were awarded because of the natural condition of the country rather than on the skill of the operators.

R. F. HOLTERMANN: If you admit the same in dairying, we shall admit it in reference to honey. There is a great deal in running for extracted honey that requires less skill perhaps than for comb, because you do not require grading of bees, and it does not matter whether they fill the comb or not, while in comb honey it is necessary to get your sections well filled and not to leave a single cell unfilled.

Mr. BOWMAN: At what time should the bee section be put on the hive to get the comb honey?

Mr. PICKET: When you find the bees beginning to widen the tops of the combs then put on the section.

R. F. HOLTERMANN: I do not want to take any comb honey before clover comes in. If I find my bees strong and not able to be in the brood chamber, I put an extractor on at first and let them work as they will, and when the clover comes on I remove the extractor and put on the comb and let them go to work.

QUESTION DRAWER.

Q. Is it advisable to cut potatoes for seed or plant them whole?

Mr. RENNIE: We at first cut our potatoes when growing for exhibition purposes, but during the last year or two have planted them whole, and we never had better results than with the whole potatoes.

Q. Do potatoes give a greater yield in hills or in drills? Should the end of the potato having the large bunch of eyes be cut off and not planted? and should they be covered up deep or not? If they heave the ground will it hinder the growth? What distance would you put the rows apart, and what distance should the potatoes be apart in the rows?

Mr. RENNIE: With regard to hills and drills, it depends a little on circumstances. I do not know but what you can get more potatoes to the acre by planting in hills, but it would not be a plan to be recommended for the farmer who is growing a number of acres. The drill is more convenient. Our ground at the farm here for potatoes is plowed, and we are now hauling out manure and will simply cultivate and work it on the surface in the spring and not plow it under. It is a great mistake to plow under manure.

It is not valuable for plant food until it dissolves, and as soon as it dissolves it goes down. When worked on top it is food for the plant when it is growing and it is a mulch at the same time. In potatoes, and especially in all roots, the manure should be kept on the top, and then take the double mould plow, covering them six or seven inches deep it may be, and then harrow down again after the potatoes have been planted a short time. Between the rows of mangels which I used to grow for exhibition purposes there was a perfect mulch of manure and a perfect net-work of fibres; and you can see the mistake it would be to destroy these fibres. It was gone over every day or two with the garden rake to break the crust. The moment you allow that crust to form on the ground you can see the leaves of the mangels wilt. The dew, even, seemed to moisten the soil when properly cared for. While you want cultivation when plants are growing, it must be shallow cultivation, just to break the crust on the surface. Two and a half feet apart is a proper distance for the rows, and in the drills the potatoes should be 12 inches apart.

Q. What would you say is the best remedy for rot? What place in the rotation should the potato occupy?

Mr. Rennie: Rotation is a broad question. It is well to put potatoes on clover sod, then grain for a year or two, after which have clover and potatoes again.

H. L. Hutt: I know a gentleman in Welland County who plows his clover in the spring, putting the potatoes in every third furrow, and as soon as they come through they are harrowed. That is all right for field culture; but where farmers just grow potatoes for their own use I think a good place in the rotation would be following strawberries. I saw very fine potatoes this summer grown after the strawberries were picked. The potatoes were plowed in with the strawberries.

Q. Do you advise shading bee-hives? What is the best time adapted to the purpose?

R. F. Holtermann: It depends upon the time of the year. In the spring of the year we want the hive to absorb all the warmth possible. The same in the fall. Through the hot part of the summer is the time, I think, it is advisable to shade. I like to have my hives standing under the outer edges of the trees. The result is that the morning and the evening sun will strike the hives, while during the mid-day they are shaded. The tree I would prefer would be one on which the foliage comes as late as possible in the spring.

Q. What are the most profitable varieties of apples to grow for the market? What do you think of the Ben Davis for exporting?

Mr. Hilborn: The most profitable varieties of apples to grow depends very largely upon the location, and it is the kind of apple you can get the largest percentage of good fruit from that will pay best. Cultivation also has a good deal to do with it. Good cultivation will give good crops of some varieties, and poor cultivation perhaps give no crop at all; while other varieties with ordinary cultivation may give a fair yield. So it is a very broad question. If I knew the location and method of cultivation and some other things, then I might be able to give the name of varieties; but in a general way the Baldwin, Greening, Ben Davis, Golden Russet and Northern Spy have, perhaps, been the best shipping apples of the winter varieties, that is, taking it for the whole of Ontario. The Duchess is, perhaps, the most profitable of all early apples. For an early apple it is a good one, and will ship well, and commands a good price.

Dr. Mills: Is not the poor quality a great objection to the Ben Davis?

Mr. Hilborn: Yes, but it looks well and carries in the best of condition, and I think will sell for many years to come. There are more advocates of the Ben Davis to-day than there were a few years ago.

Q. Has Professor Robertson's ensilage crop of corn and English beans been tried in the Province?

Mr. Kenny: As far as I understand that question, I do not think that they have been grown to any sufficient extent to decide definitely.

S. HUNTER: I tried the combination myself, and like all the rest of the reports the beans have been a complete failure, but the corn did very well. I grew the sunflowers separately. I think it was a good success so far as the crop was concerned, but cut perfectly green and fed to the cattle they did not seem to fancy them. Whether the effec of the silo will remove that or not I do not know, but unless there is some change the cattle are not going to eat them very readily.

C. A. ZAVITZ: I might say that we grew a large number of beans here this year. We received them from England and Montreal, and I may say that they were a failure here, but of course would not like to say very much about it, as this is the first year that we have had them.

Prof. HUNT: Did they all turn black?

Mr. ZAVITZ: Yes. We secured the horse bean from six different seedsmen. Early in the season the stem and leaves all turned black, a month before the corn would be ready to harvest. I think the hot weather had a good deal to do with it.

J. S. PEARCE: I know of several who have tried this combination, but have not heard what the results of the food have been after coming from the silo. So far as the growing is concerned the corn has been all right, and the sunflowers have been very successful. The beans have been, I think, a failure all over, owing to the effect of the dry weather. English horse beans want a moist soil and plenty of moisture. I have tried them myself and have known quite a few others who have tried them, but have never succeeded owing to the fact that the weather and the sun is too hard for them.

Mr. KENNY: This is not the part of the country to grow beans in. They can raise beans at Ottawa and farther west, but to raise them in this part of the country for a crop I do not think it can be done.

Prof. HUNT: We tried the horse beans, but just as with all the rest of you when the beans got up so high they got black. We tried them both with the corn and without. We have no trouble in growing the corn and the sunflower.

Q. What effect has the freezing of milk upon the quality of the butter? Give causes, symptoms, and treatment of milk fever?

Prof. DEAN: We had a considerable amount of frozen milk last winter, but so far as I could see there was no bad effect on either butter or cheese.

Capt. McCRAE: What effect has the boiling of milk upon butter?

Prof. DEAN: We have boiled quite a bit. It has the tendency to make the butter soft. We heated it to 160° or 170° for about ten minutes and then cooled.

Mr. KENNY: When getting milk fever the cows first get uneasy. If your cattle are in good condition there is more danger than at other times. The first thing to be given to them is a physic, say, two pounds of salts. Also apply warm water with blankets. I do not know of anything else that can be done. I want to correct one fault among people in regard to milk fever. Most of farmers think that a cow should be milked as soon as she calves; and if there is any danger of milk fever, milk her every two or three hours. I think this is the very thing that will bring it on. On inquiry, I find that when the calves are allowed to suck the cows there is no danger of milk fever; but where they milk and do not allow the calves to suck, you will find the fever. When a cow is fat she is very liable to take milk fever.

Q. How can the country roads in Ontario be best improved?

Hon. JOHN DRYDEN: I do not think I should be asked to answer that question just offhand. It requires a good deal of thought. Another reason why I do not wish to answer it is because I occupy a little different position to most of you. Whatever I say might be put out as coming from the Government. I am watching for this coming convention in Toronto. I find that most of the gentlemen who are writing on the subject do not give us the information we want. They tell you how valuable it would be to have good roads and they leave it there. Now, the question how to get these good roads is going to be one surrounded by a great deal of difficulty. I may say that my

Department is undertaking to get answers to a number of questions which will give us some facts. One will be how many miles of road have we got, say, in an average township? What would it mean to build all these roads after the fashion that some of the gentlemen have been suggesting? Until we have these facts, one can scarcely discuss it intelligibly. I believe we had this subject discussed last year, when we had an admirable paper by Mr. Burns, in which he struck out on original lines. What suits one section of the country, however, will not suit another. The worst road I ever saw was in Essex. Men have had their rigs stuck fast in the middle of the road and have had to get out and walk and leave their rigs there. It is a clay road, and the clay is of that peculiar character which sticks to everything that it comes in contact with, and it gathers on the wheels until they will not run at all. In that part of the country they have no material such as we have in the east, and such as you may have here, out of which to make the road, except the clay itself. I have wondered why, in that country, they do not undertake to use the clay for road-making—why they do not undertake to make brick of the clay and use that for the material. Before doing that, of course, they would have to pay special attention to drainage. Where you have plenty of gravel in many sections of this country, it is only a question of how you will apply the labor. I find that a great many people accept the idea that our system is all wrong and we have to start something new. The system is not so wrong as some of the people. I find that where the people are willing to work it out it answers the purpose quite well, but if they are not it will not work at all. My experience is that on a locality where the roads are near the best of gravel and where it is the easiest thing in the world to make a road, they have got about the poorest roads in the country, for the reason that it is the Queen's highway. In other places where they have a little more public spirit and realize that the building of these roads is something that they are doing for themselves, and every person feels an interest in it, you will have no difficulty. It is not for me to say just here what the remedy ought to be, but I think there should be some remedy provided; but I should be very careful before undertaking to sweep away our system just with one stroke and go to taxing the people to build all the leading roads in this country—somebody would begin to find fault. It is all well enough for a man who lives in a town and wants to show off a good driver to want good roads, but when you come to go to these steady-going, hard-working farmers and ask them to put up the dollars for building the roads, they want to know why they should do it. I wish to say that all this agitation, and talking, and writing is similar to the temperance question—although you have no law, you are accomplishing a good deal by talking and thinking about it.

Mr. McKenzie: We were troubled in our township in the county of Oxford. We have plenty of gravel, and the statute labor system has been in operation with us. The point was should we do away with statute labor and get some other method? They decided to still continue the statute labor system; but this discussion has so educated the people up that they are now demanding better work. I was talking to our township treasurer about the matter, and he came to the conclusion that if we were to build our roads in the best way to do it in two or three years, our farms would not pay for it. We think, by improving our system of statute labor, straightening the roads, etc., that we are going to gradually improve, and as we do, legislation, which is always a slow thing in moving, will bring in new lines and we will adopt them.

Mr. Wright: I would like to find fault with one system that is adopted in our township and in others, that is, for the council to let contracts for gravelling. The jobs are let sometimes to men who do the work properly, and sometimes to men who do it very improperly; but it does not matter so much, in my estimation, who the men are or how they do it if they but take good loads. There are a great many dollars spent also for big stones; and when a wheel strikes one of these stones, it causes a hollow to be made on the opposite side of the road. I think this should be remedied.

F. J. Sleightholm: We had a very warm discussion a couple of times in our township council on that question, and it was decided that the great drawback was that there was not a unanimity amongst pathmasters as to what is the proper width or grade for a road. It was suggested that a draft of what constituted a proper road should be got out and adopted. Some were of the opinion that where the pathmasters knew their business the present system of statute labor was a success. I know that we are now very far ahead, even in our clay roads, where we have no gravel, than we were some years ago. We have now through a large section of that district an excellent road, except at such times as we have an abundance of rain in the spring; but where attention has been paid and good work done in statute labor, we have a very good road compared to what it was.

WM. RENNIE: I suppose you have all heard about the York roads, outside of those macadamized roads where they have the old toll-gates—there are no worse roads than in the County of York. The reason is not so much because of the labor system, but because of the pathmasters. My idea is that all councils should adopt a system, and that should be carried out by instructions to all pathmasters in that county, and then we would work on some uniform system throughout the county.

Mr. McKENZIE: Should you put a drain right down the middle of the road? Would that drain serve the purpose of preventing the frost from going down, or would it pay just as well to have a drain on each side of the roadbed, so that no water would lie in the ditches?

Mr. WALDON: If you get the drain in the centre of the road certainly it would keep the most dry. A tile drain would keep a place drier than an open ditch in any place. I have faith in an underdrain if you can keep it deep enough for the frost not to touch it.

E. LICK: If you are going to use a tile in a road, you must put it below the frost. I know of a drain that the frost froze up, and it was put in three feet deep and six inches of gravel put on top. My advice is to put in two or three lines of tile side by side. From what I have seen of drains in hills, I feel confident that it will pay to put considerable expense in tiling.

Mr. KENNY: If you are going to use tile, why not use it in ditches along the side of the road. Your road is only supposed to be two rods wide, and tile will certainly draw a rod on each side of them. If they will not draw a rod on each side, how is one in the centre going to drain the whole side of the road?

E. LICK: If there is water in the tile in the winter, it will freeze down at the lower end and gradually form until sooner or later it will fill the tile. I have seen where there was a perfect outlet the tiles were frozen full.

Prof. HUNT: If you have a retentive soil, it would probably be well to have a tile in the centre and one on each side of the road; but where the soil is not so retentive, I think one tile in the centre would accomplish the purpose.

J. S. PEARCE: I think this is a very important question, but as Mr. Rennie has said, it is more the fault of the system than the law. I have thought about this thing a good deal, and my idea is that the government or the councils should pass some laws or bills by which they would govern the making of roads, and would have an engineer for every township or county, and the pathmasters would have to be subject to his instructions and build the roads according to instructions. Two essential things to good roads are: first, pathmasters who know their business; second, keep the one man at it. You should give them something for their labor. I think it would be well if there was one man, a road commissioner, for every township, and have the pathmasters subject to his instructions.

Mr. McKENZIE: Last year the question was asked me, should not the Experimental Union do something to protect the farmers against bad seed? I think the Fruit Growers' Association have taken steps to protect themselves, and with some success. I have no plan to suggest for doing this, but I think the seedsmen would do well to keep well informed by this Union; and those seeds that we recommend, they try to recommend also.

R. F. HOLTERMANN: I see only one way of overcoming this difficulty, that is, keep yourself posted by taking reliable periodicals, etc.

Mr. McKENZIE: We sometimes buy seed without vitality and sometimes we do not get the variety. Suppose I go to my market town and say I want such and such a variety. The seedsman sends to one of the leading seedsmen in Toronto; if they have not that variety he will come to me and say I have got it. It may have vitality enough but it is not the right variety.

Wm. Rennie: I have known to my own knowledge (I could name the parties if necessary) country dealers, who have told friends of mine that they handled our seeds, and the fact was that they never bought seed from us at all. There is the whole thing in a nut shell. With regard to testing the germinating qualities of seed, I may say that every kind of seed is tested before it is sent out; and then we also have the trial grounds. You understand that most of the leading seedsmen have their seeds grown on contract, and we make contracts with these men to grow our seeds two or three years ahead, and it is grown just the same as if it were grown on our own farm. This we have no doubt about. Those we do not require to test on the trial grounds. You may depend upon it that if you deal with any of the leading seedsmen in this country you are all right.

Mr. Wright: Where did the bad rape seed come from?

J. S. Pearce: I think I can throw a little light on the subject of where the rape seed came from. It came chiefly from one seed house in England; but that house while they are a fairly reliable house, and had no intention of sending out anything that was wrong, found that their regular stocks were exhausted, and they bought more through brokers and were deceived.

Mr. Rennie: Of course you are aware that all agricultural societies throughout the country get their seeds in bulk, and of course get it at a reduction. It is just as easy to put up a bushel as a pound of clover seed, and those who buy in bulk get it at the wholesale rates.

J. S. Pearce: I would suggest to get the seedsmen's catalogues—I do not say mine or Mr. Rennie's, or any other particular person's—and send your order with the money, or a portion of the money. Where we know our customers, we have no hesitation in sending them all the seeds they want; but we have to lay down the rule that unknown people must be recommended or send the money. With regard to varieties, I would like to say that we have too many varieties, and the great difficulty is to keep them down to a fair number. I want all the members of this Union to understand that, as Mr. Rennie has said, every respectable and responsible seedsman is doing all he can to introduce new varieties that are worthy of introduction and weed out the old varieties.

ANNUAL SUPPER.

After the close of the afternoon session, President Mills invited all the ex-students and other visitors present to join the College officers and students in the dining hall, to partake of the Matron's hospitality. After supper was served, various toasts were proposed, and fittingly responded to by members of the Union and by visitors, among whom the following might be mentioned: Hon. John Dryden, M.P.P., Toronto, and Prof. T. F. Hunt, Columbus, Ohio.

SECOND DAY.

The first item of business was the reading and adoption of the financial statement, which is as follows :

TREASURER'S REPORT.

——	Dr.	Cr.
	$ c.	$ c.
To balance from last year	2 30	
" membership fees	60 00	
" Government grant	650 00	
By grains, fertilizers, postage, printing, etc. (agricultural experiments)		414 88
" potatoes, printing, postage, etc. (horticultural experiments)		38 14
" printing, postage, self-hivers, etc. (apicultural experiments)		21 05
" printing, etc. (botanical and entomological experiments)		7 73
" reporting meeting, editing report, etc		50 00
" travelling expenses of officers, circulars, programmes, etc		40 42
" Secretary's salary		25 00
" expenses of speakers at meeting		40 05
" balance on hand		75 03
Total	712 30	712 30

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 have found them to be correct.

O. A. C., GUELPH,
December 22nd, 1893.

Signed { JAS. ATKINSON,
W. J. BROWN.

OFFICERS AND COMMITTEES FOR 1894.

The next business taken up was the report of the Nominating Committee. The election of officers resulted as follows :

Honorary President	Prof. H. H. Dean, O. A. College, Guelph.
President	Allan Shantz, B. S. A., Waterloo, Ont.
Vice-President	C. A. Keil, Chatham, Ont.
Treasurer	G. F. Marsh, B. S. A., London, Ont.
Secretary	R. F. Holtermann, Brantford, Ont.
Editor	C. A. Zavitz, B. S. A., O.A. College, Guelph.

AUDITORS.

Jas. Atkinson, T. F. Patterson.

Delegate to Central Farmers' Institute—R. F. Holtermann, Brantford, Ont.

COMMITTEES ON EXPERIMENTS.

Agriculture—C. A. Zavitz, B.S.A. (Director) ; Pres. Mills, Prof. Shuttleworth, Jas. Atkinson 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 and E. G. Emigh.

Dairying—Prof. H. H. Dean, (Director) ; H. L. Beckett, B.S.A., and S. P. Brown.

Economic Botany and Entomology—Prof. J. H. Panton, (Director) ; G. A. Robertson and H. Harrison.

DISTRICT OR COUNTY SECRETARIES.

Name.	County.	Post Office.
W. A. Mattice	Stormont	Cornwall.
S. G. Carlyle	Dundas	Chesterville.
G. G. Shirreff	Russell	Clarence.
E. G. McCallum	Glengarry and Prescott	Martintown.
J. C. H. Sparrow	Carleton	Antrim.
P. McLaren	Lanark	McGarry.
W. Lindsay	Leeds and Grenville	Loch Winnoch.
J. C. Stagg	Frontenac	Brockville.
B C. Brown	Lennox and Addington	Kingston.
D. Aylsworth	Renfrew	Bath.
D. H. Leaven	Hastings	Belleville.
W. M Newman	Prince Edward	Gilbert's Mills.
Wm. Wiancko	Muskoka	Sparrow Lake.
Wm. Morrison	Haliburton	Minden.
F. J. Davidson	Peterborough	Peterborough.
W. Carlaw	Northumberland	Warkworth.
J. L. Fair	Durham	South Monaghan.
T. H. Tinny	Victoria	Oakwood.
S. P. Brown	Ontario	Whitby.
R. A. Thompson	Simcoe	Thornton.
G. A. Brodie	York	Bethesda.
J. A. B Sleightholm	Peel	Humber.
W. Ewing	Dufferin	Mulmur.
E. P. White	Grey	Clarksburg.
A. R. Vannater	Wellington	Ballinafad.
H. Black	Halton	Scotch Block.
H. L. Beckett	Wentworth	Hamilton.
J. Harcourt	Lincoln	St. Anns.
A. M. Soule	Welland	Southend.
D. Z Gibson	Haldimand	Willow Grove.
Allen Shantz	Waterloo	Waterloo.
G. C. Emigh	Oxford	Holbrook.
G. N. Hunter	Brant	St. George.
B. E. Kitchen	Norfolk	Waterford.
Jno. Buchanan	Huron	Hensall.
N. Monteith	Perth	Stratford.
J. B. Muir	Bruce	North Bruce.
E. M. Husband	Middlesex	Cairngorm.
C. R. Stevenson	Elgin	Fingal.
N. J. Clinton	Essex	Windsor.
Wm. Dolsen	Kent	Chatham.
A. E. Wark	Lambton	Wanstead.

MISCELLANEOUS MOTIONS.

The different committees, having fully considered their individual requirements, decided to ask the Legislature for an additional grant of $100, and a motion was carried to that effect.

Upon motion of Mr. E. LICK, seconded by R. F. HOLTERMANN, Mr C. A. Zavitz was granted the sum of $80 as a partial remuneration for his valued services in connection with the Union.

Moved by F. J. SLEIGHTHOLM, seconded E. M. HUSBAND: That the time has come when it is desirable that every effort should be made to bring the results of our experimental work prominently before the farmers of this province; therefore we would respectfully submit to those who arrange the work of farmers' institutes that a Union member or other person qualified be sent with each delegation who shall be prepared to briefly indicate the work of the Union and give results of the experimental work. Carried.

A vote of thanks was also tendered to the press for giving reports of the proceedings.

SHEEP AS PROFITABLE FARM STOCK.

The following paper was prepared by JOHN HARCOURT, St. Anns, Ont., and read by Robt. Harcourt, O.A.C.:

At the present time when hired help is so scarce and wages accordingly high we are instinctively looking for some way by which we can keep up our incomes without so much outside help. One of these ways I believe to be the keeping of more sheep. Many look upon sheep as objectionable stock because of their tendency to bite the heart out of clover and to eat the pasture so close that there is no protection for the ground from the burning sun of mid-summer, thus stopping the growth of the grass and destroying the vitality of the plants. While this is true, especially on heavy land, if the run is too limited, yet I cannot but say something in favor of the gentlest of all farm stock. They require the least labor and time in caring for them. They are the first stock to be turned out in the spring and last to require care in the fall. The only time when breeding ewes require special attention is during lambing time and even then the work is not arduous.

The shelter necessary for wintering them comfortably need not be so expensive as for other stock. A good frame building with a tight roof is all that is required except where early lambs are raised; then a warmer room for lambing will be necessary. While I believe this is all the shelter that sheep require, I would just say that there are those who claim that it is just as profitable to feed sheep in warm stables during winter as any other stock. I know of sheep that are being kept in a bank barn as warm as the cattle, with scant room for moving about, and with little or no outside exercise.

Sheep are as easily pastured during the summer as any other stock. Where only a small flock is kept they do not require so much pasture in proportion, for they will pick off every odd corner about the farm, and if they have the chance will help materially in the cleansing of a dirty farm. A large number of fields especially in the poorer parts of our province would give better returns if used as sheep pasture than they do under the present method of raising light crops of grain at a loss; for the cost of putting in a crop on a poor hard field is greater than the cost of putting in the same crop on a rich one. Rape has come into great use in the feeding of sheep, not only as a crop grown by itself, but also sown with oats to be pastured after the oat crop has been harvested. The same might be done with a corn crop for lamb pasture. The time is coming when those who wish to push a large flock of sheep along well and cheaply will hurdle them on a crop of oats and vetches. Breeding ewes will do well during the first part of winter on pea straw with a little hay and a very small amount of grain, but as lambing time approaches stronger feed will be required.

Sheep leave their droppings much more evenly over the field than do either horses or cattle. Horses leave the greater part of their mature on the already rich low land, while sheep congregate and leave considerable of theirs on the high and poorer land where it is needed.

Early lambs, if large enough for Easter market, bring in the best returns; in fact the sooner lambs are marketed the more profitable they will be found. Higher prices will be received and the ewes can be kept cheaper when the lambs are gone. A good flock of ewes will raise an average of one and a half lambs to the ewe. Many flocks do more than this. At an average of three dollars and a half per head for the lambs and one dollar per head for the fleece each ewe will bring in six dollars and a quarter. When everything, time, labor, food and shelter is taken into consideration we may look upon this as a good return. This is what is being done every year by those who take very little care of their sheep, and where early lambs and higher prices are received the returns are correspondingly better. To those who are willing to put in more capital, more care and better feed, pure-bred stock gives a better return.

Mr. MASON: I have had some experience with sheep, and have always raised a few of them. With regard to the point raised about keeping them in a warm pen in bank barns, I do not think it is advisable. On the whole, I think the health of the sheep is better if they have just an ordinary frame shelter or anything else, the main point being to keep them thoroughly dry over head and under foot. They want good shelter and plenty of liberty. I think it is a good plan to have doors arranged so that they may go out and in at will. I sold this year for $1\frac{1}{8}$c. per pound less than I received last year. The buyer had been in business for 30 years, and he told me that he had sold a load of lambs at $4.20 live weight, which was the lowest he ever received. This, of course, is very discouraging. However, I am not sick of the sheep yet. We had nearly as bad a depression in 1877; and as a consequence every person went out of sheep. In about three years, in 1881, things were good in the sheep business, and every person was anxious to get in sheep. I think we are just repeating the same experience. We cannot expect to recover in one year, however.

Dr. MILLS: What did your lambs net you this last year?

Mr. MASON: Less than $3 a piece, weighing about 90 lb. each. I sold in the latter part of October or first of September.

Dr. MILLS: What is the best time for early lambs to come in?

T. H. MASON: As early as you can get them. If you can get them in January or February it is all the better.

F. J. SLEIGHTHOLM: From what knowledge I have of live stock, one of the first questions that presents itself to me is at what price can we produce an article in live stock and put it on the market at a profit? It is not so much a question with us what the price of an animal is, as the profit at any given price. We want to know if at the present low prices we can produce sheep at a profit. What does it cost in cents at from seven to eight months?

R. S. SHAW: In calling upon me to speak, I do not know whether you expect me to answer Mr. Sleightholm's question or not. I think it is a very difficult question to answer, and one which I do not think it would be possible for me to answer. At the present time, we are handling quite a number of sheep, but being somewhat differently situated to what a number of sheep breeders may be, it pays us to keep a number of sheep, although the prices are low, owing to the fact that there is a certain amount of feed which can be used by the sheep, which would be lost if we depended upon other animals to use it. There is also another point which one of the speakers mentioned in regard to sheep, that the prices would probably be lower next year. Well, it is a good idea, has been in many instances, when prices are low, when others are going out of a certain line, to get into it to be ready for the rise. Pork, for instance, has been a very good price of late, and the probabilities are that a great deal of pork will be produced for some time. Of course, we have no surety as to what the prices will be, but should we not watch carefully and not have a large supply of pork when the prices drop. At the same time, while mutton is low, should we not be on the lookout to have a supply, should the demand and price increase?

Mr. McKenzie: We know that it is the practice to rush out of one thing into another. We can go out of the sheep business quickly, but in cattle it takes longer to make a change, and if we make a mistake we are sure to lose some money.

T. H. Mason: I think it better on the whole for a person to keep a steady, uniform supply of all the classes of stock best adapted to his farm and to his liking. This everlasting going in and out of things is what does the mischief.

Robt. Harcourt: With regard to the question of keeping sheep in a bank barn, I think the same as Mr. Mason, that sheep as long as they have a dry shelter, above and below, it is all that they need, except at lambing times. A certain party in our neighborhood has made a practice for three years of feeding lambs in a bank barn along with his cattle and huddled so close together that they would not be allowed more than four feet square to each animal, and the fleeces are all damp. I cannot see how the sheep did well, but he is satisfied that they did better than in an open shed.

E. Dunn: With regard to keeping sheep in warm stables, I think it can be done with profit. Our sheep are kept in the bank barn all the time, and in a place just about as warm as where the cattle are. By a warm stable for sheep, we mean one that is moderately warm—water will freeze in the stable, but not solid, in the colder days. They must have fresh air, and their fleeces get wet if they are kept in three or four days. If they are kept warm, they do not need so much food to keep up the animal heat and if they are kept outside you will see them with their backs humped up, and if they are cold the lambs will lie on their backs, which causes the wool to mat. My experience is that they can be kept in a warm stable with profit.

J. F. Clark: I have not had very much experience in sheep-breeding, but we keep 30 or 40 usually. We are unfortunately situated in P. E. Island on account of winter communication. The only way to get across the channel is by ice-boats. On the ice-boats there is not much chance of transporting sheep at the best and so we cannot ship at the time that prices are best. The Island, I think, is very well adapted for sheep raising. Our mutton and our lambs bring the very highest price in the United States, also in Canada. I saw the P. E. I. mutton selling at 18 cts. a pound alongside of 8 cts. per pound mutton; and I believe American people who are judges of first-class quality of mutton put the P. E. I. productions at the very top as regards quality.

REPORT OF EXPERIMENTS IN AGRICULTURE.

The following report was presented by C. A. Zavitz, B.S.A., Agricultural College Guelph:

There were thirteen distinct co-operative experiments in agriculture conducted by the Association during the past year, two were with fertilizers, three with fodder crops, three with root crops and five were with grain crops. Two years ago 2,642 packages of fertilizers and seeds were distributed, one year ago 5,688 packages were distributed and during the present year no less than 7,181 packages were sent out to members of the "Union" and other interested farmers throughout the province. Nothing was sent out but choice material, both in regard to quality and variety. The seeds and fertilizers were forwarded to twelve hundred experimenters over Ontario, and not one complaint has been received from the experimenters regarding the quality of the material sent or the manner of preparing the same. The majority of those who carried on experiments in 1893 forwarded us reports after the crops were harvested. Great care has been exercised in selecting only the full reports of carefully-conducted tests for the summary report here presented. Four hundred and sixteen experimenters sent in satisfactory reports which are certainly of very great value, and those who conducted the work deserve much credit. These successful reports were from all parts of Ontario, sixteen coming from Muskoka, eleven from Parry Sound and six from Algoma. Less than five per cent. of the experimenters for 1893 have mentioned that they were unable to continue the work another year, while hundreds have expressed a desire to continue the work in 1894.

The following circular was sent out in February to members of the Association, previous experimenters and to others who applied for seed of different kinds:

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 two 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, and in 1892 there were upwards of 5,000 plots used for these co-operative tests over Ontario. Reports of successful and interesting experiments were received during the past year from every county in Ontario, with the single exception of the county of Russell.

The members of the Committee on Agricultural Experiments are pleased to state that for 1893 they are again enabled to distribute into every township of Ontario material for experiments with fertilizers, fodder crops, roots and grains. Upwards of 700 varieties of farm crops have been tested at the Experiment Station, Guelph, during the past four years. These consist of nearly all the Canadian sorts and about four hundred new varieties imported during the past six years from different parts of Europe, Asia, Africa, New Zealand, 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 report of similar experiments from other parts of Ontario. The results of carefully conducted experiments are presented in 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 1893, fill out the accompanying form of application and return the same to the Secretary 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 plot will, of course, become the property of those who conduct the experiments. In return the Committee desires to ask that each experimenter be very careful and accurate in his work and forward to the Secretary by October 25th, 1893, a complete report of the results obtained from the tests.

Along with the above circular, the following list of experiments for 1893 was sent, to which the blank form on which each person could make his application was attached:

No.	Name of experiments.	Plots 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 and superphosphate over no fertilizer with rape	3	2 " x 1 "
III.	Ascertaining the relative value of three varieties of millet	3	2 " x 1 "
IV.	Growing lucerne as a crop for fodder	1	4 " x 4 "
V.	Testing six promising varieties of fodder corn	6	1 " x 1 "
VI.	Testing five promising varieties of turnips	5	1 " x 1 "
VII.	Testing five promising varieties of mangels	5	1 " x 1 "
VIII.	Testing five promising varieties of carrots	5	1 " x 1 "
IX.	Testing six promising varieties of spring wheat	6	1 " x 1 "
X.	Testing six promising varieties of barley	6	1 " x 1 "
XI.	Testing six promising varieties of oats	6	1 " x 1 "
XII.	Testing four promising varieties of peas	4	1 " x 1 "

Material for No. I 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 the 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 Experimental Farm.

FORM OF APPLICATION.

To be filled and returned to C. A. Zavitz, Agricultural College, Guelph, Ont.

Experiment chosen (*indicate by number*) { First choice
Second choice

Name	Line of railway
Post office	Township
Express office	County

The demand for material for the co-operative experiments in agriculture for 1893 surpassed that of any previous year. We were enabled to supply nearly all the applicants with what they desired except those who applied late in the season. Material was sent into every county of Ontario, and also into the majority of the townships of the province. At the time the seeds were forwarded to the various experimenters, instructions for conducting the different tests were also sent as well as the following letter, informing the applicants that the experimental material was being forwarded :

DEAR SIR, —Your reply to our letter regarding the co-operative experiments for Ontario during 1893 has been received. We wish to inform you that 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 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. 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 the larger fields.

We hope the material which we have forwarded will reach you safely, and that you will have good success with your experimental work.

During 1893 there were four hundred and sixteen full reports of successful experiments received. Eighty-two experimenters sent in good reports of part of the varieties sent them, but these reports along with all of those which indicated carelessness in any way, are not included in the report here presented. Eighty-three experimenters mentioned failure from bad weather, and fifty-nine from the ravages of the grasshoppers.

To show the broadness of the work it might be mentioned that sixteen successful reports were received from Muskoka, eleven from Parry Sound, and six from Algoma.

The following table shows the progress of the co-operative experimental work in agriculture for the past eight years. Nothing is here mentioned except the purely successful part of the work, all partial or unsuccessful reports being discarded.

Successful Experimental Work for 8 Years.

Years.	Distinct experiments.	Successful reports.	Number of plots used for successful experiments.
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	1585
1893	13	416	2105

The results of the experimental work for the past year are not only very interesting but they are also very valuable. The uniformity of results for 1892 and 1893 are very marked. The fertilizers used with oats hold the same relative position in the results of the present year as they held in the results of 1892. The varieties which stood first in yield per acre last year, also in nearly all cases, claim the same high position in the average results for 1893. There is also a marked uniformity of results of the co-operative experiments for the past two years, and the farm experiments for the past two, three, four and five years.

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 the five plots, as indicated by the labels on the bags. Aim at seeding one inch deep, and cover the seed by going crosswise over the plots with a light harrow, or by using a hand rake.

(3) Apply the fertilizers upon their respective plots, as indicated by the labels on the bags.

(4) When the plants are three or four inches high, cut off all those outside of the plot limits.

(5) Your safest method of harvesting would probably be to cut the crops with a cradle after the oats have become sufficiently ripened, and then, when properly dried, thresh with a flail.

Individual results of twenty experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Weight of oats per plot.				
					Mixture.	Nitrate of soda.	Muriate of Potash.	Superphosphate.	No fertilizer.
					lb.	lb.	lb.	lb.	lb.
Jas. Clark	Glengarry	Gravelly loam.	Oats, 1892	1887, b.y.m.	39	33	28	28	27
David McCrae	Wellington	....	....	....	51	50	38	42	34
D. Hartley	Halton	Light	Turnips	Never	37	34	35	34½	24½
Frank Shuh	Waterloo	Sandy loam	Fall wheat	1890	29½	27½	25½	24	24½
Thos. Wheatley	Grey	Clay loam	Clover	1886	24	30	26	36	20
C. M. Honsberger	Lincoln	Gravelly loam.	Corn, 1892	1889	33¾	31	32½	27½	25½
as. W. McLean	Lambton	Clay loam	Oats	Never	32½	30	31	31½	28
as. M. Henderson	Middlesex	"	Fall wh't, 1892	1889	20	25	25	27	19
N. C. Brown	Elgin	Sandy loam	Corn	1892, b.y.m.	39	48	34	36	40
David H. McCallum	Middlesex	Clay loam	Oats	1887	15½	14½	13½	14	8½
Jno. Smailes	Elgin	Sandy loam	Fall wheat	Never	40	31	44½	35¾	26¾
T. C. Wheatley	Lambton	Swamp muck.	Pasture	"	20	13½	20	16	17½
Jos. Mountain	Perth	Clay	Barley	"	36	35	46	38	28
Wm. Marjerrison	Glengarry	Black loam	Potatoes	1888	45	43	35	34	30
W. T. Gale	Nipissing	Clay loam	Peas	Never	55	42	28	30	36
A. G. McKenzie	Oxford	"	Potatoes	....	42	44	39	38	42
Jackson Montgomery	Algoma	Sandy loam	....	....	28	24	32	22	20
Robt. Keppy, jr	Parry Sound	"	Oats	....	20	24	20	22	17
Geo. Hopf	Grey	Heavy clay	"	1889	50	38	47	43	38
Jno. A. McDonald	York	Clay	Corn	"	44	38	40	36	28

The mixed fertilizer was made up 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 were applied at the same time as the seed was sown. The following table shows the amount applied and the cost per acre of each fertilizer used :

Fertilizer.	Quantity applied per acre.	Cost per acre.
	lb.	$ c.
Mixture	213	4 35
Nitrate of Soda	160	4 40
Muriate of Potash	160	4 48
Superphosphate	320	4 16

Average results of twenty experiments:

Fertilizer.	Yield of straw per acre.		Yield of grain per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	tons.	tons.	bush.	bush.
Mixture	1.18	1.31	41.3	47.2
Nitrate of Soda	1.21	1.30	38.6	43.3
Muriate of Potash	1.17	1.22	37.6	40.8
Superphosphate (mineral)	1.20	1.18	36.2	39.3
No fertilizer	1.00	1.09	31.4	35.9

Conclusions.

(1) The average results obtained by twenty experimenters over Ontario in 1893 show that the fertilizers increased the oat crop as follows: Mixture—grain 9.9 bushels, straw .18 ton; nitrate of soda—grain 7.2 bushels, straw .21 ton; Muriate of Potash—grain 6.2 bushels, straw .17 ton; Superphosphate—grain 4.8 bushels, straw .2 ton.

(2) The mized or "complete" fertilizer gave an average increase yield of 31.5 per cent., the nitrate of soda 22.9 per cent., the Muriate of Potash 19.7 per cent., and the Superphosphate 15.3 per cent. of oats over no fertilizer.

(3) The grain crop was almost doubled upon some soils by the use of fertilizers, while upon others it was influenced to a very limited extent.

(4) In eleven experiments out of twenty the mixed fertilizer gave the highest yield of grain per acre.

(5) In seventeen out of twenty experiments the fertilized plots gave a greater average yield of grain than the unfertilized.

(6) The earliest maturing grain was produced on the plots which had received the mixed fertilizer in both 1892 and 1893.

(7) The shortest average straw was produced on the unfertilized plots in 1893 as in 1892.

(8) The fertilizers occupy the same relative position in regard to yield of grain per acre when applied on either heavy or light soils.

II. SODIUM NITRATE AND SUPERPHOSPHATE WITH RAPE.

(1) From a section of ordinary land, to which no manure has been applied for at least four years measure out 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 two 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 the package of sodium nitrate upon plot No. I., 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.

Results from one experiment.

Experimenter.	County.	Nature of Soil.	Cropping of 1892.	How or when last manured.	Yield of green rape per acre.		
					Nitrate of Soda.	Superphosphate	No fertilizer.
D. Aylesworth	Lennox	clay loam	pasture	f. y. m. 5 or 6 years ago.	tons. 9.2	tons. 5.1	tons. 4.0

Nitrate of soda was applied when the rape plants were about two inches high. It was sown broadcast at the rate of eighty pounds per acre. The cost price of the fertilizer was $2.20 per acre. The Dwarf Essex variety of rape was used, which was obtained in Ontario.

Conclusions.

(1) The demand for rape seed for experimental purposes is still very limited in Ontario.

(2) The plot which received nitrate of soda produced more than double the amount of green rape, which was produced from the unfertilized plot.

(3) The increase in the rape crop caused by the application of nitrate of soda was made at a cost of forty-two cents per ton.

III. Testing Three Varieties of Millet.

(1) Measure off three 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 three packages of millet seed upon their respective plots during the first week in June. Aim at seeding one inch deep.

(4) Cut the crop as soon as all the heads are in appearance.

(5) Weigh the produce from each plot immediately on cutting.

Individual results of two experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of green millet per plot.		
					Salzer's Dakota.	Golden Wonder.	Common.
					lb.	lb.	lb.
G. S. McTaggart ...	Hastings ...	black-muck.	pasture	....	60	48	30
A. G. McKenzie	Oxford	clay	fall wheat ..	f. y. m. 1893	132	123	95

Average results of two experiments.

Varieties.	Average height of plant.			Yield of green crop per acre.		
	From four tests, 1892.	From two tests, 1893.	Two years, 1892-3.	Four tests, 1892.	Two tests, 1893.	Average two years, 1892-3.
	in.	in.	in.	tons.	tons.	tons.
Salzer's Dakota	51.0	24.0	37.5	9.3	3.9	6.6
Golden Wonder	31.7	23.0	27.4	7.1	3.4	5.3
Common	33.0	19.0	26.0	5.8	2.5	4.2

Conclusions.

(1) The Salzer's Dakota millet surpasses the other varieties in yield per acre in each of the co-operative experiments for 1893.

(2) The Salzer's Dakota millet gave an average increase yield per of green fodder of 55.8 per cent. in 1892, and 53.6 per cent. in 1893 over that of the common millet in the co operative experiments.

(3) The Salzer's Dakota millet possesses a large amount of leaf, and is the tallest grower of the varieties in the test.

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 emain unbroken for a number of years.

(2) Cultivate the ground thoroughly, making a fine seed bed.

(3) Sow the 1.8 pounds of lucerne in the same way as you would seed with red clover.

(4) If there is a heavy crop of lucerne in the autumn, cut high ; if the crop is light, leave uncut.

Individual results of nineteen experiments

Experimenter.	County.	Nature of surface soil.	Nature of sub-soil.	Character of drainage.	Remarks.
Jas. Edmondston	Grey	sandy loam	gravel	stone drain	it was 6 in. to 1 ft. high, light and uneven.
J. E. Dyer	Durham	clay loam	red loam	good	cut it once, allowed horses to eat it down once, also pastured sheep on it, and it is getting thicker all the time.
Robt. Keppy, jr.	Parry Sound dis.	sandy loam	clay	under drained.	the lucerne was quite uniform.
Wm. Young	Lambton	alluvialdeposit	"	tile drain	about 1 ft. high and very uniform.
R. C. Twiss	Middlesex	clay loam	"	surface	did very well although tested severely with a heavy crop of oats and a very dry fall, was about 6 in. high.
Benj. Mannen	Brant	clay loam	"	fair	uniform and about 8 in. high.
J. H. Garbutt.	Peterboro'	light loam	hard-pan	good	the grasshoppers stripped the leaves.
S. J. Hogarth	Exeter	clay loam	heavy clay	natural slope	although fairly uniform was thinnish and plants slender.
John Hazel	Norfolk	-od	sand	none	looked well but burnt to ground by drouth, later rains recruited it very much indeed.
James A. Kidd	Simcoe	clay loam	clay	tile	fairly uniform and about 6 in. high.
R. DeLaMatter.	Lincoln	clay	"	surface dr'nage	quite uniform and knee high.
A. G. McKenzie	Oxford	clay loam	"	poor	8 in. high in Sept. and uniform.
W. I. Cook	Monck	sandy	sand	natural	I like it and think it will do better than red clover on poor soil.
H. Smith	Huron	strong clay l'm	clay	none	germination good and growth satisfactory until dry weather set in.
C. H. B. Angell	Wellington	black loam	sandy	none	quite uniform.
Wm. Scott	Stormont				from 10 to 24 in. high.
Crawford Scott.	Stormont	loamy			about 13 in. high.
D. Kennedy	Peterboro'				a good crop, 1 ft. high, well pleased.
James Burt	Wellington				about 15 in. high in Sept.

Average results of nineteen experiments.

Crop.	Number of days required to germinate, 1893.				Height of plant in autumn, 1893.			
	Minimum.	Maximum	Average.	Average two years, 1892-3.	Minimum.	Maximum	Average.	Average two years, 1892-3.
Lucerne......	7	26	13.5	11.4	4	24	10.5	12.4

The lucerne seed was obtained in Ontario. It was sown broadcast at the rate of eighteen pounds per acre. In most instances no additional crop was sown with the lucerne, and with but few exceptions the plants were left uncut during the present year.

Conclusions.

(1) The remarks of the experimenters are quite encouraging regarding the growth of lucerne the first summer after sowing.

(2) A large crop of lucerne cannot be expected during the first season after sowing.

(3) From seed sown in the spring of 1892 some experimenters speak of total failure by winter killing, etc., while others report of having two, three, and even four cuttings of the lucerne crop during the present year.

V. Testing Six Promising 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 each 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 conditions of field corn, or when the ears are in the glazed state.

Average results of 35 experiments.

Varieties.	Average of 35 co-operative tests, 1893.		Average of Experimental Farm tests—2 years, 1892-3.	
	Weight of green ears per acre.	Total weight per acre.	Weight of green ears per acre.	Total weight per acre.
	tons.	tons.	tons.	tons.
Mammoth White Surprise	2.4	17.5	1.1	24.3
Thoroughbred White Flint.........	3.5	15.9	2.1	22.2
Giant Beauty......................	3.0	15.5	3.7	23.0
Mammoth Cuban...................	3.4	15.2	3.9	19.7
Wisconsin Earliest White Dent.....	3.6	14.1	3.9	17.0
Salzer's North Dakota	3.5	13.2	3.4	18.4

The seed of all the above-mentioned varieties of corn was obtained from the United States, with the exception of that of the Thoroughbred White Flint, which was obtained from an Ontario seedsman.

Individual results of 35 experiments.

Experimenter.	County.	Date of seeding.	Nature of soil.	Cropping of 1892.	Weight of whole crop per plot.					
					Mammoth White Surprise.	Thoroughbred White Flint.	Giant Beauty.	Mammoth Cuban.	Wis. Earliest White Dent.	Salzer's North Dakota.
					lb.	lb.	lb.	lb.	lb.	lb.
John McKee	Oxford	June 1st	clay loam	hay	250	170	185	165	160	140
Robert Bandeen	Elgin	May 25th	sandy loam	wheat	255	240	200	225	186	236
W. G. Robertson	Dundas	" 23rd	"	oats	263½	256	213	234	196½	187¾
F. H. Patterson	Lincoln	June 8th	black loam	wheat	221	123	165	117	122	131
A. S. Hodgins	Stormont	May 30th	sandy loam	buckwheat	188	152	244	208	256	240
Jonathan Cross	Prescott	June 1st	"	fodder corn	275	325	300	225	250	200
John Heard	Grey	May 30th	gravel loam	corn	375	262	300	400	237	175
Wm. Merkley	Dundas	" 27th	"	"	170	100	155	150	100	150
D. Macfarlane	Par. Sound (D)	" 18th	clay loam	potatoes	340	355	333	367	330	341
Robert Wilson	Bruce	" 30th	l. s. loam	oats	318½	291	300	285	227½	218¾
E. Chambers	Welland	June 3rd	muck	oats & g. peas	220	275	220	195	225	190
A. Wiancko	Muskoka (Dis)	May 29th	clay loam	potatoes	152	153	160	142	165	126
Samuel Hunter	Wentworth	" 31st	sandy loam	oats	370	310	250	270	235	287
P. S. McLaren	Lanark	" 29th	"	turnips	188	211	148	120	124	136
Joshua Knight	Frontenac	" 20th	clay loam	potatoes	324	324	330	336	216	228
Geo. R. Thomson	Essex	" 25th	black loam	clover	350	225	200	152	225	163
Wm. Sutherland	Oxford	June 3rd	clay loam	oats	207½	193	139½	192	107	100
John A. Walker	Lanark	May 30th	"	potatoes	130	110	140	125	122	162
Wm. Johnston	Elgin	" 2 th	sandy loam	"	450	460	450	442	440	400
Thos. Henderson	Wentworth	" 27th	"	oats	256	386	236	154	205	236
Robert Ford	Essex	June 5th	clay loam	potatoes	214	170	184	166	143	110
V. E. Gamley	Bruce	" 16th	"	spring wheat	195	160	200	190	180	175
D. C. Gardiner	Huron	May 26th	"	oats	300	200	275	300	300	250
Joseph Mountain	Perth	" 27th	"	grass	210	150	180	270	160	240
Wm. Marjerrison	Glengarry	June 2nd	black loam	wheat	350	275	300	390	300	100
A. G. McKenzie	Oxford	" 12th	clay loam	fall wheat	153	132	137	153	122	107
Walter Carlaw	North'mberl'd	" 9th	clay	potatoes	53	67½	95	67½	60½	73½
A. S. McBean	Glengarry	" 8th	dark loam	turnips	84	82	87	80	81	80
James Gray	Peel	" 9th	clay loam	oats	85	80	88	88	71	65
Sleightholm Bros.	"	May 25th	heavy clay	"	79	72	76	60	79	51
A. J. Haist	Haldimand	" 31st	new ground	sod	108	198	79	70	90	94
Thomas Irwin	Middlesex	" 24th	black loam	oats	195	168	118	98	99	70
Richard Stutt	Lambton	" 29th	clay loam	"	74	77	130	102	165	110
E. Wright	Lennox	June 9th	"	hay	105	80	90	80	90	85
A. McCall	Elgin	May 26th	sandy loam	sod	150	120	85	102	78	101

Conclusions.

(1) The individual experiments show that no one variety of corn is equally suited for all parts of Ontario.

(2) The order of the varieties, when placed according to the average yield per acre, also represents their relative standing in their approach to maturity, the Mammoth White Surprise being the latest and the Salzer's North Dakota the earliest variety.

(3) The greatest average yield of green ears was produced by the Wisconsin Earliest White Dent in the co-operative tests, and by the Wisconsin Earliest White Dent and the Mammoth Cuban, in the Farm test for two years.

(4) The Mammoth White Surprise and the Giant Beauty produced the longest average plants, and the Salzer's North Dakota and Thoroughbred White Flint produced the shortest plants.

(5) The Wisconsin Earliest White Dent and the Salzer's North Dakota produced the highest average number of well developed ears, and the Mammoth White Surprise and the Throughbred White Flint produced the lowest average number of well-developed ears.

VI. TESTING FIVE PROMISING VARIETIES OF TURNIPS.

(1) Five plots, each containing 272 square feet, are required with the experiment with turnips, or mangels, or carrots.
(2) The drills for the roots should be twenty-five inches apart.
(3) Make all plots alike, and arrange each plot according to one of the following plans: *(a)* Eight drills, 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 the following distances apart: Mangels and turnips, ten inches carrots, four inches.
(6) Be careful of the plants when cultivating and hoeing the ground.

Individual results of nineteen experiments.

Name.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of turnips per plot: Jersey Navet.	Red Globe Norfolk.	Hartley's Bronze Top.	Carter's Elephant.	White Swede.
					lb.	lb.	lb.	lb.	lb.
W. H. Locke	Northum'l'd	Clay	Corn	......	423	390	242	210	196
Wm. Simpson	Kent	Rich clay loam	Beans	Never	320	280	272	312	250
Robt. Keppy, jr	Parry Sound	Clay loam	Peas	1893	280	280	200	216	200
Robt. B. Fleming	Bruce	Rich loam	Oats	1893	199	237	196	274	103
M. Johnson	Simcoe	Sandy	Spr'g wheat.	b. y. m	263	398	229	103	53
Jno. Grierson	Grey	Clay loam	Oats	Green manure	372	330	199	238	150
Wm. Dinniwell	Bruce	"	Fall wheat	Hog manure	765	620	770	780	624
G. S. Hull	Middlesex	"	Oats	b. y. m	335	279	238	246	204
Albert Edwards	Russell	Sandy loam	Corn	1893, b. y. m	277	318	378	330	266
G. H. Clare	Hastings	Heavy loam	Potatoes	b. y. m	765	608	692	744	575
M. J. Fisher	Stormont	Light & sandy	Beans	1891, lightly	221	196	130	116	126
Jas. A. Kidd	Simcoe	Clay loam	Barley	1892, 18 l'ds pr acre.	400	270	270	240	207
D. Kiernan	Dufferin	" "	Clover sod	1893	525	385	350	360	260
J. F. Davidson	Peterboro'	Sandy "	Spr'g wheat.	1892, f. y. m	405	459	238	203	193
W. A. Richardson	Durham	Clay "	Barley	1892, top dressed	287	325	242	348	280
Harry E Beemer	Norfolk	Sandy "	Pasture	......	470	480	450	500	500
Gordon Young	Huron	Rich loam	Fall wheat	1893, 25 l'ds pr acre.	280	200	250	200	110
Robt. Webster	"	Clay "	Potatoes	1893, s. m	125	130	145	150	120
Jas. Nickason	Muskoka	Sandy loam	....	......	390	300	240	240	180

Average results of nineteen experiments.

Varieties.	Average of 19 co-operative tests. Yield per acre, 1893.	Average of Experimental Farm tests, 2 years, 1892-3.
	bushels.	bushels.
Jersey Navet	996.7	689.7
Red Globe Norfolk	911.5	604.7
Hartley's Bronze Top	804.3	659.3
Carter's Elephant	801.3	562.5
White Swede	645.1	638.8

The Jersey Navet and the Red Globe Norfolk are both fall turnips, and the Hartley's Bronze Top, Carter's Elephant and White Swede are Swede turnips. The seed of the Jersey Navet was obtained from the United States, that of the Carter's Elephant from England, and that of the other three varieties from Ontario.

CONCLUSIONS.

(1) The fall turnips give a greater yield of roots per acre than the Swede varieties in the co operative tests of 1893.

(2) The Hartley's Bronze Top gave the largest yield per acre of the Swede varieties in the co-operative tests of 1893, as well as in those of 1892.

(3) The Jersey Navet gave the largest yield of roots per acre in the co-operative tests for 1893 and in the Farm tests for the past three years.

VII. TESTING FIVE PROMISING VARIETIES OF MANGELS.

INSTRUCTIONS—Same as those given for turnips.

Individual results of eighteen experiments.

Name.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of mangels per plot.				
					Steele Bros.' Long Red Selected.	Mammoth Red Intermediate.	Carter's Warden Orange Globe.	White Silesian (sugar beet).	Mammoth Golden Giant.
E. L Smith	Kent	sandy	new ground	never	572	440	399	450	425
Manley Smith	"	"	"	"	572	459	404	440	425
A. G. McKenzie	Oxford	clay loam	fall wheat	b.y.m., 1893	249	175	161	253	175
R. H. De La Matter	Lincoln	clay	potatoes	b.y.m., 1892	620	490	788	505	497
Jas. A. Kidd	Simcoe	"	barley	"	150	150	122	165	152
Robert Scott	Stormont	"	peas and oats	"	301	249	218	262	162
Wm. Rowand	Bruce	clay loam	potatoes	"	336	303½	235	256	272
Jno. R. Suddaby	Wellington	light loam	hay	"	285	205	253	197	189
Wm. J. Wilson	Dundas	loam	pasture	....	450	300	380	180	500
D. C. Gardiner	Huron	clay	oats	b.y.m., 1893	360	220	280	160	330
Wm. Simpson	Kent	sandy loam	potatoes	b.y.m., 1892	640	520	320	326	440
Thos. Topping	Frontenac	"	"	"	310	320	312	295	314
Geo. Baird	Huron	clay loam	fall wheat	"	143	126	136	165	138
Jas. Cruickshank	Kent	sand	corn	"	222	234	150	320	180
Joshua Knight	Frontenac	clay	potatoes	"	427	430	357	266	420
Jos. H. Davison	Wellington	clay loam	onions	b.y.m., 1893	326	356½	376	358	267
Forbes Clark	Dufferin	clay	turnips	"	706	558	296	500	129
J. D. Smith	Durham	light sand	potatoes	....	194	165	116	160	119

Average results of eighteen experiments.

Varieties.	Average of eighteen co-operative tests—Yield per acre, 1893.	Average of Experimental Farm tests—two years, 1892-3.
	bushels.	bushels.
Steele Bros.' Long Red Selected	1016.8	618.8
Mammoth Red Intermediate	844.5	644.2
Carter's Warden Orange Globe	785.6	424.7
White Silesian (Sugar Beet)	778.9	509.2
Mammoth Golden Giant	761.9	368.0

The variety of Sugar Beet is one used mostly for stock-feeding.

CONCLUSIONS.

(1) The Steele Bros.' Mammoth Long Red Mangel gave the highest yield of roots per plot in eight of the co-operative experiments out of ten conducted in Ontario in 1892, and eleven out of eighteen conducted in 1893.

(2) The Vilmorin's Improved White Sugar Beet gave an average yield of 828.9 bushels per acre over Ontario in 1892, and the White Silesian Sugar Beet an average of 778.9 bushels per acre in 1893.

(3) In regard to yield per acre the Sugur Beet holds an intermediate position among the mangels in the co-operative tests in 1892, and also an intermediate position among the mangels in the Farm test for two years.

VIII. TESTING FIVE PROMISING VARIETIES OF CARROTS.

INSTRUCTIONS—Same as those given for turnips.

Individual results of twenty-four experiments.

Name.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of carrots per plot. Improved Short White.	Large White Belgian.	Large White Vosges.	Danver's Half Long.	Guerande.
					lb.	lb.	lb	lb.	lb.
Peter Rutherford ..	Algoma	clay loam	tomatoes	....	208	180	220	216	214
A. Dawson	Brant	sandy	carrots	b.y.m., 1892..	202	176	168	154	100
R. H. De La Matter.	Lincoln	clay........	potatoes......	" ..	612	500	506	516	510
Jas. A. Kidd	Simcoe	....	....	....	258	148	152	195	162
Wm. Quinn	Muskoka ..	sandy loam	potatoes	1893.........	134	73	134	94	71
Geo. A. Snyder	Lincoln	black loam	"	never	194	104	132	78	67
Wm Clark	Muskoka ..	sandy loam	beets	1892.........	167	200	114	190	188
Wm. Ferguson ..	" ..	"	oats	1892.........	320	328	312	192	200
Nicholas DeHart ..	Simcoe	light clay	potatoes	1893.........	260	263	275	257	213
Daniel Edge	Grey	light loam......	mangels	b.v.m., 1892..	342	246	266	210	218
W. A. Johnston....	Dufferin...	clay loam	barley........	1893.........	310	296	280	208	190
Wm. J. Phillips....	Algoma	light sandy loam	potatoes	1892.........	525	640	450	490	395
S. M. Peacock	Elgin	sand	corn	1892.........	141¼	120¼	148¼	110¾	156¾
Robt. Keppy, jr....	Parry Sound	sandy loam	roots	1893.........	148	120	104	150	140
D. P. L. Campbell..	Glengarry..	clay loam	oats	1893, f.y.m...	201	230	203	180	234
Jas. Pegg	Grey	sand loam.....	mangels	1892, b.y.m ..	269	261	372	275	317
Joshua Knight	Frontanac..	clay loam	potatoes	" ..	366	270	368	302	310
Jas. Smith	Bruce	"	peas	1893, b.y.m ..	375	372	362	288	335
David Sinclair......	Muskoka ..	light sand	rape	1892, b.y.m ..	189	131	195	163	177
Alex. Kirk	Perth	....	potatoes	....	454	313	320	295	245
Wm. Esson	Muskoka ..	clay loam	"	b.y.m	320	215	192	264	279
Manley Smith....	Kent	mucky sand	1893, cat tails.	never	240	280	160	220	160
W. H. Smith	Elgin	sand	potatoes	1892, s.m	480	248	360	352	320
Jacob Factley	Welland ...	gravelly loam ..	"	never	304	280	201	520	215

Average results of twenty-four experiments.

Varieties.	Average of twenty-four co-operative tests—Yield per acre, 1893.	Average of Experimental Farm tests—two years, 1892-3.
	bushels.	bushels.
Improved Short White	780.0	1009.7
Large White Belgian	666.1	853.0
Large White Vosges	657.9	958.8
Danver's Half Long Orange	657.9	861.3
Guerande	601.9	740.0

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, and in 42 per cent. of the co-operative experiments during 1893.

(2) The white-fleshed varieties of carrots all gave better yields of roots than the yellow-fleshed varieties.

(3) The Guerande was perhaps the easiest removed from the ground of all the varieties tested.

(4) The Improved Short White is an excellent variety of carrots for general cultivation.

IX. TESTING SIX PROMISING VARIETIES OF SPRING WHEAT.

(1) Select a portion of uniform soil and mark off six plots, for either spring wheat, or barley, or 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.

Individual results of 29 experiments.

Name.	County.	Nature of soil.	Cropping of 1892.	When and how last manured.	Yield of grain per plot.					
					Herison Bearded.	Blue Stem.	Rio Grande.	McCarlin.	Red Fern.	Pringle's Champi'n.
					lb.	lb.	lb.	lb.	lb.	lb.
J. M. Tupper	Grey	clay loam	potatoes	....	7	6.5	5	6	5.5	6.5
M. Munro	Glengarry	"	turnips	1892, f.y.m.	11.3	13	8	7.5	10.1	9
L. Dillabough	Dundas	gravelly	potatoes	1892	4.5	3	6.3	4.8	6	5
Jno. F. Eaton	Grey	clay loam	fodder corn.	1892, b.y.m.	6	9	5	5	5.5	6.5
Wm. Marjerrison	Glengarry	"	oats	1893	3	3	8	8	2	2
J. I. Graham	Grey	loam	....	....	3	4	3	2	6	8
J. K. Campbell	Grey	sandy loam	corn	1892	2.5	2.5	2	1.8	1.8	2.5
Chas. Rankin	Simcoe	clay	fall wheat	1892	4.5	5	3	3	3	3
Hugh Smith	Victoria	clay loam	oats	1892, b.y.m.	5	2	2	2	3	4
No name	....	gravelly	clover	....	6	10	10	9	9	8
Geo. E. Johnson	Peterborough	" loam	fall wheat	1891, b.y.m.	1.8	3.5	1.3	5	2.8	2
Alfred Kay	Muskoka	sandy "	barley	1892, b.y.m.	5.3	6	8	4.5	5	3.5
Jno. Stewart	Durham	clay "	wheat	1891	4.5	4.5	6	4	6	4
Jas. Cook	Wellington	heavy clay	peas & oats	1890, b.y.m.	5.3	7.5	4.4	3.9	6.6	4.5
W. S. Scott	Stormont	clay	potatoes	1892	8	9	9	5	5.5	5.5
T. W. Klinck	York	clay loam	barley	1890, b.y.m.	5.2	5.2	[illegible].1	3.7	5.6	3.5
W. H. Clark	Leeds	"	wheat	1893, b.y.m.	2.2	1.6	[illegible].4	2.9	2.3	1.2
Robt. Waterston	Russell	"	oats	1886	5.2	3.3	4.3	5	4	6
C. J. S. Naftel	Huron	sandy loam	spring wheat	1892, b.y.m.	5.3	4	6.2	5	3.6	4.4
P. W. Russell	Kent	clay "	corn	1891, b.y.m.	6	4.5	7	7.3	4.8	3
Alex. S. Wier	Muskoka	sand "	....	1893, b.y.m.	14.5	14.5	13	13	12	14
Isaac W. Reid	Victoria	clay "	peas	....	6	7	5	3.5	4	3
Geo. Martin	Simcoe	clay "	fall wheat	1891	4.5	4.4	4.6	5.5	4.4	5
J. N. Kernighan	Huron	....	....	....	5	4	4.5	5	4	3.5
Jno. Alton	Victoria	clay loam	potatoes	b.y.m	5	3	5	4	2.5	4
Ed. Wynne	Bruce	clay	fall wheat	never	2	2	2	1.5	1.5	1.5
No name	....	clay loam	barley	1890, b.y.m.	6	4.5	4	5.5	3.5	5
Louis N. Smith	Norfolk	sandy	carrots	b.y.m	5.9	3.1	5.8	5.9	2.6	3.7
Sid. McKenzie	Ontario	clay	potatoes	1892, b.y.m.	16.5	15	9	15	10	9

Average results of 29 experiments.

Varieties.	Average of 29 co-operative tests—1893.		Average of Experimental Farm tests—2 years, 1892-3.	
	Straw per acre.	Grain per acre.	Straw per acre.	Grain per acre.
	tons.	bush.	tons.	bush.
Herison Bearded	1.2	15.3	2.4	27.4
Blue Stem	1.1	15.3	1.8	25.3
Rio Grande	1.2	14.5	2.0	23.5
McCarlin	1.3	14.1	2.3	22.8
Red Fern	1.4	13.1	2.4	30.8
Pringle's Champion	1 3	12.9	2 2	26.9

The seed of the Herison Bearded variety was imported from France in 1888 and that of the Pringle's Champion from Germany the same year. The seed of the Blue Stem was sent as a gift to this station in the spring of 1892 by the director of the North Dakota Agricultural Experiment Station. The Rio Grande, McCarlin and Red Fern are all Ontario varieties.

Conclusions.

(1) The Herison Bearded stands at the head of the list in point of yield in the co-operative experiments of 1893, and also in the Farm tests with spring wheat for the past five years.

(2) The first variety to reach maturity was the Herison Bearded and the last was the Blue Stem.

(3) The Red Fern and the Pringle's Champion made a much better yield relatively in the station test for two years than in the co-operative tests for 1893.

(4) The longest average straw in the co-operative tests was produced by the Red Fern and the shortest average straw by the Blue Stem.

X. Testing Six Promising Varieties of Barley.

Instructions.—Same as those given for spring wheat.

Individual results of 11 experiments of barley.

Name.	County.	Nature of Soil.	Cropping of 1892.	How and when last manured.	Yield of grain per plot.					
					Mands-cheuri.	Oder-brucker.	Hun-garian.	Guyma-laya.	Kinna Kulla.	Highland Chief.
					lb.	lb.	lb.	lb.	lb.	lb.
A.G. McKenzie....	Oxford	clay loam	potatoes	b.y.m., '92.	10.5	7.0	7.5	5.5	5.0	4.5
Chas. Doherty.....	Peel	black loam ...	fall wheat	b.y.m., '91.	8.0	8.0	9.0	6.0	7.0	5.5
Jno. Henderson....	Hastings ...	clay loam	potatoes	....	10.0	6.0	6.0	9.0	3.0	2.0
Thos. Appleby....	Huron	... .	....	....	4.0	5.0	4.0	2.5	2.5	3.0
David Graham.....	Hastings ...	clay loam	wheat	b.y.m., '91..	8.5	10.6	5.5	6.0	9.0	7.3
J. E. Dyer	Durham....	clay loam	hay	b.y.m., '90..	4.5	4.0	7.5	4.5	4.5	8.5
Robert Keppy.....	Parry Sound	sandy loam ...	oats	....	6.0	3.0	3.0	4.3	3.0	3.0
Jos. Kinder.......	Renfrew ...	light loam....	wheat	b.y.m., '93..	6.8	6.2	10.1	9.1	6.0	5.4
John Mortimer....	Algoma ...	....	.. ..	....	8.0	7.0	4.0	3.0	6.0	6.0
John Watson......	Ontario	loam	wheat	b.y.m., '91..	5.5	5.0	3.5	4.0	4.0	4.5
Chas. Young	Algoma	sandy loam...	hay	never	6.5	6.0	6.0	6.0	7.8	7.3

Average results of 11 experiments.

Varieties.	Average of 11 co-operative tests, 1893.		Average of Experimental Farm tests, 2 years, 1892-3.	
	Straw per acre.	Grain per acre.	Straw per acre.	Grain per acre.
	tons.	bushels.	tons.	bushels.
Mandscheuri	.9	23.7	1.6	53.3
Oderbrucker	.9	20.7	1.5	49.7
Hungarian	.8	20.0	1.4	32.3
Guymalaya................	.9	18.0	1.5	33.9
Kinna Kulla	1.0	17.7	2.0	57.1
Highland Chief	.9	17.3	1.3	56.1

The above named varieties of barley were all imported by this station in the spring of 1889. The Mandscheuri came from Russia, the Oderbrucker from Germany, the Hungarian from Hungary, the Guymalaya and the Kinna Kulla from Sweden, and the Highland

Chief from the United States. The Mandscheuri and the Oderbucker are six-rowed varieties; the Hungarian and the Guymalaya, hulless varieties, and the Kinna Kulla and Highland Chief, two-rowed varieties.

CONCLUSIONS.

(1) The Mandscheuri variety of barley gave the highest yield of grain per acre in the co-operative tests for both 1892 and 1893.

(2) The six-rowed varieties of barley gave the highest yield per acre in the co-operative tests for 1893; the hulless varieties the next highest yield, and the two-rowed varieties gave the lowest yield per acre.

(3) The Kinna Kulla and the Highland Chief have both done exceedingly well in the station tests for the past two years.

(4) The varieties which ripened first were the Mandscheuri and the Oderbrucker and the varieties which ripened last were the Hungarian and the Kinna Kulla.

(5) The Oderbrucker barley which stood second in the tests of 1892 for yield of grain also stands second in point of yield per acre among the varieties tested in 1893.

XI. TESTING SIX PROMISING VARIETIES OF OATS.

INSTRUCTIONS—Same as those given for spring wheat.

Average results of 105 experiments.

Varieties.	Average of 105 co-operative tests, 1893.		Average of Experimental Farm tests, 2 years, 1892-3.	
	Straw per acre.	Grain per acre.	Straw per acre.	Grain per acre.
	tons.	bushels.	tons.	bushels.
Siberian	1.7	52.4	2.8	75.1
Poland White	1.6	52.0	2.6	67.6
Joanette	1.5	51.0	2.7	82.4
Danebrog	1.6	50.4	2.5	71.7
Bavarian	1.6	49.6	3.0	71.5
Golden Giant	1.6	45.1	2.3	62.4

The Siberian variety was imported from Russia, the Poland White and the Joanette from France, the Danebrog from Germany, and the Bavarian and Golden Giant were obtained in Ontario.

CONCLUSIONS.

(1) The Siberian, which stands at the head of the list in average yield of grain per acre of one hundred and five experiments in 1893, also occupied first place in the average of one hundred and twenty-five experiments in 1892.

(2) The Joanette, which stands third in the list of 1893, also occupied third place in the list of 1892.

(3) The Joanette has done exceedingly well on the station plots.

(4) The Golden Giant made a poor record, comparatively, both in the co-operative and the station tests.

(5) There seems to be a greater demand in Ontario for oats than for any other kind spring grain.

XI. TESTING SIX PROMISING VARIETIES OF OATS.—*Continued.*

Individual results of 105 experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of oats per plot. (lb.) Siberian.	Poland White.	Joanette.	Danebrog.	Bavarian.	Golden Giant.
Forbes Clark	Dufferin	clay loam	oats		18.0	21.0	18.0	12.0	18.0	12.0
J. R. Randell	York	sandy loam	potatoes	b.y. m., '92	10.0	8.5	9.0	9.5	10.0	7.5
W. J. Young	Grey	clay loam		" '90	3.5	5.0	2.5	4.0	3.0	4.0
Edward Wynne	Bruce	clay	grass		3.5	3.5	3.0	4.5	4.5	1.0
Robert Sparling	Lambton				2.0	4.0	5.0	3.0	5.0	3.0
W. J. Oke	Huron	clay loam	potatoes	b.y m.	14.5	13.0	19.0	10.0	17.0	11.5
R. H. Mitton					13.5	13.0	13.0	12.0	12.0	10.0
Jas. Laurie	Kent	clay loam	beans	never	8.0	10.0	14.0	9.0	7.5	11.0
Fletcher Davis	Welland	black loam	hay	"	7.0	9.0	10.0	8.5	9.5	9.0
Geo. Glaister	Waterloo	clay loam	oats	b.y. m., '91	24.5	18.0	26.5	17.5	25.0	18.0
A. G. McKenzie	Oxford	"	potatoes	" '92	12.0	10.5	9.0	11.0	10.0	9.0
Henry Rivers	Lambton	"	corn	" '92	25.0	22.0	24.0	15.5	21.0	14.5
Dugald Talmon	Elgin	gravelly loam	potatoes	" '92	8.0	6.5	7.5	9.0	6.0	7.0
Walter Hick	Huron	clay loam	corn	" '92	8.8	7.9	9.6	6.3	7.6	8.0
E. Barrick	Welland	clay	fall wheat	never	10.5	10.5	8.0	9.0	8.5	6.0
Jos. W. Newman	Grenville	sandy loam	corn	b.y. m., '92	15.0	13.0	14.5	13.5	12.0	15.5
Robert C. McNeil	Kent	clay loam	corn	" '89	22.0	29.0	18.0	20.0	21.0	26.0
Peter Grant	Bruce	"	potatoes	" '92	11.5	12.0	10.5	11.0	11.0	10.5
W. J. McLean	Grey	sandy loam	sod		7.5	6.8	7.3	5.0	6.0	4.0
W. H. Caton	Welland	clay loam	bare fallow	f.y. m., '92	8.3	8.0	5.0	6.0	6.0	3.5
W. J. Falconer	Dufferin	"	peas	" '92	14.0	11.0	14.5	12.0	13.5	14.0
James Stitt	Norfolk	sandy loam	turnips	b.y. m., '92	11.0	12.0	13.0	10.3	12.3	12.0
Thos. Mollard	Huron	clay loam	bare fallow	" '92	11.5	10.8	11.0	9.8	9.3	9.5
W. A. Scott	Parry Sound Dis.	sandy loam	hay	" '93	21.0	24.5	18.0	21.0	17.0	19.0
Samuel Brown	Parry Sound Dis.	"	wheat	never	11.8	10.5	9.8	7.5	8.0	12.0
Edward Mans	Brant	"	beans	never	11.0	11.0	9.5	9.5	9.5	6.5
R. McKenzie	Bruce	light loam	oats	never	7.0	8.0	8.5	9.0	10.0	7.5
Isaac E. Groff	Waterloo	sandy loam	carrots	b.y. m., '92	9.0	10.0	9.5	9.0	8.5	6.5
D. H. Dougald	Glengarry	light clay	barley	" '91	22.0	17.0	15.0	22.0	16.0	16.0
J. W. Hunter	Huron	loam	old pasture	never	8.0	6.0	8.5	8.0	7.0	8.5
John Sirr	Parry Sound Dis.	clay loam	"	never	10.5	12.0	15.0	11.0	11.0	10.0
R. M. Vanluven	Frontenac	sandy loam	oats	b.y. m., '93	9.8	7.0	9.0	11.0	8.5	10.0
Jas. Gardiner		sandy	oats	" '93	9.0	7.5	10.0	12.5	12.0	12.0
John Wilson	Halton	light sandy soil	potatoes	" '92	4.8	6.8	5.5	6.3	5.3	6.5
Jas. Johnston	Muskoka	clay loam	peas and oats	never	7.5	9.0	6.0	9.0	8.5	6.0

XI. TESTING SIX PROMISING VARIETIES OF OATS.—*Continued.*

Individual results of 105 experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of oats per plot. (lb.) Sheridan.	Poland White.	Joanette.	Danebrog.	Bavarian.	Golden Giant.
Chas. E. Thompson	Oxford	clay loam	wheat		10 0	10.0	13.0	9.0	9.3	8.5
Jas. W. Grady	Grey	"	turnips	b y. m., '92	8.3	13.5	12.5	11.0	11.5	11.5
W. Fotheringham	Huron	"	barley	" '87	11.0	11.0	12.0	10.3	8.3	9.3
John F. Andrew	Huron	"	wheat	" '92	10.5	11 0	15.0	7.5	8.5	7.0
Fred. Christensen	Haliburton	light sandy loam	potatoes	never	7.5	5.5	6.5	8.0	9.0	9.0
Isaac L. Laughlin	Middlesex	clay loam	"	b.y. m., '92	15.0	12.5	14.0	15.8	15.8	15.0
Hugh C. Claridge	Peel	"	"	" '92	14.0	12.7	11.7	16.8	12.6	11.6
Robert Templeman	Lanark	"	hay	" '90	26.0	27.0	18.0	24.0	21.0	25.0
W. H. Clark	Leeds	sandy loam	wheat	"	4.4	3.6	3.9	1.6	2.5	4.4
Crawford Scott	Stormont	clay loam	oats	" '89	7.0	6.0	7.0	8.0	8.0	4.0
Wm. Sterritt	Perth	"	hay	" '90	11.0	10.5	9.0	9.5	8.0	8.5
Wm. Emerson	Halton	"	turnips		10.0	8.0	7.5	2.5	6.0	5.0
Lewis Lamb	Bruce	"	hay	b y. m., '92	14.0	21.0	16.0	16.0	16.0	17.0
Daniel Marshall	Middlesex	light clay loam	peas	" '84	10.0	8.0	8.5	8.0	10.0	5.5
Archie Carmichael	Middlesex	clay loam	mangels	" '93	16.5	16.0	17.5	15.0	12.5	14.0
W. A. Boyce	Peterborough	"	turnips	never	17.0	14.5	16.5	21.0	13.5	16.0
W. Wight	Lambton	black clay loam	hay	f.y. m., '89	4.3	4.5	4.5	5.0	4.0	4.3
J. C. Clark	York	clay loam	barley	b.y. m., '87	10.3	9.6	12.0	8.4	10.9	8.1
James McEwen	Lambton	clay	beans	" '93	9.5	9.3	9.0	9.8	9.3	6.0
Thomas Stephenson	Grey	clay loam	spring wheat	" '91	15.5	12.8	12.3	15.8	13.5	11.0
Wm. Stitzinger	Welland	sandy	potatoes		12.5	8.5	6.5	6 0	8.8	8.0
Francis Collinson	Parry Sound	sandy loam	peas	b.y. m., '93	10.5	10.1	9.8	10.2	11.9	8.6
Alex. Wood	Oxford	clay loam	pasture	f.y.m. and salt, '93	14.0	14.0	13.0	10.5	12.0	10.0
James Cook	Wellington	"	peas and oats	f.y. m., '90	15.5	16.5	14.5	12.9	10.8	11.5
Peter D. Campbell	Lanark	sandy loam	corn	" '92	8.0	10.0	10.0	9.0	9.0	10.0
Neil McLean	Middlesex	clay	oats	" '85	12.3	12.0	10.0	12.0	11.3	9.5
Jas. A. Stewart	Northumberland	clay loam	corn		21.0	16.0	24.0	15.0	15.0	14.0
Jas. Reed	Lambton	clay	oats		22.0	25.5	22.0	22.3	16.0	8.0
Arch. Carmichael	Elgin	black loam	strawberries		5.0	9.0	5.5	7.0	6.0	7.0
P. Hutshins	Grenville	sandy loam	corn	f.y. m., '89	8.0	8.0	6.0	9.0	10.0	8.0
John Steele	Lanark	clay	corn	never	12.0	17.0	12.0	15.5	13.5	9.0
E. R. Lewis	Brant	clay loam	barley	f.y. m., '92	17.0	17.0	17.0	23.0	20.0	17.5
J. H. Macfie	Middlesex	sandy loam	wheat	" '91	8.0	7.3	8.5	5.3	7.0	6.0
Thomas Shanks	Halton	clay loam	pasture	b.y. m., '88	7 5	8.0	7.0	6.5	8.0	5.3
Robert Keppy	Parry Sound	sandy loam	oats	indefinite	2.5	2.0	2.0	2.0	4.0	3.0
Wesley Stephens	York	clay loam	potatoes	f.v. m., '92	10.3	14.0	15.0	10.0	9.0	10.0

Abram Elsworth	Elgin	sandy loam	wheat	b.y. m., '91	6.5	3.7	6.5	6.6	4.5	3.6
John Bushy	Russell				3.3	3.0	4.0	3.0	2.8	3.0
W. C. Ruthven	Leeds	sandy loam	oats	b.y. m., '91	12.0	12.0	10.0	9.0	12.0	17.0
Royal Rogers	Ontario	clay loam	turnips	" '92	11.5	12.0	12.0	12.0	11.5	11.0
John McAsh	Huron	"	turnips	" '92	12.3	12.5	11.5	10.5	11.8	11.5
Robert Watson	Grey	sandy loam	wheat	" '91	7.5	8.0	6.5	8.8	9.5	7.0
Thos. S. Henderson	Wentworth	"	peas	" '87	9.5	8.5	11.5	11.5	11.0	9.0
Robert McDonald	Glengarry	"	oats	" '91	14.0	14.0	19.0	18.0	17.0	12.5
J. D. Tinney	Victoria	heavy clay		never	10.0	12.8	11.0	10.0	9.8	11.5
Jos. Armstrong	Middlesex	clay loam	wheat		5.8	3.9	4.0	5.0	4.6	1.6
Wm. Henderson	Wentworth	sandy loam	hay	b.y. m., '88	5.1	5.3	6.4	5.6	4.3	5.1
Henry Robertson	Dundas				8.5	7.0	5.0	9.5	9.0	8.0
John F. Wilson	Oxford	gravelly	peas and oats	b.y. m., '93	10.5	8.0	9.0	10.0	9.0	8.0
Thos. Appleby	Huron	gravelly loam	peas	" '93	9.0	10.0	13.0	9.0	10.0	11.0
John E. Roland	Perth	clay loam	oats	never	11.0	14.0	12.0	14.0	12.5	11.0
James Duncan	Huron	clay loam	corn	b.y. m., '92	25.0	27.0	20.0	27.0	26.0	17.0
Geo. Lyall	Simcoe	sandy loam	spring wheat	" '91	3.0	3.5	4.5	5.0	3.0	3.0
Thomas Smith	Simcoe		potatoes		7.8	8.3	2.0	9.0	7.3	5.5
Francis E. Petit	Oxford	clay loam	corn	b.y. m., '89	7.0	9.5	9.0	7.0	8.8	8.0
John Crawford	Kent	"	fall wheat	" '91	14.0	13.5	15.5	15.5	18.5	19.5
Walter Gardiner	Perth	clay	"	b.y. m., '91	3.0	4.0	4.5	3.0	3.5	4.0
Joseph Tuck	Wellington	clay loam	oats	" '87	20.0	21.0	20.0	23.0	20.0	22.0
John Dickin	Halton	"	pasture		6.0	5.5	4.0	5.0	4.3	5.0
W. S. Scott	Oxford	sandy loam	sugar beet	b.y. m., '92	7.0	5.0	6.0	8.0	6.0	4.0
O. A. Lawrence	Halton	clay loam	corn	" '91	7.0	8.0	7.9	8.0	7.5	4.5
Wm. Marjerrison	Glengarry	"	oats	" '93	18.0	14.0	13.0	13.5	13.5	13.5
W. J. Fisher	Durham	"	roots	" '92	19.0	20.0	15.0	17.0	16.5	17.5
Wm. Sword	Muskoka	sandy loam	peas	" '92	9.5	9.0	10.0	7.0	7.5	10.0
John Phillips	Huron	"	roots	" '92	9.0	6.0	12.0	7.0	5.0	4.0
Wm. Watson					6.0	12.0	4.0	10.0	10.0	8.0
Peter A. Campbell	Lambton	gravelly loam	corn	b.y. m., '92	12.0	12.0	12.0	15.0	16.0	8.0
Wm. E. Beatie	Lambton	clay loam	mangels		16.0	13.0	13.5	16.8	14.0	14.5
Jas. Burns	Ontario		oats	b.y. m., '89	12.0	9.0	8.0	10.0	9.0	5.0
Thos. A. Millichamp	Simcoe	sandy loam	hay		12.0	9.5	8.0	10.8	12.0	8.5

XII. TESTING FOUR PROMISING VARIETIES OF PEAS.

INSTRUCTIONS.—Same as those given for spring wheat.

Individual results of 73 experiments.

Name.	County.	Nature of soil.	Cropping of 1882.	How and when last manured.	Yield of peas per plot.			
					Prussian Blue.	Tall White Marrowfat.	Canada Cluster.	D'Auvergne.
					lb.	lb	lb.	lb.
Wm. McKenzie	Perth	clay loam	pasture		18.0	19.0	16.0	15.0
W. Hamilton	Russell	red clay	potatoes	b.y.m., '92	10.0	7.0	11.0	13.0
John Hall	Grey	clay loam	"	never	13.5	13.0	14.5	11.5
David Gilmour	Grey	heavy clay	peas	"	5.0	5.5	4.0	6.3
Edward Prout	Durham	clay loam	pasture	b.y.m., '92	11.0	8.5	12.5	8.0
R. E. King	Haldimand	vegetable clay	hay		7.5	6.3	6.3	6.8
John Alton	Bruce	sandy loam	oats	b.y.m., '89	5.0	9.3	6.3	5.5
Jas. B. Muir	Bruce	clay loam	peas and oats	never	8.0	13.0	11.0	13.0
A. T. Bean	Huron	"	fall wheat	b.y.m., '91	10.0	8.5	8.0	6.0
Robert Russell	Bruce	sandy loam	turnips	" '92	5.0	8.5	8.5	6.0
Wm. H. Baird	Wentworth	"	wheat	" '91	9.6	7.0	9.2	6.1
F. W. Lowin	Nipissing District.	heavy loam	oats	never	20.0	22.0	16.5	20.0
Simon Burns	Lambton	clay	oats	"	12.5	8.0	9.0	9.5
David Krick	Monck	loam	hay	b.y.m., '90	5.0	6.5	4.0	5.0
Wm. McDonald	Algoma District	clay loam	wheat	never	32.0	42.0	43.0	23.0
W. L. Buskin	Grey	light loam	hay	b.y.m., '90	15.0	12.0	10.0	10.0
Jas. D. Rose	Wentworth	clay loam	peas and oats	never	1.5	2.0	2.0	7.0
John W. Salkeld	Huron	sandy loam	hay		6.0	6.5	8.0	7.0
Thomas Gadd	Grey	clay loam	fall wheat	b.y.m., '91	15.0	12.0	13.0	10.0
Benj. Mannen	Brant	"	oats		3.5	4.0	5.5	3.0
Jas. Andrews	Durham	gravel loam		b.y.m., '92	12.0	8.5	11.0	8.0
J. Baxter	Perth	clay loam	turnips	" '92	11.0	14.0	10.0	9.0
Wm. Fotheringham	Huron	"	barley	" '87	9.5	12.5	9.5	6.5
John F. Andrew	Huron	"	wheat	" '92	7.0	10.0	9.0	7.5
H. Jacobs	Muskoka	sandy loam	roots	" '93	11.0	10.0	10.0	8.0
Jas. Bell	Lanark	clay loam	hay	" '87	3.0	5.0	3.5	4.0
M. W. Steacey	Leeds	black clay	"	" '93	13.8	10.5	7.0	13.0
Walter Carlaw	Northumberland	clay	fall wheat	" '85	3.5	10.5	10.0	10.5
Joseph Tinney	Victoria	heavy clay	wheat	" '91	5.5	5.0	2.3	.8
J. B. Aylesworth	Addington	sandy loam	potatoes	" '93	6.5	9.0	8.0	7.0
David Campbell	Huron	"	fall wheat		7.8	6.0	6.8	3.5
Jas. Murison	Elgin	"	potatoes	b.y.m., '92	7.0	6.0	2.0	3.0
Robert Brock	Lambton	clay loam	oats		8.0	5.5	7.0	7.0
Robert Keppy	Parry Sound Dis.	sandy loam	"		5.0	3.0	5.0	4.0
Daniel Quinlan	Simcoe	clay loam	old pasture	b.y.m., '89	16.0	15.0	17.0	13.0
John Priddle	Norfolk				9.5	6.8	4.5	2.5
W. C. Ruthven	Leeds	sandy loam	oats	b.y.m., '91	9.5	6.0	12.0	6.0
C. R. Gies	Waterloo	clay loam	"	" '90	8.8	7.3	6.1	8.3
Isaac K. Turner	Grey				10.0	12.0	11.3	9.5
James Johnston	Dufferin	clay loam	oats	b.y.m., '89	13.0	14.0	10.0	11.0
John Douglass	Bruce		sod		8.5	9.0	7.5	7.8
Wm. Cumberland	Simcoe	clay loam	spring wheat	b.y.m., '92	5.0	5.0	4.0	3.0
D. Graham	Perth	clay loam			13.0	10.0	10.5	10.0
D. Oram	Hastings	"	sod		8.3	14.0	8.3	10.0
Joseph Martineau	Prescott				14.0	15.0	15.0	16.5
H. G. Manley	Bruce	clay loam		b.y.m., '89	7.0	8.0	3.5	5.5
W. J. Beatson	York	"	peas	" '89	2.5	4.5	2.5	.5
Henry Coben	Peterborough	sandy loam	oats	" '93	12.0	10.5	8.0	12.5
Wm. Scott	Simcoe	clay	fall wheat	" '87	6.0	8.0	7.0	4.0
John Tiffan	Huron				6.0	5.5	11.0	8.5
V. Forester	Huron				14.0	10.0	8.0	6.0
Bernard Kelly	Simcoe	clay loam	hay	b.y.m., '85	14.0	11.0	11.8	11.0

XII. TESTING FOUR PROMISING VARIETIES OF PEAS.—*Continued.*

Name.	County.	Nature of soil.	Cropping of 1882.	How and when last manured.	Yield of peas per plot. Prussian Blue.	Tall White Marrowfat.	Canada Cluster.	D'Auvergne
					lb.	lb.	lb.	lb.
Wm. Stewart	Northumberland..	clay loam	....	hen m., '93 .	20.0	10.5	12.0	12.5
D. J. Bagshaw	Ontario	sandy loam	turnips	b.y.m., '93..	5.5	2.0	3.3	4.4
A. J. Quinn........	Muskoka District.	"	carrots	" '92..	8.0	9.0	8.0	11.0
Thos. Smith........	Simcoe	....	potatoes	....	7.5	2.0	3.0	4.0
Alex. Mitchell......	Wentworth	clay loam	hay	....	7.0	5.5	7.0	6.5
R. Lawrence........	Halton	clay soil.......	pasture	....	9.8	8.3	11.0	8.0
Wm. Marjerrison...	Glengarry	clay loam	oats..........	b.y.m., '93..	15.0	3.5	13.5	7.0
Robert Gardiner....	Huron	"	hay	.. ..	7.0	5.0	5.0	5.0
Robert Camplin	Grey	"	fall wheat	b.y.m., '91..	6.8	6.5	5.8	6.0
John E. Rice	Lanark	sandy loam	pasture	" '87..	9.5	8.5	8.5	8.0
W. J. Young	Grey	clay loam	....	" '90..	3.0	3.5	3.0	2.5
Allen Shantz	Waterloo	loam	mangels.....	" '91 .	4.5	4.8	3.1	4.0
Nelson Gies	Waterloo	sandy loam	potatoes.....	" '92..	5.0	8.5	9.8	6.5
John Dalgarno	Grey	clay loam	pasture	" '89..	13.0	15.0	14.0	15.0
John McAuley	Grenville	gravelly........	hay	....	14.0	11.0	15.0	10.0
Wm. Casselman	Muskoka District.	sandy loam	potatoes.....	b.y.m., '91..	14.0	14.8	14.3	10.0
Daniel Madden.....	Bruce	clay loam	clover........	never	17.5	19.0	15.0	14.3
Edward Wynne ..	Bruce	clay...........	spring wheat .	"	11.0	6.0	10.0	4.5
Rymal Young......	Wentworth	clay loam	pasture ...	... .	5.0	4.5	6.0	4.5
Richard Connolly ..	Oxford	"	meadow......	b.y.m., '89..	10.0	10.0	9.0	9.0
No name	....	"	"	never	17.5	18.3	16.0	15.0

Average results of 73 experiments.

Varieties.	Average of 73 co-operative tests, 1893.		Experiment farm results, 1893.	
	Straw per acre.	Grain per acre.	Straw per acre.	Grain per acre.
	tons.	bushels.	tons.	bushels.
Prussian Blue	.9	25.9	1.9	39.8
Tall White Marrowfat......	.9	25.0	1.5	33.1
Canada Cluster............	.8	24.5	1.6	34.8
D'Auvergne	.8	21.8	1.2	27.9

The Prussian Blue, Fall White Marrowfat and Canada Cluster were all obtained in Ontario, and the D'Auvergne was imported from France.

Conclusions.

(1) The Prussian Blue has given the largest average yield of grain per acre in both the co-operative and the station tests.

(2) The D'Auvergne has given the lowest average yield of grain per acre in both the co-operative and the station tests.

(3) There is a great demand in Ontario for good varieties of peas.

XIII. 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.

Individual results of 60 experiments, received before August 20th, 1893.

Experimenter.	County.	Nature of soil.	Previous cropping.	Yield of grain per plot.				
				Dawson's Golden Chaff.	American Bronze.	Early Red Clawson.	Bulgarian.	Jones' Winter Fyfe.
				lb.	lb.	lb.	lb.	lb.
Richard Mooney	Essex	sandy loam	fall wheat	14.5	9.5	11.0	14.0	9.5
John McNaughton	Wellington	strong loam	clover	11.0	9.5	14.0	10.5	6.5
Jonathan Austin	Norfolk	sandy loam	potatoes	7.5	5.0	5.0	6.5	5.0
John Dalton	Simcoe	clay loam	spring wheat	14.0	16.0	12.5	15.5	11.0
John Lawson	Huron	light loam	peas & oats.	8.0	6.0	6.5	8.0	8.0
David Krick	Lincoln	clay loam	buckwheat	3.0	4.8	4.0	7.0	3.5
John Cragg	Kent	clay loam	oats	3.8	3.6	3.3	4.0	3.0
Benj. McKillican	Lambton	clay	potatoes	15.0	23.0	12.0	20.0	17.0
E. Langford	Middlesex	clay	potatoes	13.0	12.0	12.8	10.5	10.8
Robert Robertson	Durham	gravel loam	potatoes	8.5	9.0	7.0	8.5	8.0
J. G. Docker	Elgin	clay loam	peas & oats.	12.5	11.0	7.8	9.0	7.0
T. J. M. Skelly	Simcoe	light loam	fallow	4.0	5.3	4.0	1.8	3.5
James Smith	Lambton			13.0	8.0	11.0	14.0	9.0
J. H. Huffman	Lambton	sandy	fallow	6.5	3.0	6.0	4.5	5.0
John Wakem	Middlesex	sandy	corn	6.3	8.5	7.3	8.0	9.5
Abram Rowand	Bruce	clay loam	fallow	10.0	7.5	14.5	14.0	7.5
Alfred Weekes	Middlesex	clay loam	strawberries	26.5	22.0	8.0	20.0	10.0
James McMohan	Lambton	sandy loam	potatoes	17.5	13.8	17.5	16.3	13.3
A. T. Bean	Huron	clay loam	peas	8.3	6.5	7.3	9.0	8.0
George Doe	Elgin	sandy loam	hay	12.5	10.5	11.5	11.0	12.5
Phillip Frazer	Lambton	clay loam	peas	11.0	9.5	11.5	8.0	12.5
Fred Foyston	Simcoe	sandy	peas	17.8	12.3	19.0	12.3	12.8
Daniel Madden	Bruce	clay loam	peas	14.5	14.0	15.3	14.0	12.0
James Gibson	Huron			9.5	7.8	11.0	7.5	10.5
William Sharpe	Simcoe	clay loam	fallow	8.0	7.0	8.0	7.5	7.5
William Kersey	Peel	clay loam	peas	10.5	6.5	6.0	9.5	8.5
William Wood	Simcoe	clay loam	oats	13.0	10.0	14.0	15.0	9.0
Thomas Medcraft	Elgin	gravel loam	potatoes	16.0	14.0	12.0	13.0	13.0
Charles Robins	Haldimand	sandy loam		14.0	16.0	16.0	12.0	9.0
H. Ball	Norfolk			5.1	4.5	6.3	4.0	5.5
								Mediter'n.
W. Schisler	Welland			5.0	4.1	5.3	3.5	6.8
George P. Gould	Huron	heavy clay	oats	13.5	10.8	10.5	11.3	10.8
J. D. Drummond	Middlesex	clay loam	peas	8.0	7.0	7.5	8.5	8.0
V. I. Springsteen	Kent	gravel	beans	13.0	9.3	8.0	9.0	10.0
W. N. Mansley	Grey	blue clay		4.9	4.1	6.5	2.7	4.6
John Malyou	Ontario	loam	peas	11.0	10.0	9.0	9.0	8.0
William McAlister	Elgin	clay loam	sod	15.3	17.5	17.0	13.5	17.0
James D. McKinlay	Kent	clay loam	clover	13.5	10.5	14.0	12.5	14.5
						Jones' Wntr. Fyfe.	Gldn. Drop.	Fultz.
S. D. Robinson	Durham	clay loam	peas	17.0	17.0	16.5	14.5	16.5
Hugh McPhee	Huron	clay loam	fallow	10.5	10.5	10.0	9.0	5.0
C. S. Johnson	Monck	clay loam	peas	8.0	6.9	4.5	7.3	5.5
Andrew Kirk	Middlesex	clay	oats	12.0	12.0	9.5	14.0	12.0
C. W. Taylor	Perth	clay	peas	6.3	7.5	4.8	5.8	5.8
J. W. Clark	Kent	gravel	beans	12.3	11.3	10.3	12.3	11.8

Individual results of 60 experiments, received before August 20th, 1893.—*Concluded.*

Experimenter.	County.	Nature of soil.	Previous cropping.	Yield of grain per plot.				
				Dawson's Golden Chaff	American Bronze.	Jones Winter Fyfe.	Golden Drop.	Fultz.
				lb.	lb.	lb.	lb.	lb.
David Smith	Peel	sandy loam	peas	5.0	5.0	8.0	7.0	7.0
W. A. Cowie	Wentworth	gravelly loam	pasture	16.0	14.0	9.0	12.0	11.0
						Sur-prise.	Ful cast'r.	Red Wndr.
James Stephens	Simcoe	clay loam	fallow	10.0	7.5	9.8	9.5	7.0
Alfred Gray	York	stiff clay	potatoes	4.5	4.0	9.0	4.5	9.0
G. T. Markham	Oxford	light clay	fallow	14.0	10.3	10.3	11.0	10.0
Angus McKinlay	Lambton	clay loam	potatoes	11.0	13.0	7.0	8.0	11.0
Wilson Smith	Norfolk	clay loam	clover	11.5	7.0	9.0	11.5	8.5
William Roland	Perth	clay loam	fallow	13.0	4.0	5.0	5.0	6.0
F. W. Roberts	Lincoln	clay	fallow	8.8	9.0	6.0	6.5	5.3
Duncan MacNarmel	Perth	clay loam	peas	14.0	15.0	13.0	15.0	8.0
Robert Walter	Dundas	gravel	potatoes	15.0	12.0	12.0	10.0	10.3
Adam Scott	Huron	....	hay	11.0	7.0	6.5	1.3	1.5
Donald McDiarmid	Kent	clay loam	beans	5.0	2.5	1.3	2.0	3.5
Robert Ford	Lambton	clay	....	19.0	8.0	8.0	15.0	10.0
John McTavish	Huron	clay loam	peas	15.0	9.0	13.0	12.0	11.0
John B. Stone	Northumberland	clay loam	barley	11.0	6.0	6.0	6.5	5.5

Summary Report of Winter Wheat Experiment.

The following report of the winter wheat experiment was sent to the Public Press of Ontario in August 1893 :

In the autumn of 1892, eleven valuable varieties of winter wheat were sent out. These were chosen as the best among sixty-two kinds tested upon the farm plots. They were divided into three sets, with five varieties in each set, two of the same kinds being used in every instance for the sake of comparison. Each applicant had the privilege of choosing the set he desired and one-half pound of each of the five varieties chosen were sent to his address, until the limited supply of some of the kinds became exhausted. The size of the plots used in all cases was one square rod, and paths three feet wide were allowed between the plots. The seed was sown at the rate of one and one-third bushels per acre. Up to the present date one hundred and thirty-five experimenters have been heard from. Of this number, sixty favored us with very satisfactory reports of carefully conducted experiments, sixteen forwardrd partial reports, and fifty-nine wrote of failure or unreliable results. The sixty satisfactory reports came from twenty-three counties, eleven of which were east and twelve west of the City of Guelph. The names of the different experimenters and the detailed results of the tests will be presented in the annual report of the Experimental Union for 1893. The greatest advantages arising from these experiments are certainly gleaned by the experimenters themselves, but many very valuable lessons can be obtained by thousands of others who carefully study the results. All the eleven varieties were grown upon the experimental plots at the farm in exact accord with the instructions sent out over Ontario. As two of the same varieties were sent to each experimenter, it is possible to obtain a very reliable comparison of all the kinds distributed. The yields per acre have been calculated from the amounts grown upon the plots. The following table gives the average amount of straw and of grain per acre of the eleven varieties grown on sixty Ontario farms and at the Experimental Farm at Guelph :

Name of Variety.	Straw per acre (tons.)	Grain per acre (bush. 60 lb.)
1. Dawson's Golden Chaff	1.84	34.9
2. Golden Drop	1.71	34.4
3. Early Red Clawson	1.60	32.6
4. Bulgarian	1.76	31.4
5. American Bronze	1.84	31.3
6. Mediterranean	1.85	30.8
7. Surprise	1.51	30.7
8. Jones' Winter Fife	1.65	30.0
9. Fulcaster	1.50	27.4
10. Fultz	1.92	26.4
11. Red Wonder	1.26	24 9

As great care has been taken to select none but the best reports for the above table, the writer considers this summary of very great value and one well worthy the careful attention of the farmers of Ontario. The yields per acre may be rather higher than would be obtained from larger fields of the same varieties, but it will be remembered that the plots were of similiar size in every instance. The conclusions drawn and the remarks made by many of the experimenters indicate much thought, accuracy and good judgement.

The following facts have been obtained from the average results of the sixty reports under consideration :

(1) The Dawson's Golden Chaff gave a larger yield of grain than any of the other varieties in thirty-five experiments out of sixty.

(2) The Early Red Clawson, Surprise, and Golden Drop gave the largest average amount of grain to every one hundred pounds of straw, and the Fultz and Mediterranean gave the smallest.

(3) The Fultz, Dawson's Golden Chaff, Golden Drop, and Early Red Clawson proved to be the earliest maturing varieties, and the Jones' Winter Fife and the American Bronze the latest.

(4) The Dawson's Golden Chaff, Golden Drop, and Fultz made the best appearance in the spring, and the Mediterranean looked the poorest.

(5) The Bulgarian, Fulcaster, and Red Wonder were the least affected by rust, and the American Bronze, and the Jones' Winter Fife were the most affected.

(6) The Dawson's Golden Chaff, American Bronze, and Golden Drop possessed the greatest strength of straw.

(7) The Mediterranean, Bulgarian, and Fultz possessed the longest straw, and the Surprise and Golden Drop the shortest.

(8) The Golden Drop, Fultz, and Mediterranean possessed the plumpest grain, and the American Bronze, and Jones' Winter Fife the most shrunken.

9 The Dawson's Golden Chaff, American Bronze, and Early Red Clawson varieties seemed to be the most in favor with the experimenters, and the Fultz and Red Wonder the least in favor.

(10) The Counties of Lambton, Huron, Simcoe, Middlesex, Elgin, and Kent furnished 34 out of the sixty best reports received.

(11) The average yield of the eleven varieties of winter wheat tested over Ontario was 25.7 bushels per acre, and the average of the same varieties at the Experimental Farm was 35.2 bushels per acre.

(12) The co-operative experimental work in agriculture seems to be much appreciated by the ex-students of the College and by many other leading farmers throughout Ontario who are actually engaged in the work.

None of the winter wheat catalogues yet received from Ontario seedsmen have advertised the Dawson's Golden Chaff. This is a variety claimed to have been originated by Robert Dawson, Paris, Ont., who, along with his neighbors, are growing it quite extensively. There are no varieties of winter wheat kept for sale this season at the Experiment Farm.

DISTRIBUTION OF SEEDS. The Experimental Union has furnished sufficient money for the distribution of two thousand packages of winter wheat over Ontario this year. These will supply four 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.
Golden Drop.	Surprise.
Early Red Clawson.	Jones' Winter Fife.
Bulgarian.	Early White Leader.
American Bronze.	Early Genssee Giant.

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.

HOG RAISING.

BY THOMAS MASON.

Hog raising has of late years become one of the most important sources of revenue to the Ontario farmer, and although important advances have been made in this direction, still much remains to be done. The question is, are we doing as much as we ought to do? I think if we look carefully over the situation that as a nation we have made a grave mistake in not paying greater attention to this branch of industry. We have one of the healthiest climates for swine in the world, hog cholera, with the exception of a few cases, being almost unknown. We produce large crops of wheat, peas, oats and barley, which, when combined, make the finest food for hogs possible, and already our product is known and appreciated in Great Britain. Hon. Thos. Ballantyne states that last year he saw Canadian bacon selling in England at 20 shillings per cwt. over American and equal to the best English. With those great material advantages, what are we doing? Actually not supplying the home demand. We are engaged in the unprofitable work of raising wheat at 50 to 60 cents per bushel, and barley at 30 to 40 cents, and sending these grains to market to compete with the products of the Indian coolie, working for 6 to 8 cents per day, or the Russian peasant at starvation wages, at the same time sending large sums of money out of the country to buy hog products that should have been produced at home at a large profit. Our imports of pork, hams, bacon and lard for the last year, for which I have correct returns, amounted to over 26,000,000 pounds, valued at $1,458,585, while our exports amount to a little over 6,000,000 pounds, valued at $684,409. So you will see that there is room for a very considerable expansion in the production before we overtake our own home demand. Then, if we examine the foreign markets, we find that there is an immense demand for all sorts of hog products. Great Britain imports, according to Board of Trade returns, 488,000,000 pounds of ham and bacon, of which Canada furnishes less than $1\frac{1}{2}$ per cent. There ought to be room there for an expansion in the Canadian trade. I think that we are likely to have safer, steadier markets in the future than we have had in the past decade. A few years ago there was a great outcry raised against American pork in Europe on account of a few cases of trichinæ, developed, it is said, by the use of American pork. Germany, France, and, in fact, nearly every European country, except Great Britain, passed laws prohibiting the importation of American pork. About two years ago, in consequence of Secretary Rusk's Meat Inspection Act and the diplomacy of Mr. Blaine, these laws were removed, and larger quantities are again being exported to those countries, Germany alone having imported as high as $24,000,000 worth in a single year. This fact, coupled with the great shortage of hogs, has been the cause of the very high prices the last two years. There has been a decided change in the style of hog wanted in the last few years. The very fat, heavy hog is not in demand. A long hog, giving plenty of lean meat of a large percentage of bacon, and weighing from 160 to 220 pounds, live weight, is what the leading packers want. This change I regard as directly in the interest of the farmer, as it is much more profitable to sell at those weights than to make them heavy. It has been demonstrated time and again by different experiments that the older a hog gets the more it costs to produce a pound of gain. From my own experience, I think it costs twice as much to make a pound of flesh at nine months of age than it does at four months; consequently I have decided not to keep any hogs longer than six months and sometimes not that long. My first load last summer went at four months and seventeen days, and weighed 150 pounds, live weight; the second load, a week later, 166 pounds; third, a week later, 180 pounds, and the last load, 187 pounds. The average birth date was April 5th. They were from large, vigorous sows and a mature boar. The sows were moderately fed all winter on a little grain, some sugar beets and carrots, with some slop. About two weeks before farrowing, they were separated and fed on a sloppy food of shorts, bran and a little ground grain. They were given a good bed, and when the pigs came were closely watched so that none were killed at first. We managed to save 39 pigs from four sows. They were fed lightly at first, and the food increased as the needs of the pigs demanded it. They had a good clover pasture and plenty of water and shade, and a little salt in their food. Their food consisted at first of skim and buttermilk and wheat shorts. They were weaned at six weeks old; after a couple of weeks a little corn and pea-meal was added; at three months the corn was increased, as soon as the wheat was threshed. About August 1st we commenced feeding ground wheat mixed with shorts until finished. They were fed three times a day all they would eat up clean. After lying down two or three hours they would get up and eat clover. The following is a statement of the cost of the transaction:

Shorts fed to young pigs	$ 40 00
Corn " "	25 00
Wheat " "	66 00
Keep of sows in winter up to weaning	48 00
Skim-milk, buttermilk and pasture	25 00
	$204 00
Less little pigs sold at weaning	15 00
Net cost	$189 00

This would make the cost of raising that 6,000 pounds of pork $3.15 per 100 pounds.

I do not think that we can feed young pigs in large numbers nearly as cheaply in pens as we can on pasture. The orchard, if seeded down, makes a capital run for pigs. I have five fields within easy reach of the house, and as each field in rotation comes into grass I intend to pasture them with hogs, and take the milk and stuff out to them in a large milk can set on a wheelbarrow. The fall litters of pigs cost generally about 1 cent per pound more, live weight, than the spring litters, but often bring that much more in the market. I like them to come in the latter part of August or early in September, so as to have them large and strong when winter sets in. A good, dry, warm pen is needed and a good yard for exercise. I am a strong believer in exercise for animals, especially young animals that are being fed high. Good supplies of wood ashes and salt are essential to pigs in confinement. A few sugar beets or carrots and parsnips daily are an advantage. One very essential point is never to over feed; always have them clean the troughs at once A dry bed is also essential. To summarize:

Strong, vigorous parentage; a liberal supply of the best food available; a good clover or grass pasture in summer; careful feeding, never surfeiting; a careful attention to details, and marketing at 150 to 200 pounds, are the most important points on hog raising.

Exports—Bacon, 1892	11,544,295 lb.,	worth	$1,094,205
" Hams, "	598,083	"	57,801
Imports—Hams and bacon	1,016,367	"	94,846
" Pork	9,819,087	"	504,349

F. J. SLEIGHTHOLM: You say that fall pigs cost one cent more per pound than spring pigs. Will you explain the reason?

Mr. MASON: In the first place you have not the pasture nor the same mild, warm weather. They do much better on pasture in the summer than when they are confined in pens in the cold weather in the winter. I claim that they will make a pound of gain much easier when on pasture than they will in winter, but I cannot state positively how much more.

R. F. HOLTERMANN: I was told by some men from the other side that the reason that pork was so high was because there was so much hog cholera in the United States that they were not able to raise the pigs.

Mr. MASON: Within a few miles of where I live, we have had a few cases of hog cholera. We do not know where the infection came from unless it was from the hogs going through on the trains from the west.

Mr. KEIL: I agree with Mr. Mason in regard to feeding hogs in winter, especially young pigs. They will not stand the cold weather; and I do not care how warm you have the pens, there is still something lacking. When they run out on pasture, they will gain fully one-third faster, in my experience.

F. J. SLEIGHTHOLM: I cannot agree with the gentleman that there is so much difference. The cost of raising pigs in winter does not exceed one-third of a cent per pound more than for our best summer-fed hogs. We do not find difficulty in winter, even with young pigs. We have been able to raise them very satisfactorily, and I think at fairly good weights in winter time just as well as in summer. Certainly it does cost a little more to raise them. The weight from appearance in winter-fed pigs far exceeds the summer fed ones.

THE FEEDING VALUE OF STOCK FOODS.

BY PROF. T. F. HUNT, COLUMBUS, OHIO.

I feel greatly complimented at having an invitation to appear before an audience in our sister country, whose kindred ties, as well as geographical position, should bind us into the closest social and commercial relations. I feel complimented, I repeat, when I remember I am to talk upon a subject before an audience whose countrymen have always stood in the front rank. Canadian cattle and Canadian feeding have always been the pride and envy of American stockmen.

Being myself an alumnus of an agricultural college of an American university, it gives me great pleasure to appear before an association composed largely of agricultural alumni, believing most firmly, as I do, that the success not only of American agriculture, but of American institutions, depends largely upon the number, success and influence of the agricultural alumni of America.

The favorite subject for an oration by the college student, and the favorite catch word for the vendor of nostrums, is "Know thyself." This expresses a great truth. We should know the things with which we deal. If we till the soil we should know the soil and the plants that we wish to grow upon the soil. If we make butter we should know the milk and the butter. If we would instruct students, we must not only know the subject we teach, but we must also know the students we seek, though ofttimes fail, to instruct. If we would feed animals of whatsoever kind, we should know the animals, the feed we seek to nourish them with, and the relations of the animal to the food and the food to the animal. This then is my subject. What is the animal? What is the food? And what are the relations of one to the other? Of these things we know little. But we know something.

Let us look first at the animal. If we kill an ox, take off its hide, its feet and its head, and take out its organs of respiration, digestion and generation, we have left a mass of bones, muscle and fat, known as the carcass. This carcass may vary from forty to seventy per cent. of the live weight of the ox, and in a few cases has been known to exceed this latter amount. At the great Fat Stock Show held at Chicago for fifteen years past, the carcass has averaged two-thirds of the live weight. This carcass consists of bones, muscles and fat. The carcass of a fairly good ox will contain about seven pounds of bones, eighteen pounds of fat and thirty-five pounds of muscle and tendons from each hundred pounds of live weight. The quantity and relationship of these parts, together with their quality, is what gives the animal its value as butchers' meat. It is what makes one animal sell for three cents a pound and another sell for six cents a pound.

We seek to produce an animal with as small a quantity of bone as is consistent with health and strength, and as large an amount of fat and muscle as possible. We want neither an excess nor a deficiency of fat. If an excess, it is distasteful, while if there is a deficiency the meat is likely to be tasteless and stringy. The more intimately the fat is mixed with the muscle, the more perfectly it is marbled, the better the quality of the meat. It is not mere fiction that the foot-ball man or the prize-fighter toughens his muscles by exercise. Exercise toughens meat, hence that portion of the muscle of the animal which gets the least exercise, such as the loin, is the most tender, while the leg or the round is tougher. The muscles of the neck, which are constantly exercised in maintaining the head, are naturally tough. To get unexercised muscle, nicely embedded in fat, is the aim of him who feeds for beef, mutton and pork. Looking at the animal from the standpoint of the butcher, helps us to realize the object we are seeking to obtain, and it is often half the battle to know what we are fighting for, but it does not help us much with regard to the methods of attaining our object.

We must look at the more minute structure. We can understand this best by comparing the animal with the food that the animal eats. All plants contain ten primitive substances known as chemical elements. These are: carbon, hydrogen, oxygen, nitrogen, sulphur, potassium, phosphorus, calcium, magnesium and iron. Animals require in addition, sodium and chlorine.

Common salt is composed of sodium and chlorine. No plant could grow without the ten elements mentioned, and no animal could grow without these ten elements and the addition of sodium and chlorine, hence the need of salt for all animals, including man, and the need of a regular supply. Undoubtedly plants do contain small quantities of the elements composing salt, but they are usually deficient as they are not necessary to plant growth. Besides being required for the building up of tissue in the animal body, salt has the property of increasing the activity of the secretive organs of the body. Salt has an awakening power as it were; it makes the animal live fast. A fast life in the ox intended for the shambles or in the dairy animal is as objectionable as the fast young man. It is not profitable for us for the steer to sow his wild oats while being prepared for the butcher, hence while salt should be fed in abundance and with regularity, it should not be fed in excess. It is a very common practice for showmen to feed their cattle a little sulphur. Sulphur is not only one of the substances needed in all muscular tissue, but it is a fact, as shown by analysis, that the hair contains more sulphur than any other part of the body. Hence if there is any deficiency of sulphur in the food, the hair cannot be in as good condition as it should be, and the animal will look unthrifty.

As is well known, bones are largely composed of lime and phosphoric acid. Animals fed on a variety of foods generally get a sufficient quantity of these substances, for while the grains contain an excess of phosphoric acid and a deficiency of lime, coarse fodders usually contain an excess of lime and a deficiency of phosphoric acid. When we feed animals on coarse fodders only, there may be bone hunger, while when we feed hogs on corn alone there may be a deficiency of lime, and weak bones.

The chemical elements which we have just been discussing, cannot sustain life if fed separately. Charcoal, saltpetre, flowers of sulphur, powdered iron, ground bone and common salt mixed up with water, does not constitute animal food. These substances must first be organized into vegetable substances. This is the function of plants. Plants construct the ten elements mentioned, into certain compounds called nutrients, and the reason for an animal eating a food is that these nutrients, if digested, sustain life and growth. The relation between these compounds in the vegetables and in the animals is best understood by comparing two characteristically American products, the hog and the corn that made the hog.

NUTRIENTS IN 100 POUNDS.

—	Corn.	Fat hog.
Water	11	44
Ash	1.5	2
Albuminoids	10.5	12
Fibre	2	None.
Starch, etc.	69.5	None.
Fat	5.5	42

This is probably not quite a fair comparison, because we do not feed corn exclusively except to fattening swine, and the increase of a fattening hog is somewhat different in composition than is that of the whole animal, inasmuch as during the fattening period the animal puts on a relatively much larger amount of fat and a less amount of muscle than it did during its earlier period of growth. Five hundred pounds of shelled corn will on an average produce one hundred pounds of increase in a fattening hog.

The following table shows the pounds of the different nutrients in corn necessary to feed, in order to get one hundred pounds of increase, and also the number of pounds of the different nutrients in this one hundred pounds of increase.

—	500 pounds of corn contains:	And forms 100 pounds increase in a fattening hog, as follows:
Water	55	22
Ash	7.5	0.06
Albuminoids	52.5	6.44
Fibre *	10	None.
Starch, etc. *	347.5	None.
Fat	27.5	71.5

* Carbo-hydrates.

From this table it will be seen that in five hundred pounds of corn, there are something over three hundred and fifty pounds of carbo-hydrates, mostly starch, of which there is practically none in the animal body. This is a fundamental difference between plants and animals. One is composed principally of carbo-hydrates and the other has none. Why does the animal consume such large quantities of carbo-hydrate? All the activities of the animal organism are manifested by the production of heat. This heat is the result of the burning of the carbon in the animal body, just as the burning of coal in the boiler of an engine produces heat through the combustion of the carbon in the coal. The more a man works, the more active a man is, the more he gets up steam, the more carbon is burned in the body. The carbo-hydrates are the principal source of this heat, although the fat and protein is also a source of heat and power. The function of fat and carbo-hydrates is practically identical. There is this difference, however: A pound of fat when digested, will produce about two and one quarter times as much heat or force as a pound of carbo-hydrates. The fat of foods may be laid up in the animal body with very little change. Albuminoids and carbo-hydrates may also be changed into fat. We have seen that practically our ultimate aim in the feeding of an animal for the shambles is the production of albuminoids and fat. The fat of the organic substance which we feed may produce heat, force and fat, but only albuminoids will produce albuminoids, that is, muscle in the animal. A dog will live upon lean meat, but will speedily die if fed only upon fat.

The following table will help us to understand the relation of these proximate substances to animal growth.

CHEMICAL ELEMENTS IN THE NUTRIENTS OF VEGETABLE FOODS.

Nutrients.	Chemical elements.				
Water	Oxygen.	Hydrogen.			
Ash	Potassium.	Phosphorus.	Calcium.	Magnesium.	Iron.
Albuminoids	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.
Fibre	Carbon.	Hydrogen.	Oxygen.		
Starch, etc.	Carbon.	Hydrogen.	Oxygen.		
Fat	Carbon.	Hydrogen.	Oxygen.		

A little study of this table will show that an animal cannot live upon starch, fibre or fat, because they do not contain nitrogen and sulphur, which are necessary for the production of muscle. But if an animal has plenty of water, ash and albuminoids, it may live without starch, fibre, or fat, because the albuminoids contain carbon, hydrogen and oxygen. In our subsequent discussion in this paper we will not concern ourselves with the ash, for in ordinary feeding, with the exception already pointed out, the animals get a great abundance of ash constituents. The adult animal is half water, and this important substance should be abundantly supplied in a pure form from pail or trough, but except as far as it affects the mastication and palatability of foods it need not concern us, with two exceptions. First, we should be careful not to feed substances that have so much water that the animal must consume more water than it needs in order to get the necessary food. This is often the case with sheep fed largely upon roots. Second, we should remember that the amount of dry substance is inversely proportional to the amount of water it contains. There may be as much dry substance, and therefore as much food value, in 10 pounds of corn fodder as in 30 pounds of ensilage. When we begin feeding ripe ear corn in the fall, it often takes 100 pounds of ears to make a bushel of dry shelled corn. The next spring 71 pounds of this same corn will make a bushel. It may take several roasting ears to satisfy the appetite of a hungry man, but a small portion of a ripened ear made into Johnny cake will make a substantial meal.

What constitutes the differences in the foods which we feed? We have seen that all vegetable foods contain the same chemical elements and the same nutrients. Wheat and straw, corn and corn fodder, oats and shoe pegs, all contain exactly the same nutrients. Why, then, are some of the substances so much more valuable for food than others? The value of all substances as food, whether for man or other animals, depends primarily upon three things. First, the composition; second, the digestion; and third, the palatability. The differences between oats and shoe pegs are, first, that the oats contain more albuminoids, starch and fat, and less fibre; second, that a much larger proportion of them are digested; and third, that animals like them better.

The palatability of a food is often of more importance than it may at first seem. The better an animal likes a food, the more he will eat. The more the animal eats, the more he is likely to gain in flesh, or she to give milk. It takes a certain amount of food to keep the animal organism going. It has been determined that to maintain an ox weighing 1,000 pounds, without either losing or gaining in flesh, will take 17½ pounds of dry food per day. It is only when an animal of this weight eats more than 17½ pounds of dry food per day that he makes any gain. And why should the turkey intended for Thanksgiving dinner, or the ox intended for Christmas beef, eat more than enough to maintain the animal organism? They will both be as comfortable, and probably live much longer, if they do not eat and grow fat. The lean man enjoys life just as well, and often much better, than the fat man. If we wish him to grow fat we must furnish him some inducement in the way of something he likes to eat; we must tickle his palate.

I once conducted an experiment in feeding pigs shelled corn and corn meal, giving each lot of hogs all they would eat. It was found that the hogs that were fed shelled corn would eat more than those fed on corn meal, and, of course, for reasons just given, made a greater gain for the amount of food eaten. In the same way it has been found, in general, that hogs fed on cooked food will not eat as much as when fed on raw food, and they do not make as good gain for the amount of food eaten. Hence it does not pay in general to cook feed for hogs, if you get it done for nothing.

The only value as food that I have been able to discover in ensilage over corn fodder is that it is more palatable. The difference in composition between ensilage is not very great, and for the most part is in favor of the corn fodder. Experiments have shown that the digestibility of the two are practically the same. In feeding experiments, a pound of dry matter in one has been found to produce about the same gain as the other. In an experiment which I conducted in feeding Shorthorn heifers, there was found a slight advantage in favor of the corn fodder. This I attributed, in part, to the fact that the animal fed ensilage consumed daily all told about 7 pounds of water more than those which were fed the corn fodder. As they did not gain any more than those which had corn fodder, 7 pounds more water had to be eliminated from the system, which required a portion of the food eaten to accomplish. If you feed milch cows 30 pounds of ensilage, with 5 pounds of grain and 4 or 5 pounds of clover hay, they will generally eat all the ensilage up clean, but if you feed the same amount of dry matter in corn fodder, these same cows will leave from ⅛ to ¼ of the corn fodder fed. The advantage, then, of ensilage over corn fodder is that the cattle like it better. When you feed corn fodder, part of it goes to waste; when you feed ensilage it is all eaten.

The reason for feeding a variety of foods is that the cattle like it better, and hence will eat more. Bread and milk is a perfect food, but we would soon get tired of it if fed exclusively upon it. In this careful adjustment of the food to the needs and appetite of the animal consists the art of the feeder.

No mere knowledge of the value of foods can replace the art of the feeder. We have our doctors who are eminent in the treatment of diseases; we would not think of getting along without them, but in many cases the skill of the physician would avail nothing had we not had the hand of the all-seeing nurse to administer the medicine, be she wife, mother or trained servant. So in a proper system of feeding, nursing is often half the battle.

Apart from the palatability of the food, its value as before stated depends upon its composition and its digestibility. It depends upon the relative proportion of the various nutrients and upon the amount of these that is absorbed into the system.

Let us compare a few well-known feeding substances:

POUNDS OF NUTRIENTS IN A TON.

——	Corn.	Corn fodder.	Corn stover.	Timothy.	Clover.
Water	446	644	644	474	551
Ash	27	70	81	100	120
Albuminoids	184	115	75	100	228
Fibre	36	271	434	512	389
Starch, etc	1,212	858	719	751	609
Fat	75	42	27	63	103
Total dry matter	1,554	1,356	1,356	1,526	1,449

A comparison of this table shows that corn contains more albuminoids, starch and fat than the stover, while the stover contains more fibre, many times over. The great coarse growing corn stalk compares favorably with timothy hay. And when we compare timothy hay with corn fodder (by corn fodder is meant the stover with the corn left in) we find that so far as the composition is concerned, it is in every way superior to timothy hay except in fat. Experiments on the digestibility of these two substances go to show that the corn fodder is the more digestible. That such a coarse product as corn fodder should be as good chemically, or perhaps better, and should be more digestible than timothy, may at first surprise us, but we must remember that appearances are often deceiving. Turnips and pumpkins contain more water than does fresh milk.

Here again the palatability comes in. In an experiment at the Pennsylvania Experiment Station, conducted under my direction, it was found that the feeding value of a pound of corn fodder for the production of milk was somewhat greater than that of timothy, but owing to the fact that all the timothy was eaten and a portion of the fodder was not, the value of the corn fodder was $7.30 per ton when timothy was worth $10 per ton.

The relation of the composition and the digestibility may be illustrated by comparing oats with clover hay for horses:

NUTRIENTS IN A TON.

——	Oats.		Clover hay.	
	Fed.	Digested.	Fed.	Digested.
Ash	68	....	166	....
Albuminoids	264	230	312	172
*Fibre	216	56	550	242
*Starch, etc	1,340	1,032	860	593
Fat	112	87	112	63
		1,405		1,070

*Carbo-hydrates.

Oats and clover hay are somewhat alike in that they contain about the same amount of albuminoids and the same amount of fat. The carboh-ydrates are not much unlike, except that in the clover much more of it is fibre and less of it starchy substance. When we come to feed these substances to a horse, we find striking differences, because of the greater digestibility by horses of oats. In the oats, a horse would digest 1,405 pounds in a ton, while only 1,070 pounds of the clover hay would be digested, assuming the digestion experiments which have been made to be correct.

Assuming that a horse requires daily 15 pounds of digestible substance, he could get it by eating 21 pounds of oats or by oating 28 pounds of clover hay. The oats thrown into a feed box would occupy about $\frac{2}{3}$ of a bushel, while, if the clover hay was packed as tightly as it is in a hay mow, it would more than fill five bushel baskets. The mere physical exertion of getting outside 28 pounds of clover would be considerable. This does not prove that clover hay is not a good food for horses. Indeed, it is a good food for horses when in good condition and fed in moderation. We must not follow the work of the chemist blindly. If we do so, we do it at our own peril, and it is a financial peril.

We have seen that animals are composed of bones, muscle and fat, and that to supply this fat and muscle we must feed a certain amount of albuminoids, from which only muscle can be produced. Nothing can produce muscle in animals but the albuminoids. About one-third of the solids of milk is albuminoids. We cannot produce these albuminoids in the milk unless we feed albuminoids in the food. We feed milch cows on clover hay and mill feed because they contain relatively large amounts of albuminoids, and this nutrient is required in large quantities in the production of milk. Young, growing animals put on more muscle in proportion to fat than do fattening animals, and hence require more albuminoids than do the fattening animals. If we feed a food with too small a proportion of albuminoids the animal has to eat more starch and fat than he needs in order to get enough albuminoids; hence there is a waste of starch. For example, suppose that a milch cow weighing 1,000 pounds requires 2 pounds of albuminoids and 12 pounds of carbohydrates, including fat. If we feed her a ration containing only 1 pound of digestible albuminoids and 12 pounds of digestible carbohydrates, the cow would have to eat twice as much carbohydrates to obtain the necessary albuminoids, which would be a clear waste of 12 pounds of carbohydrates that might be avoided by feeding 1 pound of albuminoids. It may be possible, therefore, to save several pounds of corn-meal by feeding one of linseed-meal.

Mature fattening cattle require less albuminoids than any other class. A fattening animal puts on about ten pounds of fat for each pound of muscle, if we do not take into account the water, while in the milk about one-third is albuminoids. Yet, even with fattening cattle, we may give too carbonaceous a food. A feeding test recently conducted at the Maryland Experiment Station illustrates this point. Eight grade Shorthorn steers from the Ohio Western Reserve, weighing about 1,000 pounds apiece, were divided into two lots. Lot one was fed ration consisting of corn and cob-meal 15 parts, cotton-seed meal 4 parts, bran 2 parts, with 5 pounds turnips, half pint molasses, and corn fodder as much as they would eat. Lot 2 was fed as lot 1, except they were not given cotton-seed meal nor bran.

NINETY DAY TESTS WITH EIGHT STEERS.

——	Lot 1, Well balanced ration, Corn meal, cotton seed and bran.	Lot 2, Poorly balanced ration. Corn meal.
Daily gain	2.78 lb.	1.70 lb.
First cost of steers	$154 21	$153 66
Cost of food	70 64	52 57
Total cost	$224 85	$206 23
Amount received on selling	264 24	217 37
Profit	$39 39	$11 14

The steers fed a well balanced ration, ate more food, and not only made more gain, but made more gain in proportion to food consumed. "It was noticeable throughout the test that the steers receiving the well balanced ration were always ready for their feed, eating it with great apparent relish, and it was an unusual occurrence for any of them to leave any unconsumed, while the lot fed on the plain diet had to be constantly watched for fear of overfeeding them."

It is just as essential that we should not feed too much albuminoids as that we should feed sufficient. Fat and carbohydrates are relatively cheaper than albuminoids in most cases and are more easily digested. Albuminoids are relatively expensive for the most part, are difficult to digest, and when fed in larger quantities than are needed, involve extra work upon the system.

In most stock feeding there is not much danger of feeding to large a proportion of the albuminoids. The mistake is frequently made in calf-feeding. Fresh milk is a perfect food for the infant while quite young. Fresh milk is characterized by containing a relatively large proportion of albuminoids, and also by containing a large quantity of easily digestible fat. While milk serves as a balanced food only during the early period of life, just as soon as the calf begins to eat, it begins to increase the proportion of carbohydrates and albuminoids, because it eats more carbohydrates. We know from experience that an excellent food to begin feeding calves is shelled corn.

You will see from the following table that just as soon as the calf begins to eat, he increases the proportion of carbo-hydrates to albuminoids.

NUMBER OF POUNDS OF DIGESTIBLE NON-NITROGENOUS SUBSTANCES TO EACH POUND OF ALBUMINOIDS.

Whole milk	3.3
Skim milk	1.7
Linseed meal	1.9
Pasture grass	5.6
Corn	9.0
Timothy hay	12.0

Milk is not a balanced food for infants or adults. If fed exclusively upon it, persons become nauseated. Bread and milk may be a balanced food, because the bread makes it more carbonaceous. Meat is not a balanced food. It has too large a proportion of albuminoids. Potatoes are not a balanced food. They are carbonaceous. Meat and potatoes may be a balanced food.

You will see from this that skim-milk is far from balanced food. When we change a calf from fresh milk to skim-milk we are changing the diet in the wrong direction. Our success with the skim-milk depends upon how much the calf eats of more carbonaceous foods. If we feed a moderate amount of skim-milk and the calf is eating well of hay, corn and oats, he may be able to balance his diet. On the other hand, if you feed the calf a large amount of skim-milk before it has learned to eat much, the result is likely to be—well you have seen hundreds of such calves, and I will not attempt to describe them.

The following experiment conducted under my direction at the Pennsylvania Experiment Station, illustrates this point: Nine calves from four to ten weeks in age were divided into three lots of three each. The calves in lot 1 were fed 10 lb. of whole milk (2 gals) each day. The calves in lot 2 were fed 16 lb. of skim-milk, to which was added a porridge consisting of steam cooked fine linseed meal, stirred up in four pounds of hot water. The calves in lot 3 were given 17 lb. (2 gals.) of skim-milk daily. Each of the calves had all the shelled corn, oats and hay it would eat. A summary of the results is given below:

	Lot 1 whole milk.	Lot 2 skim-milk and linseed meal	Lot 3 skim-milk.
Daily gain per animal, lb	1.77	1.11	1.5
Dry substances eaten daily, per animal	4.4	5.4	4.9
Dry substance required to produce a lb. increase	2.5	4.9	3.6
Cost of food required to produce a lb increase	9.9c	4.7c	3.4c

The whole milk was valued at one dollar and the skim-milk at $12\frac{1}{2}$ cents per hundred lb. It is evident from this table that when linseed meal was added to the milk, the calves gained less and ate more food than in the skim-milk. It is also shown that it took much less food to make a pound of increase when we fed a large proportion of easily digestible fat than where we fed a large proportion of albuminoids difficult to digest as was the case when we fed linseed meal. Of course we cannot afford to feed butter-fat worth 25 to 35 cents per pound, but we should seek to supply the fat in some cheap form. It is necessary to distinguish between linseed meal such as you ordinarily buy and such as we used, and ground flaxseed. Linseed meal is the flaxseed after most all the fat has been extracted, and hence by adding to it skim-milk, you are only making a bad matter worse. If you could get ground linseed which is over one-third fat it would be a good substance to add to skim-milk to feed to calves.

Theoretically it is not difficult to construct a fairly well balanced ration. Practically, however, financial considerations make it extremely difficult, often impossible.

Knowing what it is desirable to accomplish, we can often do much by good management. Calves during the first six months of their lives require in addition to the milk, carbonaceous foods. These are easily supplied in the winter. During the next six months, after the milk is omitted, they need an easily digestible, muscle-forming food. There is nothing better than grass. During the first six months of life the calf does not need the grass. During the second six months they should have something more nitrogenous—straw, hay, corn fodder or corn. A fall calf is much more easily supplied with the proper diet than is a spring calf.

Feeders frequently fail to help themselves financially through thoughtlessness. At an Institute last winter I questioned an intelligent and successful dairy farmer about his method of feeding his dairy cows. He stated he was feeding corn and oats largely with what little mill feed came from the wheat ground for domestic purposes. He confessed that he ought to feed more mill feed, but that he could not afford it. At the very moment he was speaking his oats were worth \$20 a ton while he could buy middlings at about \$14 a ton. There is no better grain food grown for horses than oats, but it is relatively an expensive food. During the past decade oats in the United States have averaged 97 cents per hundred pounds, corn 70 cents a hundred, and mill-feed about 70 cents a hundred. By combining corn and cob meal with wheat, bran or middlings, half and half, we can obtain a food approximately in chemical composition that of oats and costing about 25 cents per hundred pounds less. We have fed at the Ohio State University farm, ten head of horses on such a diet as this, for 15 months, with the best of success, thus saving about one fourth in the cost of the grain food.

Success in feeding is dependent upon many factors, only a very few of which I have briefly touched upon in this long paper. But in closing, I wish to call attention to one other factor. The farmer, the stockman, the stock feeder, all persons engaged in agriculture, stand sharply defined from both the other great industries of life—those of manufacturing and transportation—in that those engaged in agriculture are dealing with living things. When we know all about life and not till then, can we expect to reach perfection in the science and art of cattle feeding. When we reflect with regard to the little we do know does it not give us hope of the possibilities of great advancement through study and experiment in the future?

Prof. SHUTTLEWORTH: To my mind it seemed real interesting to trace with Mr. Hunt the composition and digestibility of foods and the relation of the food to the animal body. It seemd so to all those who have studied it, but the greatest difficulty for the farmer is to apply it in practice. It seems to me that the great question to consider is probably that one point, how can the farmer apply this theory in practice on the farm. Should measurements and weights be exactly observed in accordance with the science of cattle feeding, or should certain observations guide the practical feeder? Should the appearance be the chief guide to the feeder, or should he rigidly follow the rule of measuring and weighing? Another point in reference to water. The animals, of course, require water, but should the water given be given largely through the food or be given directly as water. I have noticed where an animal is fed roots, there is a great decrease in the amount of water that it drinks ; it decreases it ever so much more than the total amount of water in the turnips. It seems to me that that is an advantage to the animal. I believe it will help the animal in several ways. I certainly agree with Mr. Hunt's paper, but I do not think we can discuss the paper so much from the standpoint of the theory of it as we can from the standpoint of theory and practice.

Prof. HUNT: In my own work, I do not figure out a ration for my cattle, but I have to take into consideration a good many points ; one, of course, is financial circumstances. The skill of the feeder has very much to do with this thing. There are many practical men who have spent their lives with cattle, and who succeed because they know the animals; he keeps on till he gets round to the food that he wants. If a man knows besides those things the theory and knows his animals also, he is better off. I do not believe in this theory that we can figure out just exactly that an animal must have a certain amount of liquid and a certain amount of solids.

Mr. McKENZIE: In cattle feeding my idea is that the first consideration is that we must be educated to handle the animal and to have the proper conditions to give it every care, and then the next thing is to calculate the nature of the food and the quantity and quality ; and lastly consider the cost of this food. I wish Prof. Hunt to answer some questions with regard to nursing, handling, and stabling of animals. Some want them very warm, some no exercise, others considerable exercise. Some feed five times a day, others three times.

Prof. HUNT: In reference to the question as to how warm you should keep the animals, I may say at about 50° or 60° to start with. To explain a little further, you know if you drink a cup of hot tea or coffee, you are likely to perspire. You know if you eat a dish of ice cream you are likely to feel cool. If you run you will perspire. Those things ought to be kept in mind when we are discussing this question. If you put an animal into a warm room, the warmer the room the more it perspires, because he is cooling himself by an increased perspiration. Some people argue that we ought to warm the water up to a certain degree. It is not so much the degree at which the water is, because the pores of the body stop at once, and there is not nearly the amount of perspiration. So that, you do not gain anything like what you expect to gain by giving the animal warm water or putting him in a warm stable. With regard to the number of times of feeding, I think twice a day for cattle is just as good as any oftener. I know that some men do feed five or six times a day—men who feed for shows—but I do not think this practice a very good one. I think the ideal thing, outside of any question of expense, is to put them in a box stall, but for economic reasons we usually tie them.

Prof. SHUTTLEWORTH: We have some farmers who feed a few roots and a little while after some hay. I suppose you would call that one feed.

Prof. HUNT: Yes. There are some things in favor of both practices, but for the ordinary feeding I think the better way is to feed two or three feeds. For instance, take our own practice : we feed 30 pounds of ensilage, 5 of clover hay, 5 of meal food, and one pound of linseed meal. It would not do for us to feed 6 pounds of meal food a while, and then 6 pounds of linseed meal. We have pretty nearly exhausted our variety of foods, it amounts to feeding ensilage, hay, mill feed, and linseed meal.

G. E. DAY: Have you had any experience in feeding wheat?

Prof. HUNT: No. The average price of wheat in the United States has been 83c. per bushel, and it is sure that wheat will again be 83c. per bushel. We have over a thousand bushels of wheat in our bins waiting for wheat to come up, and we expect to get $28 a ton for it.

S. HUNTER: Would you advise us to hold our wheat

Prof. HUNT: I am responsible for the wheat that I am holding.

Mr. RENNIE: I have been very much interested in this paper. In many respects it just concides with the experiments I have carried on. Even when you know exactly what to feed the cattle, you require to use common sense. Ground flaxseed and skim-milk is what I have been raising calves on on my own place. I consider it too expensive to raise calves on new milk.

Capt. McCrae: Would you not advise feeding a large quantity of roots, rather than grain?

Prof. Hunt: For instance, with sheep, if you feed sheep on turnips you must feed them a good deal of dry food, for there are nine pounds of water to one of dry matter. You can feed cattle more largely on roots than you can sheep.

Capt. McCrae: Our experience here is that we find roots a very good thing, very much better than the analysis would show, for the animal system. They apparently do exceedingly well. I am feeding a considerable quantity of roots with corn cut and mixed with cut straw, and the cattle are doing exceedingly well. I was very much impressed with what the professor said about nursing; I thought of a very eminent painter who, when asked by an amateur, "How do you mix your paints, sir?" replied "With brains." So that we have to have some brains in feeding animals. It is not always those who have had the most experience in the scientific part who are the most successful in feeding.

THE SOCIAL CONDITION OF THE FARMER.

By C. C. James, Deputy-Minister of Agriculture.

There are many aspects from which we may study the farmer; he is a many-sided being; his work is so varied; his life is so complex; his relations to the world at large are so extensive and important. We might consider him as a producer of wealth, as a money-maker, as a man of culture. Here we are to discuss him as a member of society. In considering his social condition we shall find that we necessarily touch upon his financial, intellectual and moral condition, for these three are intimately related and more or less dependent the one upon the other. One of the modern writers upon social progress introduces his subject by the statement that, "The promotion of social progress may be regarded as the primary object of all human institutions." Another has stated that, "The progress of society is not moral progress, or intellectual progress, or material progress; but it is the combination of all the three." At the outset, therefore, we must admit the importance and the wide application of the subject. Social and society come from the Latin word *socius* "a companion" and society has been defined for us as being "a union of many in one general interest." We need not discuss the advisability or advantage of having farmers united for their general interest; no more can we deny that farming by its very nature has to contend with many hindrances to union and the proper development of social life. Farmers are more or less isolated, not only from other classes but from one another, their work is not so conducive to social progress as the work of some other classes of workers. The social condition of the farmer has often been held up to pleasantry and even to ridicule by the writers and humorists of our cities. How often the cartoon portrays the farmer with heavy boots, coarse clothes, antiquated carpet-bag and cotton umbrella as the representative of his class. I presume the farmer would be content to "call quits" if the dude with loud clothes, big cane and receding forehead were set up as the representative of the city classes, but too often writers in newspapers and books are apt to do injustice to the farmer because of a mistaken or warped idea of the true meaning of "society."

Our young men and women on the farm are being constantly confronted with the doings of society in towns and cities. The weekly and daily newspapers give flattering reports of the various social gatherings in the towns and cities and the social advantages are thus unduly magnified. Visits to or residence in town while attending school throws these young people into a new social world and arouses the dormant desire for society; the homes to which they go are frequently more attractively furnished, the table more liberally spread, books and papers are more numerous, lectures, concerts and small social gatherings are more common, and thus little by little the appetite becomes whetted, the home attachments dull on the palate, and, in spite of what education may do, the desire for city life becomes so strong that even the thoughts of farm work become distasteful. The social advantages of the city, real and imaginary, and the social dis advantages, real and imaginary, of the country have much to do with the rush from the latter to the former in these modern days. We all will admit that it is advisable not to unduly encourage this centralization, this draining of the farm of its best life blood; in fact we will agree, I think, that it is to the general welfare of our people that many of the best of our young men and women shall be kept upon the farm. What then shall we do? Let us turn to one of the old mythological stories for an answer. On a dangerous part of the shores of the Mediterranean there were some mysterious being called sirens who discoursed such sweet music that the sailors attracted by it, turned in their boats, were dashed upon the rocks and perished. Ulysses knowing the danger, as he passed that way, filled the ears of his sailors with wax and tied himself with knotted ropes to the mast. He and his crew passed by the danger. Orpheus also came that way, and knowing the danger, he himself produced such sweet music upon the deck of his boat, music so superior to that of the sirens, that they sailed safely past entirely oblivious to the music on the shore.

Now, let us see whether it is not possible to so improve the social condition of the farm, that go where they will, study what they may, meet whom they like, still the social life of the farm home will ever draw back with irresistible force the young men and the young women who after all are its chief ornaments.

Let us consider under the following seven heads how the social condition of the farmer may be developed and improved, viz., the farm, the farmer's roads, the farmer's house, the farmer's table, the farmer's help, the farmer's reading, the farmer himself.

The Farm. A tendency towards smaller farms should be encouraged, thereby bringing farmers closer together and necessitating a more intensive system of agriculture. Intensive agriculture means more thorough tillage, cleaner fields, increased yields, sale of concentrated products, greater return to the land causing increased fertility and, therefore, a better prospect of improved financial results. There are about 175,000 farmers in Ontario, and the farms average about 125 acres each. This will represent five families or about 25 persons resident in every square mile of farm land. In France the farms average about 10 acres giving 64 families to every square mile. The great success of France in her work of food production has been attributed very frequently to her intensive agriculture made possible by her small farms. Japan also illustrates the point. Her population is 40,453,461, and her area is 147,655 square miles of which a considerable proportion is mountain and forest. Thus with a population of 274 per square mile Japan sustains herself. Her farm holdings are small, her agriculture of the most intensive form.

It may be interesting to examine the following census statement of the occupiers of land in Ontario. The statement includes garden plots as well as farms:

OCCUPIERS OF LAND IN ONTARIO.

	1891.	1881.	1871.
Owners	224,034	169,140	144,212
Tenants	60,483	36,690	27,340
Employees	1,091	1,159	706
Number occupying 10 acres and under	108,724	36,221	19,954
" 11 acres to 50 acres	38,283	41,497	38,882
" 51 acres to 100 acres	75,307	75,282	71,864
" 101 acres to 200 acres	49,358	42,476	33,984
" over 200 acres	13,936	11,513	7,574

It will be seen that the number of tenants has increased more rapidly than that of owners; in 1871, 15.8 per cent. of the total number of occupiers of land were tenants; in 1881, 17.8 per cent., and in 1891, 21.2 per cent. Omitting the plots of 10 acres and under, which of course, refer to gardens, we find that the tendency has been towards larger farms in the last twenty years. Since 1881 the number of farmers in Ontario has decreased according to the census returns.

	1881.	1891.
Number of farmers, male	226,090	174,337
Number of farmers, female	2,822	5,245
Number of farmers' sons	71,642	113,188
Total	300,554	292,770

The Farmers' Roads. Good roads bring farmers closer together, closer to markets, closer to churches, schools and township halls. Farmers should not be prejudiced against good roads because bicyclists may be agitating in favor of them or because town and city people may be anxious to indulge in more agreeable country drives. Good roads are not a luxury; they are a necessity. Bad roads are insatiable in their constant demands upon the farmer's time, strength and pocket. Roads, like eggs, are good only when first-class. Bad roads are more expensive than good roads. Bad roads, like fair weather friends, fail us just when most needed, in unfavorable weather and times of depression. Macadam and Telford roads may be beyond our reach in most districts, but the universal earth or dirt road may be greatly improved by putting into operation a system of work that will recognize the three great elements of good roads, namely, *thorough drainage, proper grading, systematic repairing.* The following from the *Engineering News* is exceedingly appropriate and sensible. We may dismiss this part of our subject by this quotation:

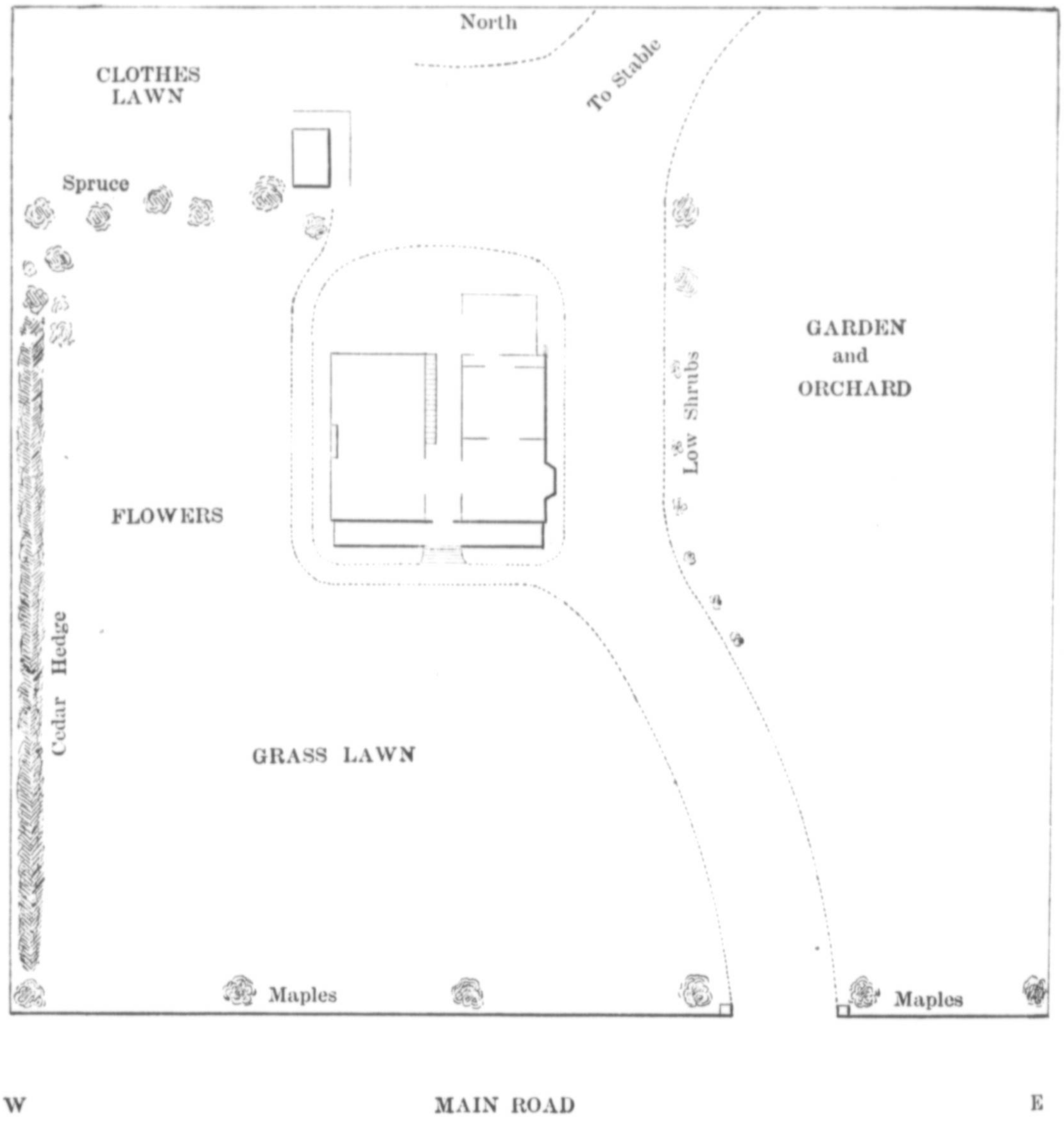
"The advantages of properly built and well maintained dirt roads seem to have been largely overlooked in the movement for the improvement of our country roads, and it has been said, with some reason, that the movement in favor of good roads has been hampered to some extent by a somewhat too enthusiastic advocacy of broken stone roads, either Macadam or Telford. The cost of such stone roads is absolutely prohibitive of their adoption in many parts of the country, where, however, improved roads are urgently needed. Comparatively little is said about dirt roads in the discussion on improved construction, but it is certain that very excellent roads may be made of earth by a proper system of construction. Both surface drainage and sub-drainage are essential in obtaining a durable road, and intelligent maintenance is another essential, which latter is rather difficult to insure. The mere dumping of piles of earth in wet spots or low places is not maintenance, but is mere waste of energy due to carelessness or misdirected zeal. With a good dirt road once completed, it would probably be found economical and advantageous to intrust its maintenance to a few skilled and intelligent men paid for their services, instead of leaving the maintenance to the spasmodic attention of the farmers and their hired men."

The Farmer's House. The importance of the house cannot be unduly magnified. It is here in the home that the women and children spend most of their hours; it is thither the men return after their hard day's work. It is the centre, the headquarters, of farm life; it is either the great attracting point that draws back the boys and girls from city and town, or it is the repelling agent that sends them off to town and city life. It is the starting point of children's lives, where the most lasting impressions are made, and which mould the opinions and inclinations to a great extent. The farmer cannot expect to have the palatial residence of the city with its superabundance of decoration, its sometimes grotesque mixture of styles, its brass knocker and plate glass; but the farmer can have a *home* just as healthful, just as comfortable and just as attractive. He can have fresh air and sunlight; he can build up his own home and surroundings, while the city resident has to buy them. The farmer can have a home built after the plan of nature; the city resident may have a residence built on the plan of the artificial.

Three things are important in the house—it should be *healthful, comfortable* and *attractive*; if it has these three characteristics it will be a home indeed, even if the cost may be measured only by hundreds of dollars. Let us consider the house as to a few particulars.

As to location the house should be placed on rising ground so as to give good drainage and an outlook. It should be near enough to the road to give a fair view of the passing travel and far enough away for a pleasant stretch of grass and a few shrubs. If possible, it should open towards the south with a verandah on the south side and one also on the west. Circumstances, of course, will control the exact situation.

The cellar should be from one-third to one-half above ground. It should be under the entire house so as to exclude damp malarial air. It should be deep enough to allow one to walk upright without danger of striking the head. It should be well lighted, divided into at least three compartments or rooms, and have a cement floor with perfect drainage. A good cellar is absolutely necessary to a good house.



The accompanying cut represents a simple but convenient arrangement of rooms. A hall runs through the centre of the house; this gives an opportunity for good ventilation. On the west side is a parlor with an open grate. A good large open grate with logs, a few easy chairs, some papers and books—these alone suggest pictures of comfort and attractiveness to many a city business man and turn back his thoughts with longing for the old farm home. And are they not possible for the farmer? Too often this room is kept closed all through the week and opened only on state occasions when "company" comes, especially if the company is from the city. An air of mystery, of sanctity I might say, and of mustiness pervades it. Throw open these doors, keep them open, and make that the living room, not the dead room of the house. If too large this room might be divided into parlor and study. On the east side we have a dining-room with bow window for house plants. Then comes the closet and pantry; then the kitchen. In the storey above there will be room for four bedrooms with closets *and a bath-room.* What! a bath-room in a farm house! Certainly, and why not? Are town and city people to have a monopoly of such healthful luxuries? And yet a good bath-room is hardly a luxury.

Along the front runs a broad verandah from which a fine cross country view can be obtained. The verandah might even be continued on the west side. How few farmers' families know the real pleasure to be had from a wide verandah, sheltered from the north winds and open to the southern sunshine! some farmers may say that their calling is not connected with verandahs and landscape viewing and lounging. To this we may say that the farmer and his family are as much entitled to such simple and enjoyable additions to home attractions as any other class, and a verandah is as useful and appropriate for a hardworking farmer as for anyone else. Along the pillars or supports there might be trained some climbing plants such as Virginia creeper, honeysuckle, clematis or climbing rose.

The road to the gate should be broad, well made and should sweep up to the house and past it with a gentle curve. To the north-west we may set out some spruces that in time will form a handsome wind-break; along the west, we can plant a cedar hedge; a fine plot of unbroken green grass lies in front, a few native shrubs from the woods stand where they will not interfere with the view, a few flowers to the west side and some maples along the road planted far apart. Whether maples should be placed immediately in front of the house depends upon the situation. How often the mistake is made of crowding the trees about the house—of smothering the home life. The trees are planted when young and being small they are placed too near; as they grow they crowd in further and further and shut out air and sunlight. To the traveller on the road the only indication of a house within the clump may be a glimmer of light through the trees or a curl of smoke above their tops. Keep the trees away from the house; let them form a background, a setting for the house, but let fresh air and direct sunlight in and around your house. As you approach the house in our illustration either from the east or west it stands out in full view with trees and shrubs to the right, to the left and to the rear. Such a home is worthy of a name. Every farmer should make his home worthy of a name and this name should be appropriate and attractive. The city residents are appropriating all your rights, and lodges and villas are quite commonly scattered over our crowded cities. If the city resident cannot have his country residence he can give his city house a rural name and call it a villa. Make your homes healthful, comfortable and attractive and give them appropriate names.

The Farmer's Table. What are the essentials of a good table? Food in fair quantity, fresh, wholesome, varied and well-cooked. Cannot the farmer have this? Can he not have this far better than any other class? He can, providing he takes the trouble to have a small garden and orchard. Let him see to it that the well or spring is well protected from all surface washings and underdrainage, from house, barnyard or outhouses. Let him see that his poultry is properly housed to give him fresh eggs winter and summer. Then he may have fresh water, fresh milk, butter and cheese; fresh meats, including poultry; fresh eggs, fresh vegetables and fresh fruits. The greatest dignitary of the land, the richest citizen of the state could not get better, and the farmer has usually in addition what the others too frequently are denied, a good digestion and a good appetite.

The Farmer's Help.—There are two points only that I desire to refer to here: first, more care should be exercised in the choice of men of good sound morals. The immoral farm hand may bring everlasting disgrace and ruin into the farmer's family. The young boy upon the farm will learn from him just as he learns from his father. There are good and bad among farm hands just as there are good and bad among farmers and among all other classes. The second point is that the social life of the farmer will be greatly improved by having separate homes for the farmer's help. Thereby there will be a greater permanency in the employment of farm help, and a better distribution of the work will be possible; the farmer's family will be relieved of extra work and have the home to themselves and the hired help can have the pleasures of home life to a greater extent.

The Farmer's Reading. There are some farmers' homes to which even the weekly newspaper is a stranger; there are very many where the local paper and the city weekly or daily come regularly but to which the agricultural journal never finds an entrance. Look at the effect upon the young people who from week to week pick up the papers printed in our towns and cities filled to a great extent with political news, reports of meetings held in towns and cities, references to urban social life. Gradually there forces itself upon the mind of the young people the conclusion that city and town life counts for more than rural life and the movement citywards has already been initiated in the mind. But what a different effect, if upon the table in the farm house are to be found every week the latest and best agricultural papers, fresh, attractive, stimulating. The county paper also should be there and one of the city weeklies or dailies for the farmer needs to know the doings of the day, to be well informed in regard to markets and the history of passing events. The addition from year to year of half a dozen of the best books on agriculture will in a short time make a fair agricultural library. The business men of towns and cities find it not merely advantageous but absolutely necessary to have all the special trade journals, reports and the best books dealing with their special work, and the business men of our farms will find it just as advantageous and just as necessary to have at their command all the papers, books and reports readily procurable, that deal with their work. Anything that adds information or arouses interest or stimulates true ambition is an important factor in developing the social life.

The Farmer Himself. After all the improvement depends upon the man himself, upon his views of life, the motives that prompt him to action, the aim or ideal that he holds up before him, the sentiment that rules his every act. I need say in conclusion only this, that if you as farmers, as young developing farmers, have a true ideal of farm life and try to live up to it, if you take a proper pride in your life work, if you arouse the world's respect by respecting yourselves, if you develop within yourselves a true sentiment; if you guide your acts by the best and noblest thoughts you will do your share to raise and improve the social condition of the farmers of Ontario.

APPLE CULTURE IN ONTARIO.

By W. W. Hillborn, Leamington, Ont.

I shall deal with the practical points as briefly as possible, and then give a chance for questions to be asked; and perhaps in that way we can get at what is required the most quickly and with the greatest interest to all concerned. The remarks I shall make shall have special reference to apple culture, but they will also apply as well, or nearly as well, to most other fruits.

Apple culture is at present managed as a side issue rather than in the way of giving close attention to the wants of the tree. The consequence is that there are very many failures. When our farms were first cleared, the soil was new and rich and there were but few orchards. We could get a crop of fruit without any trouble; but as the lands become older and more orchards planted the fertility of the soil is decreased, and our insect enemies have increased and also the fungi that affect the different trees. At present it is very much more difficult to grow fruit than it was in former years. For that reason it becomes necessary to make it a special study. I shall begin with a few mistakes that are often made: First, when men order trees to start an orchard they generally know very little about varieties; and a tree agent comes around and advises certain varieties to be planted; and, supposing that the tree agent is posted, he selects the kinds the agent recommends and plants them. Of course, they are not all according to the agent's representation. For fear of making a mistake in ordering, he will order a few of each; the consequence being that he has so many varieties that he cannot dispose of them to any advantage. Secondly, when these trees are planted the little ones take up so little room that there is apparently too much soil to be wasted; so the proprietor sows a grain crop among the trees, and the trees do not do very well, beginning after a while to dwindle, and some of them die. Third, allowing the cows to do the pruning. They do not do it so particularly as it should be done. Fourth, allowing the professional pruner to do the pruning. As a rule, the farmer has not made a study of pruning, and of course does not know how it should be done. If a professional pruner comes around, he, of course, professes to understand it. The first thing he does when he gets into a tree is, usually, if it is an aged tree, to cut out a hole in the centre and get plenty of room to work in. This allows the sun to come into the centre of the tree and strike directly on limbs that have been shaded. The bark comes off, borers get in, and the tree is ruined. Fifth, another mistake is in modes of cultivation. Sometimes a man will cultivate his orchard in good shape for a year or two, and then thinks it will do without much special care if the weather and other things are suitable. As the trees get older it sometimes happens that it is convenient to seed down the orchard or grow a grain crop. While the orchard is seeded down, the small roots of the trees come close to the surface. Of course, the ground has to be plowed up again, and a large portion of the feeding roots are thus cut off by the plow.

We shall say a few things on the method of culture. To begin with, we shall take a young tree. Always select young and thrifty trees, plant them out at a distance of about 40 feet, and give thorough cultivation by some root crop, so that you may constantly stir the soil. If you try to grow grain, it takes the moisture from the ground just when the trees require it. The idea is to stir the soil during the early part of the season, and thereby give them moisture. If the soil is allowed to become dry early in the season the trees make very little growth. If the trees become stunted while young they will never make much progress afterwards. A corn crop can be profitably grown—potatoes also—in the orchard. As the trees get older and the roots spread out they require more attention. We will always be safe in concluding that the roots reach out as far as the branches. Always give shallow cultivation, as the fibrous roots come up towards the surface. Cultivate to about the same depth each time. For this reason, I do not believe in plowing among an orchard to any depth. Of course, it is necessary to plow once a year perhaps, but do that very shallow so as not to run deeper than what you cultivate. In the selection of a place for an orchard or in the directions for cultivation it is impossible to give any general rules that will apply to all neighborhoods. We can grow apples in almost any neighborhood, but it is out of the question to lay down general rules, for the simple reason that soils and other things vary so that what suits one man may not suit the man across the road. We must, therefore, consider a tree a living thing, just as we have heard in regard to live stock. They have their requirements, and the nearer we can come to these requirements the greater will be our success. One man will plant an orchard on a piece of soil and the trees will grow very rapidly; but he gets no fruit, and he will begin to inquire and want to know why his trees do not produce fruit. He must know for himself why they do not produce—he must study the tree. If a tree is growing fast, it is possible, as I said, that cultivation has been continued too late in the fall. The soil may be naturally damp underneath and cause the growth to continue so late that the fruit buds will not mature sufficiently to withstand the winter, and for that reason will not produce a crop of fruit. Very often when we see this the cause, it is recommended to dig a trench around the tree and cut off a lot of these roots. I do not think that is right, any more than it would be to injure a cow to make her give more milk. It shows that the trees are not getting the right kind of food. It shows that they are getting too much nitrogen and not enough phosphoric acid and potash; therefore add a little bone dust and unleached wood ashes and stop cultivation, perhaps, about the middle of July, and you are very likely to start a tree into bearing. In regard to cultivation, I think that is one of the most important things in fruit culture—the method of cultivation. We should start cultivating early in the spring—early and often. The effect of cultivating will regulate the amount of moisture. In very many parts of our country we have to contend with dry seasons. If we cannot get the moisture required we cannot expect to get a good crop of fruit; but we can get that moisture to a certain extent by cultivation. By oft-repeated stirring of the soil, just a little on top, moisture will be brought from below. It also stores up the moisture that falls at night in the shape of dew. I have found that we gain much more by stirring the soil early in the morning than by leaving it till afternoon.

Now, in manuring an orchard, we have already heard that there are ten elements required in the formation of plants and fruit. There are only four, however, which we need to consider seriously. These four we need either to supply or regulate: nitrogen, phosphoric acid, potash and moisture. Now if an orchard has been planted on low land, or land that is naturally wet underneath, we must regulate that moisture by the crop we put on the land. You will find that in some cases farmers will advocate seeding down an orchard just from the fact that the land has too much moisture in it.

In selecting varieties, I do not like to name sorts for the reason that I stated yesterday, that varieties vary so in different localities; and I think we can get at the varieties to plant best by going to our neighbors, and by following them we will be pretty safe.

It strikes me that small fruits are more neglected than they should be. I see a large number of young men before me, and it is altogether likely they will go from this College back to their farms, and I wish to impress upon them the importance of fruit gardening. If they only knew how little trouble it is to have a little plot of small fruits they would have it. It takes but a small amount of work to supply the family from the time the first strawberries ripen in June till late in the fall with fresh fruits, besides a considerable amount for canning; so that you can have fruit on the table every day in the year. It is just as easy to grow these small fruits as it is to grow potatoes—in fact I can grow them easier. By planting all these small fruits in rows so that all the work can be done with a horse, it is just a matter of an hour or two a day for, it may be, three or four times in the week to have all the small fruits that any family would want to use.

Mr. KEIL: If tiles were put in an orchard, where would you advise placing them

Mr. HILLBORN: I would recommend them to be put in half way between the rows and very deep, unless the soil be a very retentive one, and then not too deep.

A. G. McKENZIE: What about planting on a northern slope as against a southern or eastern?

Mr. HILLBORN: I would select a northern slope for all fruit except grapes. The great difficulty with a southern slope is that you get the direct rays of the sun on the tree in the winter. If you notice the little branches, it is always on the south side that it is killed, while the northern side may be quite green. I have known people who have sometimes planted a tree on the south side of the house instead of the north side. A tree will stand very many degrees more cold on the north side than on the south. The sudden changes are what cause the difficulty.

Prof. PANTON: How did you originate the Hillborn raspberrys?

Mr. HILLBORN: It was grown from the seed of an old raspberry plant. In the first place, the original plants came from some nursery on the other side. I planted about an acre of the seedlings, and then I selected the best ones and produced the fruit from that.

Mr. S. HUNTER: To what age will an average bush be profitable?

Mr. HILLBORN: I have picked a quart of fruit from the Hillborn raspberry when it was one year old, but they will begin to pay the second year from planting, and with reasonable good care afterwards—it depends upon the method of culture—they should last from eight to ten years. I saw a plantation that was 14 years planted, and it was apparently in perfection at that time.

A. G. McKENZIE: What would guide you in selecting good nursery stock as to situation? Some say go north, and others to select some hardy tree and graft on it.

Mr. HILLBORN: I would first say that I would go to some reliable nurseryman. Deal direct with the firm; and in that case you are pretty sure of getting what you order. I would not be particular whether they were grown in Canada or just across the lines. I would not care, however, to go too far south of our own locality—100 or 200 miles does not make much difference. If we bought our trees and brought them from the south in the fall they would be tender—somewhat after the fashion of a hot-house plant; but if we get them in the spring, they harden in the summer.

Mr. S. HUNTER: How would you grow a rather tender variety—by grafting, or how?

Mr. HILLBORN: By top grafting on to some hardier variety.

A FEW THOUGHTS ON THE FARMING INDUSTRY.

Wm. Mulock, M.P., read the following paper: You have done me the honor of asking me to write a paper on the subject of "How to Improve the Financial Condition of the Farmer," and on beginning its consideration I at once thought of the relation of the farming industry to what is commonly known as the trade question. But feeling assured that the subject was to be treated wholly regardless of the trade relations between Canada and the rest of the world at any particular time, I have directed my thoughts without reference to tariffs, but solely to those conditions which under all tariffs affect for weal or for woe the condition of the farmer. Further, I have been obliged to change materially the title, for to write under that assigned would be to imply that no farmers are now adopting the best methods. This would be an indefensible position to assume, inasmuch as in Ontario to-day are some of the best farmers to be found anywhere, whilst progressive farmers are successfully pursuing their calling in all parts of this province. For such as these I could not venture to offer any suggestion, and my observations must, therefore, be regarded as intended solely for those who may yet regard farming as largely a matter of chance and accident and not an industry based upon scientific methods.

Further, I would say that it is with much hesitation that I venture to offer any suggestions to an agricultural audience, being but as it were an apprentice and not a master workman in the craft. Still believing that we all may be able to contribute some little useful information to each other, I venture in that modest spirit only, to respond to your kind invitation by giving expression to a few thoughts on the farming industry. First, I would say that

Farming is a Science and not a Game of Chance.

When we had our virgin soil, supposed to possess inexhaustible fertility, nature gave a bountiful return notwithstanding the most improvident methods of cultivation, but now experience has taught us that the fertility of the soil must be maintained if we are to get productive returns. And as the whole financial success of farming must largely depend upon the productiveness of the soil, my first thought is how profitably to increase the means of fertilization. It is idle to preach economy if the farm yields but the barest pittance of a living. It should be the aim of all to so conduct their business that those engaged in it shall enjoy a reasonable share of those comforts in life which increase human happiness. An industry which yields but starvation returns affords no opportunity for real economy. To those then who are continuously scolding the Canadian farmer, accusing him of extravagance and improvidence, I would say with some knowledge of the conditions that the charge is as a rule unwarranted. Why should a farmer be denied those reasonable comforts and means of improvement that are supposed to be the legitimate right of many other classes who certainly do not toil harder. Therefore I would say, that, combatting as I do the arguments of those who attribute all financial embarrassments of farmers to alleged extravagance, our attention should be rather directed towards endeavoring to increase the profits accruing from farming so as to enable the farmers to enjoy a fair share of the advantages of our civilization. I have suggested that farming must be conducted on scientific principles, and the first step towards successful farming I think is to increase the yield of the farm. How to do this involves the adoption of certain methods which science and experience alike teach us lie at the very threshold of successful farming, and first in importance is

Underdraining.

Some soils resting on gravelly or other porous foundations may not require underdraining in the ordinary sense of the term, but even these may need openings to allow the water to escape from the gravel, etc. With these exceptions all farm lands should be thoroughly underdrained. Without proper underdrainage the land never yields a full return for the labor performed upon it. On my farm I have some land underdrained with parallel drains, 24 feet apart, and alongside of this same land other land equally as fertile and as favorably situate, but not drained, and I think I am safe in saying that my underdrained land yields me fully one-third more than does the adjoining land not drained. The cost of cultivation of each kind is the same per acre, and the extra crop of about two years will pay the cost of underdraining. The farmer, therefore, whose land is not drained is losing annually about one-half as much crop as he secures. What business so conducted can be a financial success? Especially at the present time, with the prevailing low prices of farm products, every acre must be made to yield the most generous response to the demand of labor expended upon it. Again, then, I repeat that underdraining in my judgment is absolutely essential in order to successful farming. Whilst to be in debt is to be in danger, I think the cost of underdraining is one of the few expenses for which every farmer is fully warranted in going reasonably into debt. Assuming then that the land is properly prepared for cultivation, the next question is

How to Increase the Means of Fertilization.

The staple article is barn-yard manure, artificial fertilizers being expensive and not always satisfactory. The average Canadian farmer engaged in mixed farming does not, I think, expect to be able to manure his land oftener than once in six years. Everybody admits that this is insufficient manuring, and the problem is how may he increase his supply of manure.

Intensive, not Extensive, Farming Ought to be the Aim.

The yield from market gardens tells us how much more such land yields than does the ordinary farm. Now inasmuch as the cost of cultivation is the same whether the land be well or poorly manured, is there no way by which every farmer may at a reasonable cost increase the quantity of manure within his reach? I think there is, and that source is the system of

Green Manuring.

Science tells us that out of every 100 parts of atmospherical air, 78 parts are nitrogen, which is the main fertilizing element in barn yard manure. How can this nitrogen be brought down and supplied in an available form as food to our growing crops? The process is simple, comparatively inexpensive and certainly most effective. Certain plants, such as clover, peas, beans, buckwheat, etc., have the property, when growing, of storing up large quantities of nitrogen, and when plowed in, this nitrogen is immediately available for plant food, thus taking the place of the barn-yard manure. On my farm I have experimented with fall rye, clover, green peas and buckwheat. At the rear end of my farm is a sandy field nearly a mile from the barn-yard My farm was one of the earliest settled upon in the county of York, and I assume that little if any manure was ever drawn to the field in question, for after attempting for several years to grow a crop upon it I came to the conclusion that the soil was absolutely exhausted, and accordingly set about the experiment of endeavoring to restore its fertility by green manuring. I may say that the soil was so light that everything seemed to burn up in hot weather. I began the work of fertilization by sowing it with fall rye, and clover on this in the spring. When the rye was pretty well grown, but before it had commenced to get hard, I cut it down, allowing it to remain on the soil as a mulch for the clover. This protected the clover so that it lived well through the dry season and in the following year the clover when in blossom was plowed under. This field I sowed with fall wheat and had a reasonable crop, by far the best that I had yet gathered, but still not an average crop. Again I sowed this field with rye and plowed it in in the spring as before and kept the top of the land worked until fall when I again sowed it with fall wheat, and this year had a crop exceeding 30 bushels to the acre. I have also experimented with green peas, and now make it a rule instead of having fallow land for fall wheat, to treat the land as follows: plow in the fall, and in the spring work it well on top until about the first of June. This cleans the land; then sow with peas and in about sixty days, say about the first of August, plow in the peas. They will then be in blossom, and by the first of September, when the fall wheat should be sown, they will be absorbed by the soil, and the nitrogen so taken from the air be immediately available for plant food. A crop of green peas, so far as my experiments have gone, appears to produce results quite equal to those from a good coat of barn-yard manure, and the only cost is the seed, the labor involved being no greater than the labor of summer fallowing. I am not able to say whether the effect from such green manuring is as lasting as that from ordinary manuring, but this system of green manuring does enable us to supplement the supply of barn-yard manure, and thus to increase the fertility of the soil and the return therefrom, and again illustrates the proposition that farming is a science and not a game of chance. My own experience causes me now to always grow a crop of green manure for my fall wheat instead of letting the land lie fallow and bare, when if allowed to bake and get dry, it loses instead of gains fertility. There is no profit in endeavoring to cultivate more land than you can properly manure. To do so involves a waste of energy and pecuniary loss.

Agriculture is a Progressive Science,

and involves study as do other callings; but the successful agriculturist must not be a mere theorist or book scholar, but must be able to make a practical application of scientific knowledge. Science tells us that we have an inexhaustible supply of nitrogen in the atmosphere right above our farms, and that in the economy of nature certain plants such as those named are able to render this nitrogen available as plant food and to store it up in large quantities for man's use. Why not then accept this proffered gift from nature by making at least a part of your land grow its own manure?

Now, proceeding a step further and assuming that we are conducting our farming operations so as to get the best yield from the land, I would call attention to the importance of farming operations being guided with regard to

Some Definite Policy.

For example: Is it possible for the farmer to profitably carry on his industry throughout the whole year, or must the winter months be largely devoted to chores and waiting for the arrival of spring? In this age of keen competition few if any businesses admit of any considerable suspension of operations. With regard to the character of the farming, some prefer a specialty, such as dairying, fruit farming, etc., whilst others go in for mixed farming, the latter in fact being the general character of the Canadian industry. Now it seems to me important, considering our long winters, that we should endeavor to so conduct our farming operations that the farmer may find profitable employment on his farm throughout the winter. How may he secure this? A successful farmer has said that he liked his crops to walk to market—in other words, to feed his grain and sell the product of it rather than the grain itself. The ensilage system enables us to overcome largely the disadvantages of our long winters and to compete successfully in the industry of fattening cattle with countries having a somewhat milder climate. The cost of a silo is now within the reach of almost every farmer and considering that it is estimated that an acre of green corn has a feeding property of about five times that of an acre of hay land the advantage of this system of raising cattle food is manifest. Moreover, it enables us profitably to market our coarse grains whilst we have the manure remaining, and thus the producing power of our farms is increasing every year so long as we continue this system.

Dairying.

To those who make dairying a specialty, I would say that it is, I think, of the utmost importance that they should seek to supplement their pasture by the soiling system. Let them sow some green crop to be fed to the cattle during the dry season. We know with absolute certainty that year in and year out there comes a time in the summer when the pastures are dried up, when at times even the wells dry up, and flies and heat torment the cattle. Unless these results have been anticipated, the supply of milk falls off, the operations of the cheese factory become unsatisfactory by reason of the unequal supply of milk, and the cows can never be gotten back to where they were before the flow of milk fell off. To make dairying a success, then, I think it is necessary to supplement the pasture as I have before stated, with a green crop, tares, vetches, oats, corn, etc. A very small acreage will do the average farmer to make the summer's dairying operations a success instead of what often happens, a failure. As a permanent soiling crop I recommend lucerne. It is a deep feeder, the roots extending below the drouth line, and can be relied upon when almost all other vegetation has failed from heat and drouth. No doubt other methods can be suggested whereby the farmer may be able to profitably carry on his industry all the year round without regard to the season, and I only cite these as two of many possible illustrations of the proposition now under consideration. Again, I would say that in order to succeed the farmer must

Adopt Business Methods

in connection with his calling. In other callings, merchants watch the markets, sell when they can make a reasonable profit, and generally adopt business methods in marketing what they have for sale. Why should the farmer in selling his cattle depart from sound business principles to sell them to the drover by the head instead of by the actual weight? He may think that he is a better judge of the weight than the drover, but I should be sorry to put my judgment against that of any person who is an expert in his trade. I merely allude to this system of doing business in order to urge upon the farmers the adoption of business methods and not those of chance. And upon this point I would say that it is of the utmost importance to the farmer that he should keep full accounts of his business transactions as would any other business man.

Thus far my remarks have had reference to the earning power of the farm. Let me venture a few remarks of caution against loss. If our whole energies are devoted to earning, and no caution taken to husband those earnings but they are allowed to go to waste, then we are in no better position than the owner of the best milch cow in the world which after filling the pail kicks it over. Assuming that my ideal farmer is married and has a good wife, I would tell him that "A good wife and health are a man's best wealth." Therefore let him encourage his wife, for a man can hardly prosper without his wife's consent and aid. And

Let the Farmer not Overwork Himself.

It is false economy to do so, for it undoubtedly impairs his after usefulness. Let him acquire habits of regularity, and if possible keep ahead of his work. When once the work gets ahead of a man, to say nothing of the loss resulting from operations under such circumstances, the farmer becomes a prey to worry and it is undoubtedly true that freedom from care promotes longevity. Mr. Beecher has stated that "worry kills more people than does hard work." Therefore I would impress upon every farmer to conduct his operations as to avoid as much as possible all gnawing worry.

It has been well said that it is easier to make money than to keep it. One good way to lose it is in the tavern and the saloon; and it does not take long for a person to drink down the value of a farm and put his wife and children on the road. The successful man, be his calling what it may, must be temperate.

Another pitfall is debt. "A man in debt is caught in a net." He is more or less at the mercy of his creditor, and being behind-hand is obliged to buy on credit and pay credit prices, which means bearing a share of all the bad debts of others. Again, it is necessary to

Avoid all Bubble Schemes.

Glib-tongued agents may tell us of the advantages of lightning rods on every square yard of our buildings, may offer patent rights that will make a pound of butter out of a pound of milk, that almost promises to turn iron into gold, but the philosopher's stone has not yet been discovered.

Thrifty habits and hard work guided by intelligence, are the only passports to success. It has been said that lawyers are a necessary evil. Every man values what he deems his rights, but the prudent man will hesitate a long time before embarking in litigation. A trifling quarrel over a line fence may lose both neighhors their farms. "The suit is ended," said a lawyer, "both parties are cleaned out." Therefore, my advice is, avoid litigation if possible. But I might go on in many other ways to point out the dangers that beset the farmer's footsteps. For example, this has been an age of wonderful progress in the invention of agricultural implements. The prudent farmer will not be the first to buy every new-fashioned implement, but will wait until it has been thoroughly tested and until its price has become reasonable, and even then he won't buy it except for cash, and until he can pay cash will put up with what he has, and when he has purchased his implement he won't leave it exposed to the weather all the year round. And so, generally, in order to success in all operations, waste of every kind must be avoided. No man, however wealthy, can afford to waste anything.

But I have already trespassed too far upon your time. One word as to one policy that should guide the farmer's operations. Let him ascertain for himself what he can produce for which there is the most remunerative market, and to do this he ought to

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and a newspaper. The one will afford him useful information as to his calling, and the other as to business connected with his calling and general information. In this age of change and progress, it is necessary in order to success that every man should keep abreast of his calling, and this he cannot do if largely isolated from the business world, as he will be without the use of some public journal.

Finally, let him do his duty as a citizen, by standing by those public institutions of learning that are doing so much for the advancement of science, including that one which for efficiency and thoroughness of work both in the college, in the field and in the farmers' institutes, has placed itself amongst the foremost of agricultural colleges in America. It is needless to say that I allude to

The Ontario Agricultural College at Guelph.

It is always difficult to trace direct results from educational institutions, but the triumphs won by Canadian exhibitors of dairy products at the World's Fair constitute but one of many valuable results that have accrued to the people of Canada from this College under the able administration of President Mills, and I bespeak from the *alumni* and all other friends of progressive agriculture, that sympathy and support to him and his efficient staff in their high and responsible positions so necessary in order to the attainment of the best results. There are those who, whatever be their motives, are unfairly attacking and would destroy this College. To them I would say that it being universally recognized that successful farming must be based on scientific methods, their unpatriotic action is against the best interests of the farmers and of the whole country.

Any unfair attack on this College is an attack upon our farmers' institutes, our agricultural societies, this *alumni* association, and all other organizations for the purpose of advancing the farmer's interests, all of which are, as it were, schools for the dissemination, each in its way, of useful information. Let every farmer be ever seeking useful information bearing upon his industry. The progressive farmer, even if a graduate of an agricultural college, in order to secure a successful place in his calling, will not cease to be a student cn leaving his college halls, but, as he journeys through life, will continue to find "tongues in trees, books in the running brooks, sermons in stones, and good in everything." To such a farmer success will be the reward.

A. McKenzie: There is one phase of the paper which interests myself indeed, and that is the part that applies to the uniformity of work and the occupation of the winter months. We find it very difficult on the farms to secure good hired help. I think one of the reasons is that we cannot give good wages all the year round. Men wishing to obtain good wages all the year round will go to other places and leave the farms. Now, if we could so regulate the work as to give good wages all the year round and have the work regular it would be a very great advantage.

Prof. Dean: Mr. Mulock, in his excellent paper, says that it is important that a farmer should have a supply of green food for summer. I have advocated that, but never had it so much impressed upon me as this summer. In the north-west of this province I found the creameries were shutting up a month earlier than usual, and a number of cheese factories were closing because they could not get a supply of milk and cream; and the reason was there had been no provision made for green food. Last year, we had very good pasture most of the time, and some people have made a mistake by risking it for this year also. There is very little danger of us having too much food on hand, as we can use it in the winter. He also speaks about those fellows who go around talking and trying to make you believe that they can make a pound of butter out of a pound of milk. I have tried myself the black pepsin process and one or two other modes, and we have been promised Thurston's new process, giving an increase of 30 to 40 per cent. We have read of a reporter who saw an increase of over 100 per cent; they took a certain number of pounds of milk and got so much butter, and the next day got an increase of 100 per cent. I could take the milk from a couple of cows and get an increase of 200 per cent. on what was obtained from certain other cows, because there is such a difference in the quality of milk. I have very little sympathy for anyone who will invest money in that sort of thing.

R. F. Holtermann: There was one thing which Mr. Mulock referred to which is of vast importance, and that is to buy for cash. He says very correctly that the man who buys on credit must pay for the bad debts of others. If you buy for cash, you can go to any store-keeper and get the bottom prices, he can afford to give it to you. I believe farmers generally buy in too small quantities. The store-keeper cannot afford to weigh out 10 lb. of sugar at the same rate as he can sell a barrel for. I have always maintained that the farmers are making just as much progress as the business men—only 17 out of 100 business men make a living.

S. Hunter: It is quite evident that this paper has not been gotten up hurriedly. I differ, however, in some things from Mr. Mulock. The ideal farmer, which Mr. Mulock says we should all be, cannot be found on every farm home. The man that can use science in his work is the man who will succeed. Science, to put it in the simplest English that I have, is knowledge applied; and if we have knowledge and can apply it, there is no difficulty in making farming pay. The men who are applying knowledge properly in farming are not the men who are complaining of hard times. We will require to get our average farmer educated to a little higher level than he is at the present time. I have no sympathy with a man who is suffering in any way, who is in possession of knowledge to do his business and does not apply it. Mr. Mulock says we are blamed for being extravagant, and he believes that we should enjoy life and have all the comforts in life that men in business have. We believe that, but we also believe that we have to wait for these things. If we have the means, we should not deprive ourselves of the comforts; if we have not, we should wait till we have secured the means, and then the comforts will be enjoyed better after. We like the idea of paying cash for everything when we can, but then the poor man cannot pay cash. It is much better to buy one bar of soap and pay for it than to buy a box and go on credit for it.

J. S. PEARCE: This is a very important question with regard to the trouble about the financial situation of the farmer. There is too much credit in this country. I am satisfied that if our farmers will open a bank account and be in a position to raise $25 or $100 any day that he wants it, he would save thereby in many instances 25 per cent. It is not a disgrace to a man to borrow $50 or $100; and he can easily arrange with a bank by which he can open an account and have a certain amount to his credit there; and if it is overdrawn occasionally, the bank will not worry him very much. Again, with regard to the question that Mr. Hunter raised about the intelligence of the farmer, I think there is a grand opening for this Union to do what might be termed missionary work along that line, and try and encourage and stimulate the farmers in the neighborhoods from which these young men come to get out of the rut in which they now are. If this Union were run along on that line it would be a good idea, and I think there would be a great deal of improvement and a lot of good done. Mr. Mulock also mentions another very important thing, under-draining. I think there cannot be too much importance attached to that; and I have told friends of mine that if I had to borrow money, I would do so and put it into tile. I want you to remember that what I am saying is not presumption—I have been on a farm all my days. I want to give a little illustration of the results from under-draining that has come under my own experience; some five or six years ago I rented a small plot of land consisting of five acres for market gardening. There were no drains in this land, and the owner thought there was no occasion for under-draining, as the soil was somewhat gravelly. I worked it for one year without tiling, and then went to the landlord and asked him to assist me in putting in tile. No, he said, that land is better without drains. Finally, I put tile in at my own expense, and from that piece of ground after under-draining, the crops have been four or five fold greater than they were before.

DR. MILLS: My name is down to take part in the discussion to day, but I decided to leave it entirely to others. I wish simply to make one or two observations. Mr. Mulock is himself an educated man, a scholar in every sense of the term, and a public man who is in close contact with the farming community. There are very few public men in this country who are in so close contact with the farmers of Ontario as he is. I may say that when we were about constructing the farm buildings here, I visited Mr. Mulock's barns; and in regard to the arrangement of the box-stalls, movable troughs, etc., the idea came mainly from Mr. Mulock's. I wish simply to express my opinion of the paper as eminently useful, comprehensive and in every sense practical. I join you in expressing my appreciation of it as a whole.

T. H. MASON: I think on the whole that Mr. Mulock's paper is an admirable one. At the present time we know that in a great many lines of farming, on account of bad markets, that the margin of profits is very small, and in fact nothing at all. I was told by one of the best farmers in the province of Ontario that his net receipts last year were something like 3 per cent. As Mr. Pearce suggests, I think this Institution should undertake missionary work in this line.

BRAIN AND MUSCLE ON THE FARM.

HON. JOHN DRYDEN: I am sorry, Mr. President, that I was not in when the last paper was being read. I have listened to what some of you have been saying, and I think I have pretty well the gist of it. First, I want to say that farming for glory or for the fun of the thing has never been a very favorite pastime in this or any other country. The hope of gain, after all, is the chief thing which is considered. You will agree with me that the ideal object that the farmer has in view is to produce the best possible quality and the greatest possible quantity with the least possible outlay of labor and capital, which, when it is produced, ought to be sold in the best market which can be found. If I were to suggest any two things which would improve the financial condition of the farmer, it would be these: first, give him access for his products to the best markets of the world, and, secondly, give him such information and such instruction as will enable him to produce the best products in the world. Then, in that way, you would cover all that is needed. The best market may be in one place or it may be in another; and, therefore, I would say that the best market is generally the broadest and most extended market. The best market might be right at your own door; then, if it is, you have the advantage of paying no transportation charges, fees, etc. On the other hand, if a market which is a long distance off is of such a character that after you have paid transportation and other charges it still affords a better return than the one at hand, that is the best market in which to sell your products. In Great Britain the farmers there have the best market right at their own doors; they avoid all charges that are placed upon the articles that are being sent to that market. If you and I were confined to the market in our own country, it is manifest that a good deal of our land would soon have to go to waste. So that it is taken for granted that if we are to have the best chances we must have access as far as can be (without speaking specially of any political questions of the day) to the best market. We should produce an article in which we can excel, and which we can produce at a profit. Now, that is an advantage which is very desirable and is perfectly patent to everyone. In other words, the stock raiser should produce the very best stock, the bee-keeper the very best honey and the dairyman the best dairy products. The farmer should choose which of all the products he would make a specialty of on his own farm, or which would best suit the special circumstances in which he finds himself placed. Taking that for granted, I may say that the farmer's position will be improved by a study of the soil which is found on his own farm. So far as I have been able to judge, I think the paper given by Mr. Mulock is an admirable one; but I have this to say, that what might suit Mr. Mulock might not suit Mr. Hillborn and might not suit me at all in the county of Ontario; and, therefore, I am bound to consider the special conditions in which I am situated. The fact is we have too many *imitators* among farmers—men who are not thinkers and who will not study out for themselves what is the best to do. I cannot give a rule for you, and I do not want you to give a rule for me; I must look out for myself in that regard. I do not need to stop to give you illustrations, but I have seen hundreds of them in my own section of the country. I have seen a man watching another man who is growing an excellent crop of fall wheat, and he wakes up and says, "Here is a grand way of growing wheat." He buys some seed and sows it, but under circumstances not at all similar to those of the man who has grown the good crop. The chances are that he has wasted his labor and seed, because he is a mere copyist. Now, if our farmers wish to better their financial condition, they must not do that, but study their own circumstances. Again, do not undertake too much. I have made up my mind that in these days the man who is a skilful manager on a small farm comparatively will do better than the man who manages a larger farm with less skill. In the older days, when the growing of grain was remunerative, it was different; but now we have to concentrate our crops; and when that is the case, there is a great deal more attention needed in the details of farming; and I generally discover that the man on a small farm will do better proportionately than a man on a larger one. In connection with this, his position will be improved if he will bear in mind that he cannot succeed on any of the old line, haphazard methods. Whatever you do is worth doing well, and the difficulty is that so many of our farmers neglect this thought altogether, and they are careless in all their operations. This applies in every department; grain growing, stock breeding, dairying and in every other department. Take the man who is growing grain. You had it brought out in Mr. Mulock's paper, and I believe that a greater amount of success is due to a proper tillage of the land than most of us have been wont to believe. Some think it does not make any difference how you cultivate. If a man ignores this thought, and does not do every part of it well, he will find that he is the loser and not the gainer. If we shall make progress in connection with this agricultural industry, we need to adopt the most economical methods—that is to say, we want to get the greatest results with the least outlay of capital. The merchant has to study his business; and we, if we are going to succeed, must study ours also. Now, when I speak of economical methods, I do not mean that we are not to spend any money in the development of the farms on which we are placed. Not to spend money on drainage is parsimony, not economy. There is no doubt at all if there is one thing which should receive our attention more than another it is the subject of drainage. I suppose that some of you have seen just what I have observed—you have seen land pay for the drain the very first crop that was taken from it; and still there are farmers who refuse to drain their farms. They are too stingy—when they get a dollar they stick it in the bank or in the vault, and say, "I will not let that loose." If I can spend a dollar and make five I am foolish if I do not do so, if I want to increase and better my financial position. I have seen men in such a position that if they had purchased a machine it would have paid them tenfold, and yet they refused to do so, and have wasted money and energy. The farmer ought to be business-like. Why should he not be? Why should we not consider that our work requires business methods and business habits just as well as any other? But the fact is, if you go to any place in this province you will find numbers of farmers who never read a solitary paper; they have not even a weekly in their possession, much less any agricultural papers—the fact is they do not know what the market is. A great many of our farmers do not succeed because they have no capital. How many times I have seen men start with no capital. Such a man is handicapped from the first, and will lose in his business. I would rather see a man work for some person and get a little capital before he starts business. A merchant cannot succeed without capital; and I fancy that because such a large percentage of the business men fail is really on that account. In England, a landlord will not rent to a man who has not the capital. They require him to have a certain amount of capital, so that he can work to advantage. That is manifest, and the farmers would be in a better condition if they were able to hold their products and not be compelled to sell and pay interest, which might be necessary in some cases, but which is a little dangerous after all. I could take you in my own township to men who are as industrious, as intelligent, and as successful as most farmers, but who are going down because years ago they borrowed, and the reduction in value of farm crops and farm property has been so great lately that it is likely to take away all they have. I do not say that Mr. Pearce is not right in his arguments, if a man does not go too far beyond his means. I believe that farmers, more than any body else, need to be thinking men. How will they become thinking men? By becoming educated men. I have seen men who could not read or write very well, and yet I call them educated in the sense that I am suggesting. They have got their education, however, in a very hard school—by experience—by having blundered and made mistakes; but they have been thinking men and have taken advantage of their various experiences, and profited by them. It is manifest that if the condition of the farmer is to be better financially he must be in the sense that I am suggesting an educated man. He must not be afraid of science either. So many farmers are afraid when you begin to talk about science. What is it? It is simply truth in reference to agriculture. If the science be correct, that is what it represents. I need not be afraid of all you can bring to me along that line; but while I am not afraid of the science of agriculture—of learning about the science—I ought not to be ashamed to acknowledge and to take hold of the practice of it as well. Science is of no use unless you bring it down to some practical use. Your scientific investigations are useless unless some one is going to be able to put them in practice. Now, I ought not, therefore, to be ashamed to put knowledge into practice. One of the things that will improve the financial condition of the farmer is to allow the muscle and the brain to go together. I am delighted that in this province we have got so good an equipment in order to afford this special advantage—where a young man, if he desires so to do, can become educated in this way; not that he can acquire knowledge merely, but that he may become a thinking man. He requires such education as will enable him to think out his own course in after life. I am glad to say that this institution is so valuable a one in this direction. We have scarcely begun as yet to see the good results which will flow from the education which is being given in this institution. Sometimes in the Legislature

I am attacked by being asked, "Where are your men?" We do no find them. And they say, "You had better stop this education. They are not numerous enough." Now, it takes a great many years to fill up a province when probably from 50 to 100 are sent out annually. It takes a long time to permeate the whole community; and whoever lives to se it will find that in this province the farmers will occupy more than they have in the past a first place among the farmers of this continent. I would like to say in the presence of Prof. Hunt that we are now finding some of our brightest and best young men in this country going to work on the farm. They are properly equipped and drilled and educated, so that they will be able to think out the proper course which they are to take in after life. It is certainly being done, and will redound greatly to the advantage not only of the agricultural interests of this province, but to all the people who dwell in this land.

REPORT OF COMMITTEE ON ECONOMIC BOTANY AND ENTOMOLOGY.

PRESENTED BY PROF. J. H. PANTON, AGRICULTURAL COLLEGE, GUELPH.

The committee appointed to collect information regarding the presence of injurious insects, fungi and weeds throughout the Province of Ontario, sent out 100 circulars of enquiry to the secretaries and some others of the Union; 50 of these were returned containing replies to the questions issued. These 50 embrace 30 counties, as follows: Addington, Lennox, Russell, Prescott, Hastings, Frontenac, Glengarry, Lanark, Renfrew, Prince Edward, Ontario, York, Simcoe, Peel, Wellington, Perth, Oxford, Middlesex, Brant, Haldimand, Lincoln, Welland, Kent, Peterborough, Bruce, Grey, Muskoko, Monck, Haliburton, Dufferin.

The replies may be thus summarized:

WEEDS. Forty different species are referred to, but only eleven are named by ten or more correspondents. The following is the list with figures indicating the number that referred to each:

1. Canadian Thistle (Cnicus arvensis)	42
2. Mustard (Brassica Sinapistrum)	36
3. Couch grass (Agropyrum repens)	28
4. Burdock (Arctium Lappa)	26
5. Ox-eye Daisy (Leucanthemum Vulgare)	25
6. Ragweed (Ambrosia artemisiaefolia)	24
7. Pigeonweed (Lithospermum arvense)	22
8. Cockle (Lychnis Githago)	20
9. Wild Oat (Avena fatua)	18
10. Pigweed (Amarantus retroflexus)	15
11. Wild Tare (Vicia Cracca)	12

In connection with weeds the use of common names leads to much confusion when reporting upon them. For instance, Redroot is applied by some to No. 7 and by others to No. 10; Pigweed is applied to No. 10 and the so-called Lamb's Quarters (Chenopodium); Dock is applied to Burdock and true Dock (Rumex); Wild Tares are frequently called Wild Peas.

It is pleasing to notice that Chess is reported as a species of plant, and not a modified or deteriorated wheat plant.

Bulletin XLVI, or Report O. A. C., 1889, and Bulletins LXXXV and XCI, or Report O. A. C., 1893, will be found of service in the study of weeds.

FUNGI. Among the mildews, rusts, etc., we find reference is made to 24, and of these only the following are referred to by ten or more observers:

Rust (Puccinia graminis)	36
Loose Smut (Ustilago Carbo)	18
Rust (Tilletia Cariss)	16
Smut (corn) (Ustilago Maydis)	20
Potato Blight (Phytophthora infestans ?)	30
Black Knot (Plowrightia morbosa)	25
"Spot" on Apple (Fusciladium Dendriticum)	23
Grape Mildew (Peronospora Viticola ?)	13
Pear Blight (Entomorporium maculatum ?)	12
Pear Mildew (Perono spora Viciæ)	10

The reports upon injurious fungi are not as definite as desired, owing no doubt to the fact that most observers consider some of these plants as the same species. For example, loose smut and smut are entirely different types of smut; the former readily seen as black mosses; the latter concealed in the kernels, which are known as *smut balls*. We find the same difficulty arising in speaking of potato blight, of which there are at least three types. Some use the term blight or rot for all the kinds. Three types of fungoid pests affect the grapes under the name mildews by some. Observers should as far as possible give the particular type in each case. We have no doubt that ere long, as a knowledge of these obscure forms of plant life becomes more general, the indefiniteness referred to will be a thing of the past. Rust and smut seem to have been quite common, the former likely owing to climatic conditions when it appeared; the latter may have been from sowing smutty seed. It is to be regretted that so much black knot can still be seen and allowed to remain on the trees as centre of distribution. We would refer observers to consult the following bulletins and reports for information upon rust, smut, etc.:

Bulletin II, or O. A. C. Report, 1886, Potato Rot; Bulletin XXXVI, or Report O. A. C., 1888, Rust.

Bulletin LII, or O. A. C. Report, 1890, Black Knot; Bulletin LVI, Report 1890, Smut.

INSECTS. Fifty species are referred to, the most common being:

Potato Bug (Doryphora Decem-lineata)	39
Grasshopper (Melanoplus femur-rubrum)	31
Cabbage Worm (Pieris ropae)	27
Codling Moth (Carpocapsa pomonella)	24
Tent-Caterpillar (Clisiocampa Americana)	21
Turnip Fly (Phyllotreta vittata)	20
Curculio (Conotrachelus nenuphæ)	18
Currant-worm (Nematus ventricosus)	18
Cutworms (Agrotis)	17
Wireworms (Agriotes mancus)	16
Apple Borer (Saperda candida)	12
Clover Midge (Cecidomyia Leguminicola)	11
Pea Bug (Bruchus pisi)	10

From the replies it is readily seen that two insects not usually common, appeared in many places, viz.: grasshoppers and aphis upon turnips, rape and cabbages. One observer refers to the larva of a moth (Drasteria erechtea) affecting the clover. A correspondent refers to a "new pest" preying upon forest trees, but gives no description of it. The increased distribution of the horn-fly (Haematobia serrata) is quite marked; replies referring to it have been received from Bruce, Perth, Oxford, Middlesex, Ontario, Prince Edward, Simcoe, Carleton. The tent-caterpillar (Clisiocampa Americana) seems to have become common again. We have found some difficulty in determining the exact species in this case; but as some referred to the species mentioned, we were inclined to think that it was the one generally observed. Reference to Bulletin LXXXVII, or O. A. C., Report, 1893, will give information as to the best way to get rid of many, if not all, of these pests.

The committee thank the observers for the trouble taken in assisting them to inaugurate their new work, and hope they will as readily aid in the work as long as it continues. In further work we would recommend correspondents to mention any new weeds, blights and insects that have appeared in their districts as well as the most injurious forms. The Professor of Natural History at the College will always be pleased to assist in determining species of plants or animals referred to him, and will consider it a favor to have such sent him at any time. We have no doubt that if this committee be continued from year to year, it will develop many accurate observers, who will have a definite knowledge of the subjects concerning which information is sought.

Committee: H. L. HUTT, J. HOYES PANTON, JAS. ATKINSON.

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