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ONTARIO AGRICULTURAL COLLEGE, GUELPH.

SIXTH ANNUAL REPORT

OF THE

ONTARIO

AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM,

FOR THE YEAR ENDING 31st DECEMBER,

1880.

Printed by order of the Legislative Assembly.

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REPORT OF THE PRESIDENT

OF THE

ONTARIO AGRICULTURAL COLLEGE,

GUELPH,

FOR THE

YEAR COMMENCING 1ST JANUARY AND ENDING 31ST DECEMBER,

1880.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, 31st December, 1880.

To the Honourable S. C. Wood,
Commissioner of Agriculture for the Province of Ontario.

SIR,—I have the honour to submit for your consideration a brief report on the work done in the Ontario Agricultural College during the year 1880, which is the Sixth Annual Report of the institution.

On the 11th February last the Legislature of the Province finally decided to give the College a legal status in the country by passing the following Act, which defines somewhat minutely the objects and scope of what is henceforth to be known as the "Ontario Agricultural College and Experimental Farm":—

No. 60.] BILL. [1880.

AN ACT RESPECTING THE AGRICULTURAL COLLEGE.

HER Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

1. The School of Agriculture, heretofore established in the county of Wellington, in this Province, for instruction in the theory and practice of agriculture, horticulture and arboriculture, and the conducting of experiments relating thereto, is hereby continued, at its present site, under the name of the "Ontario Agricultural College and Experimental Farm." School of Agriculture continued. Site. Name.

Nature of instruction.

2. The said college shall be furnished with all appliances, such as land buildings, implements, tools and apparatus generally, as may be necessary for theoretical and practical education in agriculture, horticulture and arboriculture, and the course of instruction therein shall be with reference to the following subjects :—

(1) The theory and practice of agriculture ;

(2) The theory and practice of horticulture ;

(3) The theory and practice of arboriculture ;

(4) The elements of the various sciences, especially chemistry, (theoretical and practical), applicable to agriculture and horticulture ;

(5) The technical English and mathematical branches requisite for an intelligent and successful performance of the business of agriculture and horticulture ;

(6) The anatomy, physiology, and pathology, of the ordinary farm animals ; with the characteristics of the different varieties of each kind ; with the management thereof in the breeding, raising, fattening, and marketing of each, and with a knowledge of the cheese and butter factory systems ;

(7) The principles of construction and skilful use of the different varieties of buildings, fences, drainage systems, and other permanent improvements, machinery, implements, tools and appliances necessary in agricultural and horticultural pursuits ;

(8) And such other subjects as will promote a knowledge of the theory and practice of agriculture, horticulture and arboriculture.

Practical education insisted upon.

3. The education and instruction shall be at once theoretical and practical, the former known as a course of study and the latter as a course of apprenticeship ; and a time, not less than three and not more than five hours daily, on a yearly average, shall be spent in undergoing the latter, and for the encouragement of such labours, an allowance in part liquidation of expenses may be made ; yet, notwithstanding, the course of apprenticeship may be dispensed with, if a satisfactory examination be previously passed in all the operations therein required.

Nature of experiments.

4. Experiments with the different varieties of cereals, grasses, and roots ; of trees, plants, shrubs, flowers, and fruits ; with different modes of cultivation ; with different manures ; with the breeding, raising, and fattening of animals ; with the products of the dairy ; and with whatsoever else may be of practical benefit in adding to the knowledge of the facts, principles and laws of the science and art of agriculture, horticulture, and arboriculture under the climatic conditions of this Province, shall be carried out on the experimental farm ; and the modes of procedure and results published from time to time.

Publication of procedure and results.

Rules, regulations and curriculum of the College.

5. The government of the college shall be under and according to such rules and regulations as the Lieutenant-Governor in Council may from time to time prescribe ; and such rules and regulations shall contain provisions for the standard and mode of admission, the course of study, and apprenticeship in each branch in which instruction is given, and may authorize diplomas, certificates of proficiency, scholarships, or other rewards to be given, after examination, in any of such subjects ; and may also impose reasonable fees for attendance.

Appointments to be made by the Lieutenant-Governor in Council.

6. The Lieutenant-Governor in Council may from time to time appoint a president and such professors, instructors, officers, assistants, and servants as the Lieutenant-Governor in Council may deem necessary for the efficient working of said college, and the promotion of its usefulness, and may pass by-laws regulating and prescribing their respective duties.

Sessions, terms and vacations.

7. There shall be two sessions in each year, and two terms in each session; the winter session shall open on the first day of October, and close on the thirty-first day of March; the summer session shall open on the sixteenth day of April, and close on the thirty-first day of August; and the time between the closing and opening of the respective sessions shall constitute the regular vacations.

Affiliation of the College with the University of Toronto.

8. The Lieutenant-Governor in Council may agree with the University of Toronto for the affiliation of the said College with the said University, but only to the extent of enabling the students of the said college to obtain at the examinations of the said university such rewards, honours, standing, scholarships, diplomas and degrees in agriculture as the said university, under its statutes and the Acts of the Legislature in that behalf, may be allowed to confer.

Museum and Laboratory.

9. In connection with the college there shall be a museum of agriculture and horticulture, together with the scientific and technical branches relating thereto, in order to afford aids to practical instruction, and illustrations of the agricultural and horticultural products of the Province; as well as a botanical and chemical laboratory to which vendors of seeds and artificial manures may send such seeds and manures, in order that after the proper inspection and tests their purity and strength may be reported for the benefit and protection of the agricultural community.

Gifts, bequests, &c., to College, Museum or Laboratory.

10. It shall be lawful for the Lieutenant-Governor in Council on behalf of the Province to accept, hold and enjoy any gifts, bequests, or devises of personal or real property or effects which any person may think fit to make for the purposes of the said college, museum or laboratory.

No religious test or profession required; but all facilities given for acquiring religious training.

11. The Lieutenant-Governor in Council may make such regulations as may be deemed expedient touching the conduct of the students, and their attendance on public worship in their respective churches or other places of religious worship, and respecting their religious instruction by their respective ministers, according to their respective forms of religious faith, and every facility shall be afforded for such purposes.

Reports and returns to the Legislative Assembly.

12. Full reports of the progress of the said college and farm shall be annually returned and submitted to the Legislative Assembly, which reports shall, amongst other things, contain:—

(1) A tabular statement with the name and residence of each student attending in each session of the year, together with the name, residence and occupation of the parent or guardian, the number of classes that each student attended, and his progress and efficiency therein;

(2) A return of the professors, instructors and assistants, with a summary of the instruction given by each;

(3) A copy of the examination papers used in the sessional examinations, and the results thereof;

(4) A summary of the operations in the various departments of the farm;

(5) A clear and succinct account of the modes of procedure and results of the various experiments carried on during the year;

(6) A detailed statement of the income and expenditure of the college and farm for the year;

(7) A copy of all rules and regulations made during the year by the Lieutenant-Governor in Council, regarding the standard and mode of admission, the course of study and the course of apprenticeship;

(8) A comparative statement showing the progress of the college and farm from year to year.

In pursuance of the objects stated in the Bill, the work has been carried on conjointly by the Farm Superintendent and myself, each of us being the independent manager of certain departments. The outside departments are—

I. The Farm Department.
II. The Live Stock Department.
III. The Horticultural Department.
IV. The Mechanical Department.
V. The Experimental Department.

These are entirely under the control of the Farm Superintendent, and for a full account of the year's operations in each, I have pleasure in referring to Mr. Brown's exhaustive Report in the second part of this volume. The inside departments comprise—

I. The Course of Instruction in the College.
II. The Boarding House and College Buildings.
III. The Business Department.

For all these I am directly responsible, and having had full charge of them during the past year, I shall now proceed to report briefly under each head.

I. The Course of Instruction in the College.

The regular course of study is one of two years, and embraces the following subjects:

First Year.—*Agriculture, Live Stock, Inorganic Chemistry, Organic Chemistry, Veterinary Anatomy, Veterinary Materia Medica, Zoology, Structural and Physiological Botany, Geology and Physical Geography, English, Book-Keeping, Arithmetic, and Mensuration.*

Second Year.—*Agriculture, Live Stock, Agricultural Chemistry, Veterinary Pathology, Veterinary Surgery and Practice, Systematic and Economic Botany, Entomology, Meteorology, English Literature, Political Economy, Book-Keeping, Mechanics, Levelling and Surveying.*

During the past year, these subjects were taught by a staff of five lecturers, as follows:—

1. *James Mills, M.A., President.*
   (1) English.
   (2) Political Economy.
   (3) Structural and Physiological Botany.
   (4) Zoology.
2. *William Brown, Esq., Gold Medallist of the Highland and Agricultural Society of Scotland.*
   (1) Agriculture.
   (2) Live Stock.
3. *J. Hoyes Panton, M.A.*
   (1) Chemistry—Inorganic, Organic, and Agricultural.
   (2) Geology, Physical Geography, and Meteorology.
   (3) Systematic and Economic Botany.
   (4) Entomology.
4. *E. A. A. Grange, V.S.*—Veterinary Anatomy, Pathology, and Materia Medica, with the Practical Handling and Judging of Horses.
5. *Alexander McTavish—1st Class Provincial Certificate.*
   (1) Arithmetic, Mensuration, Mechanics, Levelling, and Surveying.
   (2) Book-Keeping.

The scholastic year, which begins on 1st October, is divided into two sessions, and each session into two terms:

SESSIONS.

Winter Session (1st October to 31st March).
Summer Session (16th April to 31st August).

TERMS.

Fall Term (1st October to 22nd December).
Winter Term (5th Jan. to 31st March).
Spring Term (16th April to 30th June).
Summer Term (1st July to 31st August).

Lectures commenced on the 1st October and continued throughout the first three terms—from the 1st October to the 30th June. During that time all regular students were engaged in class-room work and manual labour alternately—three hours a day having been spent at the former and from four to five at the latter. To this were added five hours in two weeks for set-up drill and gymnastics under the very efficient drill sergeant of the Wellington Field Battery. So that the daily routine of every student in the Regular Course was—

Lectures, three hours a day (excepting Saturday),
Manual labour, four to five hours a day,
Study under a master, two hours a day,
Drill, one hour a day (for five days of every alternate week),

making from nine to ten hours a day, for nine months of the year, devoted to college and farm work. While the first year students were attending lectures in the College, the second year students were engaged outside. Those that went out to work in the forenoon, came in for lectures in the afternoon, and *vice versa*. Thus the theoretical work inside and the practical work outside went on simultaneously during the fall, winter, and spring terms.

In order to place systematically and clearly before the readers of this report a correct outline of the literary work done in the institution, I have drawn up the following syllabus of the lectures delivered by the professors in the several departments and sub-departments during the scholastic year commencing on the 1st October, 1879, and ending the 31st August, 1880. The work of each term is given separately, and also that of the first and the second year students. The summer term, which is the last in the year, being devoted entirely to work in the outside departments, is omitted from this syllabus, but will be treated of further on.

OUTLINE OF CLASS-ROOM WORK.

(*1st October to 30th June.*)

FIRST YEAR.

FALL TERM—1ST OCTOBER TO 22ND DECEMBER.

Department 1.—Agriculture.

Introductory.—Ancient and modern agriculture; agricultural literature; arts and sciences affecting agriculture; different kinds of farming.

Reclamation of Land.—Clearing, stumping, stoning, fallowing, etc.

Soils.—Origin and distribution of soil; natural conditions of soil and plant; examination and classification of soils; physical and chemical properties of each kind.

Rotation in Cropping.—Importance and necessity of rotation; principles underlying it; rotations suitable to different kinds of soil; examination and criticism of different systems of rotation.

Buildings.—Location of house, barn and stables; framing a building; stables for horses, sheep and cattle; arrangement of farm buildings.

Implements and Machinery.—Principles in construction of implements and machinery; points to be aimed at; classification, examination, and description of the same.

Miscellaneous.—Roads, lanes, fences, wells, etc.

Department 2.—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, pyrometers, specific and latent heat; sources, nature, and laws of light; spectrum analysis.

Inorganic Chemistry.—Scope of subject; elementary and compound substances; chemical affinity; symbols; nomenclature; combining proportions by weight and by volume; atomic theory; atomicity of the most important elements; 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; carbon; combustion; carbonic acid and its relation to the animal and the vegetable kingdom; sulphur and its compounds; manufacture and uses of sulphuric acid; phosphorus; phosphoric acid and its importance in agriculture; chlorine—its bleaching properties; bromine; iodine; silicon, etc.

Natural History.—Nature of life; vital force; difference between animals and plants; morphology and physiology; homology and analogy; definition of species; classification; subdivisions of the animal kingdom; characters of the classes and most important orders of *Invertebrates*; general characters of *Vertebrates*; classes and orders, with a brief description of each.

Department 3.—Veterinary Science.

Anatomy and Physiology of the horse, ox, sheep and pig; osseous system, muscular system, syndesmology, plantar system, and odontology.

Department 4.—English.

Lectures on Composition.—The sentence, the paragraph, and the period; capitals and punctuation; style—its qualities and varieties. *Exercises in Composition.*

English Classics.—Committing to memory, and critical study of "Gray's Elegy in a Country Church Yard."

Department 5.—Mathematics.

Arithmetic.—Review of subject, with special reference to farm accounts; tables of weights and measures discussed; compound proportion, interest, discount, stocks and partnership.

Mental Arithmetic.—Calculations in simple rules, fractions, and compound rules.

First Year.

Winter Term—5th January to 31st March.

Department 1.—Agriculture.

Breeding, rearing, and feeding of animals. Points to be considered in deciding what kind of animals to keep.

Horses.—Different breeds of horses, and leading characteristics of each; type of horse required for farm work; breeding, feeding, and general management.

Cattle.—History and characteristics of Shorthorns, Herefords, Polled Angus, Ayrshires, Jerseys, Devons, Galloways, etc.; grade cattle; milch cows—points of a good milch cow; breeding generally, cross-breeding, in-and-in breeding; pedigree.

Sheep.—Breeds of sheep generally considered; long-wooled sheep; medium wooled sheep; short-wooled sheep; crosses between different breeds compared; texture, quality, quantity, and uses of different kinds of wool.

Swine.—Characteristics of various breeds; management of sows; stores; bacon curing, etc.

Department 2.—Science.

Inorganic Chemistry.—Subject continued from Fall Term.

Organic Chemistry.—Constitution 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.

Natural History.—Subject continued—Special study of *Infusoria*, *Scolecida* and *Insecta*. General characters of the *Vertebrates*—the various orders, with morphological and physiological distinctions of each, illustrated by common examples. Special study of the families of the *Aves* containing the insectivorous birds, and the families of the *Mammalia* containing the farm animals.

Department 3.—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.

Department 4.—English.

Lectures on Composition continued.—Common mistakes in speaking and writing discussed and corrected; most important figures of speech defined and illustrated.

Exercises in Composition continued.—Exercises in synthesis; abstracts of speeches and essays; letter writing.

English Classics.—Committing to memory and critical study of Goldsmith's "Traveller."

Department 5.—Mathematics and Book-keeping.

Arithmetic.—Equation of payments; percentage; profit and loss; stocks; partnership; alligation; exchange.

Book-Keeping—Business forms and correspondence; general farm accounts; dairy, field, and garden accounts.

First Year.

Spring Term.—16th April to 30th June.

Department 1.—Agriculture.

Preparation of Soil—Modes of preparation for different crops, as wheat, barley, oats, rye, peas, maize; modes suited to various kinds of soil.

Seeds and Sowing.—Testing the quality of seed; changing seed; quantity of seed per acre; methods of sowing.

Improvement of Lands.—Ordinary cultivation; subsoiling in some cases; fallowing; draining; manuring. Farm yard manure, and management of the same; the properties, application and uses of artificial manures—lime, plaster, salt, bone-dust, superphosphates, etc.

Roots.—Cultivation of roots and tubers—turnips, mangolds, carrots, potatoes; effects of each kind on soil.

Green Fodders.—Tares, lucerne, sainfoin, prickly comfrey, clovers, grasses; the cultivation and management most appropriate for each.

Management of pastures; harvesting and preparing crops for market or one's own use; crops of current year examined.

Department 2.—Science.

Geology.—Connection between geology and agriculture; classification of rocks—their origin and mode of formation, changes which they have undergone after deposition; fossils—their origin, inferences from their presence in rocks; geological periods and the characteristics of each. Geology of Canada, with special reference to the nature and economic value of the rock deposits; glacial period and its influence in the formation of soil. Lectures illustrated by numerous diagrams and specimens.

Physical Geography.—Scope of the subject—earth's place in space, external and internal conditions, atmosphere, ocean, land; superficial configuration of Ontario; theory of springs; classification of lakes; zones of animal and vegetable life.

Botany.—Structural and physiological botany; internal structure of plants—cells and vessels; structure and development of the external parts of plants—root, stem, leaf, flower, seed, fruit; physiology of cells and vessels—chlorophyll, starch, gum, sugar, crystals, etc.; movements of fluids in plants, respiration, nutrition, reproduction; hybridization; modes of propagation; propagation of *varieties* by grafting, budding, layering, and division; diseases of plants—smut, rust, mildew, etc.

Department 3.—Veterinary Science.

Materia Medica.—The preparation, doses, action, and uses of about one hundred of the principal medicines used in veterinary practice.

Department 4.—English.

Lectures on the subject, and class-room exercises in business correspondence, etc.

English Classics.—Committing to memory and critical study of Scott's "Lady of the Lake."

Department 5.—Mathematics.

Mensuration.—Mensuration of surfaces—the square, rectangle, triangle, trapezoid, regular polygon, circle, sector, segment, etc. Special application to the measurement of lumber. Mensuration of solids—tetrahedron, cube, prism, cylinder, spherical segment, spherical zone, parabolid, frustum of parabolid, spheroid, circular segment of spheroid, etc. Special application to the measurement of timber, earth, etc.

Second Year.

Fall Term—1st October to 22nd December.

Department 1.—Agriculture.

Experimental Plots.—The results of last season's experiments with wheat, oats, barley, pease, grasses, clovers, roots, etc.; liability to disease; effects of various manures on different crops; growth of plants, etc.

Farm Management.—Detailed account of the treatment of each field; results from different kinds of seed and soil; effects of manure; harvesting, storing, and threshing of crops; fall ploughing; subsoiling, etc.

Stock-Feeding—Value of feeding materials; estimate for winter keep of live stock; housing, feeding, and fattening; points to be observed in selecting animals for fattening; feeding experiments; common diseases of animals; management of animals on pasture; value of green fodder. Dairy management and cheese-making.

Department 2.—Science.

Agricultural Chemistry.—Connection between chemistry and agriculture; the various compounds which enter into the composition 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; composition of different plants in relation to the soils upon which they grow; rotation of crops; preservation, development, and renovation of soils; manures classified, the chemical action of manures on different soils; chemical theories in reference to the action of superphosphates; the action of lime in the decomposition of double silicates; feeding of animals; classification of foods; chemical results in the use of different foods; points necessary to be considered in order to obtain the full value of artificial and natural foods.

Meteorology.—Relation of Meteorology to Agriculture; composition and movements of the atmosphere; nature and manipulation of the barometer, its importance in forecasting the weather; temperature, description of the various instruments used in its measurement and how to use them; solar and terrestrial radiation; the influence of forests on climate; mists, fogs, clouds, rain, hail, and snow; description of instruments used in measuring rain and snow fall; velocity and direction of wind; causes affecting climate; influence of climate on vegetation.

Department 3.—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 bog-spavin, curb, and, other diseases of the joints.

Plantar System—Nature, causes, symptoms, and treatment of corns, sand-crack, founder, and other diseases of the foot.

Odontology—Diseases of the teeth and treatment of the same.

Department 4.—English.

Lectures.—Etymological, syntactical, and rhetorical forms of the English language; history of its formation, its connection with other languages; rhetorical figures; their use and abuse; prose and poetic diction.

Composition.—Essay writing; familiar and business correspondence.

English Classics.—Critical study of Shakespeare's "Julius Cæsar."

Department 5.—Mathematics.

Statics.—The mechanical powers; friction; the steam engine; strength of materials; units of work; etc.

Drainage.—General principles; discharging water-ways; how, where, and when to commence draining; depth of drains and distance apart; furrow drains; draining followed by other improvements; drainage implements; levelling.

SECOND YEAR.

WINTER TERM.—5TH JANUARY TO 31ST MARCH.

Department 1.—Agriculture.

Laws affecting agriculture; capital required in farming; laying out of farm; general management and economy; measuring, levelling and draining; permanent pastures; inventory and valuation; cost of production; buying, selling, and marketing; field experiments.

Management of cattle, sheep and other animals in winter; breeding generally considered; special management of ewes before, during, and after the season of lambing; treatment of other animals in parturition; rearing of lambs, calves, and pigs; washing and dipping sheep, etc., etc.,

Arboriculture.—Planting and attendance of forest trees, shade trees, etc.

Department 2.—Science.

Agricultural Chemistry.—Subject continued from Fall Term.

Entomoloy.—Anatomy of insects; geographical distribution and classification of insects; metomorphosis of insects; insects injurious to vegetation, their habits and the best methods of checking and preventing their ravages—all illustrated by a good collection of specimens.

Department 3.—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.

Circulatory system—description of the diseases of the heart and blood vessels.

Respiratory system—nature, causes, symptoms, and treatment of catarrh, nasal-gleet, roaring, bronchitis; pleurisy, inflammation of the lungs, etc.

Urinary system—nature, causes, symptoms, and treatment of inflammation of the kidneys, etc.

Nervous system—nature, causes, symptoms, and treatment of lock-jaw, string-halt, etc.

Sensitive system—nature, causes, symptoms, and treatment of the diseases of the eye and ear.

Generative system—nature, causes, symptoms, and treatment of abortion, milk-fever, etc.

Tegumental system—nature, causes, symptoms, and treatment of scratches, sallenders, mallenders, parasites, and other diseases of the skin.

Department 4.—English and Political Economy.

Lectures.—Lectures on accuracy, purity, propriety, clearness, precision, strength, and grace; varieties of style described; false syntax discussed and corrected.

Composition.—Exercises in impromptu composition and letter writing continued.

English Classics—The critical study of Shakspeare's "Hamlet,"

Political Economy.—Utility; production of wealth—land, labour, capital; division of labour; distribution of wealth; wages; trades-unions; co-operation; money; credit, credit cycles; functions of government; taxation; etc.

Department 5.—Mathematics.

Dynamics.—Motion, forces producing motion, momentum, etc.
Hydrostatics.—Transmission of pressure; the hydraulic press; specific gravity, density; pumps, siphons, etc.
Road-Making.

SECOND YEAR.

SPRING TERM.—16TH APRIL TO 30TH JUNE.

Department 1.—Agriculture.

Review of all past lectures with special drill on outside work. Reasons for management, etc.

Department 2.—Science.

Systematic and Economic Botany.—Subject defined; principles considered in the classification of plants—plants classified; orders containing the plants of greatest importance to the agriculturist described; plants classified in regard to their economic value for food, medicine, fabrics, forage, timber, etc. The course illustrated by a large collection of well preserved plants.
Practical and Analytical Chemistry.—Chemical manipulation, preparation of common gases and reagents; operations in 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.
Quantitative analysis of soils, manures, and farm produce.

Department 3.—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.

Department 4.—English.

Lectures.—Taste, characteristics of taste, standard of taste; pleasures of the imagination—their sources, viz., the novel, the wonderful, the picturesque, the sublime, the beautiful; wit, humour, ridicule, etc.
Composition.—Business forms and correspondence; general letter-writing, etc.
English Classics.—The critical study of Milton's "L'Allegro" and "Il Penseroso."

Department 5.—Mathematics and Book-keeping.

Surveying.—Fields surveyed with chain and cross-staff; heights and distances found by the theodolite.

Book-Keeping.—Review of previous work; laws relating to farming—deeds, mortgages, notes, etc., with laws relating thereto.

The College Roll, which will be found in Appendix C, gives the names and post-office address of all students who have been in attendance during the year—176 in number—some from Quebec and Nova Scotia, and others from Britain; but the great majority from Ontario. Now, as applicants from Ontario have at different times been refused for want of accommodation, the question is asked why any from abroad have been admitted. This I consider a very reasonable question; and hence I shall explain the why and the wherefore. When applications from Ontario are sent in, I answer them at once, accepting such as are prepared to comply with the terms of admission as laid down in the circular, a copy of which will be found in the first appendix to this report. As regards applications from other provinces or countries, a different course is pursued. They are generally placed on file, and the question of acceptance or refusal postponed till within a few weeks of the entrance examination. If at that time the applicants from Ontario are not sufficient to fill all vacancies, I admit some from abroad, selecting as far as possible those who intend to buy land and settle here. Thus you see our own people always, and in my opinion very properly, get the preference. Vacancies are kept for them till the time arrives when non-residents must have a definite answer—yes, or no. If after that—within a few days of the entrance examination, or when it is over—some apply for admission and find all vacancies filled, I think they should not complain.

I may be wrong, but the following reasons seem to me to justify the course pursued:—

1st. It is generally admitted that if a new country would grow and develop its resources rapidly, it must encourage immigration, and even spend a portion of the public funds in order to secure it.

2nd. The Dominion of Canada, and nearly every province in the Dominion, recognizing this fact, has spent, and is still spending large sums of money to induce emigrants from Europe to come and settle here.

3rd. The eyes of Europe are now turned towards this country, and many young men of good standing with moderate means in England, Ireland, Scotland and Wales are disposed to purchase land and settle among us; but before doing so they wish to acquire some knowledge of Canadian farming and the manners and customs of the Canadian people. Hence they apply for admission to the Ontario Agricultural College.

Now, if these propositions are true, and if such young men are a valuable acquisition to our country, I maintain, that in admitting a few of them from time to time, we have in no way injured, but rather benefited the Province of Ontario, especially since according to present regulations they pay cost price for their board and washing, and a fee of $50 a year for tuition.

From the following list it will be seen that the Ontario students are from all parts of the Province. Thirty-one counties and five cities are represented. Of the counties Wellington has the largest number, and Oxford next, while Ottawa has more than any other city, having no less than fifteen representatives. Some, no doubt, will view this as not altogether satisfactory, because they have serious doubts about city boys ever settling down to the life of a Canadian farmer; but to all such I am bound to say that we have no more faithful students than many of the young men from our cities. Their whole work inside and outside shows that they intend to be practical farmers—men who know how both to rule and to be ruled, to work and to superintend.

Counties, &c.	*Students.*	*Counties, &c.*	*Students.*
Bruce	2	Northumberland	1
Brant	4	Ottawa City	15
Carleton	1	Ontario	2
Durham	1	Oxford	11
Elgin	1	Prince Edward	4
Frontenac	3	Prescott	1
Glengarry	2	Perth	6
Grey	5	Peel	2
Hamilton City	5	Peterboro'	1
Halton	4	Renfrew	1
Huron	7	Simcoe	2
Haldimand	2	Toronto City	8
Kingston	1	Victoria	2
Lanark	8	Waterloo	4
Lincoln	3	Wellington	17
London City	1	Welland	1
Middlesex	1	Wentworth	3
Norfolk	3	York	7

Total number in attendance during 1880 176
Number of Ontario counties represented 31

To this may be added a statement showing the extent to which the different religious denominations of the Province, are availing themselves of the advantages offered by the institution.

RELIGIOUS DENOMINATIONS.

Episcopalian	60
Presbyterian	55
Canada Methodist	31
Canada Baptist	7
Congregationalist	7
Roman Catholic	6
Primitive Methodist	4
Plymouth Brethren	3
Quaker	2
Lutheran	1
Total	176

Having spoken briefly of the year's operations as a whole, I shall now take the liberty of asking your attention for a short time to the work of each term separately. As already stated, the scholastic year began on the 1st October, 1879, and ended on the 31st August, 1880; but the financial year, on which I have to report, began on 1st January and ends to-day, the 31st December, 1880. Owing to this fact, it is difficult to make our reports intelligible to ordinary readers. The following will, perhaps, illustrate what I mean:—

Scholastic Year— Fall Term (1879)
Winter Term (1880) } *Financial Year.*
Spring Term " }
Summer Term " }
Fall Term " }

From this it can be seen that the financial year embraces the last three terms of one scholastic year and the first term of another. Hence the confusion which arises in the minds of some.

The Fall Term of 1879—the first of the scholastic year, was treated of in last year's report. I shall, therefore, commence with the second term, viz.:

THE WINTER TERM.

5TH JANUARY TO 31ST MARCH, 1880.

The students in attendance were those who had entered at the commencement of the Fall Term in October, 1879, or previous to that date—92 in number; and the work was to some extent a continuation of the subjects begun at that time. The first year students received 180 lectures of one hour each on the subjects prescribed for the term—38 on Agriculture and Live Stock, 44 on Organic and Inorganic Chemistry, 22 on Veterinary Anatomy, 24 on English Literature and Composition, 22 on Natural History, 24 on Arithmetic, and 11 on Book-Keeping. At the same time the second year students had a course of 156 lectures and spent 22 hours in handling and judging cattle, sheep, and horses, under the supervision of a professor. The lectures were—20 on Agriculture and Live Stock, 4 on Arboriculture, 33 on Agricultural Chemistry, 22 on Veterinary Pathology, 11 on Entomology, 22 on English Literature, 22 on Political Economy, and 22 on Statics and Drainage. In reference to the "Course of Apprenticeship" in practical work, I may say that the students were sent in rotation to the different departments, *i.e.*, to the Farm, the Live Stock, the Garden, the Carpenter-shop, and the Experimental Department, so that it was in the power of every one to get a fair knowledge of all that is to be learned in each department. During the Winter Term it is always more difficult than at any other time in the year to find enough outside work of a kind suitable for the purposes of instruction; but to meet the difficulty, as much prominence as possible was given to the Mechanical and Live Stock Departments.

LIVE STOCK.

In this department, three hours a week were devoted to the study of cattle, sheep, and pigs. First, the students were taught to point out and name the different parts of an animal, such, for example, as the brisket, crops, loins, flank, hooks, and twist; and for this purpose, a cow or steer was brought into the class-room at almost every lecture, so that each student saw the animal handled and described by the lecturer, and afterwards had the opportunity of handling it himself in presence of his fellow students. The lecturer then proceeded to explain and illustrate what are considered the good points of an animal for beef and for milk, comparing and contrasting Shorthorns, Herefords, Aberdeen Polls, Galloways, Devons, and Ayrshires—breed with breed, in regard to shape of frame, quality, beefing, milking, and other properties. Thus the instruction was made in the strictest sense definite and practical. Much the same course was pursued with the different breeds of sheep—Cotswalds, Leicesters, Southdowns, Oxford Downs, and Shropshire Downs. They were frequently compared with one another as regards carcass, constitution, wool, mutton, feeding, hardiness, etc. Considerable attention was also paid to the feeding, cleaning, and general management of stock in the winter season. In this way the College furnishes a good opportunity for acquiring a thorough knowledge of this very important department.

THE MECHANICAL DEPARTMENT.

Under this head nothing very ambitious has yet been attempted. As you are aware, we have quite a plain shop, with three or four work-benches and an outfit of such tools as are required for repairing and general carpenter-work. Students are sent regularly to this department as to all the others. They are at first taught the use of the different tools, and afterwards employed in doing a variety of work such as is constantly needed on a farm—making gates, waggon tongues, whipple-trees, etc., and repairing a countless number of things about the College and farm buildings. Such is the regular rou-

tine of the department, and last winter was no exception to the general rule. In the department of

Natural Science

considerable progress was made, but the results would have been better and much more satisfactory to all concerned, if the institution had been provided with a good laboratory and apparatus suitable for making the experiments which constitute so large a part of the instruction in this important department. The Professor of Chemistry did all that any chemist could do, but he was much hindered by the utter insufficiency of our eight by twelve laboratory and its scanty equipment. The first year students, after completing the Inorganic Chemistry which they had studied throughout the Fall Term, took up the somewhat difficult but interesting subject of Organic Chemistry. A full course of lectures was delivered, embracing all the important organic compounds; but special attention was paid to the nature and sources of sugar, starch, oils, fats, the albuminoids or flesh-formers, and other substances which have a more or less direct bearing on agriculture and stock-raising. At the same time they received lectures from another professor on Zoology, the object of which was to give them a general view of the whole animal kingdom, and thus make them more intelligent and appreciative students of particular parts of that kingdom under the heads of Entomology and Veterinary Science. While the students of the first year were thus employed, those of the second year were attending lectures on Agricultural Chemistry and Entomology. During the previous term they had learned the close connection between Chemistry and Agriculture, and with this knowledge they now proceeded to study the nature and sources of plant food, the origin and properties of the different kinds of soil, their preservation and renovation, the causes of unproductiveness, artificial fertilizers and farm-yard manure, the chemical composition of various fodders, and the nutritive value of each. With such subjects as these, they were occupied three hours a week, and spent one hour a week in examining specimens of the various insects which infest our crops and fruits, and in studying the best known means of preventing their ravages.

Veterinary Science.

As will be seen from the syllabus of lectures given on a previous page, the Winter Term in the Veterinary Department is devoted to the anatomy, physiology, and pathology of what we call the farm animals—the horse, ox, sheep and pig. The lectures to the first year students were on the anatomy and physiology of these animals, and were illustrated by the complete skeleton of a horse and portions of other skeletons. Those delivered to the students of the second year, discussed various diseases and their treatment, especially of the horse; as, spavin, ringbone, curb, founder, inflammation, and such like. Here again, for the purpose of making the instruction as definite and practical as possible, horses were regularly brought into the class-room and examined, first by the professor in presence of the class, and afterwards by some of the students. Thus the Veterinary Surgeon was each day enabled to see whether his lectures were really understood by those to whom they were delivered. This part of the work I am pleased to say, was heartily entered into and much appreciated by the second year men.

English and Political Economy.

The Ontario Agricultural College has never failed to give special prominence to agriculture, live stock, and one or two other branches, which some would call the dollar-and-cent, and hence, the only important subjects in a farmer's education. Notwithstanding the example set by most of the American agricultural institutions, our College has strictly and persistently confined its course of study to those branches which have a somewhat direct bearing on the ordinary duties of the average Canadian farmer. This, I think, is right, and may fairly be urged as one of the reasons for the existence of the institution—a place where any young man who intends to follow farming can get instruction in those subjects which he constantly requires in the discharge of the neces-

sary duties of his occupation, and that, too, without being compelled to spend a large portion of his time in studying foreign languages, or anything else which has only a very remote bearing on his life work. While speaking thus, I am not amongst those who would confine a farmer's education within too narrow limits; and my reason for introducing the matter here is to enter an emphatic protest against the vicious idea which has somewhere been instilled into a number of the young men who come here to study—that even English should be excluded from our programme. Some, when they first arrive, are not only unable to speak or write correct English, but have apparently made up their minds that they will not study it or any other subject, unless you can first prove to them that it will put so many dollars into their pockets within a given time.

We want a broader culture for the farmers of this country—something that will raise them above the level of mere drudges, and fit them for filling respectable and influential positions in the state.

"For just experience tells, in every soil,
That those who think must govern those that toil."

Hence, we insist on their sons devoting a portion of their time to the study of English literature and composition, as well as to the bread-and-butter subjects of the curriculum; and not unfrequently, I am sorry to say, we do so in the face of very marked and provoking indifference. During the winter term of last year all our students wrote letters, essays, and impromptu compositions; and spent two hours a week in the critical study of English classics—the first year men having read Goldsmith's "Traveller," and the second year, Shakespeare's "Julius Cæsar." Towards the end of the term the indifference gave way, and the subject was entered into with considerable interest and profit.

During this term also, the second year students gave considerable attention to the study of Political Economy. I believe there was not one in the class who did not enter into the subject with an earnest desire to learn at least some of the great problems connected with land, labour and capital. Nearly every one entered heartily into the discussion of such questions as the division of labour, protection and free trade, the functions of government, etc.; and the result was that the subject proved to be one of much interest and not a little profit to all concerned.

Mathematics and Book-Keeping.

In this department, the first year students commenced the study of book-keeping on the 5th of January, and continued that of arithmetic from the Fall Term. In the former, the master in charge having devoted special attention to the subject, gave several valuable lectures and a number of important exercises on what may be called farm book-keeping—farm, field, garden and dairy accounts; in the latter, particular stress was laid on the commercial part of the subject, and the solution of such problems as are required in the buisness of the farming community. At the same time, the second year students were engaged in the study of dynamics, hydrostatics, and road-making. The principles learned in hydraulics were applied in studying the construction and working of pumps, siphons, hydraulic rams and presses; and under the head of road making, several matters of importance were discussed, such as road materials, the construction of various kinds of roads, lanes, and walks—macadamized, gravel, plank, etc.; also the relative cost and value of each, under a variety of conditions. In this way the young men were interested in what might appear a very common place subject, and were led to see how our country roads might be much improved, without any additional expenditure, if the principles of grading and drainage were generally understood and acted upon.

Special Course.

During the first three terms of the year, 1st October to 30th June, as already explained, the students in the regular course had lectures and manual labour alternately;

during the last term, embracing the months of July and August, they had nothing but manual labour. There is also a special course for the convenience of farmers' sons who wish to attend lectures during the fall and winter months, and return home about the 1st April, in time for the spring work on their own farms. Such students, doing little or no outside work, are able to take in two terms all the lectures that the regular students get in three terms. The following will, perhaps, show what I mean :—

REGULAR STUDENTS.

Fall Term—1st Oct. to 22nd Dec.
Winter Term—5th Jan. to 31st Mar. } Lectures half-day and work half-day, alternately.
Spring Term—16th April to 30th June.
Summer Term—1st July to 31st Aug.—Work all day on "Experimental Farm."

SPECIAL STUDENTS.

Fall Term—1st October to 22nd December } Lectures six hours a day.
Winter Term—5th January to 31st March
Spring Term—16th April to 30th June } Work at home.
Summer Term—1st July to 31st August

Last fall and winter we had ten young men in this course—five first and five second year men. One half of the day, they took lectures with the regular students of their year; the other half, when the regulars were engaged outside, they (the specials) had lectures by themselves on the work of the Spring Term. Thus, by omitting the practical work, they were enabled, during the fall and winter terms, to take not only the lectures of those terms, but also the lectures of the Spring Term as well. In appendix B, the "Special Time-table" will be found, shewing the lectures delivered to the first and the second year specials on the work of the Spring Term. The "Regular Time-table" in the same appendix, shows the work which they did with the ordinary students in the Fall Term.

EASTER EXAMINATION.

Just before Christmas, 1879, we held a written examination with printed questions on the work of the preceding term, and at Easter on that of the two preceding terms. The latter examination commenced on the 18th March, and continued till the end of the month. The questions set on that occasion will be found in appendix D. I think they are sufficiently close and comprehensive to test the knowledge of the best student, and at the same time give all a fair chance to pass. The answers were carefully valued, and the candidates arranged in three classes according to the percentage of marks taken.

100 per cent. down to 67 per cent..... .....1st class honours.
66 " " " 50 " " .....2nd class honours.
49 " " " 33 " " ....3rd class or passed.
All below 33 " " ..... "plucked."

For the results of the examination, I would refer to the class-lists in appendix E. There, a full record of all the candidates will be found—not only those who passed or obtained honours, but also those who failed. About ten per cent. of the first year and nineteen per cent. of the second, got first-class honours. A small percentage failed.

One feature of this examination was, I believe, entirely new; and owing to its manifest importance I beg leave to call your attention to it more particularly—that is, the *practical* examination in the Department of Live Stock. After the students of the first year had spent eight hours, and those of the second year seven hours, in writing out answers to questions on Agriculture and Live Stock, they were all subjected to an oral examination on cattle and sheep, which lasted for three days. The examination of

the first year students on cattle occupied a day, and that on sheep a day; the second year students, being less numerous, got through both cattle and sheep in one day. Three cattle of different breeds were taken into a room which was provided with fodder and bedding for the purpose. Mr. Brown and myself took charge of the examination. The students were sent in one by one from an adjoining room. Each was allowed a certain number of minutes to handle the animals and answer the questions found in appendix D, under the head of "Practical Examination on Live Stock." When his time was up, he passed out and another took his place. The same course was pursued with the sheep; and though it was fatiguing to both students and examiners, nevertheless all felt satisfied that no other part of the session's work was so well adapted to fit young men for discharging intelligently and promptly the duties of a buyer in a stock-yard, or a judge in a show-ring.

In order that our readers may the more clearly understand the nature of this practical examination, I shall quote the questions from the appendix before referred to—

SESSIONAL EXAMINATIONS—EASTER, 1880.

Practical Examinations in Live Stock.

Examiners: *Wm. Brown, Esq., and James Mills, M.A.*

First Year.

Cattle.

Animals examined:
- Shorthorn Bull
- Ayrshire Cow.
- Shorthorn Grade Cow.

1. Show the weak points of the Shorthorn.
2. What are his best points?
3. What are the indications in this bull of good beefing properties?
4. Judge the Ayrshire cow as a milker.
5. Which of the cows would mate best the bull for beefing purposes, and why?

Sheep.

Animals examined:
- Leicester Ram.
- Cotswold Ram.
- Southdown Ram (1).
- Southdown Ram (2).
- Oxford Down Ram.
- Oxford Down Grade Wether.

1. Distinguish the characteristic points of the Leicester and Cotswold.
2. Which is the best long wooled fleece of the lot as regards density and soundness?
3. Which is the oldest and youngest sheep of the lot?
4. Compare the wether with the Oxford Down, and say wherein they agree or differ as regards carcass and wool.
5. Judge the oldest Southdown by the standard used for the breed.

Second Year.

Cattle.

Animals examined:
- Shorthorn Steer.
- Galloway Steer.
- Grade Cow.

1. Describe the Shorthorn with reference to five most important qualities for fattening purposes.

2. Point out the four greatest defects in the same animal.
3. Handle and describe the weakest point and the best point of the frame of the Galloway for carrying beef.
4. Judge and decide upon the relative merits of the two steers as regards quality and evenness of flesh.
5. Show the five best indications in this cow as a milker.

Sheep.

Animals examined: Leicester Ram. Cotswold Ram. Southdown Ram (1). Southdown Ram (2). Oxford Down Grade Wether.

1. Show wherein one Southdown is superior to the other.
2. Which is the oldest and the youngest sheep of the lot?
3. Judge the Oxford grade wether, and compare him with the Leicester standard of points.
4. Explain the principal points of difference between the frame of the Cotswold and that of the Leicester.
5. Which is the best wooled sheep of the lot, as regards uniformity and lustre?

Closing Exercises.

As a fitting conclusion to the work of the session, a number of friends from Guelph and the surrounding country met at the College to witness the closing exercises. Among others present were James Laidlaw, M.P.P.; Thos. Ballantyne, M.P.P.; and Wm. Johnston, M.A., ex-president of the College. Short addresses were delivered by a number of gentlemen, and the honour certificates presented by others; but the chief feature of the exercises was the presentation of the prizes by the Hon. Oliver Mowat, who did us the honour of coming to Guelph for that purpose, and also, no doubt, to acquaint himself more fully with the working of the College. I need scarcely add that his address to those assembled in the afternoon, and words of counsel to the young men in the evening, were much appreciated by all who heard them. Such visits by members of the Government are undoubtedly a benefit to the institution.

PRIZE LIST.

Ontario Agricultural College.

Easter Examination, March, 1880.

First Year.

Agriculture and Live Stock.—1st, W. Howitt; 2nd, W. Motherwell.
Chemistry and Zoology.—1st, W. Motherwell; 2nd, J. G. Ross.
Geology and Botany.—1st, W. Howitt; 2nd C. S. Dickinson.
Veterinary Anatomy.—1st, R. J. Phin; 2nd W. Motherwell.
Veterinary Materia Medica.—1st, J. G. Ross.
English Literature and Composition.—1st, W. Howitt; 2nd, J. G. Ross.
Arithmetic and Book-Keeping.—1st, W. Motherwell; 2nd, J. G. Ross.
Mensuration.—1st, W. Howitt and J. G. Ross; 3rd, W. Horne.
General Proficiency.—1st, W. Motherwell and W. Howitt; 3rd, J. G. Ross; 4th, R. J. Phin; 5th, W. E. Phin.

SECOND YEAR.

Agriculture and Live Stock.—1st, W. Ash; 2nd, R. F. Holterman; 3rd, H. Joyce.

Agricultural Chemistry, Meteorology, and Geology.—1st, J. L. Webster; 2nd, R. K. Chapman.

Practical Chemistry and Economic Botany.—1st, J. L. Webster; 2nd, R. K. Chapman.

Veterinary Pathology.—1st, W. Ash and A. H. Clutton.

English Literature, Composition, and Political Economy.—1st, J. L. Webster and H. R. Macaulay; 3rd, R. F. Holterman.

Mechanics, Levelling and Surveying, Book-Keeping.—1st, J. L. Webster; 2nd, H. R. Macaulay.

General Proficiency.—1st, J. L. Webster; 2nd, R. F. Holterman and H. R. Macaulay; 4th, J. Lomas.

SPECIAL PRIZE.

Sheep-Shearing.—1st, W. Ash; 2nd, A. H. Clutton; 3rd, M. A. Dawes.

THE SPRING TERM.

16TH APRIL TO 30TH JUNE.

Those in the special course, and generally a few others, leave at Easter. Hence it has been found necessary heretofore, to hold two entrance examinations in the year, one on the first of October and another on the 16th of April. To fill the places of those who left last Easter, sixteen were selected from a large number of applicants. They were examined on the 16th and 17th of April. Lectures commenced on the 18th.

As the spring term affords special opportunities for practice in the outside departments, the class-room work did not receive quite so much attention as during the winter term. Every one had to attend lectures three hours a day as usual; but a little less time was occupied in study than during the winter months. Five hours a day were devoted to practical work outside, a part of which was spent under the instructor, and the balance with the foremen of the several departments. By the instructor, I mean one of our men who spends his whole time in teaching the students how to perform such operations as they require to understand before taking full charge of a farm—harnessing and driving horses, ploughing, sowing, harrowing, rolling, mowing with scythe, driving a mower, and such like. The young men are sent to him in rotation, according to our knowledge of what they require; and while under his instruction they get no wages. Hence they are generally anxious to learn as quickly as possible, so that they may be in a position to claim the promised pay for their work.

While particular prominence was given to practical work outside, the theoretical work inside was by no means neglected. In the department of Agriculture the cultivation of the various crops was taken up; seeds were examined and judged; the different modes of sowing discussed and exemplified; the principles underlying rotation, and the rotations suitable to different soils, climates, and circumstances were explained; also the improvement of land by ordinary cultivation, subsoiling, fallowing, manuring, and laying down to grass. At the same time, under the head of Practical and Analytical Chemistry, the second year men were employed three to four hours a week in the laboratory, examining and testing waters, soils, foods, manures, and samples of farm produce. They now saw the practical value of what they had already learned in inorganic, organic, and agricultural chemistry. They had opportunities for putting their knowledge to a practical test; and hence they entered cheerfully and heartily into the work. So far all right; but the more earnest and anxious the students became, the more Mr. Panton, our Professor of Chemistry, felt himself hampered by the want of accommodation and proper appliances in the little room which has been dignified with the name of "Laboratory." In Systematic and Economic Botany they received lectures on the general classification of plants, and studied more particularly those orders which contain the most important agricultural and economic plants—cereals, grasses, roots, and plants used in the manu-

facture of fabrics, oils, medicines, and other articles of commerce. At the same time the first year students were attending lectures on Geology and Botany. In the former they learned something about the formation, composition, and character of the soils found in the country; in the latter, they studied the plant in relation to the soil and the atmosphere—its form, food, functions, and diseases, giving special attention to hybridization, the different modes of propagation, and such diseases as smut, rust, mildew, etc. The lectures of the class-room were illustrated and applied as far as possible by the garden foreman while the students were at work with him in the hot-houses, gardens, and lawns. In the departments of Veterinary Science, English, and Mathematics, the work was carried on as during the winter term. The first year students had twenty-four lectures on the preparation, action, and doses of about fifty kinds of medicine commonly used in veterinary practice; read critically three cantos of Sir Walter Scott's "Lady of the Lake;" wrote familiar and business letters; began the study of Mensuration; and continued that of Book-keeping from the previous term. During the same time, the second year men took lectures on twenty-five or thirty additional medicines and the therapeutics of the veterinary art; read Shakspeare's "Macbeth," and committed to memory the best passages; gave some attention to farm book-keeping; and went twice a week into the fields with the master in charge to apply what they had previously been taught under the heads of levelling, surveying, and drainage. The term closed with a four days' written examination on the class-room work and a practical examination on various operations in the outside departments.

The time had now arrived when it was necessary to decide who was entitled to the silver medal which His Excellency the Governor-General had offered nine months previous, for competition among the students of the second year.

The Governor-General's Silver Medal.

The terms of competition were as follows:—

"1. All competitors must be second year students.

"2. They shall compete—

"(1) By a written examination at Easter on all the class-room work of the Fall and Winter Terms.

"(2) By a similar written examination at the end of June on all the class-room work of the Spring Term.

"(3) By practical examinations at the above dates on cattle, sheep, pigs, horses, and the various operations taught or performed on the farm, in the garden or in the carpenter shop.

"3. The successful competitor must reach the required standard in the Inside and the Outside Departments separately, that is, must make at least thirty-three per cent. of the marks in each subject, and an aggregate of not less than sixty-seven per cent. of the total number of marks in all the subjects prescribed for second year students."

Three competitors strove vigorously for the prize. The competition was particularly keen and close between J. L. Webster, of Yarmouth, Nova Scotia, and R. F. Holterman, of Toronto, but without any sign of ill-feeling or any disposition to do aught but what was honourable. The final tests in the outside work took place about the middle of the Summer Term. Mr. Webster came out a little ahead and won the medal, which was presented on the 26th day of August by Professor Buckland of Toronto University.

Side-walk to the City.

The College is distant a little over a mile from the city of Guelph. The road leading thereto is muddy and unpleasant during the fall and spring. The officers and students not only do business, but attend church and Sabbath-school in the city. Hence the want of a side-walk had long been felt by those connected with the College, and also by many of the citizens who frequently visit the College and Farm. Knowing this, I sent a formal request to the City Council, asking them to build the walk. Before the meeting, I called on several of the leading aldermen privately, and laid our wants and claims

before them. The result was that they agreed to lay a four-foot walk to the city limits, if we would lay it from that point to the College. The offer was accepted with your consent, and in about two weeks from the commencement of the Spring Term the work was completed. The College and the Council met at the city limits. We have been on better terms ever since; and the unanimous verdict is that the money was well spent.

Visitors.

There is not, I believe, another public institution in the country that has so many visitors as the Ontario Agricultural College. We have them from near and from far, from home and abroad, from this land and other lands. I am safe in saying that between 8,000 and 9,000 people visited us last year. Some came from curiosity, some to learn what they could, and others to inquire into our course of study and the *modus operandi* of the institution. Ordinary visitors average not less than twenty a day, and occasionally we have large parties from different sections of the Province. On the 22nd, 23rd and 24th of June last we had four excursions, numbering 2,600 people, from the counties of Perth, Huron, Bruce, Ontario and York, under the auspices of the Prince Albert, Lucknow, North Bruce, and Ontario Division Granges. Such visits from the farming community show clearly that the interest in the College and Farm throughout the Province is increasing. Some criticised severely, and others professed to be well pleased; but all united in saying that the Government should support the institution liberally and make it as efficient as possible. Not only so, but without either hint or solicitation every one of the four excursions passed resolutions to that effect.

Many erroneous notions about the College exist among some of our farmers; and one is that regarding their relation to the maintenance of the institution. They are quite willing that the Government should vote hundreds of thousands for the support of asylums, prisons, and reformatories; and they do not seem to enquire very closely whether the money voted for such institutions is properly expended or not. But every dollar spent on the Ontario Agricultural College and Experimental Farm they regard as a direct addition to their taxes, and hence oppose the whole concern, whatever it may do or leave undone. They are surprised and incredulous when told that it has not affected their taxes to the amount of one cent in the last five years, and that they would not pay a farthing less, if it were blotted out of existence to-morrow. Gradually, however, the idea is gaining ground that the interest of the country at large and especially of the farmers is, not to destroy, injure, or cripple the College, but to correct what needs correction and make it thoroughly efficient in every particular. Personally, I have no objection whatever to fair and honest criticism; it is always helpful. If we were not criticised we might grow careless. The Farm was purchased and the College established to promote the interests of Agriculture and Stock-raising in the Province. Therefore, farmers more than any other class have a right to visit the institution, inquire into its working, criticise, and make suggestions from time to time. Those who have done so are generally our best friends. Mistakes have been corrected and prejudices removed.

THE SUMMER TERM.

1st July to 31st August.

At the close of the Spring Term (30th June), when the year's lectures were over, several farmers' sons were allowed to return home to labour on their own or their fathers' farms in haying and harvest. Some forty-five remained with us to work ten hours a day during the Summer Term (July and August). As at all other times, they were sent in rotation to the several departments, giving, of course, the largest share of their time where it was most needed, *i.e.*, on the Farm. I shall not weary you with a detailed account of the routine in each department, but simply say that the young men received instruction in the fields, the yards, the gardens, and the shop. They spent a portion of their time in a special class for the purpose, learning how to dig, plough, harrow, sow, shear sheep, mow, cradle, drive a reaper, bind, shock, and such like; and in addition

did all that is to be done in the summer months on a large grain and stock farm, and in the management of a large vegetable garden, flower garden, orchard, and lawn.

Our visitors in the month of June were chiefly farmers; but in July and August, as might be expected, they were largely of other classes. Between six and seven hundred Masons and Oddfellows did us the honour of spending a short time with us. They took a hasty run over the premises and generally expressed themselves as well pleased with what is being done.

The term closed on the 26th day of August with the Annual Atheletic Sports, which have come to be regarded as one of the most interesting exercises in connection with the institution. For several weeks before the day fixed upon, the young men occupied their evenings on the college campus in practising those manly exercises which did so much to give character and muscle to the ancient Greeks at Olympia on the far-famed banks of the Alpheus. Everything objectionable was excluded from the games, so that the most fastidious could not find fault. The day was rather cold, but nevertheless over 1,000 of the leading people from Guelph and the surrounding neighbourhood spent the afternoon in viewing the various tests of strength and speed. After the games came the *Harvest Home Procession* around the College grounds, and the presentation of the prizes by Professor Buckland of Toronto University, Wm. Johnston, M.A., and the President of the College. Thus terminated what I think I may venture to call a successful year in the history of the Ontario Agricultural College and Experimental Farm.

THE FALL TERM.

1st October to 22nd December.

The question of charging a fee for admission to the College was formally laid before the Government on the 21st July; and in a few days thereafter it was decided that rate-payers and *bona fide* residents of the Province of Ontario should henceforth pay a tuition fee of $25 a year, and non-residents $50 a year in advance, students who had already entered the College being allowed to complete their course without payment. All applicants for admission were at once notified, and requested to inform me without delay whether they wished their applications to stand on the changed terms of admission. I feared that the imposition of the fee, though a small one, would materially affect the attendance, for a time at least. I am glad to say, however, that my fears proved to be groundless; for in the month of August alone, I received applications enough to fill all vacancies, and from that till the time of opening I had to refuse quite a number for want of accommodation. During the month of September we had as much to do as at any other time in the year. Carpenters, masons, plasterers, steam-fitters, and plumbers were at work in all parts of the building, tearing down, building up, and making additions. I watched the job late and early. The old parts of the building were to be repaired, white-washed, and cleaned; and the new parts to be fitted up, scrubbed, and furnished for between forty and fifty additional students. Notwithstanding my best efforts, things seemed to move very slowly. I appealed, urged and entreated, till about the 24th September, when it became evident that we could not get possession of the building on the 1st of October. So I wrote to the old students and the new applicants for admission, informing them of your decision to postpone the opening from the 1st to the 30th October. In the meantime I purchased an additional range for the kitchen; chairs, tables, and table-ware for the dining-room; beds, bedding, and furniture for the new dormitories; and ten stoves to heat the building till the steam-fitters would be through with their part of the contract.

Matriculation Examination.

On the 30th of October, 62 old students returned, and 68 new ones came up for the matriculation examination, which commenced on the 1st and continued till the evening of the 2nd of November. The papers set were not difficult; copies of them will be found in the third part of Appendix D. The answers generally were much better than a year ago. Especially in the matter of spelling a decided improvement was noticeable. On the whole, I feel free to say that the candidates who wrote at our last matriculation examination were in every way a very superior lot of young men; and hence

there were only a few who failed to pass. Their work and conduct since the examination have justified our first impressions. The total number in attendance during the term has been 126. The following list shows where they come from, and the religious denominations to which they belong. The names will be found in the second part of Appendix C.

Counties, &c.	*Students.*	*Counties, &c.*	*Students.*
Bruce	2	Ottawa City	10
Brant	3	Ontario	2
Carleton	1	Oxford	8
Durham	1	Prince Edward	1
England	2	Perth	6
Frontenac	4	Peel	2
Glengarry	1	Peterboro'	1
Grey	4	Quebec Province	5
Hamilton City	2	Renfrew	1
Halton	2	Simcoe	1
Huron	4	Scotland	2
Haldimand	1	Toronto City	6
Ireland	1	United States	1
Lanark	8	Victoria	2
Lincoln	1	Wales	1
London	1	Waterloo	3
Montreal City	8	Wellington	10
Middlesex	1	Wentworth	5
Norfolk	3	Welland	1
Northumberland	1	York	5
Nova Scotia	2		

Total number in attendance during Fall Term	126
Number of Ontario Counties represented	29

RELIGIOUS DENOMINATIONS.

Presbyterian	44
Episcopalian	43
Canada Methodist	21
Congregationalist	5
Canada Baptist	4
Roman Catholic	4
Primitive Methodist	2
Plymouth Brethren	2
Lutheran	1
Total	126

As questions are frequently asked about the age of our students, I may say that some sessions the ages have varied considerably from fifteen years upwards. In the fall term of 1880, the range was from fifteen to twenty-six—five at fifteen, twelve at sixteen, four at twenty-four, and two at twenty-six; leaving 103 between the ages of seventeen and twenty-three. The majority were eighteen or nineteen. The following table gives the exact number at the different ages:—

AGES OF STUDENTS AT THE ONTARIO AGRICULTURAL COLLEGE IN THE FALL TERM OF 1880.

5	at the age of	15	years.
12	" "	16	"
12	" "	17	"
28	" "	18	"
29	" "	19	"
12	" "	20	"
8	" "	21	"
9	" "	22	"
5	" "	23	"
4	" "	24	"
2	" "	26	"

Total 126; average age, 19 years.

The Fall Term being the first of a new scholastic year, the different members of the staff went to work with renewed vigour and a firm determination to do better than last year. I believe the ambition of every officer is to make the Ontario Agricultural College all that the people of Ontario could wish it to be—an institution second to none of the kind in either the old or the new world. The work in the different departments, was carried on without interruption, from the 2nd November to the 22nd December. Having lost a month at the beginning, it was necessary, in order to get over the prescribed work, to crowd as much as possible into the time that was left.

The first year students were introduced to the subject of Agriculture. The lectures embraced the reclamation of land, location of roads, lanes, and fences; examination and classification of soils; a description of the buildings and implements required on a well-equipped farm; rotation of crops, and other matters preparatory to the study of live stock which is to be taken up in the Winter Term. They had an extensive course of lectures, with experiments on Chemical Physics and Inorganic Chemistry, commenced the subject of Natural History, and spent some time in studying the anatomy and physiology of the horse and ox. Under the head of Mathematics and English, they read two cantos of "The Lady of the Lake," wrote impromptu compositions once a week, and reviewed portions of Arithmetic with special reference to the requirements of farming.

The attention of the second year men was directed to such subjects as Stock-breeding, Farm Management, and the Experimental Plots—the selection of animals for beef; the housing, feeding, and fattening of the same; the comparative values of pasture and green fodder; results from the different kinds of seed, soil, and manure; and the previous season's experiments with wheat, oats, and grasses. They had several lectures on Meteorology, and a full course on Agricultural Chemistry—the composition of different plants in relation to the soils on which they grow; the preservation and renovation of soils, the chemical composition and value of different manures, the superphosphates, double silicates, and other substances which furnish plant food. They spent two hours a week at lectures on Veterinary Pathology, and one a week in handling and examining horses for spavin, ring-bone, splint, founder, and other diseases—all under the eye and direction of our veterinary surgeon, Dr. Grange; they also read and committed to memory a great portion of the first two acts of Shakspeare's "Julius Cæsar"; and gave some time to the study of Applied Statics, Levelling, Surveying and Drainage. The following outline quoted from the syllabus on a previous page will convey a clearer idea of the term's work in the lecture-room:—

OUTLINE OF CLASS-ROOM WORK.

Fall Term.

First Year.

Department 1.—Agriculture.

Introductory.—Ancient and modern agriculture; agricultural literature; arts and sciences affecting agriculture; different kinds of farming.

Reclamation of Land.—Clearing, stumping, stoning, fallowing, etc.

Soils.—Origin and distribution of soil; natural conditions of soil and plant; examination and classification of soils; physical and chemical properties of each kind.

Rotation in Cropping.—Importance and necessity of rotation; principles underlying it; rotations suitable to different kinds of soil; examination and criticism of different systems of rotation.

Buildings.—Location of house, barn and stables; framing a building; model stables for horses, sheep and cattle; arrangement of farm buildings.

Implements and Machinery.—Principles in construction of implements and machinery; points to be aimed at; classification, examination and description of the same.

Miscellaneous.—Roads, lanes, fences, wells, etc.

Department 2.—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, pyrometers, specific and latent heat; sources, nature and laws of light; spectrum analysis.

Inorganic Chemistry.—Scope of subject; elementary and compound substances; chemical affinity; symbols; nomenclature; combining proportions by weight and by volume; atomic theory; atomicity of the most important elements; 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; carbon; combustion; carbonic acid and its relation to the animal and the vegetable kingdom; sulphur and its compounds; manufacture and uses of sulphuric acid; phosphorus; phosphoric acid and its importance in agriculture; chlorine—its bleaching properties; bromine; iodine; silicon, etc.

Zoology.—Nature of life; vital force; difference between animals and plants phology and physiology; homology and analogy; definition of species; classification; subdivisions of the animal kingdom; characters of the classes and most important orders of *Invertebrates;* general characters of *Vertebrates*; classes and orders, with a brief description of each.

Department 3.—Veterinary Science.

Anatomy and Physiology of the horse, ox, sheep and pig; osseous system, muscular system, syndesmology, plantar system, and odontology.

Department 4.—English.

Lectures on Composition.—The sentence, the paragraph, and the period; capitals and punctuation; style—its qualities and varieties. *Exercises in Composition.*

English Classics.—Committing to memory, and critical study of Scott's "Lady of the Lake."

Department 5.—Mathematics.

Arithmetic.—Review of subject, with special reference to farm accounts; tables of weights and measures discussed; compound proportion, interest, discount, stocks and partnership.

Mental Arithmetic.—Calculations in simple rules, fractions and compound rules.

Second Year.

Department 1.—Agriculture.

Experimental Plots.—The results of last season's experiments with wheat, oats, barley, pease, grasses, clovers, roots, etc.; liability to disease; effects of various manures on different crops; growth of plants, etc.

Farm Management.—Detailed account of the treatment of each field, results from different kinds of seed and soil; effects of manure; harvesting, storing, and threshing of crops; fall ploughing; subsoiling, &c.

Stock-feeding.—Value of feeding materials; estimate for winter keep of live stock; housing, feeding, and fattening; points to be observed in selecting animals for fattening: feeding experiments; common diseases of animals; management of animals on pasture; value of green fodder. Dairy management and cheese-making.

Department 2.—Science.

Meteorology.—Relation of Meteorology to Agriculture; composition and movements of the atmosphere; nature and manipulation of the barometer, its importance in forecasting the weather; temperature, description of the various instruments used in its measurement and how to use them; solar and terrestrial radiation; the influence of forests on climate; mists, fogs, clouds, rain, hail, and snow; description of instruments used in measuring rain and snow fall; velocity and direction of wind; causes affecting climate; influence of climate on vegetation.

Agricultural Chemistry.—Connection between chemistry and agriculture; the various compounds which enter into the composition 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; composition of different plants in relation to the soils upon which they grow; rotation of crops; preservation, development and renovation of soils; manures classified; the chemical action of manures on different soils; chemical theories in reference to the action of superphosphates; the action of lime in the decomposition of double silicates; feeding of animals; classification of foods; chemical results in the use of different foods; points necessary to be considered in order to obtain the full value of artificial and natural foods.

Department 3.—Veterinary Science.

Veterinary 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 bog spavin, curb, and other diseases of the joints.

Plantar System—nature, causes, symptoms, and treatment of corns, sand-crack, founder, and other diseases of the foot.

Odontology—diseases of the teeth and treatment of the same.

Department 4.—English.

Lectures.—Etymological, syntactical, and rhetorical forms of the English language;

history of its formation; its connection with other languages; rhetorical figures; their use and abuse; prose and poetic diction.

Composition.—Essay writing, familiar and business correspondence.

English Classics.—Critical study of Shakespeare's "Julius Cæsar."

Department 5.—Mathematics.

Mental Arithmetic.—Calculations in reduction, fractions and analysis.

Mensuration.—The mensuration of surfaces, including lumber, etc.; the measurement of solids, including contents of tanks, ditches, wells, etc.

Land Surveying.—With chain and cross-staff.

II.—The Boarding House and College Buildings.

The college building, as shown on frontispiece, is a plain substantial structure without much claim to architectural beauty. Like the institution itself, it was built little by little without any very definite idea of the shape it might ultimately assume. When the Government first bought land and determined to establish an agricultural college, the architect drew plans for a building which would have suited the purpose exactly, but the cost seemed too great and the country was not prepared for it, consequently it was decided six years ago to commence work with a few students in Mr. Stone's farm-house. Additions and alterations were made from time to time as the number of students increased, till the result is, the building which you see outlined and described on page 36—something different from what was ever intended; and though it is not what we would like, it nevertheless affords considerable accommodation, and serves the purpose very well.

In my last report I recommended among other things, that increased accomodation be provided, and that the college be heated by steam, and lighted by gasolene. I am now happy to say that under each of these heads the Legislature did even more than I ventured to ask. The building is very different from what it was a year ago. The extensive additions and alterations made during the last eight months, have not only increased the accommodation, but changed the whole aspect of the place. The raising of the centre portion has removed the flat appearance which formerly characterized the building, while the erection of the new building in the rear of the left wing, and the filling up of the space between the centre, and the class-room in the right wing, has furnished thirty-four new dormitories, a large dining-hall, a reading room, a library, a sitting-room and a bed-room for the Assistant Resident Master, a wash-room, and two class-rooms.

In the building, as it now stands, there are one hundred and twenty-two rooms—three class rooms, a reading room, a library, a room to be fitted up for a museum, a laboratory, two offices, a public reception-room, sixty-two students' dormitories, a large dining-hall, a servants' dining-room, a store-room, pantry, kitchen, scullery, laundry, drying-room, eight bath-rooms, nine bed-rooms for servants, the messenger's room, a parlor and bed-room for the Matron, a sitting-room and bed-room for the Assistant Resident Master, nine rooms in the left wing occupied as a dwelling house by the Professor of Agriculture, six rooms in the centre occupied by the President and his family, three wash-rooms, an engine-room and a coal house. The size, position, and use of each room can be better understood from an examination of the plans above referred to than from a verbal description. Hence I shall not attempt anything more elaborate under this head.

Provision has been made for heating the building with steam; and every room in it is now lighted, not by gasolene, but by ordinary coal-gas from the city of Guelph. The gas company laid the pipes out to the college and the contractor extended them through the building. So that now we not only have good light, but are free from the danger connected with the use of coal oil in so large an institution.

In the boarding house, things have gone on much as of old; but for some months past, the duties in connection with it have been much more arduous than at any time previous. The large additions to the building, and the corresponding increase in the number of students, have added not a little to the work of the President, the Assistant Resident Master, and the Matron, while the presence of masons, carpenters, plasterers, painters, gas-fitters, and steam-fitters pacing to and fro, and plying their tools from June to January, in every hall and room from cellar to garret, has given rise to an unusual amount of worry, anxiety and confusion. In the face of such difficulties as these, the Matron discharged faithfully the many duties connected with her department; the Assistant Resident Master took charge of the students in the dining room, and assisted me in looking after them in the halls, dormitories and class-rooms; the Bursar provided the supplies; and altogether the work went on satisfactorily. The conduct of the students was good; no serious cases of discipline occurred since my last report. Some, of course, did not work so well as they should, and others were inclined to give trouble now and then; but the great majority were quiet, thoughtful and industrious. The few idle and troublesome ones were kept in their place by the exercise of vigilance, firmness and kindness; and the result, on the whole, was earnest work and good order in every hall. For a better understanding of the surroundings of our students in the boarding house, and the duties required of them, I may say that their bed-rooms are furnished with beds, bedding, bureaus, mirrors, wash-stands, study-tables, and chairs. They sleep separately, two in a room, and in a few instances three. The daily routine during the fall, winter and spring terms, is as follows:—

They rise at a quarter to six, make their beds and put their rooms in order. At fifteen minutes after six they go to morning prayers, and at half-past six to breakfast. At seven the students of one division are sent to work outside, and those of the other employ their time as they feel disposed, till eight o'clock. From eight to nine the latter are at drill or gymnastics, and from nine to twelve at lectures in the class-room. Both divisions then return to the boarding house, and prepare for dinner at half-past twelve. The bell rings at half-past one, and the division that was in at lectures in the forenoon, goes out to work in the afternoon. The other division is free till two o'clock. From two to five it attends lectures; and at five both divisions return again to the boarding-house to prepare for tea, at half-past five. From tea time to seven o'clock, and in spring to eight o'clock, they generally rest or take exercise. From seven to nine in fall and winter, and from eight to half-past nine in spring, they study in their rooms, or under a master in one of the class-rooms. At nine or half-past nine, according to the season of the year, they proceed to roll-call and evening prayers; all lights are put out at ten, and doors closed at half-past ten. Every student who is not under ban for some misdemeanour, is allowed out one evening in the week, till half-past ten. To some parents perhaps this will appear late; but, as it takes not less than thirty minutes to come from the city to the college, any earlier hour would scarcely give sufficient time. When going out, each leaves his name with the master in charge, and is required to report himself on his return, that we may know whether all are in or not before the doors are closed for the night.

Such is the routine in the boarding house, and such are the duties required of the students therein, during nine months of the year. As the months of July and August are devoted entirely to work in the outside departments, the duties inside differ but little from those of an ordinary boarding house on a large scale.

I served an apprenticeship of twenty-one years at farming in this country—I learned practically how to chop and clear, dig and plough, sow and reap, and all the rest; I afterwards taught and governed young men and women for eleven years; but never till last year did I attempt to manage a large boarding house and a college together. It is entirely a new phase in my experience, and I scarcely know how to describe it. I would like to say that it is the most thankless and annoying business in which a man ever engaged—a business which takes one away from his family day and night, which destroys the associations of home, which worries a person till he is apt to become peevish and absent-minded—in a word, a business which no man should undertake, unless he is prepared to abandon all hope of comfort and happiness while he is engaged in it. This is

what I would like to say. What I do say, is that the duties involved in the management of a large boarding house are onerous and trying under any circumstances, but especially so when there is added thereto the work of lecturing from two to three hours a day, superintending the studies and conduct of one hundred and thirty young men from six in the morning till half-past ten at night, waiting on a large number of visitors, and attending to the correspondence and general business of a college. Put all these together, add the item of no holidays, and you have a concentration of labour and anxiety sufficient to test the mettle of any man—at least, you have evidence sufficient to prove that the presidency of the Ontario Agricultural College is not a sinecure.

III.—The Business Department.

The first thing to be noticed under this head relates chiefly to the President of the College, that is,

The Correspondence.

The Ontario Agricultural College is not yet understood so well as it should be either in the Province or outside of it. There is ample evidence that it is fast growing in favour at home and becoming pretty well known abroad; but there is still an endless number of inquiries about the terms of admission, course of study, duties of students, cost, books used, books recommended—and many other questions which require to be carefully answered. Add to this the correspondence growing out of the ordinary business of the institution, and you have work enough to keep one a couple of hours a day throughout the whole year. Some letters are simply answered and no further note taken of them; others, being more or less important, are copied, and the names, post-office address, and business recorded in a book kept for the purpose. Of the latter kind, I wrote about 1,700 last year. Over 2,100 circulars and 1,800 copies of our annual report were sent out. Eleven hundred reports were distributed among the Subordinate and Division Granges, and the balance sent chiefly to those who applied for them.

Books and Accounts.

Most of the work in this branch of the business department is done by the Bursar. Every month he receives the accounts against he College and the Farm, examines them, checks them by invoices and requisitions, arranges them in due form, makes out separate statements for the College and the Farm, submits the former to the President and the latter to the Farm Superintendent for approval, and then sends both to the Treasury Department for payment. He receives and accounts for all moneys from the Treasury Department, the students, and the farm; and pays all accounts that have been approved by the President or the Farm Superintendent, and passed by the Auditor in Toronto. In addition to a cash book and memorandum books of various kinds, he keeps three distinct sets of books—

No. 1, showing the monthly expenditure under each head of the appropriation for salaries, wages, and college expenses.

No. 2, giving in detail the income and expenditure of the outside departments under three heads—the farm and carpenter-shop, the garden, and the experimental department.

No. 3, which shows the account of every student from the day he enters the College till he leaves it—fees, board and washing, amounts allowed for labour in the outside departments, and cash balances paid to the College for board and washing.

The second set involves considerable work, and the third a great deal. "Printed sheets containing the names of all the students are furnished each foreman daily, who fills in the blanks with the description of work done that day by the students

in his department, the number of hours each has worked, and the estimated value of such work. These are filed daily in the office, and journalized weekly. At the end of the financial month these sums are posted to the credit side of each student's account in the ledger, whilst on the debit side is placed the exact cost of the board and washing for that month, obtained from the books of the store-room and the laundry. At the end of the session those sheets are bound together and make the day-book for that session." From this it will be seen that one hundred and seventy-six such accounts had to be kept during the past year, involving an amount of work of which the uniniated have no conception.

General Business.

Owing to the large additions to the building, and the increase in the number of students, there was an unusual amount of general business to do in connection with the College during the year 1880. The President had not only to lecture, wait on visitors, and attend to the ordinary business of the institution, but to select and purchase a large amount of furniture for the kitchen, dining-room, beds and bed-rooms, reading-room, library, and class-rooms. The Bursar looked after the supplies for the boarding-house, and with the aid of the Matron took full charge of the college store-room—examined, checked and weighed meat, groceries and other articles as they were delivered, in order to see that all contracts were faithfully carried out. The Farm Superintendent and his foremen made all purchases for the maintenance of the outside departments—the farm, garden, carpenter shop, and experimental department. With these the Bursar had nothing to do, except arrange the accounts as they were handed in, and forward them to Toronto for payment.

The Finances.

In making out statements under this head, as everywhere else, I have endeavoured not to interfere with anything which properly comes under the report of my friend and colleague, Mr. Brown. Hence my financial tables, which will be found in Appendix F, refer to the College and boarding-house alone. The first table shows the appropriation expenditure in 1880, the second is a statement of the revenue for the same time, the third gives an estimate of the expenditure in 1881, and the fourth is a copy of the college account with the farm, garden and carpenter shop for the past year.

The sum of $2,000 was voted on capital account for furniture and furnishing. The expenditure under that head will be found at the end of Table 1. The amount allowed for maintenance was $22,850. This is no more than was actually needed. The whole amount might have been profitably laid out under the heads for which it was voted; but as we intended to ask a large sum for the erection of a new laboratory this year, we felt bound to cut down expenses at every point. Hence, by special care and economy on the part of the Matron, the Bursar and myself, we succeeded in keeping the expenditure down to $21,822.15, which leaves a balance of $1,027.85 to the credit of the Province. It may be stated thus:—

Amount voted for 1880.....	$22,850 00
Amount expended in 1880.....	21,822 15
Balance to credit of Province.....	$1,027 85

Table 2 is a very brief statement of the revenue for the year—$2,407.02 paid by students for board and washing, and $1,625 tuition fees, making a total of $4,026.02. This subtracted from the expenditure, shows the net cost of the institution for the last twelve months:—

Expenditure in 1880.....	$21,822 15
Revenue in 1880.....	4,026 02
Net outlay in 1880...	$17,896 13

Most agricultural institutions have found difficulty in combining the practical work of apprenticeship with the theoretical instruction of the lecture-room. To avoid this difficulty as far as possible, the Ontario Agricultural College adopted the plan of paying all students for their work. The intention was to vary the rate of wages according to the character and amount of the work done; but the fact is, we are forced by the circumstances of the case, not unfrequently, to pay for work that is really worth nothing. Notwithstanding this difficulty, however, the marked success of the College in securing attention to practical as well as theoretical work, proves conclusively the wisdom of the plan adopted. If the students were allowed little or nothing for their work, we could present a better balance sheet; but the College would be much less efficient, and, as often happens, the gain in money would be more than counterbalanced by a loss in another direction. By turning to the last item in Table 4, Appendix F, you will see that the allowance to students for labour last year amounted to $4,347.23. If this were deducted from the net outlay for the year the expenditure would be a comparatively small sum to run a college with :—

Net outlay for 1880.	$17,896 13
Amount of the above sum allowed students for labour...	4,347 23
Balance.....	$13,548 90

In the right hand column of Table 3, you will find the estimated expenditure for 1881. The increase under this head will, doubtless, give rise to some inquiries; so a word of explanation may be necessary. First of all, I have asked for small additions to the salaries of two or three officers who, in my opinion, should have more than they got last year; but the increase is nearly all due to three things :—

(1) The increase in the number of students, which is over one-third greater than it ever was before.
(2) The change from coal-oil to coal-gas for lighting the College.
(3) The heating of two additional buildings, which adds quite an amount to the outlay for fuel.

Apart from the last two items, the increase is not in proportion to the increase in numbers. The amount voted last year for furniture and furnishing was not nearly sufficient; hence I am forced to ask for $2,000 more. I have several times spoken and written about a new laboratory for the Institution; but I have not yet presumed to ask any definite sum for that purpose. I leave it to yourself and the architect to name the amount required.

IV.—Conclusion.

Instruction in Agriculture.

Success in agriculture ensures success in every other occupation; failure in agriculture means failure everywhere else. No argument is necessary to prove that it is the foundation on which the prosperity of this country has been built. If it gives way, the whole fabric is sure to fall. Hence the necessity of using the accumulated wisdom of the ages to secure the best results in this pursuit. If specific, technical instruction is a needful preparation for law, medicine, dentistry, or pharmacy, why not for farming? If a young man intends entering the legal profession, he spends from three to five years in the study and practice of law; if he desires to become a physician, he attends lectures on medicine and enters a doctor's office to learn the first principles of the practice; or if he aims at being a druggist, he studies the pharmacopœia and serves an apprenticeship in a drug store. But in farming, the most important of all, it is expected that a young man should go to work and make a fortune without any special training whatever. I am glad to say, however, that this idea is being exploded; our people are beginning to realize

that special preparation is needed no less for the pursuit of agriculture than for any other industry. The existence of the Ontario Agricultural College is a proof of this.

The College.

As President of the College, I cannot discuss the question of its efficiency or inefficiency so freely as I would under other circumstances. No doubt to our faults we are "a little blind," if not to our "virtues very kind"—we do not see ourselves as others see us; but admitting all past errors and present defects, I think it is not too much to say that the Ontario Agricultural College is an institution of which the Province may be proud, and one that should be supported, not only by the farming community, but by every other class that seeks the prosperity of the country. It is the only school in the Province which gives instruction in agriculture, agricultural chemistry, horticulture, and stock-raising; it is the only place where questions relating to such subjects are systematically studied and discussed. The course of study is confined to those branches which have a somewhat direct bearing on the duties of the agriculturist, horticulturist, and stock-raiser; its success in combining practical work with theoretical instruction has not been surpassed anywhere; and the whole tendency of the training given is not only to make more intelligent farmers, but to educate them to the belief that there is no more honourable occupation than that of the agriculturist; that socially, politically, and even financially, there are few to compare with it; and that in the matter of independence, contentment, and real happiness, there is scarcely one equal to it. The position of the College in the centre of a large stock-raising district, containing a number of the best Shorthorn, Hereford, Devon, and Galloway herds in the Dominion, is a matter of some importance. The students visit these herds from time to time, and attend the famous fat-cattle shows in Guelph at Christmas and Easter Last year each was required to examine the different animals exhibited, and afterwards draw up and read a special report on them, and on the show as a whole. In the time of my predecessor the foundation of the institution was laid broad and deep; we are now doing our best to strengthen that foundation and to build upon it. During the past year some progress has been made; a large three-storey building has been erected, and the old one very much enlarged and improved; provision has been made for heating the whole premises with steam, and lighting every room with gas; a sidewalk has been laid from the College to the city; and the number of students has increased from 92 to 130.

Reading-Room and Library.

An excellent reading-room has also been provided, and a very nice and commodious room for a library; and all we now require to make this department complete is a full supply of books, magazines, and papers. We already have 475 volumes in the library, consisting of reports, herd-books, books of reference in all the subjects taught, and a fair supply of general reading. We also have on file in the reading- room the following papers and magazines, furnished by the College and the Literary Society:

Furnished by the College.

Daily Globe.
Daily Mail.
Weekly Globe.
Weekly Mail.
Guelph Mercury.
Guelph Herald.
Canadian Farmer and Grange Record.
Farmers' Advocate.
Canadian Horticulturist.
North British Agriculturist.
Irish Farmer's Gazette.
Mark Lane Express.
National Live Stock Journal.
Boston Journal of Chemistry.
Scientific American.
Scientific Amer. Supplement.
Cultivator and Country Gentleman.
American Agriculturist.
Aberdeen Free Press.
Grip.
Bystander.
Canadian Monthly and National Review.
Leisure Hour.
Sunday at Home.
Good Words.
Quiver.
Sunday Magazine.

Provided by the Literary Society.

Canadian Illustrated News.
Punch.
Rural New Yorker.
Frank Leslie's Illustrated Paper.
The Graphic.

When visiting the Michigan Agricultural College, over a year ago, I was pleased to find that nearly every editor of any note in the State sent a copy of his paper free to the reading-room of that institution. I might here say that similar donations from the editors of Ontario and other parts of the Dominion would be appreciated by the students of the Ontario Agricultural College. The public spirit and princely munificence of our neighbours across the line, as manifested in the erection and endowment of schools and colleges in their country, are known all over the world. The people of Canada have as yet done very little in this direction; they do not seem to think that it is either a privilege, an honour, or a benefit, to contribute money for such objects. I am pleased to say, however, that there are occasional exceptions; there is now and then one whose liberality deserves special mention. A couple of months ago a very nice outfit for a gymnasium, worth about $200, was purchased for the Ontario Agricultural College by our old and tried friend, Captain McCrae, of Guelph. A portion of that outfit has been placed in a vacant class-room, and is already in use. The young men appreciate it very much; and I hereby take the liberty of thanking the Captain on their behalf for so handsome a gift; and in this connection, I may add, that since the appointment of Sergeant-Major Clarke as instructor in drill and gymnastics, the exercises under these heads have been a source of unusual pleasure and profit to the students as a whole.

Literary Society.

The young men have formed themselves into a Literary Society, with a regular constitution and by-laws. This Society meets every Friday evening at half-past seven, in one of the class-rooms, to practise declamation, read essays, and debate questions relating to agriculture, stock-raising, and other matters of interest to the yeomen of this country. These discussions are often quite spirited; and there is no doubt that the work done in such societies is a valuable addition to the educational appliances of an institution. In the performance of such work the young men have an opportunity of measuring their strength and testing their armour before they set out in the warfare of life; they gradually learn to speak in public; their wits are sharpened, their reasoning powers developed, and their manners improved. The regular meetings of the Society are open to the members only; but once a year they give a literary and musical entertainment to their friends in Guelph. The only difficulty in connection with these entertainments and other public gatherings on stated occasions is, that we have no room half large enough to accommodate those who come; and this brings me to the question of wants and

Recommendations.

In connection with my estimates for next year, I took the liberty of calling your attention to what appears to me to be the most pressing wants of the institution at the present time, I shall now venture to repeat some of the requests then made.

Salaries.—Most people are working for a living, and some few for a reputation. Hence it is not to be expected in the civil service, more than anywhere else, that a man will long continue to do the best that he is capable of doing, unless he receives suitable remuneration for his services. He may put in his time and do fairly well; but he will not work late and early, and exert every energy to secure success, so long as he feels that no one will thank him for his extra trouble, and that he cannot make a cent a year more than by the perfunctory discharge of the time-honoured routine. Poor pay generally means poor service, and very properly so. Therefore it seems evident that the wise and economical policy for either a Government, or a private individual, is to pay good salaries and insist on good work. From Table 3, Appendix F, it will be seen that I have recommended a small increase in the salaries of three or four of our staff; and,

without prejudicing the case of any, I beg leave to press the claims of one or two. When my assistant, Mr. Mactavish, was appointed, his duties were not nearly so onerous as they are at the present time. We then had a much smaller building and about forty students less to look after than we have now. His hours of duty in the boarding house are long (5.45 in the morning to 10.30 at night), his responsibility is heavy, and he lectures about three hours a day on Arithmetic, Mensuration, Mechanics, Levelling, Surveying, Book-keeping. I therefore recommend that his salary be raised from $500 to $600 a year. Our Professor of Chemistry, J. Hoyes Panton, M.A., does an amount of work in the College which seems to say that his services are worth as much to the country as those of the Science Masters in the other Government institutions, such as the Normal Schools and the School of Practical Science. Our institution is no less important; Mr. Panton is no less scholarly; his work and responsibility are no lighter. He takes charge of the library, superintends all practical work in the laboratory, and lectures from four to five hours a day on Inorganic Chemistry, Organic and Practical Chemistry, Geology and Physical Geography, Systematic and Economic Botany, Meteorology and Entomology; yet the estimates of last year show that his salary is from $300 to $600 a year less than what is paid in the other institutions. In view of these facts I think I am justified in recommending that Mr. Panton's salary be raised to $1,500, which is the lowest sum paid any other Science Professor in the service of the Province.

The Horticultural Department.—I think the time has come when steps should be taken to reorganize the Horticultural Department of the institution. A short trip through almost any portion of the Province will convince one that an effort should be made to impress upon the minds of our young people the importance of making the surroundings of home as tidy, tasty, and cheerful as possible. In most country districts there is a great lack in this respect; and therefore I think the College should give the matter considerable prominence. Our present hot-houses are behind the times; they are not only too small, but the heating apparatus is so defective that most of the plants are stunted in growth, and a few of the best destroyed every winter with smoke. A portion of the farm has lately been allotted to the Fruit Growers' Association for the purpose of experimenting with various fruit and forest trees; and some person is needed to take charge of it, and to publish the results from year to year. Therefore, I beg leave to recommend that new hot and propagating houses be built, and that a Professor of Botany and Horticulture be appointed to take charge of the experimental plots, orchards, lawns, and gardens; to lecture on Botany, Horticulture, Fruit-culture, Floriculture, and Forestry; and to prepare and publish annual reports on the work done.

A Laboratory.—I shall not trouble you by repeating what I have already said regarding books for the library, the fitting up of the museum, or the building of a convocation hall and two or three cottages; but content myself with referring briefly to our need of a laboratory. And I have so often spoken of this matter that it seems useless to say anything more. It is undoubtedly the most pressing want of the institution at the present time. When we had from fifty to ninety students we could make some progress in a laboratory eight feet wide by fourteen feet long, but with 130, it is little less than a farce to attempt any practical work in the department of chemistry. Hence, I think no one will deny that we very much need a large laboratory, equipped with the best apparatus that money can purchase—a place where at least eighty young men could work under the direction of our chemist, and where, at small cost, samples of soil, manure, and fodder could be analyzed, and the results published for the information of the farming community. Therefore, I not only recommend, but urge that the sum of $12,000 be placed in the estimates for the erection of a laboratory which shall meet the requirements of the College and the country.

I have the honour to be,

Sir,

Your obedient Servant,

JAMES MILLS,

President.

AGRICULTURAL COLLEGE, AND EXPERIMENTAL FARM, GUELPH, ONTARIO.

DESCRIPTION OF THE BUILDINGS, ETC., PREPARED BY THE ARCHITECT OF THE PUBLIC WORKS DEPARTMENT.

The Farm, containing 550 acres, was purchased from Mr. F. W. Stone, Guelph, in 1873, for the sum of $75,000, and is situated on the Dundas road, about one mile from the City of Guelph.

The buildings have been erected on an elevated portion of the Farm, on the north side of the Dundas road, commanding an extensive view of the surrounding country, and the City of Guelph. The principal entrance is from the Dundas road, at the south-west angle of the grounds in front of the buildings, which have been skilfully planted; the hot-houses and horticultural gardens being in the south-east part of the premises, and having a separate entrance on the Dundas road.

The original building, to which additions have been made according to the requirements of the College, as the number of pupils increased, consisted of a stone dwelling house, 53 feet by 39 feet, with addition in the rear for kitchen, laundry, etc., 60 feet by 24 feet, the whole being two storeys in height.

Commodious farm buildings of stone and wood, with enclosed yards, also stone, brick, and wood farm houses, were also on the premises when purchased, and the lots were surrounded by good post and rail fences. The greater portions of the lots were cleared and well cultivated, the remaining portions being wooded and retained for ordinary farm requirements.

The following additions were made from time to time to the original dwelling house:—Dining, reading, and class rooms, also a lavatory, laundry, steam heating apparatus, and apartments for the domestics were constructed in 1873-4, the College having been opened in the latter year. Apartments for twenty-eight pupils were fitted up in the stone farm house, in the front portion of the grounds. This building was burnt down in February last year, and the walls were so much injured that it has not been re-constructed.

In 1875 a mansard roof was constructed over the front portion, and at a distance of 50 feet on the south-east side, the College authorities erected a building 40 feet by 50 feet, two storeys in height, with mansard roof, for lecture and class rooms.

An addition, 94 feet in length by 50 feet in width, two storeys in height, with mansard roof, was made on the north-west side in 1877, affording accommodation for thirty additional pupils, with a new dining-room, also apartments for the Professor of Agriculture. A cheese factory was also erected south of the Dundas road. Further additions were made in 1879 and 1880, consisting of store rooms, Matron's and domestic apartments, also a larger dining room, 62 feet by 40 feet, and dormitories for sixty additional pupils, making, in all, apartments for 130 pupils, with larger reading room and library, baths and wash rooms, all being heated by steam, on the direct low pressure principle, by means of coils and radiators, a new boiler house, 38 feet by 24 feet, containing two large steam boilers, with coal house attached, having been constructed for the purpose.

The water supply at present is from wells and tanks on the premises; and the water is pumped into a large tank in the centre tower, from whence it is distributed to the several baths, wash-rooms, and sinks, the baths and sinks being also supplied with hot water. Arrangements will probably be made with the city water works of Guelph to extend their mains to the buildings during 1881, when water will not only be supplied for the requirements of the College, thereby saving the cost of pumping, according to present arrangements, but the buildings will be protected from fire by means of hydrants in the grounds.

The City Gas Company of Guelph, extended their mains to the buildings during 1880, and all the apartments are now supplied with gas light. The buildings now completed

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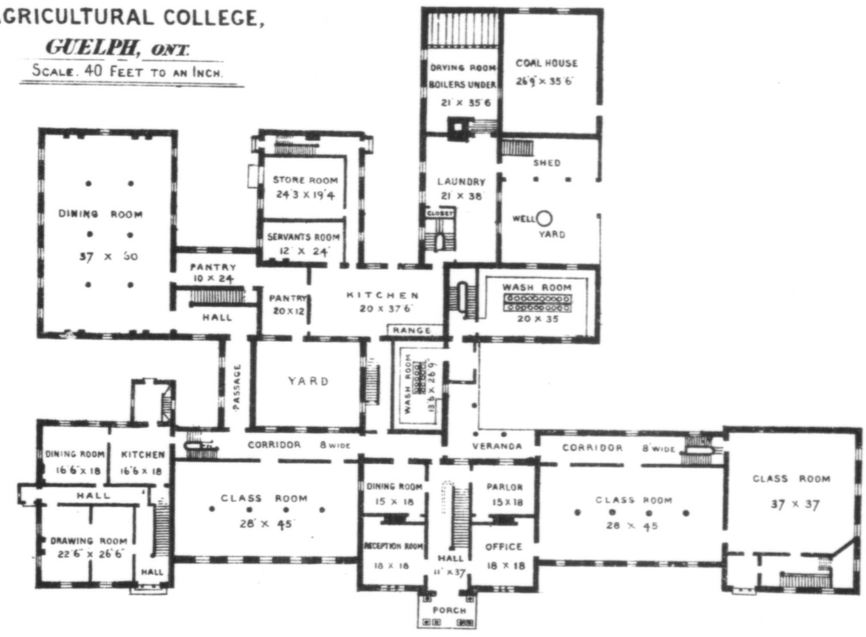

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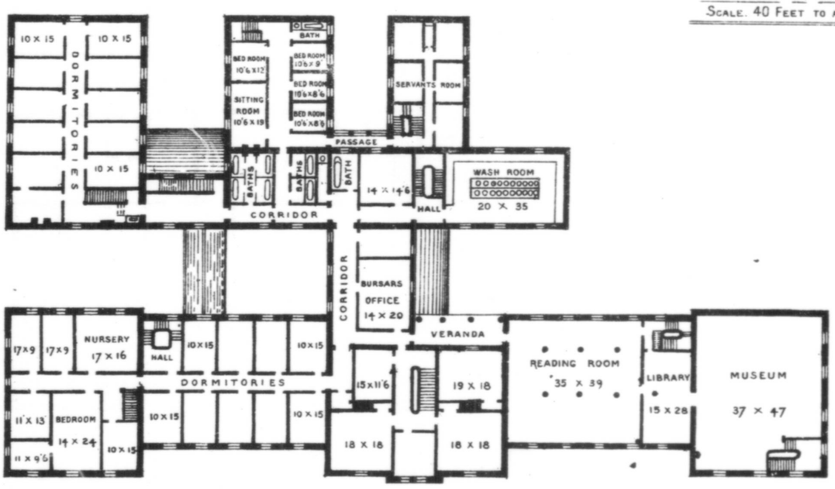

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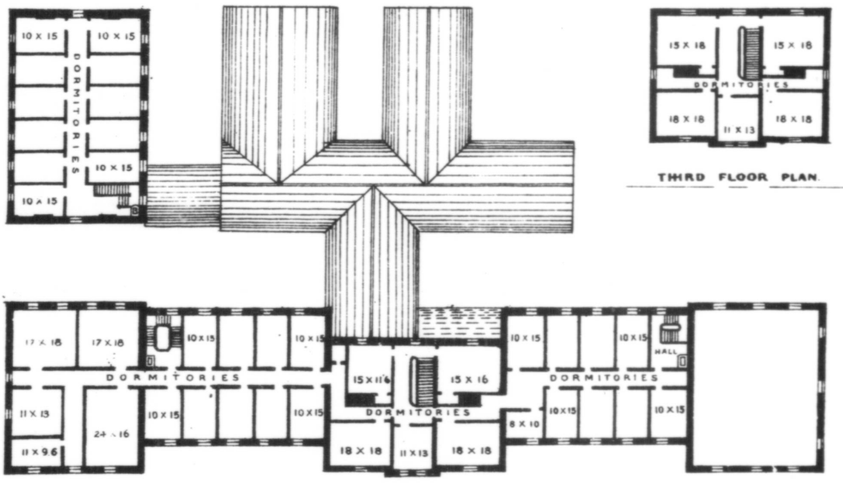

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occupy a space of 240 feet in front by 180 feet in depth, and contain a reception-room and office, four large class and lecture-rooms, with dining and reading-rooms, library, dormitories for 130 pupils, bath-rooms and lavatories, and apartments for the President, Professor of Agriculture, Assistant Master, and Bursar, also Matron's and servants' rooms.

The perspective view shown on frontispiece and the accompanying plans which have been prepared in the Department, will explain the arrangement, dimensions, and relative position of the various apartments, also the external appearance of the building, which now presents more of a public character than might have been expected, considering the basis on which the various superstructures were erected.

Further improvements will have to be made in 1881, to complete the furnishing and other internal arrangements, and render the buildings suitable in all respects for the requirements of the College.

The total cost of land and buildings, furniture, live stock, implements, drainage, etc., to the end of 1880, amounts to $198,029.51.

APPENDIX A.

CIRCULAR OF THE ONTARIO AGRICULTURAL COLLEGE FOR 1880.

Staff.

James Mills, M.A., *President, Professor of English Literature and Natural History.*

William Brown (*Gold medallist of the Scottish Arboricultural Society and of the Highland and Agricultural Society of Scotland*), *Professor of Agriculture and Farm Superintendent.*

J. Hoyes Panton, M.A., *Professor of Chemistry.*

E. A. A. Grange, V.S., *Professor of Veterinary Science.*

Alexander McTavish (*First-Class Prov. Certificate*), *Assistant Resident and Mathematical Master.*

P. J. Woods, *Instructor in Farm Department.*

James Forsyth, *Instructor in Horticultural Department.*

James McIntosh, *Instructor in Mechanical Department.*

Thomas Johnston, *Bursar.*

Introduction.

The institution known as the "Ontario Agricultural College and Experimental Farm," is situated about a mile to the south of the City of Guelph, in the centre of an extensive agricultural and noted stock-raising district, readily accessible by rail from all parts of the Province. The Farm consists of 550 acres, about 400 which are cleared. It is composed of almost every variety of soil, and is therefore well suited to the purposes for which it was selected.

Immediately upon taking possession, the Government appointed a Commission to inquire and report regarding "the manner of adapting the said farm and management and control thereof to the purpose of a Model and Experimental Farm." A few extracts from the Report of this Provincial Farm Commission will show clearly the basis upon which the institution is at present established.

"The objects of the institution should be—First, to give a thorough mastery of the practice and theory of husbandry to young men of the Province engaged in Agricultural or Horticultural pursuits, or intending to engage in such; and, second, to conduct experiments tending to the solution of questions of material interest to the Agriculturists of the Province, and publish the results from time to time.

"That the Farm should be separated into five distinct departments, namely:—

"1. Field Department.
"2. Horticultural Department.
"3. Live Stock Department.
"4. Poultry, Bird and Bee Department.
"5. Mechanical Department.

"All permanent improvements on the Farm should be carried out on a gradually developed system, and in such a manner as to exhibit and test the comparative values of the most approved methods of executing the several works; and to test the cost, convenience and durability of the several appliances from time to time recommended for adoption on the farms of the Province."

In order to carry out the suggestions of the Provincial Farm Commission, the Government made such improvements on the residence found on the place as would best utilize it for present purposes. Accommodation was provided for about twenty-five pupils, a Principal and a Rector were appointed, and a Foreman for each of the following departments engaged, viz.:

1. Farm Department.
2. Live Stock Department.
3. Horticultural Department.
4. Mechanical Department.

Work commenced in May, 1874. Since that time considerable progress has been made. There are now ninety-two students in attendance—all boarding in the institution; and it is hoped that our Parliament, at its next session, will make an appropriation, to increase the accommodation at once. Many improvements have been made on the Farm. A considerable portion of it has been well drained, suitable implements have been provided, and a very fair representation of stock secured—seven breeds of cattle, five of sheep, and three of pigs. The Horticultural Department has been thoroughly established, and is now one of the most efficient means of education in connection with the institution.

TERMS OF ADMISSION.

1. Each candidate must be at least fifteen years of age.
2. He must produce satisfactory certificates—
   (1) As to moral character.
   (2) As to physical health and strength.
   (3) As to the assent of his parents or guardian.
   (4) As to his intention to follow Agriculture or Horticulture as an occupation.
3. He must pass the Matriculation Examination.
4. If a ratepayer or a *bona fide* resident of the Province of Ontario, he must pay a fee of $25 a year in advance; if not, he must pay a fee of $50 a year in advance.

The subjects for matriculation are as follows:

(*a*) Reading, writing and dictation.
(*b*) English Grammar—parsing and analysis.
(*c*) Arithmetic—to the end of Simple Proportion.
(*d*) The outlines of General Geography, and the Geography of Canada.

Candidates for admission are required to present themselves for examination on the 16th of April or the 1st of October, at 9 a.m., in the Lecture Room of the College.

First, Second and Third Class Teachers, holders of Intermediate Certificates or Certificates of Entrance to High Schools, Graduates or Undergraduates of any University in Her Majesty's dominions, will be admitted on presentation of certificates or diplomas. Intending students who do not hold any such certificate or diploma are advised to pass the examination for admission to High Schools, to save the expense and annoyance of having to return home in case of their failing to pass our Matriculation Examination.

Heretofore there has been a Preparatory Class in connection with the College for young men who understood the ordinary routine of farming, but could not pass the Matriculation Examination. In future, such candidates will be admitted if the number of qualified applicants be not sufficient to fill all vacancies.

Farmers' sons, or others following the occupation of farming, will be allowed to attend the Classes during the winter session, which shall count as a year, under conditions hereinafter specified.

COURSE OF INSTRUCTION.

The instruction given at the institution is embraced under two heads: a Course of Study and a course of Apprenticeship.

1.—COURSE OF STUDY.

The regular course of study for matriculated students is one of two years. There is a special course for those attending during the winter session only, whereby, no apprenticeship being undertaken in that time, additional studies are possible, and the whole two years' course is completed in two winter sessions.

First Year.

SUBJECTS:

Practical Agriculture.
Veterinary Anatomy.
Veterinary Materia Medica.
Physical Geography.
English.
Chemistry.
Botany.
Zoology.
Geology.
Mathematics.

Second Year.

SUBJECTS:

Agriculture.
Veterinary Pathology
Veterinary Surgery and Practice.
Book-Keeping.
Levelling and Surveying.
Agricultural Chemistry.
Economic Botany.
Entomology.
Meteorology.
English Literature.
Political Economy.

DEPARTMENTS OF INSTRUCTION.

1.—Agriculture.

Introduction.—*History of Agriculture*—Ancient, mediæval, modern; *Literature*—standard works, reports of societies, periodicals; *Varieties of Farming*—dairy, stock, ordinary mixed husbandry.

Soils.—Origin, distribution, physical properties and classification of soils; *Reclamation of lands*—Forest clearing—stumping, stoning, fallowing, etc.

Preparation of the Land for Crops.—Ordinary operations of tillage, ploughing, harrowing, cultivating, rolling, subsoiling, levelling, general cultivation most appropriate for the various kinds of soils.

Succession of Crops.—Importance and necessity of rotation, principles thereof, rotations suitable for various soils; crops—root, forage, cereal—treated with reference thereto.

Cultivation of Crops.—The various crops; *Cereals*—wheat, oats, barley, etc.; *Leguminous*—peas, beans, etc.; *Roots*—turnip, carrot, potato, etc.; *Forage or Herbage*—tare, lucerne, clovers, grasses, flax, hemp—cultivation most appropriate for each; *Seeds*—purchasing, testing, preparing, changing; *Sowing*—kind and quantity of seed, method of sowing; *After cultivation—harvesting—consumption*, or preparing for market, cost of production, laying land down to grass, management of grass and pasture land.

Improvement of Soils and Lands.—Improvement by thorough ordinary cultivation, subsoiling; *Draining*—its value, principles, various methods of draining, formation, levelling for, materials used in formation, cost and remuneration; *Manuring*—farm-yard manuring; application, uses, and properties of *artificial manures*—lime, plaster, salt, bones, superphosphate, nitrate of soda, etc., etc.

Breeding, Rearing, and Feeding of Animals.—Horses suited for agricultural purposes, various breeds, breeding, feeding, and general management; *Cattle*—characteristics of the various breeds—Shorthorns, Herefords, Devons, Ayrshires, etc.; methods of breeding, cross-breeding, in-and-in breeding, pedigree system, rearing young stock, the fattening process, relation of food to increase, dairy management, butter and cheese management, the factory system, realization; *Sheep*—characteristics of various breeds, long wools, medium wools, short wools, breeding and management of ewe flock, winter and spring feeding, rearing of lambs, relation of food to increase; Wool—texture, quantity and quality, dipping and salving, quantity maintained per acre; *Swine*—characteristics of the various breeds, breeding and management of sows, fattening, relation of food to increase, bacon curing; *Poultry*—characteristics of the various breeds, general management.

Implements of the Farm.—Mechanical principles entering into their construction; ploughs, harrows, cultivators, other tillage implements, sowing machines, grass seed and manure distributors; mowing and reaping machines; hay-making and harvesting machines, threshing and dressing machines; barn implements; waggons, sleighs, carts; straw cutters, turnip cutters and pulpers, implements used in stock-feeding, common, steaming; implements of less general use.

General Economy of the Farm.—Laying out a farm, formation and management of roads and lanes; *Fences*—varieties, position, mode of construction, materials, movable fences, hurdles; *Hedges*—varieties, methods of planting, after cultivation; *Buildings*—dwellings, out-buildings, stables, barns, sheds—principles of construction, plans and specifications.

General Business of the Farm.—Capital necessary, values and prices of land, stock, implements and improvements, value of all kinds of labour, making of inventories, keeping of stock and produce registers; *Markets*—economical laws regulating them, customs affecting them, modes of buying and selling, common laws relating to agriculture, relation of agriculture to the other industries.

Arboriculture.—Application to the American continent, different kinds of trees—occurrence, habits, uses, values—value of timber as a crop, raising of trees from the seed bed, what parts of the country should be planted, planting operations, transplanting large trees, enclosing and draining planted ground, management of trees with a view to shelter and economy.

Miscellaneous Subjects.

2.—Horticulture.

Occasional lectures are all that are yet given in this important department. The course of practical work, however, is extensive.

3.—Science.

I.—Chemistry.

Chemical Physics.—Force and matter, correlation of force, properties of matter, gravity, cohesion, heat—light, magnetism—electricity; forms of matter, liquids, solids, gases.

Inorganic Chemistry.—Scope of chemistry, atomic theory, chemical affinity, the *non-metallic* elements—oxygen, hydrogen, water—its nature, occurrence, functions, states and decomposition, nitrogen, the atmosphere, ammonia, its sources and important uses, oxides of nitrogen, nitric acid and its importance to plants, sulphur and its compounds, sulphuric acid, its manufacture and uses, phosphorus, the agricultural importance of phosphoric acid, carbon, silicon, flint, sand, silicates, chlorine, bromine, iodine, etc.;

The metals—the alkalies, sodium, potassium, soda, salt; calcium, lime, plaster; lead and its compounds; iron—its ores and manufactures; arsenic—its compounds and detection—gold, silver, platinum, tin, etc., etc., occurrence and uses, alloys.

Organic Chemistry.—Scope of the divisions of the science, organic compounds derived directly or indirectly from plants and animals, artificial formation of organic compounds, classification of organic bodies and their complexity, determination of the empirical and rational formulæ of organic bodies. *Wood Spirit* and its derivatives, methyl compounds, chloroform, acetic acid and its compounds, alcohol and the process of fermentation, constitution of oil and fats, manufacture of soap and candles; *starch and sugar*, and the other amyloids and glucoids—manufacture of sugar, tartaric, lactic, citric, and malic acids. The flesh-formers or albuminoids and their congeners; *Essential oils and resins*—varnishes, petroleum; *Vegetable Alkaloids*—quinine, strychnia; aniline dyes; urea and uric acic; *Animal Chemistry. Vegetable Chemistry.*

Agricultural Chemistry.—History of the connection between agriculture and chemistry, the food of plants, the origin and nature of soils, analysis of soils, relation of different plants to the soil, composition of different crops, chemical changes during the growth of different plants, rotation of crops, manures—special and general, the composition of farmyard manure, nature and analysis of guanos and superphosphates, other manures, feeding of animals, foods, ingredients of foods, relation of increase to composition of food, economy of food.

Practical Chemistry.—Chemical manipulation—the practical testing of waters, soils, foods, superphosphates, and other manures, and the preparation of the common gases, and the common acids.

Analytical Chemistry.—Qualitative and quantitative analysis, especially the analysis of soils, manures and farm produce.

(*a*) *Through all the courses, both of laboratory and experimental lectures, a constant endeavour is made to illustrate the principles of the pure science of Chemistry, on which the whole teaching is based, by Agricultural examples.*

II.—Natural History and Entomology.

Botany.—*Structural and Physiological*—internal structure of plants, cells and vessels, construction and development of the external parts of plants, root, stem, leaf, flower, seed, fruit, physiology of cells and vessels, chlorophyll, starch, gum, sugar, crystals, etc., movement of fluids and gases, nutrition and respiration, reproduction, methods of fertilization, hybridization, varieties, propagation, budding, division; diseases of plants, smut, rust, mildew, etc.

Systematic and Economic Botany.—Special morphology and general classification of plants, flowerless plants, mosses, ferns, fungi, etc.; flowering plants, characters of larger divisions. The orders containing important agricultural and economic plants, the cereals, grasses, roots with geographical distribution, agricultural seeds and fruits.

Zoology.—Nature of life, vital force, differences between animals and plants, differences between different animals, morphology and physiology, definition of species, origin of species, classification, characters of the general classes and orders of the *Invertebrates*, with examples. Special study of *Infusoria*, *Scolecida*, *Annelida*, and *Insecta*. General characters of the *Vertebrates*—the various orders, with morphological and physiological distinctions of each, illustrated by common examples. Special study of the families of *Aves*, containing the insectivorous birds, and the families of the *Mammalia*, containing all the various farm animals. Comparative anatomy and physiology of farm animals.

Entomology.—Structure and physiology of insects, metamorphoses of insects, senses of insects, insects injurious to vegetation, to growing plants; to fruits, the apple, plum, pear, peach, small fruits, etc.

III.—Geology, Physical Geography and Meteorology.

Geology.—Geological epochs, classification of rocks, structure, stratification, cleavage, foliation, dip, fault, denudation; elevation and depression of land; disintegration of rocks by aqueous and atmospheric agencies, formation of soils, Canadian geology.

PHYSICAL GEOGRAPHY AND METEOROLOGY.—Connection between physical geography and geology, distribution of land and water, superficial configuration of Ontario, theory of wells and springs. *History and scope of meteorology*—weight of atmosphere, how ascertained, *barometer*—various kinds, manipulation; *Temperature*—how observed and calculated—*thermometer*—varieties, Fahrenheit, centigrade, etc., use of each, manipulation; solar and terrestrial radiation, moisture of the atmosphere; mists, fogs, clouds; rain, snow, hail; winds and storms; miscellaneous, causes affecting the climate, influence of climate on vegetation.

4.—VETERINARY SCIENCE.

ANATOMY AND PHYSIOLOGY OF THE DOMESTIC ANIMALS.—Horse, ox, sheep, pig. Osseous system, muscular system, syndesmology, plantar system, odontology, digestive, system, circulatory system, respiratory system, urinary system, nervous system, sensitive system, generative system, tegumental system.

VETERINARY PATHOLOGY.—Osseous system, giving the nature, causes, symptoms, and treatment of the various diseases of bone as splint, spavin, ringbone, etc.

Muscular System—nature, causes, symptoms, and treatment of flesh wounds, etc.

Syndesmology—nature, causes, symptoms, and treatment of bog spavin, curb, and other diseases of joints.

Plantar System—nature, causes, symptoms, and treatment of corns, sand-crack and other diseases of the foot.

Odontology—describing the diseases o. the teeth; also the mode of determining the age of the animals by the same.

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.

Circulatory System—describing the diseases of the heart and blood vessels.

Respiratory System—nature, causes, symptoms, and treatment of catarrh, nasal gleet, roaring, bronchitis, pleurisy, inflammation of the lungs, etc.

Urinal System—nature, causes, symptoms, and treatment of inflammation of the kidneys, etc.

Nervous System—nature, causes, symptoms, and treatment of lock-jaw, string-halt, etc.

Sensitive System—nature, causes, symptoms, and treatment of the diseases of the eye and ear.

Generative System—nature, causes, symptoms, and treatment of abortion, parturition, milk fever, etc.

Tegumental System—nature, causes, symptoms, and treatment of scratches, sallenders, mallenders, parasites, and other diseases of the skin.

MATERIA MEDICA.—Giving the prepartion, actions, uses, doses, of over one hundred of the principal medicines used in Veterinary practice.

GENERAL SUBJECTS.—The external form of the horse, thorough-breds, half-bred hunters, harness animals, draught animals. The external forms of stock, breeding, selection of animals, crosses, transmission of hereditary diseases; spavin, splints, side bones, ring-bones, grease, blindness, roaring, etc., and their remedies, sterility, abortion, general management to produce successful gestation, parturition, natural and præternatural presentations, their treatment. The management of young stock, weaning, feeding, method of preventing blood disease. The feeding of animals, ventilation, water, stabling. The influence of climate upon animals.

DEMONSTRATION OF ANATOMY IN THE DISSECTING ROOM.

5.—ENGLISH AND POLITICAL ECONOMY.

ENGLISH.—*Review of past school work.*—study of etymological, syntactical and rhetorical forms of the English language, history of its formation, elements entering into it, its connection with other languages. Analytical study of one of Shakspeare's plays, and of extracts from some of the other English classics each year. *English composition*—the sentence, the paragraph, rhetorical figures, their use and abuse, species of compo-

sition, qualities of style, varieties of style. Essay writing, familiar and business correspondence.

POLITICAL ECONOMY.—Wealth, labour, capital. Production, distribution, exchange, government, and the position that agriculture holds in each; relation of agriculture to all the other industries of a nation.

6—MATHEMATICS.

MATHEMATICS.—*Arithmetic—Review of past work in arithmetic, with special view to farm accounts*—tables of weights and measures, proportion, interest, discount, partnership, square and cube roots; *Mental Arithmetic; Mensuration*—the mensuration of every kind of surface, including the quantity of land cultivated by various machines, the surface occupied by different crops, the measurement of solids, including the contents of tanks, ditches, wells, manure heaps, walls, the materials for roads, timber, etc. *Surveying* in its commoner branches, fields surveyed with the chain and cross-staff, heights and distances found by the use of the theodolite, levelling practised. *Mechanics*—methods for calculating the weights of different materials, the units of work performed by various agents in the execution of particular works, the strength of materials, the mechanical powers, friction, the steam engine, etc. Those parts of dynamics which have reference to agricultural machinery, such as centrifugal force, accumulated work.

II.—COURSE OF APPRENTICESHIP.

The pupils are daily distributed to each of the following departments:

1. The Live Stock Department.
2. The Field Department.
3. The Horticultural Department.
4. The Mechanical Department.
5. The Experimental Department.

They are taught the manner of performing the various operations in each department by the instructor or his assistants in that department; and being distributed alternately to each, it is expected that at the end of two years a thorough apprenticeship will have been served.

The instruction received in the class-room is, as far as possible, illustrated and exemplified in the fields, yards and shops. The following may be taken as a few of the operations, in the performance of which apprenticeship is served:

FIELD DEPARTMENT.—Cleaning, harnessing and management of horses, ploughing, harrowing, cultivating, drilling, subsoiling, sowing, broadcast and by drill, planting, hoeing and grubbing, haying—by scythe and mower, harvesting by cradle and reaper, stoning, threshing, winnowing, marketing, draining, levelling, land measuring, stumping, logging, chopping, etc., etc.

LIVE STOCK DEPARTMENT.—Cutting, pulping, steaming, mixing, feeding, cleaning, and general management of *cattle*. Feeding, lambing, shearing, castration, dipping, salving, hurdling, and general management of *sheep*. Feeding and general management of other stock.

HORTICULTURAL DEPARTMENT.—Digging, ploughing, raking, seeding, planting, hoeing, mowing, harvesting, storing, and general management of vegetables, flowers and lawn. Pruning, grafting, budding, mulching, cleaning, harvesting and storing, and general management of an orchard. General management of propagating-houses, greenhouses, vinery, nursery, hedges, walks and roads, etc., etc.

MECHANICAL DEPARTMENT.—Planing, sawing, nailing, grooving, matching, mortising, framing and general use of commoner mechanical tools. Fencing, hurdle making, gate making, and management of general farm improvements. Repairs of all farm buildings, implements, machines, etc., etc.

SESSIONS AND EXAMINATIONS.

For those taking the regular course there are two Sessions in the year—a Winter and a Summer Session. The former commences on the first of October, the latter on the 16th of April.

There is a vacation at the end of each Session.

Examinations, which every student is required to pass, are held at the close of the Session—in each inside Department, on the subjects of Lectures in that Department, for the Session; and in each outside Department, on the work of that Department for the Session.

For those taking the special course there is but one Session—the Winter Session—extending from the first of October to the end of March. To those who pass the requisite examinations, not only in the regular studies, but in the special ones likewise, this Session counts as a year, and is so designated.

DIPLOMAS.

A diploma is given to each student who completes his course of study, and passes satisfactorily all examinations, both on the subjects contained in the curriculum, and on the work of his apprenticeship.

RESIDENCE, LABOUR, FEES, REMUNERATION.

1.—Regular Course.

It is desirable that all students taking the regular course should reside in the building. As the city, however, is distant but a mile and a half, students may board in it and attend lectures.

The number of hours of labour for regular students varies with the season of the year, but the arrangements are such that an annual daily average of not more than five hours is enforced.

Tuition, $25 a year for ratepayers and *bona fide* residents of the Province of Ontario; for all others, $50 a year.

Board and washing charged at cost.

For skilled work, faithfully and zealously performed, ten cents an hour is paid—for all other in proportion.

By this arrangement the cost of education is reduced to a minimum:

1st. The entire cost to an Ontario farmer's son, able and willing, with considerable experience in farm work, is $35 to $50 a year for *board*, *washing*, and *tuition*.

2nd. To an Ontario student without any previous knowledge of farming, $45 to $65 a year.

3rd. To non-residents, $65 to $85 a year.

2.—Special Course.

The special course, as stated above, commences on the 1st of October and ends 1st of April. It is intended for farmers' sons, or others engaged in that occupation, who desire to attend lectures during the winter, and return home in time for the spring work on their own farms. Such students doing little or no manual labour, are enabled to take a whole year's lectures in the Winter Session, which counts as a year.

Tuition $25 for the session to ratepayers and *bona fide* residents of the Province of Ontario; to all others, $50.

Board and washing charged at cost—$2.18 to $2.20 a week.

No opportunity of defraying expenses can be promised to students taking this course, but if work be required of them they will be paid at the same rates as other students.

GENERAL RULES.

I.—Students are Required

1. To render cheerful and willing obedience to orders.
2. To conduct themselves in a gentlemanly and orderly manner at all times.
3. To avoid all noisy or boisterous conduct in or about the building.
4. To observe neatness of dress at prayers, meals and lectures, and tidiness in their rooms.

II.—The Following Practices are Absolutely Forbidden:—

1. Swearing, improper language, and gambling.
2. Use of intoxicating liquors, cards, or fire-arms.
3. Use of tobacco while on detail, in or about the building, or in any place except in the smoking room.
4. Entering domestic or private apartments without permission.
5. Absence without leave.
6. Cutting, marking, or in any way defacing the College buildings or furniture.

GENERAL REGULATIONS.

1. All students who reside in the building are under the charge of the President.
2. A register is kept of the attendance of students at prayers, work and lectures.
3. All students must attend morning and evening prayers, unless exempted from doing so in consequence of the objection of their parents and guardians.
4. They are required regularly to attend their respective places of worship on Sabbath forenoon.
5. No student is allowed to be absent from the institution after seven o'clock in the evening, except by permission of the President.
6. Students are provided with everything in the shape of furniture, bedding, towels, etc., that may be requisite, but each is accountable for every such article placed at his disposal.
7. Every student damaging or breaking anything is required to report the same, that the value of the repairs may be charged to his account.
8. The morning bell is rung at 5.45 a.m.; bell for morning prayers, at 6 a.m.; breakfast, at 6.30 a.m.; farm bell, at 7 a.m.; school bell, at 9 a.m.; farm bell, at 12 noon; dinner, at 12.30 p.m.; farm and school bells, at 1.30 p.m.; farm and school bells, at 5 p.m.; tea, at 5.30 p.m.; school bell, at 7 p.m.; bell for evening prayers, at 9 p.m.; lights out at 10 p.m., and doors locked at 10.30 p.m.
9. The President is authorized to impose fines and other penalties, for the infraction of rules and regulations.
10. No student whose moral conduct, industrial or intellectual progress is unsatisfactory to the staff, will be allowed to remain at the institution.

GENERAL REMARKS.

A few general remarks on the appliances and advantages possessed by this institution for training young men for agricultural pursuits may be given in conclusion.

Classes of Students.

There are in our Province, as a general rule, at least three classes of young men whom an institution of this kind can benefit. The first class are those who, from our cities and towns, or from other countries, with or without a small capital at their command, desire to serve an apprenticeship at farm work. The second class is farmers' sons, or the sons of those closely connected with that occupation, who wish to complete their education before commencing their life-work. Both of these are provided for in our regular course. And lastly, there are farmers' sons or others engaged in farming who desire to obtain an agricultural education, but cannot remain with us during the summer months. These are provided for in the special course. By taking that course, they can do a year's work in the winter session, be back on their own farms in time to commence their spring work, and return to college again in the fall.

Teaching Appliances on the Farm.

The farm itself is being gradually laid out, cleaned, and drained, and the students assist in these operations. The best and most approved farm implements and machinery are used. The possession of seven breeds of cattle, five of sheep, and three of swine, is in itself an important advantage for the purposes of instruction. Besides this, there are in the immediate neighbourhood several herds which are frequently inspected by the students. In the adjacent city, monthly fairs, fat cattle shows, and a central exhibition are held. All of these are visited by the students, who regularly report on what they have observed.

Experiments.

A portion of the farm has been laid out in experimental fields and plots, and regular systematic experiments with varieties of grasses, cereals and roots, with different manures and different modes of cultivation, are carried on. In these the second year students, as far as practicable, are engaged. Besides these field experiments, others in the feeding of live stock are made during the winter, to test the several breeds and the comparative values of different kinds of food. The benefit of such experiments to the Province need not be pointed out. The discovery of one or two really good varieties of wheat, oats or pease would not only cover all expenses, but pay for the place itself in a couple of years by their value to the country. Without mentioning this, however, it will be seen that second years' students are trained in the modes of carrying out experiments.

Teaching Appliances in the School.

These are constantly being added to, although in the meantime they are not so numerous as might be desired. Especially is the want felt in the department of the Professor of Chemistry, for as yet there is but a small working laboratory in connection with the institution. Appliances in a school are usually the growth of years, and with five teachers—masters of their subjects—the College may be said to be fairly equipped.

Veterinary Department.

This most important department has been fully organized and is doing good work. A complete skeleton of a horse and all the principal bones of ordinary farm animals have been provided for the class-room. When an animal dies from disease or any other ailment, it is dissected, the cause or causes of death sought for and pointed out in presence of the classes. Thus the work is made as practical as possible.

Library and Reading Room.

The library is well selected, and, though small, is being constantly augmented. The reading-room is furnished by the College with daily and weekly newspapers, with some half-dozen general periodicals, and the leading agricultural papers of Canada, the United States and Great Britain. Several papers are likewise provided by the Literary Society.

Advantages of the Course.

Besides becoming fairly skilled in the work of a farm, the student takes part in the cultivation of a garden, and thus increases his knowledge and improves his taste in a very important direction. He also acquires skill in the use of tools, so that afterwards he is not only able to make his own repairs, but knows when such work is properly done. He sees for himself the effects of various rotations and different modes of cultivation, and becomes acquainted, on the experimental ground, and in the class-room, with many varieties of grasses, grains, roots, and manures. The different breeds of cattle, sheep and swine, of common use in Canada, become familiar to him from daily contact with them; and the excellencies and defects of each he learns by lectures in the class-room, and by reference in the yards. He is taught how to keep live stock registers, accounts of field cropping, and regular farm accounts. By personal observation he learns the routine of auction sales, of ordinary fairs and stock markets, and of the common grain market. He becomes acquainted with the prices of stock, implements and produce, with the cost of building and improvements—in a word, he is prepared to transact the *business* of a farm. He obtains in the Veterinary Department a knowledge of the structure and functions of farm animals, and the most approved methods of treating and preventing the ordinary diseases to which such animals are liable. The study of the relations of the plant, the soil, and the animal to each other, and to his profession, under the heads of Botany, Chemistry, etc., not only shows him the reasons for the rules of the best farm practice, and enables him afterwards to discover other such rules, but likewise forms in him habits of reasoning closely, systematically and correctly, which cannot fail in after life to make him a better citizen. And, lastly, by this, as well as by the teaching in the class-room, by reading the standard works in the library, and the newspapers and periodicals in the reading-room, by contact with his fellow students, and by discussions carried on with them in their Literary Society, his mind is sharpened and strengthened, his views widened, and his power of thinking and his ability to express his thoughts greatly increased.

If the student be careless, thoughtless, or lazy, few of those advantages will be reaped; but if he be attentive, energetic and diligent the majority of them will undoubtedly be secured.

TIME TAB

Time table N
week; time table
No. 1 and No. 2 h

	Hours.	Mon
Forenoon.	7–8	Study Recrea
	8–9	Drill Gymna
	9–10	Arithm
	10–11	Inorga Chemist
	11–12	Natural Hi
After-noon.	1.30–5	Work.

	Hours.	Monday.
Forenoon.	7–12	Work.
Afternoon.	2–3	Arithmetic
	3–4	Agriculture
	4–5	Inorganic Chemistry.

APPENDIX B.

TIME TABLES FOR FALL TERM (1st October to Christmas), 1880.

Time table No. 1 gives the routine of the different years and divisions for the first week; time table No. 2, the routine of the same years and divisions for the second week, No. 1 and No. 2 having been followed alternately, for a week each, throughout the term.

TIME TABLE No. 1.—1st WEEK.

1st Year.—Division I.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7–8	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Half Holiday.
	8–9	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	
	9–10	Arithmetic.	Arithmetic.	Natural History.	English Composition.	English Literature.	
	10–11	Inorganic Chemistry.	Agriculture.	Inorganic Chemistry.	English Literature.	Agriculture.	
	11–12	Natural History.	Inorganic Chemistry.	Veterinary Anatomy.	Agriculture.	Veterinary Anatomy.	
Afternoon.	1.30–5	Work.	Work.	Work.	Work.	Work.	Work.

1st Year—Division II.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7–12	Work.	Work.	Work.	Work.	Work.	Work.
Afternoon.	2–3	Arithmetic.	English Composition.	Natural History.	Natural History.	Arithmetic.	Half Holiday.
	3–4	Agriculture.	English Literature.	Agriculture.	Inorganic Chemistry.	Inorganic Chemistry.	
	4–5	Inorganic Chemistry.	Veterinary Anatomy.	Veterinary Anatomy.	English Literature.	Agriculture.	

2ND YEAR.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7–12	Work.	Work.	Work.	Work.	Work.	Work.
Afternoon.	2–3	Agricultural Chemistry.	Levelling and Surveying.	Statics.	Meteorology.	Agricultural Chemistry.	Half Holiday.
	3–4	Veterinary Pathology.	Agriculture.	Agricultural Chemistry.	Agriculture.	English Literature.	
	4–5	Handling and Judging Horses.	English Literature.	Hand. & Judging Cattle or Sheep.	Levelling and Surveying.	Veterinary Pathology.	

TIME TABLE No. 2.—2ND WEEK.

1ST YEAR.—DIVISION I.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7–12	Work.	Work.	Work.	Work.	Work.	Work.
Afternoon.	2–3	Arithmetic.	Arithmetic.	Natural History.	English Composition.	English Literature.	Half Holiday.
	3–4	Inorganic Chemistry.	Agriculture.	Inorganic Chemistry.	English Literature.	Agriculture	
	4–5	Natural History.	Inorganic Chemistry.	Veterinary Anatomy.	Agriculture.	Veterinary Anatomy.	

1ST YEAR.—DIVISION II.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7–8	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Half Holiday.
	8–9	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	
	9–10	Arithmetic.	English Composition.	Natural History.	Natural History.	Arithmetic.	
	10–11	Agriculture.	English Literature.	Agriculture.	Inorganic Chemistry.	Inorganic Chemistry.	
	11–12	Inorganic Chemistry.	Veterinary Anatomy.	Veterinary Anatomy.	English Literature.	Agriculture.	
Afternoon.	1.30–5	Work.	Work.	Work.	Work.	Work.	Work.

2ND YEAR.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7–8	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Half Holiday.
	8–9	Drill.	Drill.	Drill.	Drill.	Drill.	
	9–10	Agricultural Chemistry.	Levelling and Surveying.	Statics.	Meteorology.	Agricultural Chemistry.	
	10–11	Veterinary Pathology.	Agriculture.	Agricultural Chemistry.	Agriculture.	English Literature.	
	11–12	Handling and Judging Horses.	English Literature.	Hand. & Judging Cattle & Sheep.	Levelling and Surveying.	Veterinary Pathology.	
Afternoon.	1.30–5	Work.	Work.	Work.	Work.	Work.	Work.

TIME TABLE No. 3.—SPECIAL COURSE.

1ST YEAR.—SPECIAL.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7–8	Work.	Work.	Work.	Work.	Work.	Work.
	9–10	Arithmetic.	Arithmetic.	Natural History.	English Composition.	English Literature.	
	10–11	Inorganic Chemistry.	Agriculture.	Inorganic Chemistry.	English Literature.	Agriculture.	
	11–12	Natural History.	Inorganic Chemistry.	Veterinary Anatomy.	Agriculture.	Veterinary Anatomy.	
Afternoon.	2–3	Study.	Study.	Study.	Study.	Study.	Holiday.
	3–4	Book-keeping.	Geology and Phys. Geog.	Botany.	Veterinary Mat. Med.	Study.	
	4–5	Mensuration.	Agriculture.	Study.	Agriculture.	Geology and Phys. Geog.	

2ND YEAR.—SPECIAL.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7–8	Work.	Work.	Work.	Work.	Work.	Work.
	9–10	Agricultural Chemistry.	Levelling and Surveying.	Statics.	Meteorology.	Agricultural Chemistry.	Holiday.
	10–11	Veterinary Pathology.	Agriculture.	Agricultural Chemistry.	Agriculture.	English.	
	11–12	Handling and Judging Horses.	English.	Hand. & Judging Cattle or Sheep.	Levelling and Surveying.	Veterinary Anatomy.	
Afternoon.	2–3	Study.	Economic Botany.	Agriculture.	English.	Study.	
	3–4	Book-keeping.	Dynamics.	Study.	Study.	Practical Chemistry.	
	4–5	Study.	Veterinary Mat. Medica.	Practical Chemistry.	Economic Botany.	Practical Chemistry.	

APPENDIX C.

1.—COLLEGE ROLL FOR THE YEAR 1880.

2.—COLLEGE ROLL FOR THE SESSION 1880-'81 (1st Oct. to 31st March.)

1.—COLLEGE ROLL FOR THE YEAR 1880.

Name.	P. O. Address.	County, &c.
Anderson, Henry F	London	Middlesex.
Anderson, John P	Guelph	Wellington.
Ash, Wm. E	Thorold	Lincoln.
Atkinson, Geo. M.	Montreal	Montreal.
Armstrong, Christian	Knowlton	Quebec.
Armstrong, Francis	Knowlton	Quebec.
Ballantyne, Wm. W	Stratford	Perth.
Barclay, Edmund H	St. Andrews	Scotland.
Batty, Jonathan	Meaford	Grey.
Bignell, Edward	Claude	Peel.
Bethune, Kenneth	Ottawa	Carleton.
Begg, Robert A.	Bracebridge	Victoria.
Bell, James	Montreal	Montreal.
Beaudet, George	Quebec	Quebec.
Blake, Oliver C	Waterford	Norfolk.
Blanchard, Monson G.	Windsor	Nova Scotia.
Bowman, Byron	West Montrose	Waterloo.
Brown, William	Guelph	Wellington.
Cushing, George	Kenilworth	Wellington.
Chipman, Percy H.	Montreal	Montreal.
Charlton, Geo. A.	St. George	Brant.
Clark, Donald	Bremar	Oxford.
Cuppage, Alexander	Orillia	Simcoe.
Condell, Geo.	Yorkville	York.
Cross, A. Ernest	Montreal	Montreal.
Chapman, Richard	Plymouth	England.
Clutton, Alexander	Millburn	Huron.
Clutton, John G	Millburn	Huron.
Campbell, D. P. L.	Vankleek Hill	Prescott.
Craig, William	Abbottsford	Rouville.
Corwin, Arthur J.	Drummondville	Welland.
Chase, Oscar	Cornwallis	Nova Scotia.
Carpenter, Chas	Simcoe	Norfolk.
Duthie, James	Guelph	Wellington.
Denman, Arthur W.	Cranbrook	Huron.
Dickinson, Charles S.	Seaforth	Huron.
Dickinson, Samuel	Zion	Durham.
Dunne, Peter	Ottawa	Carleton.
Dawes, Mark A	Montreal	Montreal.
Dennis, James F.	Weston	York.
Davis, Robert A.	York	Haldimand.

1.—COLLEGE ROLL FOR THE YEAR 1880.—*Continued.*

NAME.	P. O. ADDRESS.	COUNTY, &c.
Douglas, Joseph	Blake	Huron.
Dewar, John D.	Tiverton	Bruce.
Dunlop, John	Woodstock	Oxford.
Dawson, John	South Zorra	Oxford.
Egleston, George	Ancaster	Wentworth.
Elworthy, Robert	Norwich	Oxford.
Fenton, James	Rochdale	England.
Fotheringham, James	St. Mary's	Perth.
Fotheringham, William	St. Mary's	Perth.
File, John J.	Brantford	Brant.
Ferguson, George A.	Kingston	Frontenac.
Ffolkes, Edward	Hillington Lynn	England.
Gilpin, William	Ottawa	Carleton.
Green, Harry	Waterford	Norfolk.
Gibson, Robert	Glen Allan	Wellington.
Gibson, William J.	Ottawa	Carleton.
Gordon, William	Guelph	Wellington.
Grindley, Arthur W.	Wolfe's Island	Frontenac.
Grant, Peter	Thornyhurst	Lambton.
Grant, Robert, H.	Ottawa	Carleton.
Glass, William	East Zorra	Oxford.
Gibb, J. Gordon	Ottawa	Carleton.
Gaw, W. W.	Leadville	Colorado.
George, Alexander	Keith	Scotland.
Grant, William M.	Woodville	Victoria.
Goold, George E.	Kingston	Frontenac.
Hermon, Ernest B.	Rednersville	Prince Edward.
Horne, William H.	North Keppel	Grey.
Hill, James L.	Ottawa	Carleton.
Howitt, William	Guelph	Wellington.
Hogarth, George	Hespeler	Waterloo.
Holterman, Richard F.	Toronto	York.
Hogarth, Stephen J.	Exeter	Huron.
Hallesy, Frederick	Merthyr Tidfil	Wales.
Henderson, Daniel	Loch Winnoch	Renfrew.
Irving, Christopher H.	Hamilton	Wentworth.
Jackson, Charles S.	Brantford	Brant.
Joyce, Henry G.	Toronto	York.
Joy, Harold H.	Grimsby	Lincoln.
Job, John	Waterdown	Wentworth.
Jones, George F. B.	Hillier	Prince Edward.
Jones, George	Guelph	Wellington.
Jones, Frank C.	Guelph	Wellington.
Kippen, Horace B.	Lennoxville	Quebec.
Law, F. E.	Stratford	Perth.
Landsborough, John	Clinton	Huron.
Leask, John	Pinkerton	Bruce.
Lindsay, William D.	Woodstock	Oxford.
Lindsay, Samuel J.	Woodstock	Oxford.
Lomas, Joseph W.	Yorkville	York.
Lang, William	Ottawa	Carleton.
Lewis, William	Montreal	Montreal.
McNaughton, James M.	Laggan	Glengarry.
Motherwell, William R.	Perth	Lanark.
McIlquham, John J.	Lanark	Lanark.
McIlquham, William	Lanark	Lanark.
Minard, James H.	Sparta	Elgin.
McLachlan, Daniel	Toronto	York.
Mylne, Robert C.	Smith's Falls	Lanark.
McClelland, Henry	Hornby	Halton.
Maguire, Alexander	Sheldon	Simcoe.
Macaulay, Herbert R.	Hamilton	Wentworth.
McLaren, Harry	Montreal	Montreal.
McLaren, Peter	Perth	Lanark.
Macfarlane, David	Montreal	Montreal.
McArthur, John	Ailsa Craig	Middlesex.
McDonald, Robert	Dunvegan	Glengarry.
Macleod, Martin D.	Oak Ridges	York.
Myers, William	Guelph	Wellington.

1.—COLLEGE ROLL FOR THE YEAR 1880.—*Continued.*

NAME.	P. O. ADDRESS.	COUNTY, &C.
Moore, Charles, J.	Toronto	York.
Matthewman, Ernest	Ottawa	Carleton.
McPhail, Ernest	Toronto	York.
Mahony, E. C	Hamilton	Wentworth.
Nicol, George	Cataraqui	Frontenac.
Newton, John	Weston	York.
Nelson, Jas. R.	Sorel	Richelieu.
Noble, Frederick	Toronto	York.
Nurse, Frank J.	Hamilton	Wentworth.
Ord, William	Toronto	York.
Pope, Albert L.	Sarawak	Grey.
Pope, Edward	Sarawak	Grey.
Pope, Herbert	Sarawak	Grey.
Phin, Richard J	Hespeler	Waterloo.
Phin, William E.	Hespeler	Waterloo.
Perry, Herbert E.	Hollin	Wellington.
Patton, William	Montreal	Montreal.
Philbin, Thomas	Ottawa	Carleton.
Poe, James P.	Callan	Ireland.
Petapiece, William	Manotick	Carleton.
Robins, William P.	Beamsville	Lincoln.
Ross, James G.	Montreal	Montreal.
Ross, William J.	Smith's Falls	Lanark.
Reymond, Andrew	Ottawa	Carleton.
Roberts, Percy	Toronto	York.
Rastrick, Alfred	Hamilton	Wentworth.
Rae, William L.	Fitz-William Road	London, Eng.
Ramsay, Robert A.	Eden Mills	Wellington.
Rogers, Frederick	Deans	Haldimand.
Roblin, Adelbert G.	Rednerville	Prince Edward.
Redmond, Samuel	Peterboro'	Peterboro'.
Snyder, Elias	Burgessville	Oxford.
Surtees, William S.	Ottawa	Carleton.
Stinson, Lewis A.	Bloomfield	Prince Edward.
Small, Alexander T.	Ottawa	Carleton.
Sutherland, Alexander D.	Bennington	Oxford.
Silverthorn, Newman	Summerville	Peel.
Scott, Archie	Hastings	Northumberland.
Segsworth, Frederick	Monck	Wellington.
Stubbs, William H.	Bosworth	Wellington.
Skaife, John	[illegible]	Montreal.
Switzer, William G.	Palermo	Halton.
Stover, John W.	Norwich	Oxford.
Shaver, Charles B.	Stratford	Perth.
Schüll, Charles	Guelph	Wellington.
Stonehouse, Marshall	Shirley	Ontario.
Smith, Miles H.	Oakville	Halton.
Shuttleworth, Arthur	Mount Albert	York.
Sherer, Edward	Ottawa	Carleton.
Torrance, W. Percy	Guelph	Wellington.
Templer, William	Jerseyville	Wentworth.
Tronson, Harold	Oakville	Halton.
Terhune, Frederick	Brantford	Brant.
Willis, Thomas	Whitby	Ontario.
Wilson, Samuel J.	Bosworth	Wellington.
Wilson, William A.	Ottawa	Carleton.
Webster, Lindsay	Yarmouth	Nova Scotia.
Watt, James M.	Montreal	Montreal.
Watt, D. A.	Montreal	Montreal.
Ward, Thomas M.	Stanhope	Prov. of Quebec.
White, William G.	Lanark	Lanark.
White, Charles	Lanark	Lanark.
Wettlaufer, Frederick	Tavistock	Perth.
Williams, Albert	Culloden	Oxford.
Woodley, Francis E.	Quebec	Quebec.
Wyndham, Walter	Roach's Point	York.
Total		176

2.—COLLEGE ROLL FOR THE SESSION 1880-81 (1st Oct. to 31st March).

Name.	P. O. Address.	County, &c.
Anderson, Henry F.	London	Middlesex.
Anderson, John P	Guelph	Wellington.
Armstrong, Christian.	Knowlton	Quebec.
Armstrong, Francis.	Knowlton	Quebec.
Ballantyne, William W.	Stratford	Perth.
Begg, Robert A.	Bracebridge	Victoria.
Bignell, Edward	Claude	Peel.
Blanchard, Monson.	Windsor	Nova Scotia.
Barclay, Edmund H.	St. Andrews	Scotland.
Blake, Oliver C.	Waterford	Norfolk.
Batty, Jonathan	Meaford	Grey.
Bowman, Byron	West Montrose	Waterloo.
Bethune, Kenneth	Ottawa	Carleton.
Beaudet, George	Quebec	Quebec.
Bell, James	Montreal	Montreal.
Brown, William	Guelph	Wellington.
Cuppage, Alexander	Orillia	Simcoe.
Cross, Alfred E.	Montreal	Montreal.
Clutton, John G	Millburn	Huron.
Corwin, Arthur J	Drummondville	Welland.
Chase, Oscar	Cornwallis	Nova Scotia.
Carpenter, Charles	Simcoe	Norfolk.
Chipman, Percy H	Montreal	Montreal.
Charlton, George A.	St. George	Brant.
Dickinson, Charles S.	Seaforth	Huron.
Dickinson, Samuel	Zion	Durham.
Dennis, James F.	Weston	York.
Douglas, Joseph	Blake	Huron.
Dewar, John D.	Tiverton	Bruce.
Dunlop, John.	Woodstock	Oxford.
Dawson, John.	South Zorra	Oxford.
Elworthy, Robert.	Norwich	Oxford.
Egleston, George	Ancaster	Wentworth.
Fotheringham, James	St. Mary's	Perth.
Fotheringham, William.	St. Mary's	Perth.
File, John J	Brantford	Brant.
Ferguson, George A.	Kingston	Frontenac.
Ffolkes, Edward	Hillington Lynn	England.
Gilpin, William.	Ottawa	Carleton.
Green, Harry.	Waterford	Norfolk.
Gibson, Robert	Glen Allan	Wellington.
Grindley, Arthur W.	Wolfe's Island	Frontenac.
Glass, William	East Zorra	Oxford.
Gibson, William J	Ottawa	Carleton.
Gibb, J. Gordon	Ottawa	Carleton.
Gaw, W. W	Leadville	Colorado.
George, Alexander	Keith	Scotland.
Grant, William M.	Woodville	Victoria.
Goold, George E	Kingston	Frontenac.
Horne, William H.	North Keppel	Grey.
Hill, James L.	Ottawa	Carleton.
Howitt, William	Guelph	Wellington.
Holterman, Richard F	Toronto	York.
Hallesy, Frederick	Merthyr Tidfil	Wales.
Henderson, Daniel	Loch Winnoch	Renfrew.
Job, John	Waterdown	Wentworth.
Jones, George B.	Guelph	Wellington.
Kippen, Horace B.	Lennoxville	Quebec.
Law, F. E	Stratford	Perth.
Landsborough, John	Clinton	Huron.
Leask, John	Pinkerton	Bruce.
Lindsay, William D.	Woodstock	Oxford.
Lindsay, Samuel J	Woodstock	Oxford.
Lewis, William	Montreal	Montreal.
McNaughton, James M.	Laggan	Glengarry.
Motherwell, William R.	Perth	Lanark.
McIlquham, John	Lanark	Lanark.
McIlquham, William	Lanark	Lanark.
Mylne, Robert C.	Smith's Falls	Lanark.
Macaulay, Herbert R.	Hamilton	Wentworth.

2.—COLLEGE ROLL FOR THE SESSION 1880-81.—*Continued.*

NAME.	P. O. ADDRESS.	COUNTY, &c.
McFarlane, David	Montreal	Montreal.
McArthur, John	Ailsa Craig	Middlesex.
Macleod, Martin D.	Oak Ridges	York.
Myers, William.	Guelph	Wellington.
Moore, Charles J	Toronto	York.
Matthewman, Ernest	Ottawa	Carleton.
McPhail, Ernest	Toronto	York.
McLaren, Peter	Perth	Lanark.
Mahony, E. C	Hamilton	Wentworth.
Nicol, George	Cataraqui	Frontenac.
Newton, Joan	Weston	York.
Noble, Frederick	Toronto	York.
Ord, William	Toronto	York.
Pope, Edward	Sarawak	Grey.
Pope, Herbert E	Sarawak	Grey.
Phin, Richard J	Hespeler	Waterloo.
Phin, William E	Hespeler	Waterloo.
Patton, William	Montreal	Montreal.
Philbin, Thomas	Ottawa	Carleton.
Poe, James P	Callan	Ireland.
Petapiece, William	Manotick	Carleton.
Robins, William I	Beamsville	Lincoln.
Ross, William J.	Smith's Falls	Lanark.
Ross, James G	Montreal	Montreal.
Rae, William L.	Fitz-William Road	London, Eng.
Ramsay, Robert A	Eden Mills	Wellington.
Rogers, Frederick	Deans	Haldimand.
Roblin, Adelbert G.	Rednerville	Prince Edward.
Redmond, Samuel	Peterboro'	Peterboro'.
Surtees, William S.	Ottawa	Carleton.
Small, Alexander T.	Ottawa	Carleton.
Silverthorn, Newman	Summerville	Peel.
Scott, Archie	Hasting	Northumberland.
Segsworth, Frederick	Monck	Wellington.
Skaife, John	Montreal	Montreal.
Stover, John W,	Norwich	Oxford.
Shaver, Charles B.	Stratford	Perth.
Schüll, Charles	Guelph	Wellington.
Stonehouse, Marshal	Shirley	Ontario.
Smith, Miles H.	Oakville	Halton.
Shuttleworth, Arthur	Mount Albert	York.
Sherer, Edward	Ottawa	Carleton.
Torrance, W. Percy	Guelph	Wellington.
Templer, William	Jerseyville	Wentworth.
Tronson, Harold	Oakville	Halton.
Terhune, Frederick	Brantford	Brant.
Willis, Thomas	Whitby	Ontario.
Woodley, Francis E.	Quebec	Quebec.
Wilson, William A	Ottawa	Carleton.
Watt, James M.	Montreal	Montreal.
Watt, D. A.	Montreal	Montreal.
Ward, Thomas M.	Stanhope	Quebec.
White, William G.	Lanark	Lanark.
White, Charles	Lanark	Lanark.
Wyndham, Walter	Roach's Point	York.
Wettlaufer, Frederick	Tavistock	Perth.
Williams, Albert	Culloden	Oxford.
Total		126

APPENDIX D.

ONTARIO AGRICULTURAL COLLEGE.

EXAMINATION PAPERS.

I. PAPERS SET AT SESSIONAL EXAMINATIONS, EASTER, 1880.
II. PAPERS SET AT SESSIONAL EXAMINATIONS, JUNE, 1880.
III. PAPERS SET AT MATRICULATION EXAMINATION, OCTOBER, 1880.

I. PAPERS SET AT THE SESSIONAL EXAMINATIONS, EASTER, 1880.

FIRST YEAR.—(FIRST PAPER.)

AGRICULTURE.

Examiner: W. BROWN.

1. Give a full description of the accompanying samples of wheat as regards plumpness, structure, form, quality and evenness of sample.
2. What is considered to be the most approved mode of making and preserving farm-yard manure; and by what principles and facts should we be guided in its application to varous crops?
3. Sketch the general management of a root crop in a system of mixed farming.
4. In the fattening of cattle, what regulates the kind, quantity and condition of the food, and by what circumstances are the results influenced?
5. Tell all you know about the kinds of crops best suited for green fodders, and briefly explain the plan of cattle feeding called "soiling."
6. Enumerate the various points to be attended to in securing and maintaining permanent pastures.
7. What are our principal special manures, and their most important properties?

FIRST YEAR.

AGRICULTURE: THE FIELD.

Examiner: WM. BROWN.

1. Explain why rotation in cropping is necessary, how it is generally conducted on soils of average texture in Ontario, and show the changes in the systems to suit lighter and heavier lands.

2. The arrangement of details in farm buildings should embrace, among others, economy of labour in management, ventilation, drainage, light, warmth and manure preservation. Show by illustration how these may best be secured.

3. The construction of roads and fences is conducted upon certain principles to secure certain objects. Explain these fully by illustrations and notes.

4. Land is under-drained primarily for the removal of superfluous water. What other advantages invariably follow this operation?

5. Lay off a field and illustrate by a sketch the meaning of the terms *main*, *lateral*, *herring-bone*, and *outlet*.

FIRST YEAR.

AGRICULTURE—LIVE STOCK.

Examiner: W. Brown.

1. By what circumstances should the Ontario farmer be guided in the selection of certain breeds, and what particular breeds of cattle, sheep, horses and swine, for specific purposes?

2. How are Britain and the American continent at present regulated in respect to pedigree of cattle and the marking of Berkshire swine?

3. When we wish to obtain the quickest returns for our field produce in the shape of beef and mutton, what breeds do we choose, and by what circumstances are individuals of them selected?

4. Take the Shorthorn, Hereford, Devon, Ayrshire, Alderney, Galloway, and Aberdeen Polled cattle, give 10 marks for each, and make a comparative table of beefing and milking properties.

5. We want a kind of sheep combining size of frame, with points, hardiness, medium wool of good quality, good flesh, and with power to improve others; which of the breeds on our farm come nearest these essentials, and in what way have they been brought about?

6. We want a horse to drive to market, plough, jump a fence under saddle, and trot 12 miles an hour; what special form should such an animal possess?

FIRST YEAR.

PRACTICAL EXAMINATION ON LIVE STOCK.

Examiner: W. Brown.

Cattle.

Subjects to be examined: { Shorthorn Bull. / Ayrshire Cow. / Shorthorn Grade Cow.

1. Show the weak points of the bull.
2. What are his best points?
3. What are the indications in this bull of good beefing properties?
4. Judge this cow as a milker.
5. Which of the cows would mate best with the bull for beefing purposes, and why?

Sheep.

Subjects to be examined: { Leicester Ram. / Cotswold Ram. / Southdown Ram (1) / Southdown Ram (2) / Oxford Down Ram. / Oxford Down Grade Wether.

1. Distinguish the characteristic points of the Leiccester and Cotswold.

2. Which is the best long-wooled fleece of the lot as regards density and soundness ?
3. Which is the oldest and the youngest sheep of the lot ?
4. Compare the Wether with the Oxford Down, and say wherein they agree or differ, as regards carcass and wool.
5. Judge the oldest Southdown by the standard used for the breed.

FIRST YEAR.

INORGANIC CHEMISTRY.

Examiner : J. HOYES PANTON, M.A.

1. Distinguish between an atom and a molecule, giving examples of each. Name the results which occur when chemical affinity takes place, and by what means can it be assisted.
2. Vessels are placed before you containing elements and compounds represented by the symbols—H, H Cl, N, N_2 O, Co_2, H N O_3, Na_2 C O_3, Ca S O_4. Classify these into solids, liquids, gases, and indicate which are bases, acids and salts.
3. Give the preparation and properties of the elements found in the atmosphere.
4. Explain what takes place when potassium is burnt on water. How would you distinguish the resulting compound from that formed by sodium burnt on water ?
5. Explain the action of the Bunsen burner.
6. Give the sources of phosphorus and the formulas for the different phosphates of lime, stating which is the superphosphate.
7. Classify the metals of greatest importance in Agricultural Chemistry, and write notes on those which enter into the composition of clay and marly soils.
8. Name the different kinds of galvanic batteries used in the generation of electricity. What are the common errors made in the erection of lightning rods ?
9 How do the following occur in nature :—ammonia, silver, potash, phosphoric acid and iron ?

FIRST YEAR.

ORGANIC CHEMISTRY.

Examiner : J. HOYES PANTON, M.A.

1. What is meant by the carbon compounds ? Contrast them with those of Inorganic Chemistry.
2. Explain what is meant by *saturated compounds*, *fractional distillation*. How is the latter applied in the manufacture of coal oil ?
3. What compounds do the following symbols represent :—

$C_2 H_4 O_2$ $C_6 H_{10} O_5$, C O $H_4 N_2$, $C_5 H_7 N$, $C_6 H_{12} O_6$, $C_6 H_6 O$.

From what sources are these compounds derived ?
4. Name the organic acids occurring in the vegetable kingdom, and state in what plants they are found.
5. Into what divisions are the hydrocarbons usually arranged ? Name six of the most important hydrocarbons and give the compounds derived from them.
6. State the changes which occur in *acetous fermentation*. What compound must be present before it can take place ?
7. Define a fat, and illustrate by symbols the effect of an *alkali* upon it. Name the compound that results.
8. Name compounds formed by the substitution of the radical of nitric acid for three atoms hydrogen and give the properties of one.
9. Name the principal organic compounds formed in wheat, barley, potatoes, apples, lemons, grapes and wood.
10. Give notes on Opium, Urea, Chloroform and Morphine.

FIRST YEAR.

GEOLOGY AND PHYSICAL GEOGRAPHY.

Examiner: J. Hoyes Panton, M.A.

1. Distinguish between aqueous and metamorphic rocks, and state some of the inferences which can be drawn from the presence of aqueous rocks in a district.

2. Name the ages into which rocks are divided, and give the periods of at least two. What periods are known as Age of Mollusks, Age of Reptiles, Age of Mammals, Age of Cycads, and Age of Cryptogams?

3. Name formations in Canada from which the following economic materials are obtained:—building stone, lead, graphite, gypsum, salt, petroleum, lime, apatite and iron.

4. Describe a *crinoid*, *trilobite*, *belemnite*, and an *ammonite*. Name rocks in which these occur.

5. Explain how rocks are formed, and state the changes which they undergo after deposition. Name the different kinds of valleys, and distinguish them from each other.

6. How do you account for the absence of whole formations in some places?

7. What is meant by a *glacier*? How is it formed? How may it affect the physical features of a place?

8. How does the presence of a lofty range of mountains affect the climate of a country? Name the currents of the ocean, and the places where they occur.

9. Classify lakes, and give a diagram illustrating the relative positions of the Canadian lakes with reference to the level of the sea.

10. Identify the fossils before you.

FIRST YEAR.

STRUCTURAL BOTANY.

Examiner: James Mills.

1. Describe the structure of the cell, and its mode of reproduction.
   (*a*) Distinguish *vascular tissue* from the other kinds of vegetable tissue and explain its formation.

2. Write explanatory notes on *axillary buds*, *aerial roots*, *root stocks*, *air-plants*, *parasitic plants*, *stolons*, *tubers*.

3. What is the ordinary potato—a root or branch? Give reasons for answer.

4. Distinguish procumbent, decumbent, and creeping stems; exogenous and endogenous plants.

5. Describe the different parts of a flower, and explain what is meant by *staminate*, *pistillate* and *diœcious* flowers.

6. Give the common classification of fruits, and state what is meant by the terms *angiospermous*, *phænogamous*, and *dehiscent*.

7. Explain how plants grow, and give their most important chemical constituents.
   (*a*) Tell what you know about the functions of *chlorophyll*.

8. Describe the following processes:
   (*a*) Hybridization.
   (*b*) Layering.
   (*c*) Grafting and budding.

FIRST YEAR.

NATURAL HISTORY.

Examiner: James Mills, M.A.

1. What is the relation of organization to life? Enumerate the chief characteristics which distinguish animals from plants.
   (*a*) Name the sub-kingdoms, and describe any one of them.

2. Give a brief description of the two great sections of the animal kingdom—*Vertebrata* and *Invertebrata*.

3. What is taken as the basis of classification in Zoology? Describe and illustrate the meaning of the terms, *species*, *variety* and *race*.

4. Name the sub-kingdoms and classes to which the following belong:—jelly-fishes, corals, tape-worms, the lobster, spider, grasshopper, housefly, oyster, trout, ox and dog.

5. Describe the different stages in the life of an insect, and compare them with somewhat similar changes in another class.

6. Write as full notes as you can on the tape-worm, the bee, and the silk-moth.

7. Give the classes of Vertebrates; and the orders of Birds and Mammals, with at least one example of each.

8. Tell what you know about the *Ungulata* and the *Carnivora*.

FIRST YEAR.

VETERINARY ANATOMY AND PHYSIOLOGY.

Examiner: E. A. A. Grange, V.S.

1. Name the different processes of digestion, and the organs concerned in performing each process.

2. Describe the difference between the digestive organs of the horse and ox, taking the horse as the standard.

3. Name the organs which carry on the circulation of the blood.

4. Name the compartments the heart is divided into.

5. What kind of muscular tissue is the heart composed of?

6. Name the layers and glands entering into the formation of the skin.

7. Name the organs which compose the nervous system.

8. Name the three classes nerves are divided into.

9. Name the twelve pairs of cranial nerves, their function and distribution.

10. Describe the circulation of the blood through the heart and lungs.

11. What change takes place in the blood in the lungs?

12. Describe the mode in which the chyle passes into the blood.

13. Describe the organs of respiration.

14. Describe the urinary organs.

15. Describe the difference between the urethra of the ox and horse.

FIRST YEAR.

VETERINARY MATERIA MEDICA.

Examiner: E. A. A. Grange, V.S.

1. What is Materia Medica?

2. Mention the circumstances which modify the actions of medicines.

3. Mention the four classes medicines are divided into, and give an example of each class.

4. Give a definition for each of the following terms, viz: Antispasmodic, Tonic, Diaphoretic, Sedative, Vesicant.

5. Mention three medicines which act as Diuretics.

6. Mention three medicines which act as Disinfectants.

7. Name the actions and doses for the horse, ox, sheep, and pig, of Aconite.

8. Name the actions and doses for the horse, ox, sheep, and pig, of Arsenic.

9. Name the actions and doses for the horse, ox, sheep, and pig, of Carbolic Acid.

10. Name the actions and doses for the horse, ox, sheep, and pig, of Castor Oil.

FIRST YEAR.

COMPOSITION.

Examiner: JAMES MILLS, M.A.

1. Write explanatory notes on the meaning of the terms, *sentence*, *clause*, and *paragraph*.

2. "In determining the laws of style, we must be guided by usage"——Explain fully what is meant.

3. Enumerate what you consider the essential properties of a good style.

4. Describe and distinguish the Simple and the Elegant Style of writing.

5. What do Purity and Perspicuity prescribe? Name the corresponding errors under each head.

6. Write a composition on one of the following subjects:—

(*a*) Farming.

(*b*) "————just experience tells, in every soil,
That those who think must govern those that toil."

(*c*) "Full many a gem, of purest ray serene,
The dark unfathomed caves of ocean bear;
Full many a flower is born to blush unseen,
And waste its sweetness on the desert air."

FIRST YEAR.

ENGLISH LITERATURE.

Examiner: JAMES MILLS, M.A.

1.—(1) "Some village Hampden, that with dauntless breast
The little tyrant of his fields withstood;
Some mute inglorious Milton here may rest,
Some Cromwell, guiltless of his country's blood.

"The applause of listening senates to command,
The threats of pain and ruin to despise,
To scatter plenty o'er a smiling land,
And read their history in a nation's eyes,

"Their lot forbade."

(2) "Remote, unfriended, melancholy, slow,
Or by the lazy Scheldt, or wandering Po;
Or onward, where the rude Carinthian boor
Against the houseless stranger shuts the door;
Or where Campania's plain forsaken lies,
A weary waste expanding to the skies;
Where'er I roam, whatever realms to see,
My heart untravelled fondly turns to thee."

(3) "Pride in their port, defiance in their eye,
I see the lords of human kind pass by,
Intent on high designs, a thoughtful band,
Fierce in their native hardiness of soul,
True to imagined right, above control."

(*a*) Explain the meaning and the allusions in the first four lines of the first extract.

(*b*) Change the last five lines of the first extract into prose.

(*c*) Parse the word *slow*, and write notes on the geographical allusions in the second extract.

(*d*) Paraphrase the last extract, and parse the words *pride* and *above*.

2. Pride in their port"—What is the meaning of the word port? Give other meanings, and account for them etymologically.

3. Derive the words *melancholy, boor, molest, wanton, hamlet, debauch, coward* and *shrine.*

4. Quote from the "Elegy" or "Traveller," two examples of *Metaphor, Simile, Oxymoron, Onomatopœia,* and *Hypallage.*

5. "Her useful sons exchanged for useless ore."
"Laws grind the poor, and rich men rule the law"
"And talent sinks, and merit weeps unknown."
"By forms unfashioned, fresh from Nature's hand."
Comment on each of these lines.

6. Compare Italy and the Italians with Switzerland and the Swiss, according to Goldsmith. Point out anything which you think incorrect or unjust in his description.

7. Write a note on the metre of the "Traveller," and scan the last two lines of the second extract.

(*a*) Quote examples of *assonance* and *alliteration.*

8. Compare the styles of Gray and Goldsmith; and write a short life of each.

FIRST YEAR.

ARITHMETIC.

Examiner: A. A. MACTAVISH.

1. A farmer had a field of corn, consisting of 129 rows, and each row contained 95 hills, and each hill had on an average 5 ears of corn; if it takes 8 ears of corn to make a quart, what is the produce of the field worth at 50 cts. per bushel?

2. *A* and *B* lend each $248 for 3 years at 3½ per cent.—one at simple and the other at compound interest. Find the difference of the amount of interest which they respectively receive.

3. Wm. Henry Warden

Bought of Smith, Jones & Co.

1879.	Jan. 15,	Mdse. on credit at	6 months,	$400
	June 25,	" "	4 months,	$150
	July 5,	" "	3 months,	$300
	Aug. 10,	" for cash		$100

When did the preceding account become due?

4. What will be the premium of insurance on buildings valued at $3,000 @ ⅛ per cent.?

5. A Board of Trustees borrowed $3,000, and agreed to pay it in 10 equal annual instalments. Determine the amount of each instalment, money being worth 10 per cent.

6. If 14 men can mow 35 acres of grass in 6 days of 10 hours each, in how many days of 12 hours each can three men mow 24 acres?

7. A person having $9,790 in the Toronto city 6 per cent. bonds, sells out at 98½, and invests the proceeds in Bank of Montreal stock at 177½, which pays a dividend of 12 per cent. per annum; find the change in his income, brokerage in each transaction being ¼ per cent.

8. Barley, at 45c, is mixed with peas, at 55c per bushel, in the ratio of one of the former to two of the latter. What is a bushel of the mixture worth?

9. A merchant in Guelph wishes to remit $2,767.80 to Manchester, England, exchange being at 108; what will be the face of his bill in pounds, shillings, and pence?

10. Extract the square root of 1550025, also the cube root of 14641, and determine the value, true to two places of decimals, of $(1.1)^{20}$.

11. In a constituency in which each elector may vote for two candidates, half of the constituency vote for *A*, but divide their votes between *B, C, D,* and *E* in the proportions of 4, 3, 2, 1; of the remainder, half vote for *B,* and divide their votes among *C, D, E* in the proportions of 3, 1, 1,; ⅔ of the remainder vote for *D* and *E,* and 540 do not vote at all. Find the order on the poll, and the whole number of electors.

FIRST YEAR.

MENSURATION.

Examiner: A. A. MACTAVISH.

1. How many square chains in the following:—

(*a*) An equilateral triangle whose base is 13 chains.
(*b*) A square whose side is 13 chains.
(*c*) A circle whose radius is 13 chains.

2. What fraction of a sphere must be cut away to reduce it to the largest possible cube?

3. How many cords of wood in a pile 64 feet long, 8 feet wide, and 6 feet high?

4. How far must a team of horses travel in cutting an acre of wheat—length of knife being 5 feet?

5. Which will carry off the greatest amount of water, one tile 6 inches diameter, or three 3 inches in diameter?

6. How many bushels (Imperial) will a bin, 12 feet long, 6 feet wide, and 5 deep, hold?

7. Neal Thorp's barn is 60 feet long, 48 feet wide, and 16 feet high, ridge 12 feet, having one driving floor 12 feet wide. Find

(*a*) The storage capacity.
(*b*) The length of rafter (1 foot over plate).
(*c*) The number of bunches of shingles necessary to cover roof (carpenter's rule).

8. Find the cost of building a sidewalk from the farm to the city limits, a distance of one half mile—walk made of two-inch plank, to be 4 feet wide, and resting on two sills (4 in. x 4 in.) running lengthwise—cost of lumber, $10 per M.

9. A farmer's experimental field is in the form of a rectangle 16 rods long, and contains two acres. It is divided into plots, thus:—

$\frac{3}{4}$ acres are set apart for wheat (three varieties).
$\frac{1}{8}$ acre is set apart for oats (two varieties).
$\frac{5}{8}$ acres are set apart for grasses (three varieties).
The rest of the field is set apart to solve the question, "Can permanent pastures be had in Ontario?"

Determine the width of these four plots.

1. Supposing them to lie across the field.
2. " " lie along "

FIRST YEAR.

BOOK-KEEPING.

Examiner: A. A. MACTAVISH.

1. Write an accepted time draft; a joint note; a receipt.

2. What are the conditions under which a personal account shows an asset?

3. A father bequeaths to his son 100 acres of good land—well drained, well fenced, and provided with the necessary buildings; also $1,500 in money. Show what you think to be the most judicious manner of using this money.

4. Bought of Henry Worden, a team of horses for $300. Paid cash $200, and gave my note at three months for balance. Write such a note, and show what ledger accounts are affected, and in what manner, by the above transactions.

5. What are the two most important points to be kept in view in framing an advertisement? A heifer has strayed from your premises. Give the form of advertisement for her recovery.

6. 1878—May 1st.—One day's labour—ploughing and harrowing potato field at $2.00 per day.

May 2nd. Bought 12 bushels of potatoes for seed at 37½c. per bushel; also paid for two days' labour planting the field at $1.00 per day.

June 20th.—One day's labour ploughing, $1.50; also two days' labour, hoeing at $1.00 per day.

July 7th.—One day's labour, ploughing, $1.50.

September 15th.—Digging and covering potatoes $5.00; also, sold 12 bushels of potatoes for cash at 25c. per bushel, and 25 bushels small potatoes at 20c. per bushel.

1879—March 17th.—Paid for 3 days' labour, marketing, at $2.00 per day; also received cash for 300 bushels of potatoes at 35c. per bushel.

Determine profits from the above potato field.

SECOND YEAR.

AGRICULTURE—THE FIELD.

(First Paper).

Examiner: W. Brown.

1. Divide a farm of a 100 acres into suitable fields for a seven course rotation in mixed husbandry, and show the annual produce, in quantity and value, on an average of seasons, under good management, in Ontario.

2. Criticize the conduct of mineral superphosphate, gypsum, and bone dust, in our experience, upon roots and grain during the last two years.

3. State what is the proper position of the growing of green fodders in connection with "soiling," and estimate results on a hundred-acre farm in this country.

4. Give your opinion upon the present and the future of pastures in Ontario.

5. Were you in possession of what is called an exhausted farm (clay loam), by what means would you most rapidly and thoroughly restore its fertility?

SECOND YEAR.

AGRICULTURE.

(Second Paper).

Examiner: W. Brown.

1. Last season The Ontario Experimental Farm produced 3,598 bushels of grain, of kinds; 203 tons straw; 234 tons hay, and 20,684 bushels roots, of sorts. Approximate the quantity of beef these would make during six months of winter.

2. Make a close estimate of the cost of the crop of spring wheat, from field 14, showing every detail item up to the bagging for market.

3. Draft ground plan of dwelling house for an average farmer, giving sizes of parts.

4. Sketch a section of levelling for the proposed drainage of field 14, showing undulations of surface, distances, cuttings, intersections, and estimate the cost of completing the drain with-four inch tiles.

5. It is proposed to alter the cropping of the O. E. Farm to a more exhaustive one. Say how this should be gradually brought about, and justify it upon scientific and practical facts.

SECOND YEAR.

AGRICULTURE: LIVE STOCK.

Examiner: W. BROWN.

1. Sketch briefly the management of a ewe flock from 1st September to 1st July.
2. Give details of the duties of a shepherd during the lambing season.
3. Specify all particulars in regard to the time, management, materials used, and the objects sought for in the dipping of sheep.
4. Explain all the *reasons* by which we were guided in the selection and purchase of our Shorthorn Bull, "*Prince Hopewell.*"
5. Make a statement showing the various items that go to make up the actual cost of a yearling bull, without reference to profit.
6. Give an example of the purchase, feeding, management, progress, and financial results of a steer during six months of winter and spring.

SECOND YEAR.

AGRICULTURE: PRACTICAL EXAMINATION ON LIVE STOCK.

Examiner: W. BROWN.

CATTLE.

Subjects to be examined:
- Shorthorn Steer
- Galloway Steer.
- Grade Cow.

1. Describe the Shorthorn with reference to five most important qualities for fattening purposes.
2. Point out the four greatest defects in the same animal.
3. Handle and describe the weakest point and the best point of the frame of the Galloway for carrying beef.
4. Judge and decide upon the relative merits of the two steers as regards quality and evenness of flesh.
5. Show the five best indications in this cow as a milker.

SHEEP.

Subjects to be examined:
- Leicester Ram.
- Cotswold Ram.
- Southdown Ram (1).
- Southdown Ram (2).
- Oxford Down Grade Wether.

1. Show wherein one Southdown is superior to the other.
2. Which is the oldest and the youngest sheep of the lot?
3. Judge the Oxford Grade Wether, and compare him with the Leicester standard of points.
4. Explain the principal points of difference between the frame of the Cotswold and that of the Leicester.
5. Which is the best wooled sheep of the lot, as regards uniformity and lustre.

SECOND YEAR.

ARBORICULTURE.

Examiner: W. BROWN.

1. What are the four main objects in the maintenance of trees in a country?
2. What kind of trees are best adapted for replanting in Ontario?
3. How would you attend to the selection, removal, preparation of the ground, planting, and subsequent management of a clump of trees?
4. Detail the cost of planting one acre, seven feet apart, by trees from our own bush.
5. Give your opinion on the whole question of replanting in this country.

SECOND YEAR.

AGRICULTURAL CHEMISTRY.

Examiner: J. Hoyes Panton, M.A.

1. Name the constituents present in the food of animals. Which of these go to the formation of *fat, bone, muscle?* Contrast the comparative amount of these ingredients in magnolds, barley, pease, linseed cake and lucerne.

2. Where and by what reagents are the following changes in the digestion of food effected? Starch converted into sugar, albuminous compounds rendered soluble, fats broken up, and fibrinous substances dissolved.

3. Name the proximate principles and ultimate elements in plants, and mention plants in which some of the former predominate.

4. What chemical compounds are characteristic of the grasses, roots, and grains? —Contrast sand, clay and loam as affording food for plants.

5. What changes does carbon undergo in plants after its abstraction from the atmosphere, and by what means are these effected?

6. From what sources have the alumina, potash, soda, silica, phosphoric acid and lime of Canadian soils been derived?

7. Give causes for unproductiveness in soils; the means by which they can be detected and overcome.

8. What is tri-calcic phosphate? Show the reaction which takes place on the addition of acids, and name the sources from which this mineral can be obtained.

9. Name the *double silicates* in soils. What compound has a beneficial effect in their decomposition? Show how this takes place.

SECOND YEAR.

ANALYTICAL AND PRACTICAL CHEMISTRY.

Examiner: J. Hoyes Panton, M.A.

1. Give an outline of the different steps followed in ascertaining the base which enters into the composition of the salt under examination.

2. Gypsum in a ground form sometimes contains crystalline limestone in a finely divided condition. How would you detect this? Give the composition of gypsum.

3. Name the adulterations usually found in white lead, and state how you would detect them.

4. Outline the method pursued in testing a portion of linseed cake for impurities likely to be present when the cake is adulterated.

5. How would you make a quantitative analysis of soil for lime and organic matter? Give an example illustrating the calculations necessary to be made.

6. Give a qualitative analysis of each of the substances before you.

SECOND YEAR.

ECONOMIC BOTANY.

Examiner: J. Hoyes Panton, M.A.

1. Name the different points to be considered in making a natural classification of plants, and distinguish between Angiospermous and Gymnospermous plants.

2. Give the life-history of the common mushroom (*Agaricus campestris*), and contrast its structure with that of a fern.

3. What peculiarity occurs in the flowers of the pumpkin and Indian turnip? Name three others in which the same exists.

4. Give the characteristics of the orders *Umbelifer*æ, *Cruciferæ*, *Labiatæ*, *Cupuliferæ*, *Coniferæ*.

5. To what orders do the following plants belong :—mangold, squash, barley, bean, kale, carrot, parsley, spinage, sage and tomato ?

6. Write notes on *Tilletia caries*, *Claviceps pupura* and *Podophyllum peltatum*.

7. Name ten plants used for economic purposes, and the orders to which they belong.

8. What peculiarity exists in the following fruits :—apple, pineapple, strawberry, pea, melon, pear, elm seed, currant and corn ?

9. Give the distribution in *time* of the following plants :—*Calamites*, *Lepidodendron*, *Cycads* and *Sigillaria*.

10. Identify the specimens before you.

SECOND YEAR.

ENTOMOLOGY.

Examiner: J. Hoyes Panton, M.A.

1. Describe what is called the *suctorial mouth* in insects, and give the orders in which it occurs.

2. Explain the terms, larva, imago, pupa, chrysalis, cocoon, grub, bug, and caterpillar, as applied to insects.

3. Name the different ways in which insects are injurious to vegetation, and give the orders to which the most injurious belong.

4. To what orders do the following insects belong ; canker worm, the borer, aphides, apple-tree pruner, fall web worm, midge, tomato worm, apple curculio, locust, potato bug, squash bug, and currant worm.

5. Give notes on *Anisopteryx vernata*, and mention the best remedies to prevent its increase.

6. Describe the larva of the forest tent caterpillar (*Clisiocampa sylvatica*), and give remedies for its destruction.

7. Contrast the apple curculio (*Anthonomus quadrigibbis*) with the plum curculio (*Conotrachelus nenuphar*).

8. Describe the imago of the pea-weevil (*Bruchus pisi*), and give remedies.

9. Give remedies to prevent the increase of the currant worm.

10. Identify the specimens before you, and name the plants affected by them.

SECOND YEAR.

METEOROLOGY.

Examiner: J. Hoyes Panton, M.A.

1. Describe the following meteorological instruments : Maximum thermometer, Barometer, and Anemometer.

2. Give notes on the reading of barometers, and the corrections sometimes necessary to be made. Expain how the barometer is of great use in foretelling the approach of storms.

3. Distinguish between convection and conduction of heat, and account for the more rapid increase in temperature of some soils as compared with others.

4. In the graduation of a thermometer, why is the boiling point made last ? Distinguish between Fahrenheit and Centigrade thermometers. Reduce 42° F. to C., 16° C. to F., 24° C. to R.

5. What is meant by the "specific heat" of a substance ? Compare the specific heat of mercury with that of water. What influence has the specific heat of water on climate ?

6. Give the causes of *radiation fogs*, and state how they can be prevented.

7. Describe Daniell's Hygrometer. Find the dew-point from the following data: Dry bulb thermometer, 74°; Wet bulb thermometer, 65°.

8. What is the effect of moisture in the atmosphere? How is it ascertained? Describe the pluviameter.

9. Name the different kinds of clouds, and state the kind of weather likely to follow their appearance.

10. Account for the wonderful rainfall in parts of India, and also for the presence of deserts in different parts of the world.

SECOND YEAR.

PATHOLOGY—(HORSE).

Examiner: E. A. A. Grange, V.S.

1. Describe the nature, causes, symptoms, and treatment of Spasmodic colic.
2. " " " " Enteritis.
3. " " " " Catarrh.
4. " " " " Bronchitis.
5. " " " " Lymphangitis.
6. " " " " Nephritis.
7. Name the diseases of the skin.
8. Describe the causes, symptons, and terminations of Inflammation.
9. Describe the various modes for the treatment of Hernia.
10. Describe the operation of Lithotomy.

SECOND YEAR.

PATHOLOGY (CATTLE).

Examiner: E. A. A. Grange, V.S.

1. Describe the nature, causes, symptoms and treatment of Choking.
2. " " " " Tympanitis.
3. " " " " Mammitis.
4. " " " " Inpaction of the Rumen.
5. Describe the nature, causes, symptoms and treatment of contagious Pleuro-Pneumonia, and the best means of prevention.
6. Describe the nature, causes, symptoms and treatment of Scab in Sheep.
7. " " " " Foot-rot.
8. " " " " Sturdy.
9. " " " " Maggots or Fly.
10. " " " " Ticks in Sheep.

SECOND YEAR.

VETERINARY MATERIA MEDICA.

Examiner: E. A. A. Grange, V.S.

1. What classes are tonics divided into? Give an example of each class; state when and how they are used.

2. Mention the medicine which is most commonly used as a purgative for the horse, ox, sheep, pig and dog; and give the dose for each animal.

3. Name diseases in which diuretics should not be given.

4. Name diseases in which purgatives should not be given.

5. Mention the actions and doses for the horse, ox, sheep and pig, of Tincture of Opium.

6. Mention the actions and doses for the horse, ox, sheep and pig, of Sulphate of Magnesia.

7. Mention the actions and doses for the horse, ox, sheep and pig, of Nitrate of Potash.

8. Mention the actions and doses for the horse, ox, sheep and pig, of Sulphate of Zinc.

9. Mention the actions and doses for the horse, ox, sheep and pig, of Acetate of Lead.

10. Mention the actions and doses for the horse, ox, sheep and pig, of Oil of Turpentine.

SECOND YEAR.

COMPOSITION

Examiner: JAMES MILLS, M.A.

1. Enumerate what you consider the most important characteristics of good composition.

2. Explain and illustrate the difference between a "period" and a "loose sentence."

3. What is meant by style? What are the essential properties of a good style?

4. Distinguish the neat and the elegant style of writing.

5. What is comprised under the head of diction? Name and account for the most important differences between prose and poetic diction.

6. Write a composition on one of the following subjects:

(*a*) "————————————————'tis meet
That noble minds keep ever with their likes;
For who so firm that cannot be seduced."

(*b*) "————lowliness is young ambition's ladder,
Whereunto the climber upward turns his face;
But when he once attains the utmost round,
He then unto the ladder turns his back,
Looks in the clouds, scorning the base degrees
By which he did ascend."

(*c*) Canada.

SECOND YEAR.

SHAKSPEARE'S "JULIUS CÆSAR."

Examiner: JAMES MILLS, M.A.

1. When was this tragedy written? Criticise the name.

2. Give in chronological order the most noted events which occurred during the period over which the action of the play extends—from February 44 B. C. to autumn, 42 B. C.

3. Which is the best drawn character in the play, and why?

4. Compare the following:—

(1) Shakspeare's character of Julius Cæsar with that given in Roman history.
(2) Brutus and Cassius.
(3) The speeches of Brutus and Antony after the assassination.

5. "The quarrel between Brutus and Cassius is managed in a masterly way"—Show this by quotations and comments.

6. Sketch the character of Portia.

7. Write a short article on the Elizabethan period of English literature.

8. "I,—as Æneas, our great ance tor,
Did from the flames of Troy upon his shoulder
The old Anchises bear,—so from the waves of Tiber
Did I the tired Cæsar."
Explain the simile; point out any irregularity in the syntax; accent the word *ancestor* according to the requirements of the metre; scan the Alexandrine line and account for its use in this passage.

9. Explain and illustrate Shakspeare's use of the words *an, given, envious, factious* and *favour.*

10. (*a*) "The quarrel will bear no colour for the thing he is."
(*b*) "The genius and the mortal instruments are then in council."
(*c*) "The insuppressive metal of our spirits."
(*d*) "Cæsar, I never stood on ceremonies."
(*e*) "Set a huge mountain between my heart and tongue."
(*f*) "You yourself are much condemned to have an itching palm."
Explain the connection and meaning of each of these extracts.

11. Derive the words *blaze, rheumy* and *brooked.*

12. "You have ungently stole from my bed"; "that have spoke the word"—Point out peculiarities in syntax, and account for Shakspeare's use of such forms.

13. Quote some of the best passages in the play.

SECOND YEAR.

POLITICAL ECONOMY.

Examiner: JAMES MILLS, M.A.

1. Explain what you mean by Political Economy. Give the divisions of the subject.

2. Define Wealth and Utility, giving suitable illustrations.

3. What are the requisites of Production? Distinguish and illustrate.

(*a*) Enumerate the advantages and disadvantages of the Division of Labour.

4. State and defend your views on—

(1) Free Trade generally.
(2) Free Trade in Canada.

5. Give reasons why every person should save something when possible.

6. Is any Government justified in forcing—

(*a*) A farmer to sell a railway company the right of way?
(*b*) The wealthy landlords of Ireland to sell a portion their land to the tenants?

Answers must be supported by reasons.

7. Discuss—

(1) The Distribution of Wealth.
(2) Paper Currency, including the "Rag Baby" question.
(3) Credit Cycles.
(4) Functions of Government.

SECOND YEAR.

NATURAL PHILOSOPHY.

Examiner: A. A. MACTAVISH.

1. Define force, and show how it is measured.

2. What is meant by work? What is its unit of measurement? How many units of work are expended in ploughing an acre of land—draught of plough 414 lbs., width of furrow 8½ inches?

3. Enunciate the principle of "Virtual Velocity," and apply it to find the relation between the power and weight in a system of pulleys where each movable pulley hangs by a separate cord.

4. A grocer uses a false pair of balances in which the beams are $9\frac{1}{2}$ and $9\frac{1}{4}$ inches respectively. A customer has bought what seemed 20 lbs. of tea; how much did he really get, the tea having been weighed in the pan of the longer beam?

5. What force must a team exert to draw a load of one ton up an incline (macadamized road) rising 1 in 50, friction estimated at one-thirty?

6. In railway curves, one side of the track is higher than the other. Which side is the higher, and why?

7. A rope-walker is about to fall to the right. Which way will he shift his pole to regain his equilibrium, and why?

8. A pebble is dropped into a very deep well; it strikes against one of the sides. Which side does it strike, and why?

9. A beam weighing 200 lbs. is carried by two men, one being at a distance of three feet from the centre of gravity of the beam, and the other at a distance of two feet. Find the weight borne by each man.

10. Tell what you know of the action of the suction pump.

SECOND YEAR.

SURVEYING AND LEVELLING.

Examiner: A. A. MACTAVISH.

1. Plan and find the area of field from the following notes—

L. OFFSETS.	CHAIN LINE.	R. OFFSETS.
	To O B	
	460	
i	410	55, K
g	180	50, H
	O A	
	To O A	
	325	
q	210	25, R
p	65	30, S
	O D	
	To O C	
	450	
n	430	155, B
D, 180	291	P
Begin at	O A	range S. W.

Scale—64 links to an inch.

2. In a hundred-acre farm, whose length is 160 rods, it is required to make a field of 20 acres, similar to it; find its length and breadth.

3. The following is a running level from station A to station B—

Back Sight.	Fore Sight.	
4.23	3.15	Peg 1, distance 100 feet.
1.66	2.48	" 2, " 100 feet.
3.09	4.89	" 3, " 100 feet.
2.47	1.25	" 4, " 100 feet.
7.21	3.45	" 5, " 100 feet.
6.24	9.03	B 78 feet.

Complete the field book.

4. Show how to measure the distance across a wide river.
5. Show how to test the accuracy of a cross-staff.

NOTE.—In addition to the above, candidates will be examined as to their ability in handling instruments for levelling and surveying.

SECOND YEAR.

BOOK-KEEPING.

Examiner: A. A. MACTAVISH.

1. Enumerate the ledger accounts requisite in the business of an average farmer in Ontario.
2. Give an example of a completed imaginary ledger account with a wheat field of twenty acres.
3. Give an inventory, with values of stock and implements, for a farm of 100 acres.
4. Bought on 1st December, 1878, sixteen head of cattle, mostly Durham Grades, fourteen of which were two and a half year old steers, and two three-year old heifers. Paid 3½c. per pound—Total weight being 17,528 pounds. The food consumed and the cost for five months were as follows:

Swede Turnips ...	162,480 lbs. @ 8c. per 60 lbs.
Mangolds	54,480 lbs. @ 10c. per 60 lbs.
Pea Meal	12,960 lbs. @ 1c. per 1 lb.
Corn Meal	10,448 lbs. @ 45c. per 56 lbs.
Fodder	24,000 lbs. @ $4 per 2000 lbs.
The cost of attendance	$52 50
The cost of bedding	15 00

At the end of five months the animals weighed 22,122 pounds, and were disposed of at 5½c. per pound. The commercial value of the manure was estimated at $269.

Determine financial results from the above experiment, by posting into ledger in proper technical form and language.

5. Write (1) a "joint and several note."
(2) a non-negotiable note.

II. PAPERS SET AT THE SESSIONAL EXAMINATIONS—JUNE, 1880.

FIRST YEAR.

AGRICULTURE.

Examiner: W. BROWN.

1. Give a full description of the accompanying sample of wheat.
2. What are the best conditions for the germination of seeds?
3. Give a concise sketch of the best method of preserving farm-yard manure.
4. Name our principal special fertilizers, and say to what crops they are particularly suitable.
5. Give a general idea of the management of cereal crops.
6. What is the usual mode of cultivating root crops?
7. What are our principal green fodders, and at what time of the year are they usually available?
8. Give a full description of the orchard and rye grasses, and of alsike and lucerne clovers.
9. Classify the various kinds of wheat, barley and mangolds.
10. Indicate briefly the management and importance of permanent pastures.

FIRST YEAR.

GEOLOGY AND PHYSICAL GEOGRAPHY.

Examiner: J. HOYES PANTON, M.A.

1. Give the characteristics of metamorphic rocks. Name some of the most important minerals found in them, and state where these rocks occur.
2. Give reasons for inferring that granite has once been in a molten condition, and cooled slowly under great pressure.
3. Name examples of chemically formed rocks, and mention formations in which large deposits of them occur.
4. Explain the terms tilting, dip, fault, denudation, stalactite, unconformability.
5. What fossils predominate in the following periods:—Silurian, Devonian, Carboniferous, Jurassic and Post-pliocene?
6. Describe what is known as the Erie and Huron geological district.
   (*a*) Name the different formations which occur in it.
   (*b*) Give its economic deposits and the formations in which they are found.
   (*c*) State the general composition of the soil.
7. In what formations do graptolites and trilobites disappear?
8. Identify the fossils before you.
9. What causes the trade winds, and where do they occur? Classify regional winds.
10. Give the characteristics of the North Atlantic Ocean. In what locality is it deepest?
11. Describe fully the equatorial current with reference to cause, locality and direction.

FIRST YEAR.

STRUCTURAL AND PHYSIOLOGICAL BOTANY.

Examiner: J. HOYES PANTON, M.A.

1. Name the parts of a plant which appear during the early stages of its growth, and state by what means you can know the class to which the plant belongs.
2. What peculiarity is observed in the growth of biennial plants during the first year?
3. Draw diagrams illustrating five different forms of inflorescence, and the difference in structure between an exogenous and endogenous stem.
4. Explain the terms, plumule, tuber, bulb, stolon, axil, key, monœcious, deciduous, epiphyte, legume as applied to plants.
5. Contrast the parts of an endogenous plant, with those of an exogenous.
6. Distinguish between a prickle and thorn and illustrate by examples.
7. Classify leaves with reference to position, outline, venation and margin.
8. Name the parts of a flower, and state the function each performs in the reproduction of the plant. Give examples of what are termed monœcious and diœcious plants.
9. What peculiarity exists in the fruit of the apple, rose, strawberry, pineapple and pear?

FIRST YEAR.

MATERIA MEDICA.

Examiner: E. A. A. GRANGE, V.S.

1. Give a definition for Materia Medica.
2. Name the various circumstances which modify the action of medicines, and describe how each circumstance modifies the action of the medicine.
3. Give a definition for each of the following terms, viz: Hœmatic, Neurotic, Eliminative, Astringent.

4. Describe the actions, uses, and doses, for the domestic animals, of Aloes.
5. " " " " " " " " Tinct. of Aconite.
6. " " " " " " " " Extract of Belladonna.
7. " " " " " " " " Linseed Oil.
8. " " " " " " " " Cantharides.
9. " " " " " " " " Cinchona.
10. " " " " " " " " Sulphate of Iron.

FIRST YEAR.

ENGLISH LITERATURE,

The Lady of the Lake.

Examiner: James Mills, M.A.

1. Describe the Spencerian stanza.
2. Write a composition giving a synopsis of the first canto.
3. What historical person does Scott intend to pourtray in Fitz-James?
4. Give a short history of the Douglas family.
5. "State your views as to the points of difference between the men of the 'Lady of the Lake' and the actual men of the period which Scott intended to describe."
6. Quote or refer to passages which illustrate Scott's narrative, descriptive, and lyrical powers.

7. "I little thought when first thy rein
I slacked upon the banks of Seine,"
etc., etc.

(*a*) Explain the allusion.
(*b*) Complete the quotation.

8. Explain the terms, *idiom*, *alliteration*, *rhythm*, *onomatopœia*, and *paragoge*.
9. Derive *quarry*, *bulwark*, *bugle*, *canopy*, *falchion*, *weird*, and *stalwart*.
10. Write notes on *Knight-errantry*, *Tine-man*, and *Clan-Alpine*.
11. *Frontlet*—Give as many examples as you can of other diminutive endings used in English.
12. Explain the meaning of *linn*, *dingle*, *ken*, *whinyard*, *cupola*, *snood*, *brook*, and *pibroch*.
13. Draw an outline map of Scotland or a portion of it, marking the position of *Katrine*, *Achray*, *Vennachar*, *Lomond*, *Trossachs*, *Benvenue*, *Forth*, and *Teith*.

14. (*a*) "Huntsman, rest! thy chase is done,
While our slumberous spells assail ye,
Dream not with the rising sun,
Bugles here shall sound reveillé."

(*b*) 4. "Row, vassals, row, for the pride of the Highlands!
Stretch to your oars for the ever-green pine.
O! that the rosebud that graces yon islands
Were wreathed in a garland around him to twine."

(1) Scan these passages, giving the names of the metres.
(2) What is peculiar in the use of "ye"?
(3) Explain the allusions in the "ever-green pine" and "the rose-bud."

16. Name Sir Walter Scott's most noted contemporaries, and write a short article on the literature of his time.

FIRST YEAR.

MENSURATION.

Examiner: A. McTavish.

1. Define circle, sphere, trapezoid, heptagon, square.
2. How many square feet in a rectangle whose sides are 15 and 20 yards respectively?
3. Find the area of a square field whose diagonal is 40 chains.
4. Find the area of the equilaterial triangle inscribed in a circle whose diameter is 12 feet.
5. How many bunches of shingles will be required to cover a barn roof; length of roof 75 feet, length of rafter 25 feet?
6. How far must a team of horses travel in ploughing a field of one acre—width of furrow 8 inches?
7. How many cubic yards in a frustum whose dimensions are as follows: length of the lower edge 40 feet, length of upper edge 30 feet, height of frustum 5 feet?
8. Find the solid contents of a cone whose base has a diameter of 10 feet and height 12 feet.
9. How many cubic feet must be excavated in digging a cellar 40 feet long, 30 wide and 8 deep?
10. How many gallons of water will a cistern whose diameter is 12 feet and depth 16 feet hold?

SECOND YEAR.

AGRICULTURE.

Examiner: W. Brown.

1. What was the nature and general result of our past winter's cattle-feeding experiment.?
2. Give in full the reasons by which we selected cows for experiment in grazing *versus* soiling this season.
3. Sketch the arrangement and general management of our farm this season, in regard to hay and pastures.
4. Take our farm as one to compete for the Medal of the Agriculture and Arts Association, and report upon its merits according to the accompanying points:

	Full Value.
(1) Nature of farming suitable to circumstances	50
(2) Proper portion of bush and permanent pasture	50
(3) Position and character of buildings in relation to farm	100
(4) Attention to preservation of timber and tree planting	50
(5) Condition of private roads and fences	50
(6) Improvements by removal of obstacles to cultivation, including drainage	100
(7) Management, character, suitability, condition, and number of live stock kept	150
(8) Number, condition, and suitability of implements and machinery	50
(9) Management of farm-yard manure	50
(10) Cultivation of crops, embracing manure, cleaning, produce per acre in relation to management, and character of soil and climate	100
(11) General order, economy and water supply	100
(12) Cost of production, and relative profits	150
	1000

SECOND YEAR.

PRACTICAL AND ANALYTICAL CHEMISTRY.

Examiner: J. HOYES PANTON, M. A.,

1. Describe fully the preparation of hydric sulphide and ammonic sulphide.
2. Give the tests for lime, silver, iron and copper.
3. Find the specific gravity, the percentage of organic matter, and the moisture in the soil given you for analysis.
4. How can you distinguish mica, gold, copper pyrites, and iron pyrites from each other?
5. Detect the adulterations present in the samples before you.
6. Analyze, and give the composition of the compounds marked 1, 2, 3, 4, 5.

SECOND YEAR.

SYSTEMATIC AND ECONOMIC BOTANY.

Examiner: J. HOYES PANTON, M.A.

1. Name the characters usually considered in making a natural classification of plants. Classify the cryptogams.
2. To what orders do the following belong: lucerne, blue weed, thistle, daisy, beet, onion, cedar, Indian turnip, rhubarb?
3. Give examples of cryptogamous plants which are of economic value, and name the classes to which they belong.
4. Name the orders of which the following are the characters:

   (*a*) Irregular corolla (papilionaceous), leaves alternate, five irregular petals, exogenous stem.

   (*b*) Herbs with square stems and opposite leaves, irregular two-lipped corolla, 4 stamens, 2 long, 2 short, leaves dotted with small glands, which contain a volatile oil.

5. Contrast *Trifolium repens* with *T. pratense.*
6. Give the characters of the orders, *coniferæ*, and *gramineæ.* Name two genera in each.
7. Describe the flower of the Indian turnip, and of the Begonia.
8. Analyze the flowers before you. Give the name and order to which each belongs.

SECOND YEAR.

MATERIA MEDICA.

Examiner: E. A. A. GRANGE, V.S.

1. Describe the actions; uses and doses for the domestic animals of Sulphate of Magnesia.
2. " " " " " " Opium.
3. " " " " " " Nux Vomica.
4. " " " " " " Calomel.
5. " " " " " " Croton Oil.
6. " " " " " " Nitrate of Potash.
7. " " " " " " Water.
8. " " " " " " Nitrate of Silver.
9. " " " " " " Linseed Oil.
10. " " " " " " Acetate of Lead.

SECOND YEAR.

ENGLISH LITERATURE: MACBETH.

Examiner: JAMES MILLS, M.A.

1. Enumerate the influences which caused the outburst of literary activity in England during the latter part of Queen Elizabeth's reign, and write a short composition on the literature of the period.

2. Comment on *Macbeth*, and name another play into which Shakespeare introduces "a supernatural element."

3. "Did Shakespeare intend to depict Macbeth as naturally prone to be the subject of illusions with regard to supernatural appearances; or as having been brought into such a state of mind that he was disposed to become the subject of such illusions; or did he intend to represent the various appearances as real? Discuss the question fully."

4. Explain the meaning of the following, point out the peculiarities, and notice different readings:

(1) "There's daggers in men's smiles; the near in blood
The nearer bloody."
(2) "Ere human statute purged the gentle weal."
(3) "If trembling I inhabit then, protest me
The baby of a girl."
(4) "The apparition of a bloody child arises."
(5) "And some I see
That two-fold balls and treble sceptres carry."
(6) "This push
Will chair me ever or unseat me now."
(7) "Boundless intemperance
In nature is a tyranny."
(8) "Now minutely revolts upbraid his faith-breach."

5. Quote examples of *metaphor*, *simile*, and *hypallage* from Macbeth.

6. Write geographical notes on Forres, Cawdor, Glamis, Scone, Dunsinane and Colmes-kill.

7. Derive *caldron*, *foisons*, *surcease*, *chalice*, *vizards*, *plague*.

8. Sketch the character of Lady Macbeth.

9. "There is an entire absence of comedy, nay, even of irony and philosophic contemplation in *Macbeth*."—*Coleridge*.

Quote a passage to prove that this statement is incorrect.

10. "If it were done when 'tis done then 'twere well
It were done quickly if the assassination
Could trammel up the consequence and catch
With his surcease success that but this blow
Might be the be-all and the end-all here
But here upon this bank and shoal of time
We'd jump the life to come but in these cases
We still have judgment here that we but teach
Bloody instructions which being taught return
To plague the inventor this even-handed justice.
Commends the ingredients of our poison'd chalice
To our own lips."

(*a*) Punctuate this passage.

(*b*) Write a paraphrase of the passage, showing clearly what you conceive to be the meaning.

(*c*) Explain particularly the expressions "bank and shoal of time" and "jump the life to come."

11. Quote what you consider the finest passages in the play.

SECOND YEAR.

NATURAL PHILOSOPHY.

Examiner: A. A. MACTAVISH.

1. Define force. Give three examples.
2. Define acceleration, and tell what is meant by saying that $g=32$.
3. A train uniformly accelerated with an acceleration of 10 ft. a second, passes two stations with velocities of 8.8 and 44 ft. per second. How far is it between the two stations?
4. How far will a body fall in 5 seconds, gravity being 32?
5. A body is projected upwards with a velocity of 640 ft. a second. How high will it rise? What will be its velocity at the end of the 20th second, also at the end of the 30th second?
6. Describe Atwood's machine.
7. A weight of 2 lbs. hangs over the edge of a smooth table and draws a weight of 50 lbs. laid on the table. What velocity will be acquired in 3 seconds?

SECOND YEAR.

LAND SURVEYING.

Examiner: A. A. MACTAVISH.

1. Describe Gunter's chain.
2. Describe the cross-staff, and show the method of determining its accuracy.
3. Show how to place a line at right angles to another, using the chain only.
4. Plan the field from the adjoining notes, and determine its area, scale ½ chain to an inch.

L. OFFSET.	CHAIN LINE.	R. OFFSET.
	To O. A.	
	480	
37	350	
28	160	
	Left of O. C.	
	To O. C.	
	585	
	450	57
	320	40
	200	72
	100	47
	Left of O. B.	
	To O. B.	
	743	
382	290	
From	O. A. go	East.

III. PAPERS SET AT THE MATRICULATION EXAMINATION, OCTOBER, 1880.

ENGLISH GRAMMAR.

Examiner: JAMES MILLS, M.A.

1. Analyze the following passage and parse the words *in Italics.*

> *There at* the foot of *yonder* nodding beech
> That wreathes *its* old fantastic roots *so* high,
> His listless *length* at noon-tide *would he stretch,*
> *And pore* upon the brook *that babbles by.*

2. Define the terms *gender, case, voice, relative pronoun,* and give an example of each.

3. Distinguish *gender* from *sex,* and write the masculine or feminine as the case may be, of *maid, marquis, dame, nephew, widow, boy, actor, earl.*

4. What is the use of the adjective? Write down the comparative and superlative of *good, bad, beautiful, much, near, old.*

5. Decline *I, she* and *which.*

6. Give the past tense and perfect participle of *eat, feed, last, lose, loose, leap, sell, sit, set.*

7. Combine the following statements into compound sentences:

> The great Southern Ocean is crowded with coral islands.
> It is crowded with submarine rocks of the same nature.
> These rocks are rapidly growing up to the surface.
> In time these rocks will rise above the ocean.
> These rocks will at length form new habitations for men.

8. Correct the mistakes in—

(*a*) These sort of arguments are out of date.
(*b*) I saw a black and white dog running together.
(*c*) As neither James nor George are going, let you and I go.
(*d*) Mind who you are talking to.
(*e*) He didn't ought to have broke the window.

GEOGRAPHY.

Examiner: J. HOYES PANTON M.A.

1. Name the principal rivers of Ontario. Give the direction in which they flow, and state where they empty.

2. Sketch a map showing the positions of the various Provinces of Canada.

3. Where, and what are the following: Mobile, Vienna, Ouse, Tasmania, Clyde, Emerson, Yarmouth, Rimouski, Goderich, Suez?

4. Name the different railroads that lead into Toronto.

5. Name some of the economic products of Ontario, and state the places where they are found.

6. Explain the terms: estuary, cape, delta, watershed, plateau.

7. Name the principal lakes of North America.

ARITHMETIC.

Examiner: A. A. MACTAVISH.

1. The product is 92,465, the multiplier is 5. What is the multiplicand?
2. If $\frac{7}{8}$ of a ship be worth $14.000, what is the value of $\frac{3}{5}$ of it?
3. Sold two colts at $75 and $85 respectively, and received $\frac{1}{5}$ in cash, and the rest in flour at $5 per barrel. How many barrels of flour were received?
4. Add together $\frac{1}{2}$, $\frac{3}{4}$, $\frac{3}{5}$, .05, .123 and $42\frac{1}{5}$.
5. Multiply .00124 by 42.368.
6. Simplify $\frac{1\frac{1}{2} + 2\frac{1}{3}}{3\frac{1}{4} + 4\frac{1}{5}}$ of $\frac{.5}{.25}$
7. $120 is divided among *A*, *B* and *C*. As often as *A* gets *one* dollar, *B* gets *two* and *C* gets *three*. How much does each receive?
8. How many more revolutions will the front wheel of a carriage make over that made by the hind wheel in going a distance of one mile, circumference being 10 and 12 feet respectively?

READING, DICTATION, AND COMPOSITION.

Examiner: J. HOYES PANTON, M.A.

READING.

1. Fourth Book, page 182. Read the last four stanzas. Beginning on page 247, read twenty lines.

DICTATION.

2. Page 208. Write from "*having——surrender.*"

COMPOSITION.

3. Contrast a professional life with that of an agriculturist.

APPENDIX E.

ONTARIO AGRICULTURAL COLLEGE.

Class Lists.

Easter Examination, 1880.

FIRST YEAR.

Class.	Agriculture.	Practical Examination on Live Stock.	Inorganic Chemistry.	Organic Chemistry.	Geology and Physical Geography.
HONOURS. I.	1 Motherwell. 2 Phin, R. J. 3 Ross, J. G. 4 Howitt. 5 Dickinson, C. 6 Phin, W. E. 7 Leask. 8 Cuppage. 9 Denman. 10 Grindley.	1 Howitt. 2 Phin, W. E. 3 Cuppage. 4 Patton. Phin, R. J. 6 Motherwell.	1 Howitt. 2 Motherwell. 3 Newton. 4 Ross, J. 5 Dickinson, C. 6 Dickinson, S. 7 Phin, R.	1 Motherwell. 2 Ross, J. 3 Dickinson. 4 Phin, W. 5 Howitt.	1 Howitt. 2 Ross, J. 3 Dickinson, C.
II.	1 Horne. 2 Hill. 3 Ward. 4 Ballantyne. 5 Glass. 6 Chipman. Fotheringham. 8 Sutherland. 9 Mylne. 10 Pope, H. Newton. 12 Landsboro. 13 Patton. 14 Surtees. Dickinson. 16 Cross. 17 Duthie. 18 Segsworth. 19 Gibson. 20 Nicol. 21 Macfarlane.	1 Denman. Horne. 3 Cross. 4 Macfarlane. 5 Fotheringham. 6 Duthie. 7 Ballantyne. 8 Dickinson, C. 9 Ross, J. G. 10 Leask. 11 Roberts. 12 Noble. Dickinson, S.	1 Torrance. 2 Landsboro. 3 Phin, W. 4 Hermon. 5 Nichol. 6 Cuppage. 7 Charlton. 8 Skaife. 9 Pope, H. 10 Surtees. 11 Wilson. 12 Robins. 13 Fotheringham. 14 Minard.	1 Hermon. 2 Nicol. 3 Newton. 4 Landsboro. 5 Dickinson, S. 6 Phin, R. 7 Wilson, W. 8 Horne. 9 Cuppage. 10 Torrance. 11 Ballantyne.	1 Fotheringham. 2 Dickinson. Landsboro. 4 Horne. 5 Ross, W. 6 Skaife.

CLASS LISTS—FIRST YEAR—*Continued.*

Class.	Agriculture.	Practical Examination on Live Stock.	Inorganic Chemistry.	Organic Chemistry.	Geology and Physical Geography.
PASS. III.	1 Gordon.	1 Chipman.	1 Grindley.	1 Charlton.	1 Wilson, W. / Lomas.
	2 Wilson.	2 Jones.	2 Patton.	2 Ross, W.	3 Stubbs.
	3 McNaughton.	3 Woodley.	3 Segsworth.	3 Patton.	4 Macaulay.
	4 Ross, W.	4 Lindsay, W.	4 Cuppage. / Leask.	4 Pope, H.	5 Phin, W.
	5 Torrance.	5 Grindley.	6 Ward.	5 Robins.	6 Minard.
	6 Small.	6 McIlquham.	7 Ross, W.	6 Segsworth.	7 Jones.
	7 Jones.	7 Pope, L.	8 Sutherland.	7 Macfarlane.	8 Cross.
	8 McIlquham, W.	8 McIlquham, J.	9 Horne.	8 Gordon.	9 Patton. / Gibson.
	9 Roberts.	9 Nicol.	10 McNaughton. / Woodley.	9 Skaife.	11 Lindsay, S.
	10 McIlquham, J.	10 McNaughton.	12 Gibson.	10 Grindley.	12 Roberts.
	11 Hermon.	11 Sutherland. / Pope, H.	13 Ballantyne.	11 Pope, L.	13 Glass.
	12 Noble.	13 Gordon.	14 Jones.	12 Anderson, H.	14 Wilson, S.
	13 Irving.	14 Ross, W.	15 Lindsay, W.	13 Fotheringham.	15 Macfarlane.
	14 Minard.	15 Lindsay, S. / Glass.	16 Cross.	14 Glass.	16 McClelland.
	15 Anderson.	17 Skaife.	17 Glass.	15 Jones.	17 Noble.
	16 Lindsay, S.	18 Newton.	18 Small.	16 Sutherland.	18 Ward.
	17 Willis.	19 Minard.	19 Chipman.	17 Denman.	19 Woodley.
	18 Skaife.	20 Landsboro.	20 Denman.	18 Ward.	20 Holterman.
	19 Jarvis.	21 Anderson, H.	21 Duthie.	19 Minard.	21 Watt.
	20 Patton.	22 Mylne.	22 Willis. / Anderson, H.	20 Surtees.	22 Lindsay, W.
	21 Robins.	23 Robins.	24 Macfarlane.	21 McLachlan.	23 Webster.
	22 Lindsay, W.	24 Hermon.	25 McIlquham, W.	22 Mylne.	24 Irving.
	23 Watt.	25 Willis.	26 Gordon.	23 Woodley.	25 Chipman.
	24 Jackson.	26 Gibson.	27 McLachlan.	24 Irving.	26 Roberts.
	25 Woodley.	27 Hill.	28 Noble.	25 Chipman.	27 McIlquham, W.
	26 McLachlan.	28 Small.	29 Jarvis.	26 Roberts.	28 Leask.
	Fenton.	Wilson, W.	30 Jackson.	27 McIlquham, W.	29 Cross.
	Pope, L.	Watt.	31 Roberts.	28 Leask.	30 Lindsay, S.
	Hogarth.	Ward.	32 Mylne.	29 Cross.	31 McNaughton.
	.....	Fenton.	33 Watt.	30 Lindsay, S.	32 Gibson.
	.....	Irving.	34 Lindsay, S.	31 McNaughton.	33 McIlquham, J.
	.....	Torrance.	35 Irving.	32 Gibson.	34 Noble.
	.....	Surtees.	36 McIlquham, J.	33 McIlquham, J.	35 Small.
	.....	Segsworth.	.....	34 Noble.	Fenton.
	.....	Charlton.	.....	35 Small.	Lindsay, W.
	.....	Hogarth.	.....	Fenton.	Jackson.
	.....	Jackson.	.....	Lindsay, W.	Willis.
	.....	Jarvis.	.....	Jackson.	Duthie.
	.....	McLachlan.	.....	Willis.	Watt.
	.....	.....	.....	Duthie.	Jarvis.
	.....	.....	.....	Watt.	.....
	.....	.....	.....	Jarvis.	.....

Names unnumbered are those of students who failed to pass.

CLASS LISTS—FIRST YEAR—*Continued.*

Class.	Botany.	Zoology.	English Literature and Composition.	Veterinary Anatomy.	Veterinary Materia Medica.
HONOURS. I.	1 Howitt.	1 Phin, R.	1 Howitt.	1 Phin, R.	1 Ross, J. J.
	2 Dickinson, C.	2 Phin, W. / Ross, J.	2 Ross, J.	2 Motherwell.	.....
	3 Dickinson, S.	4 Dickinson, C.	3 Motherwell.	3 Newton.	.....
	4 Horne.	5 Howitt. / Motherwell.	4 Dickinson, C.	4 Howitt.	.....
	5 Landsboro. / Skaife.	7 Newton.	5 Fotheringham.	5 Ross, J.	.....
	.....	8 Pope, H.	6 Phin, W.	6 Phin, W.	.....
	.....	9 Nicol.	7 Phin, R.	.....	.....
	.....	10 Torrance.	.....	.....	.....
	.....	11 Horne.	.....	.....	.....
	.....	12 Wilson, W.	.....	.....	.....
	.....	13 Landsboro.	.....	.....	.....

CLASS LISTS—FIRST YEAR—*Continued.*

Class.	Botany.	Zoology.	English Literature and Composition.	Veterinary Anatomy.	Veterinary Materia Medica.
HONOURS. II.	1 Ross, J. 2 Minard. 3 Macaulay. 4 Fotheringham. 5 Phin, W. 6 Patton. 7 Jones.	1 Patton. 2 Ward. / Charlton. / Ballantyne. 5 Hermon. 6 Fotheringham. 7 Small. 8 Anderson. 9 Glass. 10 Gordon. 11 Lindsay, S. 12 Macfarlane. 13 Dickinson, S. 14 Ross, W. 15 Cuppage. 16 Watt. 17 Segsworth.	1 Newton. 2 Torrance. 3 Wilson, W. 4 Small. 5 Robin. 6 Gordon. 7 Cuppage. / Pope, H.	1 Horne. 2 Landsboro. 3 Nichol. / Charlton. 5 Segsworth. 6 Ballantyne. 7 Dickinson, S. 8 Fotheringham. 9 Cuppage. 10 Torrance. 11 Hermon.	1 Phin, W. 2 McClelland. 3 Horne. 4 Howitt. 5 Lomas. 6 Dickinson, C. 7 Dickinson, S. / Fotherlngham 9 Ward. 10 Minard. 11 Jones. 12 Cross.
PASS. III.	1 Wilson, W. / Webster. 3 Cross. 4 Ward. 5 Lindsay, S. 6 Holterman. 7 Ross, W. 8 Lindsay, W. / Gibson. / Roberts. 11 Lowes. 12 Wilson, S. 13 Noble. 14 Macfarlane. 15 Glass. 16 Woodley. Hogarth. Stubbs. Watt.	1 Denman. 2 Leask. 3 Skaife. 4 Robins. 5 McIlquham, W. / Noble. 7 Grindley. 8 Sutherland. 9 Woodley. 10 Lindsay, W. / Roberts. 12 McNaughton. 13 Jones. 14 Chipman. / Irving. 16 Minard. 17 McLachlan. 18 Mylne. 19 Surtees. Cross. Gibson. Duthie. Willis. Jackson. Jarvis.	1 Nichol. 2 Pope, L. 3 Grindley. 4 Ballantyne. / Segsworth. 6 Skaife. 7 Jones. 8 Fenton. 9 Macfarlane. 10 Charlton. 11 Landsboro. 12 Ward. 13 Horne. 14 Ross, W. 15 Chipman. 16 Cross. 17 Glass. 18 Hermon. 19 Anderson. 20 Sutherland. 21 Leask. 22 Dickinson, S. / Minard. 24 Lindsay, S. 25 Woodley. 26 McIlquham, W. 27 Surtees. / Patton. 28 Lindsay, W. McLachlan. Hill. McNaughton. Gibson. Jarvis. Irving. Mylne. Jackson. Roberts. Noble. Denman. Willis. Duthie. Watt. Hogarth. McIlquham, J.	1 Lindsay, S. 2 Glass. 3 Sutherland. 4 Pope, H. 5 Robins. 6 McNaughton. 7 McIlquham, W. 8 Small. 9 Leask. / Chipman. 11 Wilson, W. 12 Gordon. 13 Skaife. / Minard. 15 McLachlan. 16 Patton. 17 Watt. 18 Macfarlane. / Mylne. 20 Cross. 21 Duthie. 22 Woodley. 23 Ross, W. 24 Irving. 25 Ward. 26 Willis. 27 Noble. 28 Jackson. 29 Gibson. 30 Dickinson. 31 Roberts. McIlquham. Surtees. Anderson, H. Lindsay, W. Jarvis. Jones. Grindley.	1 Webster. 2 Macaulay. 3 Glass. 4 Holterman. 5 Noble. 6 Ross, W. 7 Landsboro. 8 Wilson. 9 Woodley. / Lindsay, S. 11 Wilson, S. 12 Stubbs. 13 Lindsay, W. 14 Patton. 15 Roberts. 16 Macfarlane. 17 Skaife. 18 Gibson. 19 Watt.

Names unnumbered are those of students who failed to pass.

CLASS LISTS—FIRST YEAR—*Continued.*

	Class.	Arithmetic.	Mensuration.	Book-Keeping.	General Proficiency.
Honours.	I.	1 Motherwell. 2 Dickinson, S. 3 Phin, R. 4 Ross, J. 5 Phin, W. 6 Ballantyne. 7 Torrance.	1 Ross, J. G. Howitt. 3 Horne. 4 Fotheringham. 5 Dickinson, C. 6 Phin, W.	1 Howitt. Motherwell. 3 Nichol. 4 Ross, J. 5 Wilson. 6 Macfarlane. Minard. 8 Pope, L. Dickinson. 10 Phin, R.	1 Motherwell, W. Howitt, J. 3 Ross, J. G. 4 Phin, R. J. 5 Phin, W. 6 Dickinson, C. S.
	II.	1 Nichol. 2 Dickinson, C. 3 Howitt. 4 Pope, L. Horne. 6 Sutherland. 7 Leask. 8 Landsboro. 9 Cross. 10 Ross, W. 11 Denman. 12 Wilson.	1 Cross. 2 Wilson. 3 Dickinson, S. 4 Noble.	1 Newton. Horne. 3 Robins. Denman. Fotheringham. 6 Ballantyne. Sutherland. 8 Chipman. 9 Phin, W. Ward. 11 Hogarth. 12 Leask.	1 Newton, J. 2 Ballantyne, W. 3 Nichol, G. 4 Fotheringham, J. 5 Horne, W. H. 6 Dickinson, S. 7 Torrance, W. P. 8 Cuppage, A. 9 Landsboro J. 10 Pope, H. 11 Wilson, W. A. 12 Hermon, E, B. 13 Leask, J. 14 Charlton, G. A.
Honours.	III.	1 Robins. 2 Pope, H. Hermon. Gibson. 5 Fotheringham. 6 Small. Hogarth. Grindley. 9 Surtees. 10 Macfarlane, Mylne. 12 Noble. 13 McIlquham. 14 Ward. Charlton. 16 Roberts. McNaughton. 18 Minard. 19 Chipman. 20 Patton. 21 Watt. 22 Cuppage. 23 Newton. 24 Gordon. Hill. Glass. Irving. Anderson, H. Lindsay, S. Willis. McIlquham, J. Segsworth. Skaife. Duthie. Jackson. Lindsay, W. McLachlan. Jones. Jarvis. Fenton.	1 Ross, W. Ward. 3 Roberts. Gibson. 5 Watt. 6 Landsboro. 7 Macfarlane. 8 Patton. Glass. 10 Minard. Lindsay, S. Lindsay, W. Jones. Woodley.	1 Dickinson, S. Torrance. 3 Cuppage. 4 Grindley. 5 Pope, H. 6 Jones. 7 Gordon. 8 Patton. 9 Cross. 10 Skaife. 11 Mylne. 12 Noble. McNaughton. Small. 15 Hermon. Segsworth. 17 Ross, W. 18 Woodley. 19 Surtees. 20 Duthie. 21 Charlton. 22 Willis. 23 Glass. 24 Gibson. 25 Landsboro. 26 Irving. 27 McIlquham. 28 McIlquham. 29 Anderson. 30 Jackson. Lindsay, S. McLachlan. Fenton. Roberts. Watt. Lindsay, W. Jarvis.	1 Robins, W. P. 2 Segsworth, F. 3 McFarlane, D. 4 Gordon, W. 5 Sutherland, A. 6 Paton, W. 7 Grindley, A. W. 8 Ross, W. 9 Glass, W. 10 Ward, T. 11 Small, A. F. 12 Skaife, J. 13 Chipman, P. H. 14 Cross, A. 15 Minard, J. H. 16 McNaughton, J. 17 Denman, A. W. 18 McIlquham, W. 19 Lindsay, S. 20 Surtees, W. S. 21 Gibbon, W. J. 22 Mylne, R. C. 23 Anderson, H. 24 Noble, F. 25 Jones, G. 26 Duthie, J. 27 Roberts, P. 28 Woodley, F. E 29 Irving, C. E. 30 Willis, J. 31 McLachlan, D. 32 Lindsay, W. 33 Watt, J. 34 McIlquham, J. 35 Jackson, C. 36 Jarvis, C. 37 Hill, J. 38 Fenton, J.

Names unnumbered are those of students who failed to pass.

CLASS LISTS.—*Continued.*

SECOND YEAR.

CLASS LISTS.—*Continued.*

SECOND YEAR.

	Classes.	Agriculture and Arboriculture.	Practical Examination on Live Stock.	Agricultural Chemistry.	Analytical and Practical Chemistry.	Entomology.	Systematic and Economic Botany.	Meteorology.
Honours.	I.	1 Joyce. 2 Reymond. 3 Holterman. 4 Ash. 5 Webster. 6 Clutton. 7 Anderson. 8 Macaulay.	1 Ash.	1 Chapman. 2 Macaulay. 3 Webster. 4 Joyce. 5 Holterman.	1 Webster. 2 Chapman.	1 Webster. 2 Macaulay. 3 Lomas. 4 Chapman. 5 Joyce. 6 Holterman.	1 Chapman. 2 Webster. 3 Ash.	1 Chapman. 2 Webster. 3 Reymond. 4 Holterman. 5 Joyce. 6 Lomas. 7 Macaulay.
	II.	1 Dawes. 2 Lomas. 3 Stubbs. 4 Campbell. 5 Chapman. 6 Craig. 7 McClelland. 8 Wilson, S.	1 Dawes. 2 Lomas. 3 {Holterman. {Campbell. 5 Wilson.	1 Lomas. 2 Clutton. 3 Ash. 4 Campbell. 5 Reymond.	1 Campbell. 2 Clutton. 3 Joyce.	1 Ash. 2 Wilson. 3 Clutton. 4 Campbell. 5 Dawes. 7 {Reymond. {McClelland.	1 Joyce. 2 Reymond. 3 Dawes.	1 Clv on. 2 Ca bell. 3 McClelland. 4 Stubbs. 5 Wilson.
Pass.	III.		1 {Webster. {Anderson. 3 {Stubbs. {Macaulay. 5 Chapman. 6 Joyce. 7 Reymond. 8 Clutton. 9 Craig. McClelland.	1 Wilson. 2 Stubbs. 3 Anderson. 4 Dawes. 5 Craig.	1 Reymond. 2 Ash. 3 Dawes. 4 Craig.	1 Stubbs. 2 Anderson. 3 Craig.	1 Campbell. 2 Clutton. Craig.	1 Anderson. 2 Ash. 3 Dawes. 4 Craig.

Names unnumbered are those of Students who failed to pass.

CLASS LISTS—*Continued.*

SECOND YEAR.

Classes.		English Literature and Composition.	Veterinary Pathology.	Veterinary. Materia Medica.	Mechanics.	Levelling and Land Surveying.	Book-Keeping.	Political Economy.	General Proficiency.
Honours.	I.	1 Macaulay. 2 Chapman. 3 Webster.	1 {Clutton. Ash.} 3 Webster.		1 Webster. 2 Macaulay. 3 Lomas. 4 Holterman.	1 Holterman. 2 Webster. 3 {Macaulay. Wilson.}	1 Macaulay. 2 Holterman. 3 {Dawes. Webster.}	1 Webster. 2 Lomas. 3 Holterman. 4 Macaulay. 5 Clutton. 6 Dawes.	1 Webster, J. L. 2 {Holterman, R. Macaulay, H.}
	II.	1 Holterman. 2 Dawes. 3 Lomas.	1 Lomas. 2 Macaulay. 3 Holterman. 4 Craig. 5 {McClelland. Campbell.} 7 Dawes. 8 Anderson.	1 Craig. 2 Webster. 3 Chapman. 4 Clutton. 5 Joyce. 6 {Ash. Campbell.}	1 Campbell. 2 Clutton. 3 Reymond. 4 Dawes. 5 {Wilson. McClelland.} 7 Chapman.	1 Lomas. 2 Chapman. 3 {Dawes. McCelland.} 5 Ash. 6 {Campbell. Reymond.}	1 Wilson. 2 Chapman. 3 Reymond. 4 McClelland. 5 Campbell. 6 Joyce. 7 Lomas.	1 Campbell. 2 Chapman. 3 Anderson.	1 Lomas, J. W. 2 Chapman, R. K. 3 Clutton, A. H. 4 Ash, W. E. 5 Dawes, M. A. 6 Campbell, D. 7 Reymond, A.
Pass.	III.	1 Anderson. 2 Joyce. 3 Campbell. 4 Clutton. 5 Wilson. 6 Ash. 7 Stubbs. Reynolds. Craig. McClelland.	1 Chapman. 2 Reymond. 3 Joyce. 4 Wilson. 5 Stubbs.	1 Dawes 2 Reymond	1 Stubbs. 2 Craig. 3 Ash. 4 Anderson. Joyce.	1 Clutton. 2 {Joyce. Craig.} Anderson. Stubbs.	1 Clutton. 2 Ash. 3 Anderson. Craig.	1 Wilson. 2 Ash. 3 Craig. 4 Stubbs. 5 {McClelland. Reymond.} Joyce.	1 Joyce, H. G. 2 Wilson, S. J. 3 Anderson, J. Craig, W. 5 McClelland. 6 Stubbs, W.

Names unnumbered are those of Students who failed to pass.

APPENDIX F.

FINANCIAL TABLES.

1.—Appropriation Expenditure for 1880.
2.—Statement of Revenue for 1880.
3.—Estimated Expenditure for 1881.
4.—College in account with Farm and Garden.

Ontario Agricultural College.

1.—APPROPRIATION EXPENDITURE FOR 1880.

	$ c.	$ c.
A.—*Maintenance Account.*		
I.—*Food.*		
Meat, fish and fowl	2,388 15	
Bread and biscuit	913 50	
General groceries and butter	2,671 42	
II.—*Household Expenses.*		
Fuel		
Light	1,362 80	
Laundry, soap and cleaning	305 56	
Furniture and furnishing	199 12	
Repairs	372 43	
Servants' wages (women)	681 47	
	1,322 20	
III.—*Business Department.*		
Advertising, printing, postage, &c.	605 42	
IV.—*Miscellaneous.*		
Maintenance of chemicals	97 85	
Unenumerated	649 84	
V.—*Salaries and Wages*	9,994 01	
VI.—*Payments not provided for in Estimates.*		
Lumber for sidewalk (from college to city)	258 38	21,822 15
B.—*Capital Account.*		
I.—*Furniture and Furnishing*	1,980 99	1,980 99
		23,803 14

2.—STATEMENT OF REVENUE FOR 1880.

	$ c.	$ c.
Balances on board accounts paid by students (over and above labour done in outside departments)	2,401 02	
Tuition Fees	1,625 00	4,026 02
		4,026 02

Names unnumbered are those of Students who failed to pass.

3.—ESTIMATED EXPENDITURE FOR 1881.

	Voted for 1880 (92 Students).	Required for 1881 (130 Students).
A. *Maintenance.*		
I.—*Salaries.*	$ c.	$ c.
President, Professor of Natural History and English, and Resident Master	2,000 00	2,000 00
Professor of Agriculture and Farm Superintendent	2,000 00	2,000 00
Professor of Chemistry and Practical Chemist	1,000 00	1,500 00
Professor of Veterinary Science	600 00	700 00
Mathematical and Assistant Resident Master	500 00	600 00
Bursar and Storekeeper	500 00	600 00
Physician	300 00	300 00
Field and Live Stock Foreman—	600 00	600 00
Foreman of Horticultural Department	600 00	600 00
Foreman of Mechanical Department	600 00	600 00
Matron and Housekeeper	400 00	400 00
Engineer	500 00	600 00
Assistant Engineer (for 6 months)	150 00	180 00
Janitor and Messenger	150 00	150 00
Instructor in Drill and Gymnastics		100 00
Temporary assistance	100 00	100 00
	10,000 00	11,030 00
II.—*Expenses of College.*		
Meat, fish and fowl	2,800 00	4,000 00
Bread and biscuit	1,300 00	1,600 00
General groceries and butter	2,900 00	4,200 00
Laundry, soap, and cleaning	200 00	300 00
Fuel	1,600 00	2,500 00
Light	300 00	1,000 00
Furniture and furnishing	500 00	550 00
Repairs	650 00	650 00
Maintenance of chemicals	100 00	150 00
Advertising, postage and stationery	600 00	600 00
Unenumerated	600 00	700 00
Women servants' wages (12 in 1880, 16 in 1881)	1,300 00	1,750 00
	22,850 00	29,030 00
B.—*Capital Account.*		
I.—*Furniture and Furnishing*	2,000 00	2,000 00
	24,850 00	31,030 00

4.—THE COLLEGE IN ACCOUNT WITH THE FARM AND THE GARDEN FOR THE YEAR 1880.

Dr.	$ c.	$ c.	c.
(a) With Farm.			
To Potatoes..... 300 bags .....at	0 50	150 00	
" Turnips..... 28 bushels..... "	0 15	4 20	
" Wheat..... 120 " ..... "	1 10	132 00	
" Cordwood		35 00	
" Carting for College.....		30 00	
" Keep of College horse.....		100 00	
" Carpenter's work		70 00	521 20
(b) With Garden.			
To Asparagus..... 376 bunches..... at	0 04	15 04	
" Apples..... 50 barrels ..... "	1 00	50 00	
" Beans ..... 7½ bushels in pod..... "	1 00	7 50	
" Beets ..... 30 " ..... "	0 40	12 00	
" Cabbage ..... 54 dozen heads ..... "	0 50	27 00	
" Cauliflower ..... 12 " ..... "	1 00	12 00	
" Celery ..... 180 heads ..... "	0 08	14 40	
" Carrots ..... 35 bushels..... "	0 20	7 00	
" Cucumbers ..... 2 " ..... "	1 50	3 00	
" Lettuce ..... 51 dozen..... "	0 20	10 20	
" Onions..... 22 bushels ..... "	0 75	16 50	
" Potatoes ..... 43 bags ..... "	0 56	21 50	
" Parsnips ..... 26 bushels ..... "	0 50	13 00	
" Peas..... 13 " in pod..... "	1 00	13 00	
" Rhubarb ..... 235 bunches ..... "	0 04	9 40	
" Spinage ..... 10½ bushels ..... "	1 00	10 50	
" Turnips..... 12 " ..... "	0 15	1 80	
" Tomatoes..... 26 " ..... "	0 40	10 40	
" Vegetable Marrow 107 ..... "	0 07	7 49	
" Milk .....3653 gallons..... "	0 08	212 24	473 97
			995 17
Cr.			
By students' labour for year, as reported by foremen, approved by Farm Superintendent, and credited on board and washing account		4,347 23	4,347 23
By Balance.....		3,352 06	

APPENDIX G.

After entering on my duties as President a little over a year ago, I endeavoured to get from Europe and the United States, such information as would enable me to give the latest statistics on the subject of agricultural education in those countries; but having received answers from only a portion of the agricultural institutions, I prefer to postpone the matter till next year, and copy the following from the report of 1878, written by my predecessor, rather than give only partial information of a later date.

AGRICULTURAL EDUCATION IN GERMANY AND THE UNITED STATES.

"What I desire to do in this very brief Appendix is to give an outline of the manner in which agricultural education is carried out in Germany and the United States. I take those two as examples, although only four European countries are now without similar institutions. I will not rehearse the arguments used by the advocates of this species of education when claiming support for their colleges from the State; those have already been used here, and acted upon in the establishment and annual support of this institution by our Province.

A.—GERMANY.

This country is, as usual, ahead of all the rest of the world in this matter of agricultural education. There are four steps in her system, viz :—

1. Agricultural Farm Schools.
2. Agricultural Middle Schools.
3. Agricultural Colleges.
4. Agricultural Courses in Universities.

The course of instruction in the first two classes embraces even more than is found in the curriculum of our own Agricultural College, including as it does, a thorough grounding in a continued literary education, in the elements of the sciences, in veterinary lessons, in theoretical and practical agriculture, and in all kinds of farm work, learned on the farms, which are attached to both those classes of schools. Besides those under the charge of some of the old States, there are 156 of the two classes of schools under the direct control of the Empire; though 42 of them are devoted to the study of specialities, such as vine and grape culture, horticulture, bee-keeping, etc. The third step is the Agricultural Colleges, of which there are six in the German Empire, situated at Eldend, Proskau, Popplesdorf, Munich, Thorau and Hohenheim. In these, the elementary scientific education already obtained is applied directly to agriculture in extensive laboratories and dissecting rooms, fitted up with all the necessary apparatus and appliances, and on large farms of from 800 to 1,500 acres. Besides this practical application, the theoretical instruction is greatly widened, including all the departments of agriculture, agricultural science, veterinary science, agricultural statistics, finance, laws, taxation, etc., etc.,—in other words, the curriculum of each is wonderfully complete. Having finished his course,

the student is required to enter the ranks of agriculturists and prove himself successful, after which he can attend, thoroughly equipped, agricultural departments of nine of the great National Universities. Besides these schools and colleges, are 43 experimental stations; and the cost of all—schools, colleges and experimental stations—is borne by the State.

B.—United States.

"I have in the accompanying table grouped together the facts regarding 32 out of 39 Agricultural Colleges of the neighbouring Republic. During 1877 I placed myself in communication with each of those Colleges, and received the Reports of the numbers mentioned, so that the table is absolutely correct for the year 1876. In 1862, Congress passed what has been usually referred to as the Land Script Act, entitled "An Act donating lands to the several States and Territories which may provide Colleges for the benefit of Agricultural and the Mechanic Arts." By this Act, some 9,600,000 acres of the public domain were set aside for this purpose on the basis of 30,000 acres for every Senator sent by any State or Congress to the Senate, such State or Territory having, of course, the right of acceptance or refusal; but the acceptance bound by the conditions of Sec. 4, which required that the interest of all moneys derived from the sale of lands donated "shall be inviolably appropriated by each State which may take and claim the benefit of this Act to the endowment, support and maintenance of at least one College, where the leading object shall be, without excluding other scientific and classical studies, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as Legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes, in the several pursuits and professions in life."

Almost every State has now taken advantage of this liberal offer. The Act evidently contemplated the erection and maintenance in each State of an Agricultural and Mechanical College; but as it did not expressly say so, a contest arose in many of the States between the advocates of existing colleges and those desiring to carry out the spirit of the Act. It has resulted, in twenty States, in the endowment of some already existing college or university, which, in order to comply with the conditions, bought a farm, and added to its departments of instruction a well equipped agricultural department. In some nineteen of the States honesty won the day, and separate Agricultural and Mechanical Colleges were erected, and received the endowment, of which I have given in the accompanying table the statistics of sixteen. Only two or three of the former class have been successful, the agricultural department being overshadowed by the other departments of the university—any exception being caused by the noted excellence of the professors in the agricultural department. Of the latter class, the great majority have been successful—many extremely so. Fourteen of the nineteen are as yet quite young, however, having only been fully in operation during the last decade.

The table needs no comment, but is largely self-explanatory. The number of professors in each college is usually six or seven, and of assistants about the same. The average salary of a professor is $2,000—many being above that figure, and only three below it. Of course in the agricultural departments of the universities, the salaries are often double those figures, but these are professors of a regular university, as well. The average salary of the president is about $3,200, many receiving above that sum and none less than $3,000. As before, the presidents of the universities in which there are agricultural departments receive, of course from $4,000 to $6,000; but no precedent can be taken from them. The total number of the professors and assistants in the Agricultural Colleges of the United States, during the year mentioned was 473, and the total number of students 4,211. The former number is a third too large, owing to the universities counting their regular professors with the agricultural department. Turning from the equipment and attendance to the maintenance, it has been found almost impossible for the first class to obtain any assistance from the State, for the rival colleges or universities oppose that on the grounds that their agricultural departments have only been attached to get the endowment; but the second class, have, in all classes, been assisted in most instances very liberally, by yearly grants from the State. The interest on the lands sold

by each State will be seen to be very variable, arising partly from the size of the State but mainly from the favourable or unfavourable location of the lands. The interest received by all the Colleges during 1876 was $525,745, or an average of about $13,500 to each. Many of them have been additionally endowed by individuals, by subscriptions, or by counties, and the annual maintenance expenditure of those of them from which I could get a financial statement was for the year given somewhere between $25,000 and $38,000. And that is outside of any expenditure on capital account. And lastly, turning from equipment, attendance and maintenance, to a consideration of the several courses of study, it may simply be said that neither our space nor our time would allow even a synopsis of them. The great faults of the majority of them are the attempt to teach too many subjects superficially, to give too many optional courses, to leave out a course of farm apprenticeship, and to make their curriculum too literary, and not sufficiently technical."

The following table requires no further explanation.

JAMES MILLS,
President.

AGRICULTURAL COLLEGES OF THE UNITED STATES, 1876.

STATE. | Locality

AGRICULTURAL COLLEGES OF THE UNITED STATES, 1876.

STATE.	Locality in the State.	NAME OF THE COLLEGE.	Whether an independent college or a department of a university.	No. of Professors and Assistants in the Agricultural and Mechanical College.	No. of Students in the Agricultural or Mechanical College.	No. of Students pursuing Agricultural or Mechanical Studies.	Interest on Investments made from sale of Land Scrip (Act of 1862) Endowment.	No. of Acres in Farm.	Value of Farm (not buildings).
							$		$
Maine	Orono	State College of Agriculture and Mechanic Arts	In. College	8	115	115	7,864	370	10,000
New Hampshire	Hanover	Dartmouth College	Univ. Dept.	11	24	24	4,800	365	21,000
Vermont	Burlington	University of Vermont and State Agricultural Col.	Univ. Dept.	8	23	23	8,130	no farm.	.....
Connecticut	New Haven	Yale College—Sheffield Scientific School	Univ. Dept.	31	230	230	8,100	no farm.	.....
Rhode Island	Providence	Brown University—Agri. and Mech. Department.	Univ. Dept.	13	35	35	6,624	no farm.	.....
Massachusetts	Amherst	Massachusetts Agricultural College	In. College.	8	111	111	8,022	383	37,000
New York	Ithaca	Cornell University—College of Agriculture	Univ. Dept.	21	58	58	35,000	150	22,000
New Jersey	New Brunswick.	Rutger's College—Scientific School	Univ. Dept.	10	42	42	6,960	100	45,000
Delaware	Newark	Delaware College	Univ. Dept.	8	43	16	4,980	not known	.....
Pennsylvania	Centre County	Pennsylvania Agricultural College	In. College.	13	161	161	24,420	600	75,000
Maryland	College Station.	Maryland Agricultural College	In. College.	6	77	40	6,900	285	14,250
Virginia	Blacksburgh	Virginia Agricultural and Mechanical College	In. College.	10	255	255	20,639	250	28,000
N. Carolina	Orangeburgh	Claflin University—Agricultural Department	Univ. Dept.	9	61	61	7,500	not known	.....
S. Carolina	Chapel Hill	N. Carolina University—Agricultural Departm't.	Univ. Dept.	6	40	40	10,000	116	10,000
N. Georgia	Dahlenoga	N. Georgia Agricultural College	In. College.	8	93	93	14,000	60	2,500
S. Georgia	Athens	State College of Agriculture and Mechanic Arts	In. College.	5	245	30	3,000	25	1,000
Alabama	Auburn	Alabama Agricultural and Mechanical College	In. College.	7	104	80	16,224	100	2,200
Mississippi	Rodney	Alcorn University—Agricultural Department	Univ. Dept.	4	57	57	5,679	250	5,500
Louisiana	New Orleans	Louisiana Agricultural and Mechanical College	In. College.	6	209	115	13,734	600	40,000
Texas	Bryan	Texas Agricultural and Mechanical College	In. College.	6	50	50	12,000	2,200	20,000
Kansas	Manhattan	Kansas State Agricultural College	In. College.	16	303	303	20,491	255	25,500
Arkansas	Fayetteville	Arkansas Industrial University	In. College.	12	45	45	10,400	160	12,000
Tennessee	Knoxville	East Tennessee University—Agricultural Depart.	Univ. Dept.	12	58	58	23,760	260	24,000
Kentucky	Lexington	Kentucky University—Agricultural Department.	Univ. Dept.	8	94	94	9,900	433	130,000
Ohio	Columbus	Ohio Agricultural and Mechanical College	In. College.	11	140	126	30,000	320	200,000
Indiana	La Fayette	Pardue University—Agricultural Department	Univ. Dept.	8	71	71	20,314	159	47,700
Illinois	Urbana	Illinois Industrial University	In. College.	15	187	187	28,200	570	56,000
Missouri	Columbia	Missouri University—Agricultural Department	Univ. Dept.	6	70	70	3,040	640	60,000
Michigan	Lansing	Michigan Agricultural College	In. College.	13	166	166	16,880	676	47,320
Iowa	Ames	Iowa State Agricultural College	In. College.	15	300	75	34,822	850	51,000
Minnesota	Minneapolis	Minnesota University—Agricultural Department.	Univ. Dept.	8	6	6	13,901	120	12,000
Wisconsin	Madison	Wisconsin University—College of Agriculture	Univ. Dept.	16	124	124	13,490	196	40,000

AGRICULTURAL COLLEGE OF CANADA, 1879.

Ontario	Guelph	Ontario Agricultural College	In. College.	7	162	162	none	550	55,000

REPORT

OF THE

PROFESSOR OF AGRICULTURE

AND

FARM SUPERINTENDENT.

ONTARIO AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM,
31st October, 1880.

To the Honourable S. C. Wood,
Commissioner of Agriculture:

SIR,—I have again the honour of reporting upon the Field, the Live Stock, Horticultural, Mechanical, Experimental, Practical Instruction, and allied subjects under my charge here, and on this occasion I shall preface with some remarks on what is at once a matter of great national value as well as one that has largely brought our School to its present status.

It is now four years since we imported the animals that still principally compose the various herds and flocks of the farm. Their conduct and standing during these years are well known to all who take an interest in the progress of education and the main source of the future wealth of the Dominion. Nationally, and in the eye of the world, we are now articled to a business in beef and mutton that may reach, even in our time, as far as the wealth of any other country, and certainly much farther than any other, proportionately to age. It has been the duty of this institution to take a prominent part in the maintenance of good specimens of the leading breeds of cattle and sheep, and with reference to success in most essentials it has no reason to be dissatisfied. Having in view the increasing importance of this subject and the continuous annual drain by the public upon our herds and flocks, as well as the very largely extended educational demands upon the same thing, I am again called upon to advise why certain animals of certain breeds should be obtained for our Farm.

In the first place, I must point out that whatever is done by the Government in the matter of importations to this Farm, can be but a small thing compared with what is done by other breeders in the Province, who do so, almost regularly, annually. All the surplus cattle and sheep that can be produced from this Farm annually is not one-hundredth part of what is done by others, and not one-thousandth of what is required throughout the Province.

Secondly, in place of our being in opposition to other breeders, as some may contend, we are actually doing the advertising for them. It is a fact in my own personal knowledge, and also given me from many farmers, and some breeders themselves, that the prominence given the question of Live Stock in our annual reports, and the distribution of our surplus animals during the last five years, have very largely increased the demand

for such stock, so that many of the sales by breeders can be directly traced to our connection. It is also a fact that the hundreds from long distances who call and do not obtain from us, at once proceed to other herds and flocks, and purchase what they would not otherwise have done had the Experimental Farm not been in existence.

Thirdly, the many young men who have been educated here and who took keen interest in the Live Stock department, are not only returning or writing for certain animals for themselves, but have sent many others for the same purpose, who otherwise were indifferent to improved stock; the most of those had to call upon other breeders, by reason of our own want of supply.

Fourthly, the score of direct breeders who may be jealous of our limited efforts are an unit to the thousands now demanding the continuance and extention of our Live Stock department; the latter say, you have opened up to the average farmer what exactly suits him; he knows that on the second week of September every year he has the opportunity of obtaining a choice from several breeds of cattle, sheep and swine, at prices entirely at his own making, for no reservations are made and few private sales have been allowed, even at much higher figures than were offered in very many instances.

Fifthly, farmers are now satisfied in regard to the judiciousness of our moderate system of feeding breeding stock; the four years' proof has been extensive and severe.

Sixthly, there is also manifest satisfaction at the greater care bestowed upon the culling of young animals; offering only the best the first season and preparing the inferior for next by a gradual plan of careful feeding,—for example, the shearling rams that brought an average of $49.35 on the 10th September last, were the culls of 1879, such animals that, though sound in constitution, were not of that stamp which I considered should be offered by the Government to their own people, and which certainly would not have fetched $10 each.

Seventhly, the situation of the Farm does not make it one of local interest in regard to the service of new animals to other herds and flocks; ewes have been sent from over 200 miles, and sows from 100 miles distant, besides the fact that we have had to refuse several by reason of crowding. As to this see details in chapter on "public patronage to our various rams."

In short it may be asked, is it possible in these times to have too much stock in the country, whether by the agency of private or of public means? In saying no, I must point out that we cannot compare ourselves with such an older and more wealthy condition of things as obtain in the United States. Our average farmer yet needs help in respect to placing, for example, the essence for beef and mutton production within his easy reach. It is too risky for him to import the one or two animals he needs, and he is not prepared to give the regular breeder a large profit for such a transaction. But the Government wants no direct profits as does the special breeder, and here I must confess to regret that the Government has been obtaining profits from the sale of their Live Stock here. While this may be gratifying to the management, it need not be so to the Government that is earnestly striving for the development of all branches of its rural economy.

When, therefore, it is now matter of practical history that a Government can be a farmer and obtain direct profits from the transactions thereof, there cannot possibly be any objections to increasing the number and raising the standard of several of our breeds of cattle and sheep here. The thousands want it, whatever the score of special breeders may say to the contrary. If we cannot offer more in future than we have been doing, prices are likely to rule high, and the lower and slower will be the character of our agriculture.

In order to meet the increased demand it has been suggested to us by several leading farmers that besides the material of the Ontario Experimental Farm, the Government should appropriate $100,000 for the purpose of importing cattle and sheep next year. This, they consider, would be acting in the spirit of the times, and subserve more actual good than all the agricultural shows, or agricultural inquiries on foot. I am not prepared to discuss this point at present, but shall proceed to submit some advice regarding the educational aspect of the proposed new importations for the College and Farm.

All the public are not aware that I have been gradually extending the plan by which students are familiarized with the different breeds of Live Stock; the actual lecturing now

takes up but one-third of the whole time allowed for this division of my duties, the rest being devoted to practical examination of points, handling and comparing different animals of the same breed and of different breeds, and judging generally. When we think we are conversant with the history, characteristics and standard of points appertaining to any particular breed, we take a bull, or cow, or ram, or ewe to the class-room platform, where, in the presence of all the students, I first of all name and handle all its parts, point out wherein it is good, wherein poor; and thereafter *every student* is made to do the same thing, give reasons for what he advances, answer questions put to him by his fellows, and generally is submitted to a careful examination by myself. I have had satisfaction in this kind of work, by the warm interest taken in it by every student, without exception—the one complaint being that they have not had enough of it. The complaint is sound if the result of their own final examination is evidence of acquirements under allowance of short time, on which question I beg to refer you to my introductory remarks of last year's report. But whether for that reason, or for those of but ordinary ability, on the point both of teacher and scholar, I am convinced that the ordinary lessons in this connection must be supplemented by regular monthly and weekly drill during winter in the handling and judging of all breeds of cattle and sheep. Just as my older head had to get years to acquire the art of *systematic teaching*, so it need not be surprising that younger ones require months in place of weeks to carry the ground-work of this branch of their profession. It is very desirable that judging of Live Stock at exhibitions should be brought to a profession, in place of being a complimentary position in the hands of the few, liable thus to prejudice and unskilled dictum. It is part of our duty to make judges, and with the help of the Government, I have no fear of placing such a staff in the hands of the Ontario farmers, ten years hence, as shall be a credit to any country. To do this, our College must be replete with animals of the leading breeds of cattle, horses and sheep, suitable for Canada at least, and opportunity must be given for repeated lessons as already explained. Our importations of 1876 have now served their end with us and cannot longer be kept as a matter of profit or the same value educationally. They will, however, be good to others who do not possess blood from the same source, and I therefore propose that they should form part of the public sale in September, 1881; so that, in addition to the ordinary sale of about $3,000 of surplus Live Stock, we would receive something like $2,500 for old bulls, cows, rams and ewes—say $5,000, for certain. I may also state that since 1876 we have sold over $10,550 of surplus Live Stock. Finally, I beg to recommend the appropriation of $15,200 for the importation of the following animals—the estimate to include all expenses delivered here, and the very best to be obtained:—

Clydesdale horse and two mares	$3,000
Shorthorn bull and three cows	3,900
Hereford " "	1,500
Angus or Aberdeen Poll bull and three cows	2,000
Ayrshire bull and three cows	1,200
English Leicester ram and six ewes	400
Border " " "	450
Lincoln " " "	450
Cotswold " "	500
South Down " "	500
Oxford Down " "	400
Hampshire Down " "	450
Shropshire " " "	450
Total	$15,200

These should be sent for in February first, so as to be on hand here, through quarantine, by the 1st of August, in time for exhibitions and for notice at our public sale.

I.—THE WEATHER.

As usual, we present a Weather Table from April to September, inclusive, embracing the season of growth and maturing in connection with farm crops in this country. This should always receive a careful study before reading, or criticism, of results of field cropping or of plot experiments.

During April the lowest mean temperature of any day occurred on the 11th, when the thermometer ranged in the neighbourhood of 24°, and four days afterwards, or on the 15th, we had the highest mean for April, 58°. As the barometric pressure is not *now*, or long afterwards, a fact for a farmer's use, except in association with rainfall and temperature, I shall leave its study to the more scientific. Rain fell on ten separate days, and altogether to the depth of 3½ inches during April.

May was characterized by a low mean temperature of 34° on the 1st, and of 74° as the highest on the 25th, while rain fell on no fewer than sixteen days, and to the depth of 3⅛ inches. As a seeding month, therefore, May was somewhat unpropitious, though good for germination towards the end of it.

June had no higher mean than May (on the 23rd), and the lowest mean reached only 53° on the 1st; the rainfall was also small, not 3 inches, though spreading over twelve days. This important month for germination and growth was in most respects a good one, with the exception of a drought—warm high winds and no rain—from the 14th to the 22nd, which was directly responsible for the blight that came over most of our cereal crops.

During July the highest mean temperature of the season—81°—occurred on the 9th, and the lowest kept up to 59½°. The unusual drizzling of 1880 was upheld by this warm month as well as others, rain falling on as many as fifteen days, but only to the depth of 1⅛ inch over all, and at no time consecutive was fresh moisture wanting for more than three days. This association of much heat and much continuous moisture, in June and now, was responsible for the large extent of rust on cereals.

The heaviest rainfall came in August, yet distributed over sixteen days, mostly towards the end of the month, while the mean temperatures were, 77° on the 9th, and 58° on the 26th.

September came with a reduction to 73° on the 2nd and 47° on the 23rd, with a rainfall of 4 1-5 inches during nine days.

So then, altogether, we had rain during no fewer than 78 days out of the 182, though only to the depth of 19½ inches. The periods of drought were from the 14th to the 22nd June, and from the 4th to the 17th September. The mean range of temperature for the season was 59½°; the highest mean record of barometric pressure was 29·948 on the 22nd July, the lowest, 28·190 on the 10th April; the mean of the barometer for the season was 28·897 inches.

As another form of weather record, I beg to submit chart showing the agreement, or disagreement, of barometer, thermometer and rain-gauge.

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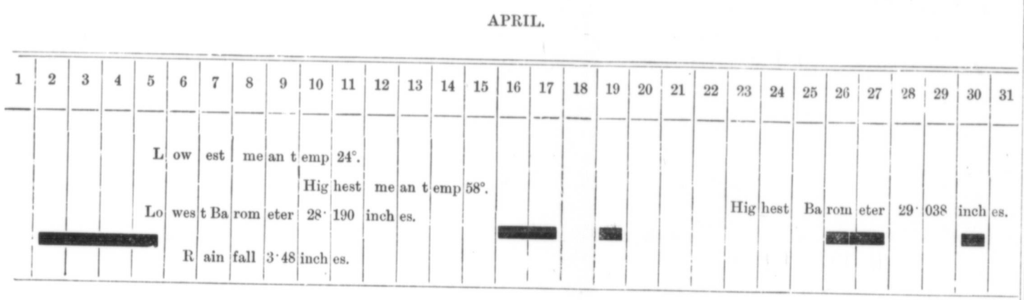
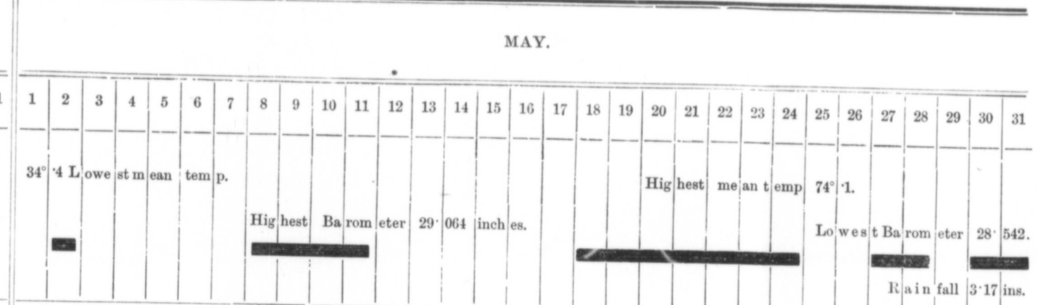
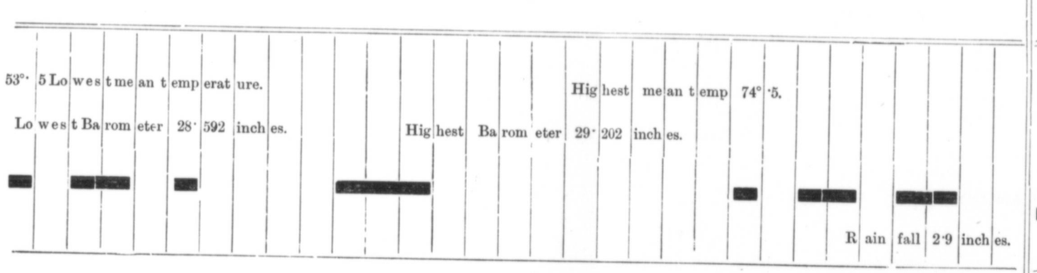
I.—THE WEATHER.

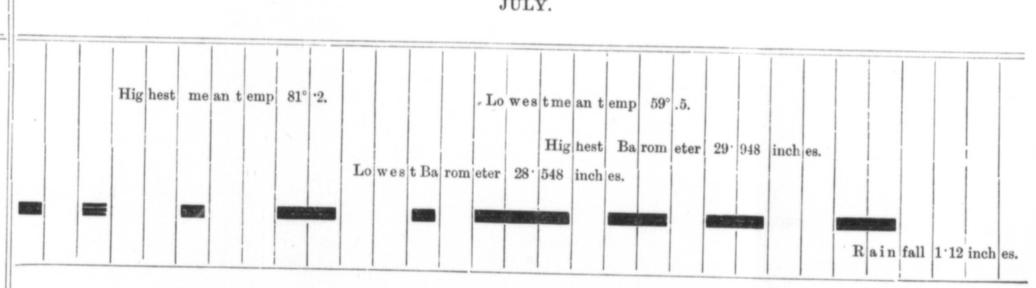
1880.

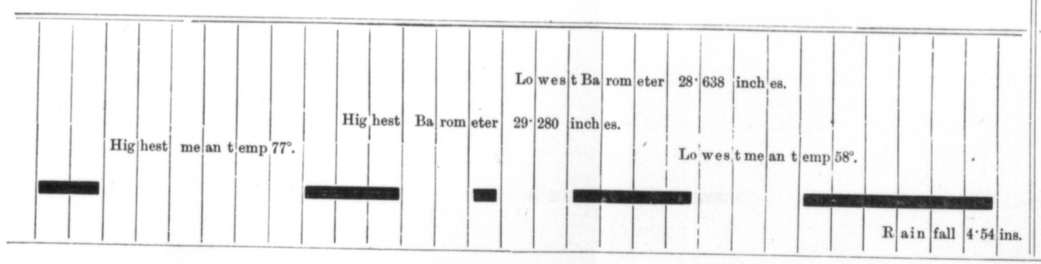
Rain, Temperature, and Atmospheric Pressure, during Season of Growth and Maturing, at the Ontario Experimental Farm.

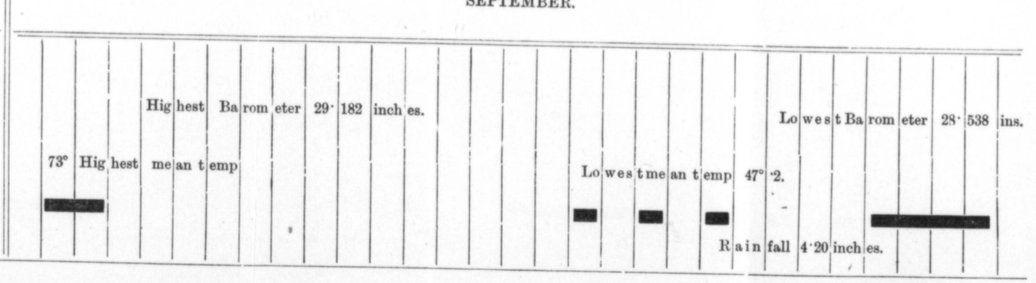








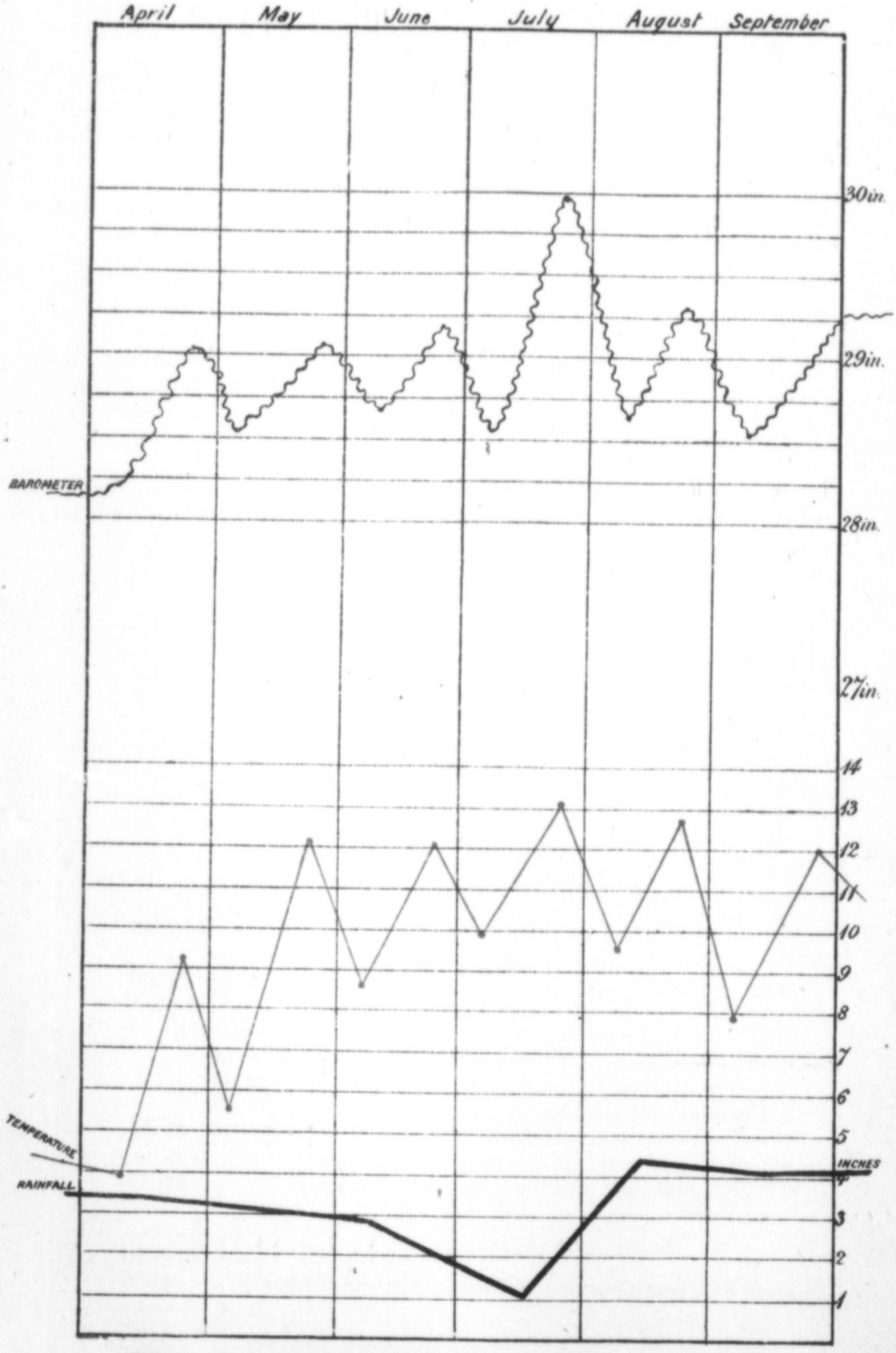




Note.—The black bars show the days on which rain fell.

Chart showing Barometric pressure Temperate and Rainfall during season of growth and maturing at The Ontario Experimental Farm.

1880.



Temperature is calculated by 5° to each of the Rainfall inches

II.—THE FIELD.

1.—Farm Plan and Cropping.

In the accompanying plan fields A and C are the experimental plots; B, the paddock; D, the garden; and E, the College grounds. Part of E is now laid aside for an Arboretum, begun this year.

Fields 6, 12, 14, 16 and 17 require underdrainage to a considerable extent, and improved fencing is needed to as much as three miles at different places, over the whole. Reclamation from stumps and stones is rapidly proceeding in Nos. 6, 12, 14 and 15. Nos. 2, 5, 8, 11, 14 and 16 are still in the possession of the original stock of thistles, and even where root cultivation has been overtaken their eradication has not been satisfactory. Looking to an early and more complete riddance of this weed, we have begun a rotation of bare summer fallowing, which will have to be debited to future crops, and credit, or help, given as the work proceeds, because the soil does not require such manurial aid, nor can we recommend such a method of farming except in these circumstances. I would respectfully beg that all interested in our success would assist in withdrawing the risks of the re-seeding of this farm with thistles.

Succeeding the usual cropping abstract, I have pleasure this year in giving a full account of the cost of cultivation, the gross value realized, and the net profit obtained from each field. The management of the various crops will readily be understood from the items of expenditure.

Field No. 1.

Spring Wheat—White Russian, Lost Nation and White Fife varieties; 8 acres; average produce 15 bushels grain, and 3,000 lbs. straw. After potatoes and Indian corn fodder, manured with 15 loads farm-yard manure per acre.

Cost per acre:

Fall ploughing		$1 50
Spring ploughing (gang)		0 75
Harrowing, twice		0 40
Seed		1 75
Seeding		0 25
Grass seeds		1 75
Rolling		0 20
Cutting thistles		0 50
Gathering stones		1 15
Harvesting		2 25
Threshing and preparing for market		1 10
		$11 60
Debit unexhausted manure (see chapter on "cost of producing crops")		8 00
Total cost		$19 60
Credit 15 bushels grain at $1.15		
" 1½ ton straw at $6	$17 25	
" 2 months' fall grazing	9 00	
	1 50	
		27 75
Net profit per acre		$8 15
Acres		8
		$65 20
12½ acres first year's pasture, less cost of cutting thistles		39 75
		$104 95

Field No. 2.

Second year's pasture; 19 acres, two-thirds thistles.

Credit grazing part of season, $2 per acre		$38 00
Cost of machine mowing thistles	$9 00	
" Three ploughings, summer fallow, at $2 per acre for first and $1.50 for others	95 00	
		104 00
Total *debit* on field		$66 00

Field No. 3.

First years Hay, 22 acres; 2¼ ton per acre on an average.

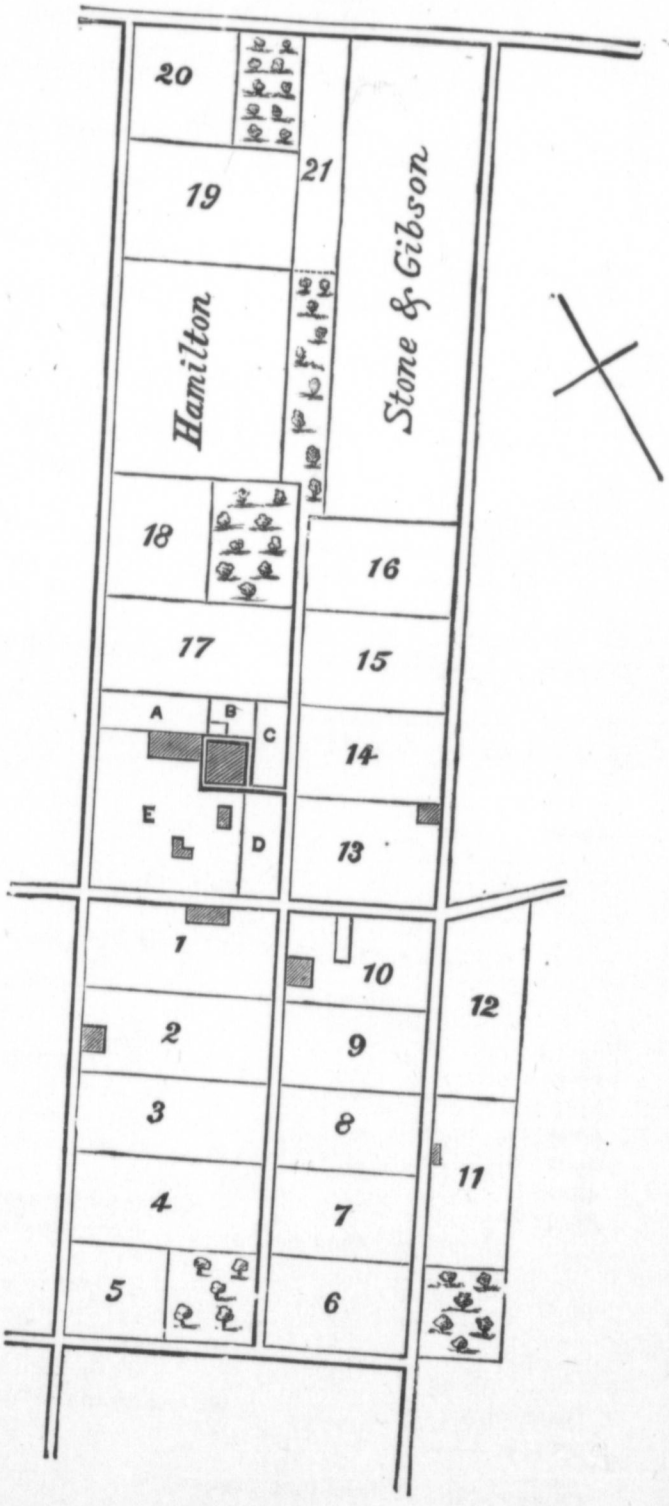
Rolling		$0 20
Gypsum, 200 lbs.		0 50
Cost of mowing, making and hauling		1 50
" Unexhausted manure		6 50
		$8 70
Value of 2¼ tons hay at $10		22 50
Hay profit per acre		$13 80
Value of after-grass at $1		1 00
		$14 80
Acres		22
		$325 60

Field No. 4.

7½ acres; average produce, 170 bushels.

POTATOES—

Fall ploughing		$1 50
Spring ploughing (gang)		0 75
Grubbing, twice		1 00
Harrowing, "		0 40
Rolling, "		0 40
Manure, 15 loads farm-yard	$19 50	
Bone dust	2 70	
Salt	0 85	
Gypsum	1 06	
Superphosphate	3 30	
	$26 61	
Distributing manure	4 00	
	$30 61	
Credit 4-5ths of farm-yard manure, and ½ of specials, applied to following crop	20 50	
		10 11
Carried forward		$14 16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Brought forward		$14 16
Drilling		0 75
Horse-hoeing, twice		1 00
Hand-hoeing, "		4 50
Cost of seed and planting		5 50
Harvesting		5 50
		$31 41
Value of 170 bushels potatoes at 35c		59 50
		$28 09
Acres		7½
		$210 67

CARROTS—1½ acres; produce, 580 bushels per acre.

Cultivation and manuring, as above	$20 30	
Seed and seeding	1 15	
Harvesting	8 00	
		$29 45
Value of 580 bushels carrots at 15c		87 00
Per acre		$57 55
Acres		1½
		$86 32

Field No. 5.

7½ acres Oats and 6 acres Barley, after Peas of 1879.

OATS—

Fall ploughing		$1 50
Gang ploughing (spring)		0 75
Harrowing, twice		0 40
Seed and seeding		2 00
Rolling		0 20
Harvesting		2 25
Threshing and preparing for market		1 25
Average of 4 loads farm-yard manure on poor knolls, at $1.30	$5 20	
Proportion for present crop		2 00
		$10 35
Value of 18 bushels oats at 35c	$6 30	
" 2,200 lbs. straw at $7 per ton	7 70	
		$14 00
		$3 65
Acres		7½
		$27 37

BARLEY—

Cultivation, manuring and harvesting, as above		$10 35
Value of 21 bushels at 60c.....	$12 60	
" 2,000 lbs. straw	4 00	
	$16 60	
	$6 25	
Acres	6	
		$37 50
		$64 87

Field No. 6.

Summer-fallow, 12 acres.

Cost of two ploughings, at $2 (rough land)	$48 00
" Gathering stones, roots, etc.	12 00
Debit.....	$60 00

BARLEY—13 acres; 33 bushels grain and 3,000 lbs. straw, per acre, sown with grasses

Fall ploughing		$1 50
Spring ploughing (gang)		0 75
Harrowing, twice.....		0 40
Seed (barley).....		1 50
Seeding.....		0 25
Grass and clover seeds.....		1 75
Rolling		0 20
Harvesting		2 00
Threshing and preparing for market		1 10
		$9 45
Debit unexhausted manures		6 25
		$15 70
Credit 33 bushels grain at 60c.....	$19 80	
" 2,000 lbs. straw at $4 per ton	6 00	
" Fall grazing (light).....	1 50	
		26 30
Profit per acre		$10 60
Acres		13
		$137 80

Field No. 7.

Corn fodder, 8½ acres; Turnips, 12 acres.

CORN FODDER—

Fall ploughing	$1 50
Spring ploughing (gang)	0 75
Carried forward	$2 25

Brought forward		
Grubbing, once		$2 25
Harrowing, once		1 00
Seed, 3 bushels		0 20
Seeding (drill)		2 00
Rolling		0 25
Harvesting (cutting with mower and shocking)		3 50
		$9 40
Manures:		
Bone dust		
Salt	$5 40	
Gypsum	0 85	
Superphosphate	1 20	
	6 60	
	$14 05	
Distributing manure	0 30	
	$14 35	
Credit ½ for future crops	7 17	
		7 18
		$16 58
Credit 22 tons green fodder at $1.50 per ton		33 00
Profit per acre		$16 42
Acres		8½
		$141 17

TURNIPS—(Swede) 12 acres.

Fall ploughing		
Spring ploughing (gang)		$1 50
Grubbing		0 75
Harrowing, twice		1 00
Rolling, twice		0 40
Manures—Farm-yard, 15 loads		0 40
Bone dust, 300	$19 50	
Salt, 250	4 00	
Gypsum, 200	0 50	
Superphosphate, 300	0 50	
	4 80	
	$29 30	
Distributing manure	4 00	
	$33 30	
Credit 4-5 farm-yard manure, and ½ of specials	23 00	
		10 30
Horse-hoeing, twice		1 00
Hand-hoeing, "		4 50
Drilling		0 75
Seed and seeding		1 15
Carried forward		$21 75

Brought forward		$21 75
Harvesting		8 50
		$30 25
Credit for extra cultivation, for future crops		2 50
Actual cost		$27 75
Value of 750 bushels turnips at 8c.		62 00
		$34 25
Credit leaves left on ground, said to be equal to what has been removed from the soil by bulbs		5 00
Profit per acre		$39 25
Acres		12
		$471 00
Brought forward		135 47
		$606 47

Field No. 8.

10 acres Fall Wheat (Clawson and Arnold's Victor), and 12¼ acres Spring Wheat (White Russian).

FALL WHEAT—

15 loads farm-yard manure	$19 50	
Credit 4-5 for future crops	14 50	
		$5 00
Fall ploughing		1 50
Seed and seeding		2 00
Harvesting		2 25
Threshing and preparing for market		1 25
		$12 00
Value of 27 bushels grain at $1	$27 00	
" 4,000 lbs straw at $5	10 00	
	37 00	
Fall Wheat profit per acre		$25 00
Acres		10
		$250 00

SPRING WHEAT—

Fall ploughing	$1 50
Spring ploughing (gang)	0 75
Seed and Seeding	2 00
Harrowing	0 20
Rolling	0 20
Harvesting	2 25
Threshing and preparing for market	1 25
Carried forward	$8 15

Brought forward		$8 15
Credit 17 bushels grain at $1	$17 00	
" 1½ tons straw at $5	7 50	
		24 50
Spring Wheat, profit per acre		$16 35
Acres		12¼
		$200 28

Field No. 9.

11¼ acres White Russian Spring Wheat, and 10 acres of Experimental Cereals.

Fall ploughing		$1 50
Spring ploughing (gang)		0 75
Harrowing		0 20
Seed and seeding		2 00
Grass and clover seeds		1 75
Rolling		0 20
Harvesting		2 25
Threshing and preparing for market		1 25
		$9 90
Debit half of unexhausted manure given in previous root crops		11 50
Cost per acre		$21 40
Value of 22 bushels grain at $1	$22 00	
" 2 tons straw at $7	14 00	
" Fall grazing	1 00	
		37 00
Profit per acre		$15 60
Acres		11¼
		$171 60
Value of 10 acres rented to Experimental Department		35 00
		$206 60

Field No. 10.

Second year's Hay, 15¼, and Potatoes, 5 acres.

Gathering stones, per acre		$0 30
Rolling		0 20
Mowing, making and housing		1 50
		$2 00
Unexhausted manures given four years ago		3 00
Cost per acre		$5 00
Value of 2 tons hay, at $10	$20 00	
" Fall grazing	1 25	
		21 25
Profit per acre		$16 25
Acres		15¼
Carried forward		$262 81

POTATOES— *Brought forward* $262 81

See details in No. 4 Field, but adding extra cost of cultivating in hills, and less produce per acre by reason of place taken up with new orchard trees, and no manure, being in sod 205 00

$467 81

Field No. 11.

Second year's pasture; 21¼ acres.

Credit grazing 10 cattle at $1.50 per month, for six months		$90 00
Cost of cutting thistles	$3 00	
" Unexhausted manures given five years ago	41 50	
		44 50
		$45 50

Field No. 12.

Uncultivated pasture, surface drained; 18½ acres.

Grazing valued at $1 per acre	$18 50
Cutting thistles	2 00
	$16 50

Field No. 13.

Second year's Hay; 23 acres, 2⅛ tons per acre.

Gypsum, 200 lbs	$0 50
Mowing, making and hauling	1 30
Unexhausted manures	3 00
	$4 80
Value of 2⅛ tons hay at $10	21 20
	$16 40
Value of fall pasture	1 30
	$17 70
Acres	23
	$407 10

Field No. 14.

First years' Hay; 23 acres; unreclaimed and wet, 3 acres.

Gypsum, 200 lbs. per acre	$0 50
Mowing, making and housing	1 30
Unexhausted manures	6 50
Carried forward	$8 30

Brought forward		
Value of $2\frac{1}{4}$ tons hay at $10		$8 30
		22 50
Value of fall pasture		$14 20
		1 20
Profit per acre		$15 40
Acres		23
		$354 20

Field No. 15.

$21\frac{1}{2}$ acres—$3\frac{1}{2}$ acres uncultivated; 1 acre Tare and Oat Fodder, 14 acres Oats, and 4 acres Peas.

TARE AND OAT FODDER—

Fall ploughing		
Spring ploughing (new land)		$1 50
Harrowing		1 50
Seed and drilling same		0 20
Cutting		3 45
		2 50
Credit 5 tons green fodder		$7 15
		30 00
		$22 85

OATS—

Fall ploughing		
Spring ploughing (gang)		$1 50
Harrowing, twice		1 50
Seed and seeding		0 40
Rolling		2 00
Harrowing		0 20
Hauling and preparing for market		2 25
		1 25
Value of 28 bushels grain at 35c		$9 10
" $1\frac{3}{4}$ tons straw at $6	$9 80	
	10 50	
		20 30
Acres		$11 20
		14
		$167 50

PEAS—

Fall ploughing		
Spring ploughing (gang)		$1 50
Harrowing		0 75
Seed and s[illegible]g		0 20
Harvesting		1 45
		1 75
Carried forward		$5 65

Brought forward		$5 67
Value of 26 bushels peas at 60c.	$15 60	
" 1¼ tons straw at $5	6 50	
		22 10
		$16 45
Acres		4
		$65 80

Field No. 16.

3 acres Peas; 7 acres pasture and bare fallow; Oats, 7 acres; 4¼ acres uncultivated; 1 acre wet.

OATS—

Spring ploughing, sod		$2 00
Seed and seeding		2 20
Harrowing, twice		0 40
Rolling		0 20
Harvesting		2 25
Threshing and preparing for market		1 25
		$8 30
Value of 15 bushels grain at 35c.	$5 25	
" 1 ton straw at $6	6 00	
		11 25
		$2 95
Acres		7
		$20 65

PEAS—

Spring ploughing, sod	$2 00	
Seed and seeding	1 50	
Harrowing, thrice	0 60	
Harvesting	1 75	
		$5 85
Value of 30 bushels grain at 60c.	$18 00	
" 1½ tons straw at $5	7 50	
		25 50
		$19 65
Acres	3	
		58 95
		$79 60

Field No. 17.

10 acres Mangolds; 10 acres Turnips.

MANGOLDS—

Debit as detailed in Field No. 7	$27 75
Value of 790 bushels at 10 cents	79 00
Carried forward	$51 25

Brought forward $51 25
Acres 10

$512 50

TURNIPS—

Debit as in No. 7 .....
Value of 675 bushels at 8 cents $27 75
54 00

Acres $26 25
10

262 50

$775 00
Credit leaves left on ground, 20 acres at $5 ..... 100 00

$875 00

Field No. 18.

PASTURE— 12 acres first year pasture; 7 acres uncultivated pasture.

(1st year) 12 acres; 1 cattle beast for every 1½ acres, at $1.50 per month .....
Debit unexhausted manures from roots, 3 years ago, at $5.50 per acre $72 00
66 00

$6 00
Uncultivated pasture, very old and good, 7 acres at $2 ..... 14 00

$20 00

Field No. 19.

OATS— Oats, 14 acres; Peas, 16 acres; after old pasture.

Debit as detailed in No. 16 Field .....
Value of 10 bushels grain at 35c. $8 30
" 1½ ton straw at $6 ..... $3 50
9 00

12 50

$4 20
Acres 14

$58 80

PEAS—

Debit as detailed in No. 16 Field .....
Value of 25 bushels grain at 60c. $5 85
" 1½ ton straw at $5 ..... $15 00
7 50

22 50

$16 65
Acres 16

266 40

$325 20

Field No. 20.

11 acres very old uncultivated pasture, worth $15 00

Field No. 21.

16½ acres, third year's Hay.

Mowing, making and stacking 12 tons	$30 00
Value of 12 tons Hay	120 00
	$90 00
Value of fall grazing	15 00
	$105 00

2.—Cropping Results, 1880.

Field.	CROPS.	Acres.	Quantity Harvested.	Gross Expense of Production.	Gross Receipts.	Profit or Loss.	Profit per B. or T.	Profit per acre.
				$ c.	$ c.	$ c.	$ c.	$ c.
1	Spring Wheat	8	120 B.	156 40	222 00	65 20	0 52	8 15
"	Pasture, 2nd year	12½	.....	.....	319 75	39 75	.....	3 50
2	2nd year Pasture	19	.....	104 00	38 00	-66 00	.....	3 50
3	1st-year Hay	22	49½ T.	191 40	517 00	326 60	6 50	15 00
4	Potatoes	7½	1275 B.	235 57	446 25	210 68	18 17	28 00
"	Carrots	1½	870 "	244 17	130 50	86 33	0 10	57 00
5	Oats	7½	135 "	77 62	105 00	27 38	0 20	3 70
"	Barley	6	126 "	62 10	99 60	37 50	0 29	6 25
6	Bare Fallow	12	.....	60 00	.....	-60 00	.....	-5 00
"	Barley	13	429 B.	204 10	341 90	137 80	0 32	10 60
7	Corn Fodder	8½	22 T.	140 93	280 50	141 17	6 65	17 00
"	Turnips	12	9300 B.	333 00	804 00	471 00	0 05	39 25
8	Fall Wheat	10	270 "	120 00	370 00	250 00	0 93	25 00
"	Spring Wheat	12½	208 "	99 84	300 12	200 28	0 96	16 00
9	Spring Wheat	11¼	253 "	246 10	425 50	206 60	0 82	18 40
"	Rented to Experimental	10	.....	.....	35 00	35 00	.....	3 50
10	Hay, 2nd year	15½	30½ T.	76 25	324 06	247 81	8 10	16 25
"	Potatoes, part Orchard	5	750 B.	40 00	245 00	205 00	0 33	41 00
11	Pasture, 2nd year	21½	.....	44 50	90 00	45 50	.....	2 14
12	Pasture, uncultivated	18½	.....	2 00	18 50	16 50	.....	0 90
13	Hay, 2nd year	23	48½ T.	110 40	517 50	407 10	8 40	17 70
14	Hay, 1st year	23	51½ "	190 90	544 10	354 20	6 80	15 40
15	Tares and Oats	1	5 "	7 15	30 00	23 85	4 75	23 85
"	Oats	14	392 B.	127 40	284 20	157 50	0 40	11 25
"	Peas	4	104 "	22 60	88 40	65 80	0 62	16 45
16	Oats	7	105 "	58 10	78 75	20 65	0 20	3 00
"	Peas	3	90 "	17 55	76 50	58 95	0 65	19 65
"	Pasture	8	See details					
17	Mangolds	10	7900 B.	277 50	790 00	512 50	0 06½	51 25
"	Turnips	10	6750 "	277 50	540 00	262 50	0 04	26 25
18	Pasture, 2nd year, and old	19	.....	66 00	86 00	20 00	.....	1 05
19	Oats	14	140 B.	116 20	175 70	59 50	0 42	4 25
"	Peas	16	400 "	93 60	360 00	266 40	0 66	16 60
20	Pasture, uncultivated	11	.....	.....	15 00	.....	.....	1 35
21	Hay, 3rd year	16½	12 T.	30 00	135 00	105 00	8 75	6 40

B. for Bushels; T. for Tons.

ABSTRACT OF AVERAGE RESULTS OF 1880 CROPPING.

CROP.	Cost per Bushel or Ton.	Cost per Acre.	Value per Acre.	Profit per Bushel or Ton.	Profit per Acre.
	c.	$ c.	$ c.	$ c.	$ c.
Fall Wheat	00 45	12 00	37 00	00 93	25 00
Spring Wheat	00 86	30 00	15 00	00 77	14 00
Hay	3 16	6 00	20 00	7 60	16 00
Oats	00 49	9 00	15 00	00 30	5 50
Barley	00 48	14 00	23 00	00 30	8 42
Peas	00 24	4 30	13 00	00 64	17 50
Potatoes	00 13	22 00	55 00	00 25	34 00
Carrots	00 27	16 00	87 00	00 10	57 00
Turnips	00 37	28 00	61 00	00 04½	33 00
Mangolds	00 35	28 00	79 00	00 06½	51 00

3.—DISCUSSION OF RESULTS OF FARM CROPPING.

With reference to this table of cropping results of season 1880 from 400 acres, I beg, first of all, to draw attention to the difference between it and that on the like subject under the heading of "The Cost of Producing Crops," herewith. The latter is the mean of several years from the same farm, and only the principal field crops thereof, which necessarily gives a higher average; the other is the showing of but one year, and includes all kinds of crops, pasture, and such like, along with the losses, and bare fallowing, so that, if 1880 was an average season as a whole, the general mean will be a better criterion of what profits can be realized from land under systematic rotation, as in our circumstances. As I place considerable value on this mode of exhibiting a farmer's income, some explanation of the details will not be out of place.

On a farm of 400 acres, rotating with peas, wheat, oats, roots, hay, pasture, and bare fallow, and where much farm-yard manure, with special fertilizers, is applied only to the root division in a seven years' course, the average net profit in such a season as 1880 seems to be $12.50 per acre.

Were we in England, as tenants, the disposal of this would take the shape of:—*One* for the proprietor, *one* for farm maintenance, and *one* for the farmer, or $4.17 each; but the Canadian farmer being in much more independent circumstances, has only to think of his own household and up-keep of his own property. As explained in the other chapter on this subject, interest on invested capital is not necessarily an item forming a debit upon this $12.50, for the reasons stated, and thus we have, as it were, *four* rents on hand in place of the Englishman's three. Of course we are to handle this profit without reference to its further disposal to live stock and household keep, which ought to draw increased profits, and which will be discussed on another occasion. This revenue then of $4,800 in the lands of an ordinary farmer may thus be apportioned:

Paid labour	$1,000
General repairs	250
Keep of live stock	1,500
Seed and special manures	250
Household keep	1,000
Taxes	80
Incidentals	200
	$4,280

Which balance of $520 may be called a clean bank deposit ready for any purpose.

But, it is interesting to note how profits vary with different crops, depending (1) upon the stage in the rotation as affected by value, or proportion, of unexhausted manures, (2) by the individual market importance of the crops, and (3) by preparing for succeeding crops. Wheat, with straw, at 15 bushels per acre, upon land recently manured, gives a profit of no less than $1.25 per bushel, because it is debited with only one-fourth of these manures, while wheat of the same kind producing as much as 22 bushels per acre, gives only 82 cents per bushel of profit by reason of getting the immediate benefit of all cultivation and manuring. Under a variety of conditions, you will observe that Wheat —fall and spring varieties—gives a profit of 99 cents per bushel, which means that in selling his wheat at $1 per bushel, the transaction is all profit—it has left no debt behind. The average profit on oats is 31 cents per bushel, even with the very low produce of 18 bushels per acre. Our oat divisions this season were very exceptional, as evidenced by the fact, on another page, that our mean for five years has been 41 bushels per acre. Barley this year was also somewhat under our average of 30 bushels per acre; but even with 27 bushels, the profit is but the half of its market value, 30 cents as against 60. If this be correct of barley in all cases, one-half of the selling price should be brought back to the farm. Peas take the same position as wheat and oats in this respect. Including under the term roots—mangolds, turnips, carrots, and potatoes, we obtain an average profit of 8½ cents per bushel of sixty pounds; this agrees very closely with what we have been charging our cattle and sheep with such keep, and is also in agreement with the rate of their progress when fed with these roots, as shown in previous reports. When Hay is put on the market at $10 per ton, $2.50 have to be taken home to square up accounts—the mean profit being $7.50. In order of profit per acre, I have to submit the following list:

Carrots	$57 00
Mangolds	51 00
Potatoes	41 00
Turnips	33 00
Fall Wheat	25 00
Tare and Oat Fodder	23 85
Spring Wheat	17 70
Corn Fodder	17 00
Hay	14 15
Pasture (crop only)	2 35

These make a mean of $28 per acre, but of course do not include bare fallowing and losses, as shown in Fields 2 and 6, along with the uncultivatd portions.

4.—The Cost of Producing Crops During the Last Five Years.

We should now be able to say something in regard to the cost of producing certain crops under a given system of rotation, upon certain soils, by special management, during a series of years. To do this reliably, requires careful figuring, and a sound handling of the facts that now guide the science and practice of our profession, especially with reference to the conduct of plants and their food as regulated by weather, soil, and management. There can be no more unsound method of arriving at this than the common one of debiting—cultivation, seed, manuring, and cost of harvesting and marketing, and then crediting the realized quantity of crop. The only case in which such a method can be reasonably applied is that of cropping upon virgin land which is insensibly impoverished during a number of years, and which requires no form of manuring; but even in this example, the economist must recognise the fact that the soil does diminish in power. We have, however, to deal with land that has been regularly cultivated for the past twenty years at least—land therefore now regularly yoked to systematic rotation of crops, and supposed to be representative of the older cultivated lands of Ontario, both as regards physical condition, natural richness, and modes of cultivation.

The first thing is to show the rotation and tabulate the average quantity of crops from a number of fields during the last five years, as recorded in previous annual reports:

Rotation of Cropping Adopted on the Ontario Experimental Farm.

1st year—Peas.
2nd " —Fall Wheat or Oats.
3rd " —Roots—manured.
4th " —Barley or Wheat (seeded with grasses and clovers).
5th " —Hay.
6th " —Pasture or Hay.
7th " —Pasture.

AVERAGE PRODUCE PER ACRE PER ANNUM FROM 1876 TO 1880 INCLUSIVE.

——	1876.	1877.	1878.	1879.	1880.	Average Produce per Acre.
Peas	30	24	31	32	35	30 Bushels.
Spring Wheat	10	18	14	20	22	17 "
Fall Wheat	34	30	32	21	37	31 "
Oats	40	35	48	36	45	41 "
Mangolds	360	765	1030	718	750	725 "
Turnips	521	766	554	630	600	614 "
Carrots	284	610	910	315	580	540 "
Potatoes	128	150	250	77	220	165 "
Barley	30	35	27	36	30	32 "
Hay	1⅓	1⅛	2½	1 3-5	2¾	1 4-5 tons.

Let us now explain the plan by which I propose to arrive at the cost of producing each of these six varieties of crops. By the rotation, all the manure allowed for the seven years, is given with the root division, and should be such as to supply all that is needed for the various crops of that period. In charging the turnips, mangolds, carrots and potatoes with the item of manure, therefore, it is plain that the whole bill is not theirs, but must be apportioned according to what experiment has shown to be the average feeding volume of each, proportionately to time, soil, season, and management thereof. If there be any residue of manurial value, or what may be called increased value of land from such management on the expiry of the seventh year—or when the wheat and oats are removed—the same should be considered in the future balance sheet, either in taking inventory of capital account (original investment in purchase of land) or increasing the credit of the coming succession of crops. I am not prepared to allow directly for superior brain work in the management of a farm, because I am not prepared to leave the management of a farm to brains alone, so if it should be argued that any of these crops should be debited with such superior management, I beg to note that the general result will embrace this in the septennial balance sheet by the inventory indicated. Credit must also be allowed the root division for the extra cultivation and cleaning of the land, the same being so much more *manure* in a different form.

Our task is now therefore very simple, and shall naturally begin with the root division, it being understood that in all examples allowance is made for tear and wear of implements.

A general table of cost of operations will conveniently precede.

Cost of Work on Various Farm Crops, Per Acre.

Common ploughing of stubble	$1 50
" " sod	2 00
Gang ploughing	0 75
Harrowing, one tine	0 20
Cultivating, once	1 00
Rolling, once	0 20
Horse-hoeing, once	0 50
Hand-hoeing, once (average)	2 25
Drilling, with single plough	0 75
Root sowing, drill	0 35
Grain sowing, drill	0 25
Hauling and spreading farm-yard manure, 15 loads	3 75
Sowing artificial manures	0 25
Harvesting Wheat, Oats, or Barley, including mowing, binding, shocking, and hauling	2 25
Harvesting Peas, pulling and hauling	1 75
Topping, harrowing, and hauling Mangolds and Turnips	8 50
Pulling, topping and hauling Carrots	8 00
Ploughing, gathering and hauling Potatoes	5 50

Cost of producing Roots per acre.

Fall ploughing, once		$1 50
Spring ploughing, gang, once		0 75
Grubbing, twice		1 00
Harrowing, twice		0 40
Rolling, twice		0 50
		$4 05
Manure:—Farm Yard, 15 loads	$19 50	
Bone Dust, 300 lbs.	4 00	
Salt, 200 lbs	0 50	
Gypsum, 200 lbs.	0 50	
M. Superphosphate, 300 lbs.	4 80	
Distributing Manures	4 00	
		33 30
Horse-hoeing, twice	$1 00	
Hand-hoeing	4 50	
Drilling	0 75	
Cost of seed and seeding	1 15	
Harvesting	8 50	
		15 90
Total cost		$53 25
Credit $\frac{4}{5}$ of unexhausted Farm Yard Manure	$15 60	
" $\frac{1}{2}$ of Special Manures	6 90	
" allowance for extra cultivation, etc.	4 50	
" half cost of distributing	2 00	
		29 00
Actual cost of producing one acre of Mangolds and Carrots		$24 25
Value of average crop of these roots, 670 bushels at 9c		60 30
Profit per acre		$36 05
Credit tops and leaves left on land—said to be equal to what has been removed from the soil, say		5 00
		$41 05

Cost of producing Grain Crops (Wheat, Oats, Barley) per acre.

WHEAT—

Fall ploughing		
Gang ploughing		$1 50
Harrowing		0 75
Seed, $1.75; and Seeding, 25c		0 40
Rolling		2 00
Harvesting		0 20
Threshing and preparing for market		2 25
		1 25
Debit value of Manures, half of residue		$8 35
		12 50
Total cost		$20 85
Value of average crop of 24 bushels Wheat at $1.15	$27 60	
" 1½ ton straw at $5	7 50	
		35 10
Wheat profit per acre		$14 25

OATS—

Debit work as above for Wheat		$8 35
" ⅓ proportion of Manure residue		8 33
Total cost		$16 68
Value of average crop of 41 bushels, 40c. per bushel	$16 40	
" 2 tons straw	12 00	
		28 40
Oat profit per acre		$11 72

BARLEY—

Debit work as above for Wheat		$8 35
" ¼ proportion of Manure residue		6 25
Total cost		$14 60
Value of average crop of 32 bushels Barley at 60c.	$19 20	
" 1 ton straw	3 50	
		22 70
Barley profit per acre		$8 10

HAY—

Mowing, making and hauling		$1 50
Debit unexhausted Manures		6 50
Total cost		$8 00
Value of 1⅘ ton Hay at $10		18 00
Hay profit per acre		$10 00

Potatoes—

Cost of cultivation as in other root crops		$48 86
" harvesting		5 50
		$54 36
Credit unexhausted Manures		25 00
Total actual cost		$29 36
Value of average crop of 165 bushels Potatoes at 35c.		57 75
Potato profit per acre		$28 39

Carrots—

Cost of cultivation as for Mangolds and Turnips		$48 86
" harvesting		8 00
		$56 86
Credit Manures unexhausted, etc		25 00
Actual cost		$31 86
Value of average crop of 540 bushels		81 00
Carrot profit per acre		$49 14

Peas—

Ploughing sod		$2 00
Seed and sowing		1 50
Harvesting		1 75
		$5 25
Unexhausted Manures		3 00
Total cost		$8 25
Value of 30 bushels Peas at 60c.	$18 00	
" 1½ ton straw at $5	7 50	
		25 50
Pea profit		$17 25

Abstract of Cost, Produce, and Profit, per Acre.

——	Cost.	Produce.	Profit.
	$ c.	$ c.	$ c.
Mangolds and Turnips	24 25	60 30	36 05
Wheat	20 85	35 10	14 25
Oats	16 68	26 35	9 67
Barley	14 60	20 80	9 70
Hay	8 00	18 00	10 00
Peas	8 25	25 50	17 25
Carrots	31 86	81 00	49 14
Potatoes	29 36	57 75	28 39
Means	$19 23	$40 60	$21 81

In the case of growing mangolds and turnips, fully one-half the cost of establishing them lies in the value of the manure, and one-seventh of the whole cost consists in harvesting. The total value of the crop is equal almost exactly to the gross cost of production when unexhausted manures are not credited, and when these are credited the actual cost is reduced one-half, so that we have a net profit nearly equal to this *bona fide* cost. With other roots the facts are the same, but a very high figure in favour of carrots.

With grain proper we have :

——	First Cost.	Gross Cost.	Value of Produce.	Profit with First Cost.	Profit with Gross Cost.
	$ c.	$ c.	$ c.	$ c.	$ c.
Wheat	8 35	20 85	35 10	26 75	14 25
Oats	8 35	16 68	26 35	20 05	11 72
Barley	8 35	14 60	20 80	14 35	8 10
Means	$8 35	$17 38	$27 41	$20 38	$11 36

So that were we not to charge the succeeding crops after roots with part of the value of the manures, the profits would be nearly double in the case of Wheat, Oats and Barley—from $11.36 to $20.38. But we shall discuss the subject from its whole course of a rotation and the mean of the results of each class of crops, and not from a particular crop. From the Abstract it appears that the actual profits from one acre over seven years by ten kinds of crops is $20.38, and that it costs $17.38 to produce this profit, or say nearly dollar for dollar.

What then is the application of this supposed profit of $20.38 per acre? In the first place it is the natural outcome of the sum of $75 originally invested in land, implements and horses, and consequently of the use of labour, implements, horses, manures, seed and skill. We have already debited all these, with the exception of the latter, so that all we have to do is to distribute this profit of $20.38. When the regular accountant begins by debiting "interest on original investment," and follows with the various charges we have already handled, I am unable to see why it should form an actual item in such a form, because the total result, whether of profit or loss, is just the interest, or no interest, upon the original investment, and in our case of producing crops, may not be all the profit or loss in the management of a farm, as the producer, being also the owner and feeder of the live stock thereof, has to run another line of chances when transferring these crops to the various animals, whether for labour, milk, beef, mutton, wool or pork, or taxes and household maintenance; he does not pay rent or interest on capital, and thus altogether the farmer is now in possession of crops valuing in the market an average of $20.38 per acre with which to make further investment as indicated.

III.—THE LIVE STOCK.

We should never rest satisfied until the Province produces a 1,500 lb. steer for every ten acres of its cultivated surface, along, of course, with the proper modicum of wheat. To do this well, in every respect up to the present times, and even anticipatory in some things, should be the duty and pride of all our yeomen. It is now a matter of fact that they are aiming at this pretty thoroughly, but it is with a much larger measure of the "probable effects and consequences" in their eye than many of us like to discuss calmly. Ontario, after all, is not so American as England would make it, and certainly is less

speculative than the one, and as cautious as the other. We are in the enviable position of being able to maintain herds and flocks vastly superior in health to either Britain or the States, and at less cost than the former, and more certainty of up-keeping the characteristics of various breeds than the latter. While for many years we will have to bow to the Americans in regard to the number of cattle per country, we never will, nor do we now, have to do so per hundred acres of arable land, or *per capita* of the population. So also, just as much as we are in advance of England for cheap production, we are ahead of our neighbours in quality of material produced. With all these important facts in our favour, the world is naturally looking for some more energy, and some more capital in this big field of our profession.

Believing that a good story will stand more than one telling, and that many of our farmers are still but indifferently well up in what guides us in the selection of cattle beasts for beefing purposes, I beg their acceptance of the following as my own likings in the particular line of steer feeding.

I am of opinion there is too much a seeking after size of frame than is desirable for rapidity, economy, and quality of growth of flesh. Bone weighs well, of course, particularly when it is coarse, but it takes longer to cover the field, more money to do it per square foot—if it ever does it—by reason of the coarsenesss in question. Commend me to the average sized animal with a tendency to fineness all over, no roughness anywhere, no big hooks, and certainly no big head. I am such a believer in a certain head, that, given the head I want, I would chance what is behind it in the majority of cases. Have the mouth and lips rather large proportionately, with a distinct concave to the top of the muzzle that joins the beginning of the face proper. I do not care if there be even a slight dishing from the line between the nostrils half way up the bridge, and almost a distinct jump of the same kind on each side immediately above the nostrils; we must have these parts clean and yet giving room enough for breathing. The wedgy face from the muzzle to the eyes must be distinct as such; that is without being rounded on to the cheek or laid with any prominence of muscle or flesh where it drops to the cheek, and the thin end of the wedge must be a wedge and not a club. Good depth of cheek or jaw bone is advisable, both for eating and breathing. Have a clean jaw, little muscle and no flesh to speak of. Avoid close set, small, sunken eyes in every case; the prominent large calm eye, but yet with a spark of liveliness, is the best one for our purpose; a clean broadish rim round the eye, or at best with but few hairs, and then a gradual lengthening of thick hair all round, with a decided looseness of skin, is my fancy for the eye of a good feeder. The lash should be long, but not thick necessarily. Above the eye line, the head should not only scoop to the horns, but stand somewhat narrower, have a thick mat of soft hair with a tendency to curl, and rather long than very short. A concave face is better than a dished one, when we speak of beef as against milk, and at present I am only upon beef. The difference is quite distinct, and without elaborating meantime it will suffice to note that a dish will hold water, while a concave won't. There is as much objection to a short as a long distance between the eye and the horn—the one savours of meanness, want of intelligence, and a corresponding type everywhere else, the other betokens a coarseness, and a little more *dourness* when accompanied with a sunken eye. A rather prominent poll (which has no connection with length from eye to horn) is a good point—with or without horns, —as being the cope stone or crown to our beefing head. And then, the horn? In a state of nature, it is a good weapon and a thing of beauty; to our ox it is much as you wish it. Its flatness and strength is lost in the altered male, but it can be made more or less so by timing the alteration, and altogether bred out if desired. A medium horn, as regards strength, is a safe criterion of pliability of character so far as it goes. I am of opinion there is more in the ear than the horn. It should be slightly attached, and rather bare of hair at the attachment to the head, but the hair must be profuse, silky and long all over the inside and out to the edge, with nothing behind but what is found on the neck. Flabbyness and a blunt point is not allowable, though a fair breadth is well liked, and in every case demand thinness without delicacy.

Such then is my *beau ideal* of the head of a splendid beefing steer. It can be contended that every point in such a head represents a characteristic throughout the frame. The open nostril tells of heart and girth; the large lips of a long, roomy, deep barrel; the

wide forehead and placid eye of good loins and corresponding hindquarters; and the ear (assisted by the horn, it may be) of a fine bone throughout. I repeat that were such a head sent to any student of this line of judging, he would, to 80 per cent., tell what the frame was, and getting the tail in addition, he should almost complete the description.

The model neck is full on the sides, tucking in and up sharply below to the throat, where a moderate amount of loose skin is better than much of it. There is a grand, firm, silky mellow handling here, difficult to describe—no flabbyness, but a curly crispness of skin and hair that fitly underlies and forms the prow of the vessel so nobly headed, as we have just seen. The neck top is fine, not too flat nor narrow, the back-half level with all the top line of the body, and the forepart drooping somewhat to the head. A clean, fine joining of neck and head is always best. Neck and shoulders join easily but not necessarily unseen in the store animal. I have no particular liking to the very deep forward brisket; perpendicular from the joining of neck and chest; no doubt it fills up the rectangular frame so much loved by the older breeders, but just as it is easy to give a ship or a plough too much dip, so our feeding steer can have too much forward keel, something in the way of its easy grazing, and at the same time portending a sluggish disposition. An important point in the get-up of the forequarters is the space between the tops of the shoulders; in many cases there is too much width here—space which the spine does not fully take up, and therefore making a looseness that affects other parts—giving no more flesh-carrying area when the chest is otherwise right. I do not wish to be thought as advocating narrow shoulders at any point, or a contracted chest—much the reverse, but bad packing of parts as between these and the spine and crops is certainly objectionable. The shoulder itself, from top to point and from point to arm should not be flat nor too perpendicular; the shoulder blade must be more of the bridge than of the tie type, in fact it should be both, tying the chest, spine and crops together, and standing as a bridge to resist weight in the case of draught, and keep the forequarters from overloading or pressing upon those behind. A fair or medium slope is better than the upright form of shoulder, because of inducing sluggishness and an awkward grazing animal. The top of the fore arm should be part and parcel of the shoulder, full and even with it in every respect, the beef coming well down, but yet not encumbering the knee, and there consisting of muscle. A rather large, flat but clean knee is the best, with a fine, clean leg and medium hoofs, not flat nor narrow. As in the case of the shoulder top with the spine, it is not good to have much space between the elbow and girth, or such a width as horsemen like, but a nice even agreement of chest, arm and girth—fulness without looseness.

And now what shall we say of the prominent Shorthorn weakness—the slack crops? It may be asked why is this the case in all beefing breeds that have been, so to speak, *made by man?* Besides the Shorthorn it is rather characteristic of the Aberdeen Polls and the improved Longhorn of England, while it is not so much so of any of the comparatively original breeds, such as the Herefords, Devons, Sussex, Irish and Argyleshire. Shall we conclude that man's interference has contracted the space between heart and barrel, or is it but an external defection consequent on a superior shoulder and better sprung mid-rib? We all like it full at any rate, which implies, I think, a well sprung fore-rib. The girth should be told by a broad, strong spine, full crops and a deep round fore-flank and chest. All the ribs should spring, arch and lengthen well down. There is also no doubt of the value of the hinder ribs and hooks keeping close acquaintance for our present purpose, and they also regulate the flank and plate spaces. It is not only possible but very common to have too wide loins and very rough hooks; such a style of hindquarters often gives a wedgy rump and apparently narrow hams. No doubt, the accompaniment of such forequarters and barrel, as we have sketched, is a corresponding loin, and it is more the case that the hocks are much too large—unnecessarily large—than that the loins are disproportionate to any part of the body. The loins themselves should be slightly arched to ensure strength, secure the long hind-quarters, the rump proper, therefore, being about equal to the length of the barrel; a slightly drooping rump, well filled, is preferable to dished ones with a high standing tail. Width at the pin-bones, or tail attachment, is very important—carrying out the corresponding style of loin and rump, and enabling beef to be carried broad and deep towards the hocks. We must have a deep full twist, going well fore-and-aft, and not afraid of encumbering the hocks. Choose the hind leg of a horse

for the hind leg of a beefing steer—straight, clean and not in-kneed. Never neglect a fine tail without much hair, and strongly attached to the body. The full prominent purse is an indication of strength of constitution, of sappyness, and of a good doer. I am no believer in colour of hair, except as a matter of fancy, but I think that a milk-giving colour of skin is a beefing one also. A thick crop of fine, soft silky hair is evidence of good soil and sub-soil. I am almost a follower of him who, with shut eyes, will *handle* and pronounce judgement on *quality*. Quality is the concentrated essence of all the virtues of blood and breeding as exhibited in hair, skin, and surface flesh, and is a long big study of itself.

2.—Public Sale of Surplus Live Stock, 10th September, 1880.

Lot.	CLASS.	PURCHASER.	Amount.	Total.
	CATTLE.			
	Shorthorns.		$ c.	$ c.
1	Heifer Calf	John Nelson, Orillia, Simcoe	63 00	
2	do	W. R. Motherwell, Perth, Lanark	71 00	
3	Bull Calf	J. R. Bullock, Hopetown, Lanark	93 00	
				227 00
	Aberdeen Polls.			
4	Yearling Heifer	James Glennie, Guelph, Wellington	87 00	
5	Bull Calf	John Rae, West Winchester, Dundas	50 00	
				137 00
	Ayrshires.			
6	Heifer Calf	Benjamin Storey, Picton, Prince Edward.	69 00	
7	do	H. Glazebrook, Simcoe, Norfolk	66 00	
8	Bull Calf	Benjamin Storey, Picton, Prince Edward.	71 00	
				206 00
	SHEEP.			$570 00
	Cotswolds.			
1	Shearling Ram	William Hunter, Underwood, Bruce	40 00	
2	do	C. V. F. Bliss, Ottawa, Carleton	38 00	
3	do	George Ormiston, Raglan, Ontario	66 00	
4	do	William Wilson, Ash Grove, Halton	68 00	
5	do	James Wright, Guelph, Wellington	60 00	
6	do	John Hadden, Moontown, Lambton	31 00	
7	do	W. C. Smith, New Hamburg, Waterloo	81 00	
9	Ram Lamb	J. C. Snell, Edmonton, Peel	25 00	
10	do	W. G. Hill, Rockwood, Wellington	18 00	
11	do	J. Devitt, Floradale, Waterloo	25 00	
12	do	W. R. Elliott, Glenallan, Wellington	27 00	
13	do	B. Williamson, Glammis, Bruce	27 00	
14	do	A. Fyfe, Guelph, Wellington	21 00	
15	do	W. G. Hill, Rockwood, Wellington	20 00	
16	do	George Rudd, Guelph, Wellington	38 00	
17	do	J. C. Snell, Edmonton, Peel	49 00	
18	do	W. G. Hill, Rockwood, Wellington	17 00	
19	do	W. Rodden, Plantagenet, Prescott	25 00	
20	Pair Aged Ewes	H. Arkell, Arkell, Wellington	30 00	
21	do	H. Arkell, Arkell, Wellington	40 00	
22	do	H. Arkell, Arkell, Wellington	38 00	
23	do	W. Quennell, Newbridge, Huron	32 00	
24	do	Robert Martin, Lucknow, Bruce	26 00	
25	Pair Ewe Lambs	H. Sorby, Guelph, Wellington	48 00	
26	do	H. Sorby, Guelph, Wellington	38 00	
27	do	H. Sorby, Guelph, Wellington	70 00	
28	do	R. Campbell, New Hamburg, Waterloo	26 00	
29	do	H. Sorby, Guelph, Wellington	32 00	
30	do	H. Sorby, Guelph, Wellington	30 00	
31	do	J. C. Snell, Edmonton, Peel	26 00	
				1,112 00
		Carried forward		1,682 00

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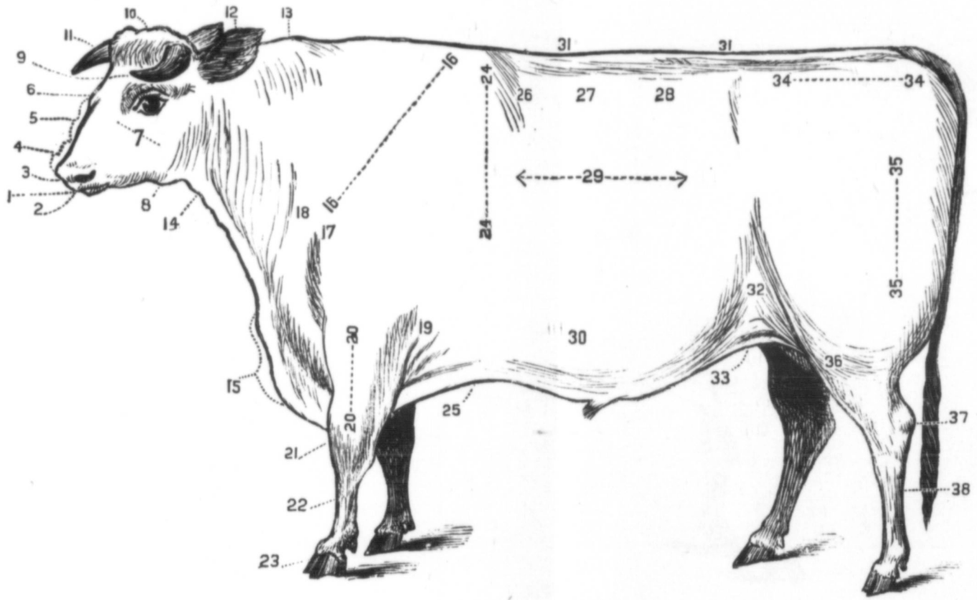
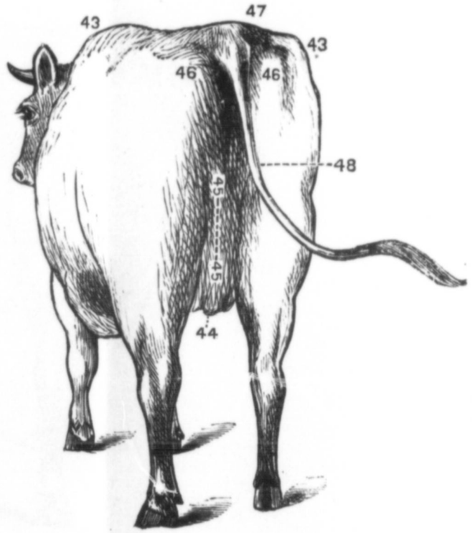
A MODEL STEER, WITH PARTS NAMED (as taught at the Ontario Experimental Farm).





1. Mouth.
2. Nostrils.
3. Lips.
4. Muzzle.
5. Face.
6. Eyes.
7. Cheeks.
8. Jaws.
9. Forehead.
10. Poll.
11. Horns.
12. Ears.
13. Neck.
14. Throat.
15. Dewlap.
16. Shoulders.
17. Shoulder Point.
18. Shoulder Vein.
19. Elbows.
20. Arm.
21. Knees.
22. Shanks.
23. Hoofs.
24. Crops.
25. Fore Flank.
26. Fore Ribs.
27. Mid Ribs.
28. Hinder Ribs.
29. Barrel.
30. Belly.
31. Spine.
32. Flank.
33. Plates.
34. Rumps.
35. Hips.
36. Thighs.
37. Hocks.
38. Hind Leg.
39. Brisket.
40. Bosom.
41. Chest.
42. Loin.
43. Hooks.
44. Purse.
45. Twist.
46. Pin Bones.
47. Tail Head.
48. Tail.

2.—PUBL

Lot.	
32	Shear
33	
35	
36	
37	Ram
38	do
39	do
40	do
41	Pair
42	
43	
44	Pair
45	
46	
47	
48	Two
49	Shear
50	Ram
51	do
52	do
53	do
54	do
55	do
56	do
57	Pair
58	
59	Pair
60	Ram
61	do
1	Boar
2	do
3	do
4	do
5	do
6	do
7	do
8	do
9	do
11	Sow
12	do
13	do
14	do
15	do
16	do
17	do
18	do
19	do
20	do
22	do
23	do

2.—Public Sale of Surplus Live Stock, 10th September, 1880.—*Continued.*

Lot.	CLASS.	PURCHASER.	Amount.	Total.
			$ c.	$ c.
	Leicesters.			
		Brought forward		1,682 00
32	Shearling Ram	W. J. Ross, Smith's Falls, Lanark	41 00	
33	do	W. R. Motherwell, Perth, Lanark	40 00	
35	do	Edward Gaunt, St. Helen's, Huron	52 00	
36	do	H. Hammond, Cainsville, Brant	48 00	
37	Ram Lamb	J. R. Bullock, Hopetown, Lanark	23 00	
38	do	H. Glakebrook, Simcoe, Norfolk	47 00	
39	do	W. J. Ross, Smith's Falls, Lanark	18 00	
40	do	J. Cuppage, Orillia, Simcoe	21 00	
41	Pair Aged Ewes	James Scott, Glenmorris, Waterloo	28 00	
42	do	J. R. Bullock, Hopetown, Lanark	20 00	
43	do	Robert Martin, Lucknow, Bruce	16 00	
44	Pair Ewe Lambs	H. Glazebrook, Simcoe, Norfolk	14 00	
45	do	W. R. Motherwell, Perth, Lanark	66 00	
46	do	H. Glazebrook, Simcoe, Norfolk	42 00	
47	do	H. Glazebrook, Simcoe, Norfolk	50 00	
				526 00
	South Downs.			
48	Two Shear Ram	M. A. Dawes, St. Aure de Bellevue, Que.	27 00	
49	Shearling Ram	George Hood, Guelph, Wellington	53 00	
50	Ram Lamb	H. Sorby, Guelph, Wellington	26 00	
51	do	Thomas Whale, Goldstone, Wellington	11 00	
52	do	Robert Marsh, Richmond Hill, York	24 30	
53	do	George Hood, Guelph. Wellington	30 00	
54	do	George Bush, Jordan, Lincoln	24 00	
55	do	Richard Martin, Verdun, Bruce	31 00	
56	do	John Jackson, Abingdon, Monckton	28 00	
57	Pair Ewe Lambs	H. Sorby, Guelph, Wellington	50 00	
58	do	H. Glazebrook, Simcoe, Norfolk	70 00	
59	Pair Aged Ewes	W. R. Motherwell, Perth, Lanark	42 00	
				406 00
	Oxford Downs.			
60	Ram Lamb	Benjamin Story, Picton, Prince Edward	41 00	
61	do	George Hood, Guelph, Wellington	31 00	
				72 00
	PIGS.			
	Berkshires.			
1	Boar	C. V. F. Bliss, Ottawa, Carleton	25 00	
2	do	F. X. Kieffer, Formosa, Bruce	26 00	
3	do	J. S. Smith, Maple Lodge, Middlesex	16 00	
4	do	J. R. Bullock, Hopetown, Lanark	15 00	
5	do	A. Denman, Canonbrook, Huron	11 00	
6	do	William Mathews, Guelph, Wellington	21 00	
7	do	William Mills, Wingham, Huron	9 00	
8	do	D. Brand, Forest, Lambton	15 00	
9	do	Robert McKim, Parker, Wellington	21 00	
11	Sow	Alexander McDonald, Brooksdale, Oxford	18 00	
12	do	W. R. Motherwell, Perth, Lanark	16 00	
13	do	William Spark, Petherton, Wellington	17 00	
14	do	C. Darby, Gourock, Wellington	7 00	
15	do	A. Darling, Mildmay, Bruce	7 00	
16	do	James Douglas, Galt, Waterloo	10 00	
17	do	J. A. R. Anderson, Clifford, Wellington	7 00	
18	do	George Green, Brooksdale, Oxford	11 00	
19	do	A. Nicol, Guelph, Wellington	9 00	
20	do	D. Gerrand, Guelph, Wellington	7 00	
22	do	Robert McKim, Parker, Wellington	8 00	
23	do	Charles Youngs, Brooksdale, Oxford	10 00	
				286 00
		Carried forward		2,972 00

PUBLIC SALE OF SURPLUS LIVE STOCK, 10TH SEPTEMBER, 1880.—*Continued.*

LOT.	CLASS.	PURCHASER.	AMOUNT.	TOTAL.
	S. Windsor.		$ c.	$ c.
24	Boar	*Brought forward*		2,972 00
25	do	William Aitchison, Elora, Wellington	15 00	
26	do	Joseph Zeben, Baden, Waterloo	8 00	
27	do	Thomas Dunbar, Marden, Wellington	4 00	
28	do	Benjamin Story, Bloomfield, P. E. County	8 00	
29	Sow	W. H. Mathews, Guelph, Wellington	13 00	
30	Boar	M. P. Doyle, Guelph, Wellington	5 00	
		Benjamin Story, Picton, Prince Edward	6 00	
	DOGS.			59 00
	Scotch Collies.			
1	Dog	P. J. Woods, Guelph, Wellington	12 00	
2	do	Thomas Crawforth. Brampton, Peel	11 00	
3	do	W. McAllister, Rockwood, Manitoba	12 00	
4	do	Thomas Crawforth, Brampton, Peel	13 00	
5	do	W. McAllister, Rockwood, Manitoba	18 00	
6	do	H. Glazebrook, Simcoe, Norfolk	11 00	
7	do	C. V. F. Bliss, Ottawa, Carleton	10 00	
8	Bitch	James Anderson, Guelph, Wellington	8 00	
	WHEAT.			95 00
	47 Lots—188 Bushels, at $1.15	per Bushel		216 20
		Gross Total		$3,342 20

2.—COMMENTS AND AVERAGE PRICES REALIZED.

Much comment on this sale is unnecessary by me. It is sixty per cent. over my valuation to you in August last, and fifty per cent over all previous sales. The reasons are not difficult to find in a wider and keener demand to meet the changing conditions of more flesh and less flour production for the foreign market, the reliability of the stock, and the unrestricted character of the sale. It is a very encouraging fact for the Government that not one animal went over our borders this year. The one point insisted upon by our farmers now is, that the breeding must be kept up by new importations. Following find average price realized for each class of animals.

		EACH.
Shorthorn calves	3	$76
Aberdeen polled calves	2	68
Ayrshire calves	3	69
Cotswold, shearling rams	7	58
" ram lambs	11	27
" aged ewes	10	17
" ewe lambs	14	18
Leicester shearling rams	4	45
" ram lambs	4	27
" aged ewes	6	11
" ewe lambs	8	22
Southdown, two-shear ram	1	27
" one "	1	53
" ram lambs	7	27
" ewe lambs	4	30
" aged ewes	2	21

		EACH.
Oxford Down, two ram lambs	2	$36
Berkshire Boars	9	18
" Sows	12	11
Suffolk Windsor Boars	6	9
" Sow	1	5
Scotch Collie Dogs	8	12

4.—Public Patronage to our various Rams.

From 20th October to 18th November, we have been honoured with the following patronage to our different rams, being three times more than any previous season.

Cotswold	63 ewes.
Leicester	59 "
Oxford Down	58 "
South Down	26 "
Shropshire Down	18 "
Merino	3 "
	227

The Cotswolds are in view for the American market; the Leicesters partly for that market, our own, and in preparation for exhibitions; the Oxford Down cross has been induced by the very satisfactory results of our own experiments in that line during the last three years; the South Downs also in view of the right kind of wool for our own manufacturers, and mutton for England; the Shropshire Down is as yet purely experimental for similar purposes with the Oxford and South Down; and the Merino is but a faint recognition of grand wool and a questionable mutton maker.

We are not prepared to keep up this increasing demand for such service unless by new importations, and more of them. The Government has to say if they are willing to help in the improvement of the grade sheep of the Province, as this is not a local demand, many of the sheep having come more than one hundred miles.

5.—Increase to Live Stock.

From 31st October, 1879, to 1st November, 1880, we have, by our own breeding, received the following thoroughbreds.

Cattle.

9th Nov., 1879.—Lady Campbell, Shorthorn, out of Ury 11th, by Duke of Bedford (36,466).

14th Feb., 1880.—Beauty of Wellington, Ayrshire, out of Beauty of Drumlanrig, by Sir Walter.

16th April, " —Heather Belle 2nd, Hereford, out of Heather Belle, by Duke of Connaught ( ).

26th April, " —Flora of Waterloo, Ayrshire, out of Flora 3rd of Drumlanrig, by Sir Walter.

22nd May, " —Sir Walter 2nd, Ayrshire, out of Juno 2nd of Drumlanrig, by Sir Walter.

5th June, " —Duke of Bedford 2nd, Shorthorn, out of Louan of Brant 5th, by Duke of Bedford (36,466).

15th July, " —Lady Bedford, Shorthorn, out of Lady Elizabeth, by Duke of Bedford (36,466).

23rd July, " —Earl of Fife, Aberdeen Poll, out of Lochiel Lass 4th (1864), by Gladiolus (1161).

19th Oct., " — ——————— Shorthorn, out of Cambridge 10th, by Duke of Bedford (36,466).

Sheep.

Cotswolds—	Ram lambs	20	from 38 ewes.
	Ewe "	31	
Leicesters—	Ram "	8	" 17 "
	Ewe "	18	
Southdowns—	Ram "	14	" 17 "
	Ewe "	12	
Oxford Downs—	Ram "	5	" 4 "
	Ewe "	4	

Swine.

Berkshire—	Boars	11	from 4 sows.
	Sows	13	
Suffolk Windsor—	Boars	6	" 2 "
	Sows	2	

We have, therefore, in the case of sheep, the very large average of $1\frac{1}{3}$ lamb from every Cotswold ewe; $1\frac{1}{2}$ each from Leicester and Southdowns, and no less than $2\frac{1}{4}$ lambs from each Oxford Down ewe.

Mr. George Hood, of Guelph, was again at the great American fat stock competition at Chicago, where he took three sweepstakes, six firsts, and two second prizes, with sheep, many of which were bred and fed at the Ontario Experimental Farm.

By invitation of the Toronto Industrial Exhibition Association, and of the Agricultural and Arts Association of Ontario, we sent specimens of all our herds and flocks to their shows this year, at Toronto and Hamilton, respectively. None of the animals had been prepared, by feeding, for such a purpose, and while, therefore, not in what is called show condition to please the few tens, their healthy and vigorous tone was admired by the more reasonable and common sense hundreds. We acknowledge to several wants, both in cattle and sheep, but as regards management, think we hold to the fair medium as regards flesh.

IV.—THE GARDEN.

1.—Vegetables.

The whole produce of this section has been unusually good—things in season and reliable at all times. While we have always had difficulty, we have never failed in bringing cabbage of all sorts to perfection—large, firm, and sound—red especially, seeming to be unusually hardy. Cauliflower were not equal to the cabbage this year; beets and turnips, particularly the former, were good, and carrots gave 800 bushels per acre. Onions were more than good—being also large, prolific, sound, and not rough. Our celery was the admiration of hundreds—we never had it so long, delicate, solid, and sappy. Potatoes were but fair in quality, somewhat on the small side, though plentiful. The most of other kitchen garden crops were represented—even to a regular and bouutiful supply of mushrooms. In naming tomatoes, we have to speak of such an unusually large crop that the difficulty was to get people to take them for nothing.

2.—Fruit.

The apple crop was abundant—maybe a little on the small side for size, and decidedly wormy. Grapes, as usual, were a fair crop, and I have pleasure in notifying that our new gardener, Mr. Forsyth, is preparing for next season, an account of the habits, characteristics, and general conduct of some fifteen of the most hardy and reliable sorts in our possession. The culture of this valuable fruit is now one of provincial interest, and anything tending to instruct in its successful spread, cannot fail to be appreciated. Pears are, as yet with us, not plentiful enough to demand much notice; we have, however, a goodly number of young thriving trees. We cannot grow the gooseberries of English fame; mildew, and louse, beat us on all hands despite all appliances, but currants are invariably a fair crop.

3.—Flowers.

The area of these was not so large as usual, because of being confined to their proper domain. Terrace potted geraniums, as well as those in beds, gave a regular succession of plentiful blossom from June to October. Annuals of all kinds made a fine show. Our English visitors gave praise to our roses—fact enough without comment from us, and thus I leave them.

4.—The Arboretum.

We are now in the satisfactory position of being able to speak of "Our Arboretum." A very good beginning has been made, and it has also been a very successful one as regards a safe summer catch and some growth. The spot selected for this interesting educational display, lies to the north and east of the main approach to the College, being the triangular part of the pleasure grounds between this approach and the public road, extending to about three acres. Here, it is proposed to establish individual specimens of every tree and shrub from any country, that is found to succeed in our climatic conditions. This means time, some money, patience, and a thorough interest on the part of all concerned.

It gives me much pleasure to acknowledge the interest taken in this branch of our rural economy by the Fruit Growers' Association of Ontario, as represented by Messrs. Beadle, Saunders, Arnold, Dempsey, Beall, and Leslie.

It will be enough, meantime, to place on record the names of those trees and shrubs planted here. All have been properly labelled at considerable expense. Those marked * are in the arboretum.

List of Ornamental Trees.

*Acer Dasycarpum laciniatum, or Cut-leaved Maple.
Acer Pseudo Platanus, or European Sycamore.
Acer Saccharinum, or Sugar Maple.
Acer Rubrum, or Scarlet Maple.
*Acer Platanoides, or Norway Maple.
*Æsculus Hippocastanum, or Horse Chestnut.
*Alnus Glutinosa, or European Alder.
Alnus Glutinosa Laciniata, or Cut-leaved Alder.

*Betula Alba, or White Birch.
*Betula Pendula Laciniata, or Cut-leaved Weeping Birch.
*Betula Lenta, or Sweet Birch.

Cerasus Pumila Pendula, or Dwarf Weeping Cherry.
*Cleditschia Triacauthos, or Three-thorned Honey Locust.

Enonymus Europius, or European Spindle Tree.

Fraxinus Americana, or White Ash.
Fraxinus Nigra, or Black Ash.
Fagus Sylvatica, or Common Beech.
Fagus Purpurea, or Purple-leaved Beech.

*Gymnocladus Canadensis, or Kentucky Coffee Tree.

*Juglans Nigra, or Black Walnut.
*Juglans Cenerea, or Butternut.
Juglans Regia, or European Walnut.

*Koelreuteria Paniculata, or Panicled Koelreuteria.

*Liriodendron Tulipifera, or Tulip Tree.

*Magnolia Acuminata, or Cucumber Tree.

Nyssa Villosa, or Sour Gourd.

*Pyrus Aucuparia, or European Mountain Ash.
Pyrus Aucuparia Americana, or American Mountain Ash.

*Salisburia Adiantifolia, or Maiden's Hair Tree.
*Salix Caprea Pendula, or Kilmarnock Weeping Willow.

*Tilia Europea, or European Lime Tree.
Tilia Americana, or American Basswood.
Taxodium Destichum, or Deciduous Cypress.

Viburnum Lantiana, or Wayfaring Tree.

List of Evergreen Trees and Shrubs.

*Abies Excelsa, or Norway Spruce.
*Pica Balsamea, or Balsam Spruce.
*Abies Nigra, or Black Spruce.
*Abies Alba, or White Spruce.
*Abies Canadensis, or Hemlock Spruce.

Pinus Sylvestris, or Scotch Pine.
*Pinus Austriaca, or Austrian Pine.
*Pinus Pumilio, or Dwarf Mountain Ash.
*Taxus Canadensis, or Canadian Yew.

*Retinispora Plumeosa, or Plum-like Retinispora.
*Retinispora Pisifera, or Pea-fruited Retinispora.
Retinispora Squanosa.

Thuja Occidentalis, or American Arborvitæ.
*Thuja Siberica, or Siberian Arborvitæ.
*Bioata Orientalis, or Chinese Arborvitæ.
*Thuja Orientalis, or Rollissin's Arborvitæ.
*Thuja, or Parson's Dwarf Arborvitæ.
Thuja, or Booth's Arborvitæ.

Spirea Prunifolia, or Plum-leaved Spirea.
*Spirea Opulifolia, or Golden-leaved Spirea.
Spirea Ulmifolia, or Elm-leaved Spirea.
Spirea Sorbifolia, or Service Spirea.
Spirea Chamaedrifolia, or Germander Spirea.
Spirea Billiardii, or Billiard's Spirea.
Spirea Callosa, or Large-flowered Spirea.
Spirea Fortunii, or Fortune's Spirea.
Spirea Ruvesii, or Lance-leaved Spirea.
*Spirea Thunbergii, or Thunberg's Spirea.
*Spirea Semperflorens?
Symphoria Glomerata, or Indian Currant.
Symphoria Racemosa, or Snowberry.

Rosa Canina, or Dog Rose.
Rosa Micrantha, or Sweet Briar.

Viburnum Opulus, or Guelder Rose.

*Weigelia Rosea, or Rose-coloured Weigelia.
*Weigelia Varigata, or Variegated Weigelia.
*Weigelia Arborea.
Weigelia Van Hontii.
*Weigelia Hortensis.

List of Deciduous Flowering Shrubs.

*Amygdalis Nana Flore-pleno, or Dwarf Double-flowering Almond.
*Amygdalis Nana Flore-pleno, Pink and White Varieties.

Berberis Vulgaris, or Common Barberry.
Berberis Purpurea, or Purple-leaved Barberry.

Cornus Florida, or Large-flowered Dogwood.
Cornus Sanguinea, or Red-wooded Dogwood.
Corylus Americana, or American Hazelnut.
Cydonia Japonica, or Japan Quince.

Deutzia Scabra, or Rough Deutzia.
Deutzia Cunata Flore-pleno, or Double-flowering Deutzia.
Deutzia Gracilis, or Slender Deutzia.

Lonicera Tartarica, or Tartarian Honeysuckle.

Ligustrum Vulgare, or Common Privot.

Maclura Aurantiaca, or Osage Orange.

*Prunus Triloba, or Double-flowering Plum.
*Philadelphus Grandiflorus, or Large-flowering Mock-Orange.
Philadelphus Coronarius, or Garland Mock-Orange.
*Philadelphus Nevalis, or Mock-Orange.
*Philadelphus Zeyheri, or Mock-Orange.

Rhus Cotinus, or Venetian Sumach.
Ribes Arnum, or Yellow-flowering Currant.
Robinia Hispida, or Rose Acacia.

Syringa Vulgaris, or Common Lilac.
Syringa Persica, or Persian Lilac.
Syringa Josikæa, or Deep-flowered Lilac.

5.—The New Orchard.

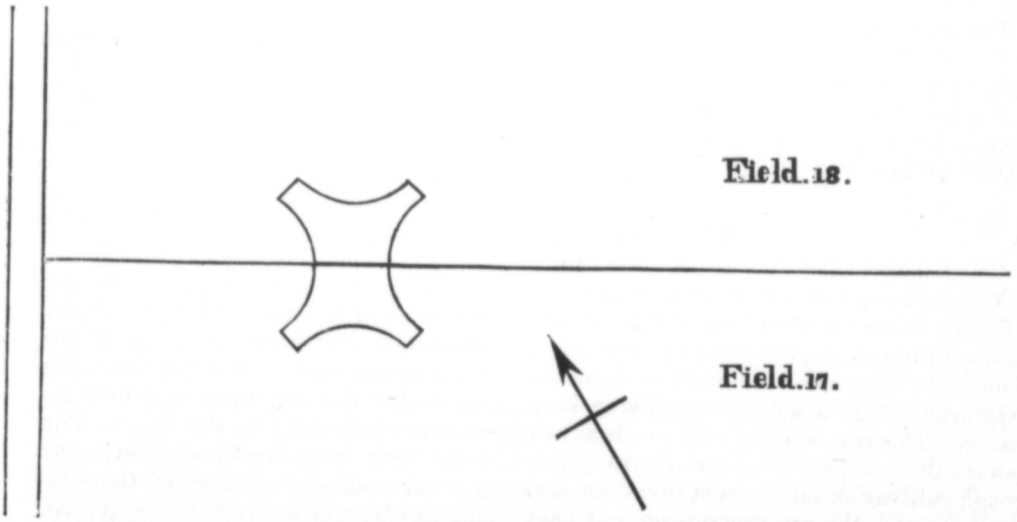
I had your instructions to give the Committee of the Fruit Growers' Association of Ontario such part of one of our fields as would be suitable, by general convenience, aspect, and soil, for the purpose of experimenting with, and establishing, those varieties of apples, pears, and plums found suitable under the circumstances. The idea is to show to the country as a whole, and to the students of this institution, what can be accomplished on

high lying and exposed situations in the growth of such fruit; anybody can do a great deal when all nature is propitious, but to attain success under difficulties means many good lessons, and such lessons as always lead to much greater success in more favoured districts than ours. The ground chosen is part of Field 10, adjoining the cheese factory and south barns—holding a north-eastern as well as a southerly aspect, with a light clay loam, gravelly loam, and a deeper and somewhat heavier clay loam, on parts. It will be the duty of the Committee to report to you in regard to kinds already planted and the success thereof,—it is simply mine to make this acknowledgment, and the assurance that the subject is in safe hands,—Messrs. Beadle, Saunders, Arnold, Dempsey, Beall, and Leslie, already command the confidence of the Province, and what they do shall be unspeculative, practical, scientific, thorough, and reliable.

6.—Tree Clumps and Shade Trees.

It is some comfort to be able to tell of increased respect, on the part of our farmers, for what was once one of their hindrances to field culture. That a tree is not now altogether a mass of so much rubbish, even in the more uncleared districts, is due to *felt* wants and persistant teaching. I cannot overstate, and I think you will testify I do so from no servile motives, how much the Government, and especially, yourself, are desirous of fostering the knowledge and practice of tree culture with a view to immediate shelter, climatic influences, and ornament. The subject is simply immeasurable in its effects, and even now absolutely one of dollars and cents. In our recent evidence before the Agricultural Commission, you will remember that even the plain matter-of-fact farmers, when pushed to the point of saying what difference they would make in the choice of two farms, alike in every respect, except tree shelter, and how much they would give for the one over the other, agreed that such shelter was not limited by at least one-third; which simply means that a $10,000 farm with sufficient tree shelter is reduced to $6,700 without it.

Working up to this, we are not only experimenting, as explained in another chapter, but under the direction of the Fruit Growers' Association of Ontario, we have this year begun the planting of tree clumps and shade trees throughout the farm, with a variety of kinds according to soil and situation. A leading idea in such work is immediate shelter and shade for live stock in the cultivated fields, and as the line between Fields 17 and 18 is high lying and exposed to the north and west, we have laid off a one-acre Black Walnut clump in the following form and position:



By this arrangement it will be observed that from *whatever direction* shelter is required in *either of the fields*, the animals can obtain it. We are mulching and cultivating

around the plants, and, to date, most of them have done well. Plants, six feet apart all over. A few Austrian pine occupy the north-west boundary.

With the view to screen an old gravel pit in Field 2, as well as to secure a shelter clump, we planted European larch around and in this gravel pit similarly to the above—result, almost an entire failure by reason of three things: (1) heated plants on a long journey from the States; (2) a summer of much drought; and (3) want of sufficient soil among the gravel and stones. Austrian Pine were also placed here as a wind break upon the north-west; some of them have struggled through the severe weather and poor conditions.

As a variety to our road-side and field-fence-side shade trees, we planted this year several hundreds of horse chestnut and European linden, alternating with each other and with our own maple, at thirty feet apart. They are all doing well, though we expect some deaths next year.

V.—THE MECHANICAL.

In the application of improved appliances to farm operations, we have made considerable progress during the past year. While it is our duty to teach and show the management of horse power in all its details, it is also ours to be up to the times, when what is otherwise available has been thoroughly tested either by ourselves or others. In this respect I have to acknowledge the introduction of steam power on our farm in the form of Waterous' (of Brantford) well-known Champion engine, twelve-horse power, vertical boiler, and spark proof furnace. Two horses can haul it to any position. It is easily understood, simple in construction, easily managed, requires small amount of fuel, and can be applied to any sort of work; this winter we have already had it in a field threshing a stack of peas, in the bush cutting cordwood, and, thrice a week, driving the straw-cutter, root-pulper and grain-crusher in the barn. The separator in connection with this engine is that of Sawyer, of Hamilton, and so far as experienced it has given much satisfaction. In all the alterations and improvements consequent on this change of motive power, our Mechanical Foreman, Mr. McIntosh, has been thoroughly at home, and many valuable lessons have been thus afforded the students.

We have also had great pleasure in working the mower of the Toronto Reaper and Mower Co. We have as yet had nothing equal to it in simplicity, easy motion, small tear and wear, light draught, facility of management under all circumstances and good work.

The strongest and at the same time one of the most efficient reapers in our experience is that of the "Champion." It is the only one that will go through a thick, strong crop of corn fodder safely.

We have had long experience of the Royce (now the Lion) reaper, of Mr. Watson, of Ayr, and can testify to its easy management, simplicity of construction, light draught and good working powers.

VI.—FARM INSTRUCTION.

We are doing our best to make this an efficient department, experiencing no difficulty and finding no wants except the one great one—want of another team of horses to give more opportunities at ploughing and other field operations. With the doubling of our students, this want has been multiplied, of course; and accordingly I must impress upon the Government the absolute necessity of keeping up to the demand upon this field instruction. This can be done with much advantage to the whole farm, in this way:—You are aware that we have been striving to get rid of the very large legacy of thistles, by thorough cultivation on our root divisions, and two or three annual cuttings of them on other divisions. We are progressing, but progressing slowly, and so in order to secure an earlier cleanness all over, I beg to propose that you allow me an extra team of horses for continuous *summer fallowing*, during two or three years, which team should be in the hands of the Instruction Department for practice in ploughing. With this and the present

instruction team we should be in a position to offer every student considerable practice in most farm operations.

I have much pleasure in reporting a winter instruction arrangement, upon an extended scale, to meet increasing wants and progress, as laid down in the following card, which is given to every student.

WINTER 1880-81.

Duties of Students in certain Departments, and upon which they will be examined at Easter, or in June.

I.—FARM CLERK.

1. He shall have charge of the Tool House, and remain in the same during hours of work, unless relieved by the Farm Superintendent, or Farm Foreman, or when otherwise employed.
2. He shall state in the Tool Record Book, the removal or return of any article, noting by whom removed or returned, with its number, name and condition.
3. He shall keep the house in good order, leaving everything in its proper place, receive no article in a dirty condition, and shall daily take to the Carpenter Shop any article requiring repairs, recording the same, and also when returned.

II.—CATTLE GROOMS.

1. To curry and brush all tied up cattle, under the directions of the Head Cattleman.
2. To make themselves acquainted with the different breeds of cattle.
3. To assist the Cattleman at extra work, as may be approved by the Farm Foreman.

III.—FARM ENGINEERS.

1. To assist Head Engineer in placing, levelling, and working the steam engine in all positions for all kinds of work.
2. Preparing fuel and water for engine.
3. Making a thorough acquaintance with the names and duties of every part of the engine.
4. Noting the quantity, value, and effect of certain kinds of fuel, water and steam.
5. To fire, clean, oil, and regulate the steam engine.

IV.—YARD-MEN.

1. To level and mix the manure in cattle court from all the stables daily,—that from Nos. 1 and 2 stables to be removed every Wednesday and Saturday by cart or waggon.
2. To scatter two pail-fulls of gypsum over the cattle court manure heap every Wednesday and Saturday.
3. To pump the liquid manure over the cattle court every Monday and Thursday afternoon.
4. To clean the barn court and road round buildings as may be required.

V.—CATTLEMEN. To be under the Head Cattleman in—

1. Feeding, watering, and bedding cattle, and seeing to their general care.
2. Cleaning cattle stables, and disinfecting same.
3. Seeing to the special care of breeding and milch cows.
4. The handling and management of bulls.
5. The special treatment of calves and young cattle.
6. Feeding, in amount, kind, form, manner, and times, to be studied.
7. The preparation of straw, hay, corn fodder, turnips, mangolds, carrots, peas, barley and corn meal, oilcake, and the use of condiments for food.
8. The kinds and modes of administering medicine.
9. The management of swine in all respects.

10. Making acquaintance with different breeds of cattle and swine.
11. Assisting in, observing progress, and studying, cattle feeding experiments.

VI.—Shepherds. To be under the instructions of the Head Shepherd, in—

1. Feeding and general care of all the sheep.
2. Attention to ailments and diseases.
3. Making acquaintance with the different breeds.
4. Assisting at lambing time, as may be arranged by Farm Superintendent.
5. Noting the kind, quantities and form of food given, and the manner and times of feeding.
6. Observing the kind and progress of experimental sheep feeding.
7. Handling and judging different kinds of wool.
8. Assisting in the feeding of farm horses.

VII.—Experimental Field Plots. To be under the Assistant Superintendent, in—

1. All kinds of work connected with the department.
2. Making an intimate acquaintance with the various kinds of farm seeds and plants.
3. Examining and judging various fertilizing manures.
4. Cleaning and preparing seeds and plants.
5. Observing the time, manner, quantity, form, effects, progress and results of various manures and crops, on certain soils, under conditions of weather, (*summer* principally).
6. Making acquaintance with the diseases of plants.

VIII.—Instruction Department. Students will be under the Instructor, in—

1. Grooming, harnessing and driving horses.
2. Management of working oxen.
3. Use of the axe.
4. Sowing by hand.
5. Management of wood-sawing powers.
6. Grinding tools.
7. Examination of farm implements and machinery.
8. Cleaning grain.
9. Crushing grain.
10. Cutting and pulping food for cattle and horses.
11. Making bands and tying sheaves.

VII.—THE EXPERIMENTAL.

A.—The Animal.

1.—Fattening of Young Cattle.

Few things puzzle the best of us so much as how to ascertain the actual cost of anything produced from the growth of the soil. It is not only very difficult to do, but when done, few believe it. The purchase and formation of a piece of iron into a plough, can be clearly shown in all its details; its beginning, progress and ending, form one straight and double line of debit and credit, without leaving any doubtful issue, or unrealized connection. It is otherwise, for example, with corn and beef,—the result on the one hand of the purchase of land, its taxes, tillage, manuring, and harvesting, and of the breeding, feeding and general management of a cattle beast, on the other hand. The actual estimate of these in their several relations has often been attempted, but never clearly defined; and probably never will be. But, such difficulties should not debar the search for more facts; as the chemist is not yet able to tell us what climate, soils, manures and plants do,

and what certain animal-life does under all conditions, we have the honour of becoming known in some such fashion as this, so that, where we stumble and doubt in our practical awkwardness he may follow to help and make more clear. Take then, at present, the interesting and popular question, for the farmer, of how best to make profit in the production of beef. The commercial standing of a fattened cattle beast consists of three things, of almost equal value; first, that period from birth up to stall feeding; second, the six or seven months of stall feeding; and third, the value of the manure made. Taking a well-to-do animal, well done to all along, and the actual cost and value of everything, including (1) bull service, (2) value of the milk and extra food for twenty-four months, and (3) ordinary feeding, with meal added up to the time when 23 months old, and, on an average, we have expended $40; then the last seven months, while in stall specially arranged for the highest results, will cost $45—together $85—for, say, 1,500 lbs. live weight, or just the market value of the fattened animal in these times. The third thing is the accumulated quantity and value of manure made during these 2½ years, and by all fair figures in our advanced agriculture it cannot be put at less that $40. Practically then, to the farmer, the animal destined for the shambles is a manure making machine, in which relation it produces one-half of the value of itself, and this value represents the only reliable source of profit to him under the better condition of husbandry.

But there are other bearings to this question. As a manure producer, the fattening animal is maturing itself for direct human food, and by all the sound laws of investment and return in risky goods, the sooner it is crowned and disposed of the better for profits. So then the farmer should breed well, feed well, mature early, and sell immediately. This not being believed by everyone, we undertook the following experiment during winter 1879-80:

On 1st October, four steers and one heifer of our own breeding, were selected and tied up in the usual manner with sliding chain. No. 1 was a pure bred Shorthorn steer, 29 months old; No. 2 a pure bred Galloway steer, 25 months old; Nos. 3 and 4 Shorthorn grade steers, 18 months each; and No. 5 a well bred, white grade heifer, 20 months old, at that date. The stamp of No. 1 was somewhat heavy boned and light in the crops, though otherwise good; the Galloway was very fair of his kind, but wanting depth and width in the hind quarters; the two Durham grades were not up in point of merit for fattening—wanting especially in depth and width behind; the heifer was particularly even, being chunky, with fine bone, clean head, and neat all over. As a matter of interest, and one also of education, the second year students judged these animals on entry, using a standard of 1,000 marks throughout some thirty detailed points. The mean of their work stood thus:

No. 1	765
No. 2	697
No. 3	713
No. 4	747
No. 5	696

The object of the experiment was to ascertain how much could be added to the weight of these comparatively young cattle, with certain foods and the cost thereof by high feeding so as to mature, or pre-mature, within eight months.

Bill of Fare per head per day.

From 1st October to 1st March, 12 lbs. pea meal.
From 1st March to 12th April, 12 lbs. corn meal.
From 12th April to 10th May, 12 lbs. pea meal and 2 lbs. oil cake.
From 19th January to 10th May, 2 lbs. extra of pea meal, and 3 lbs. of extra fodder (hay).
During whole course: 12 lbs cut fodder (consisting of 6 parts oat and wheat straw; 4 parts cut corn fodder, and 2 parts cut hay), with 2 lbs. bran; 75 lbs. turnips and mangolds pulped, and 2 oz salt, with the offer of water once daily.

Quantity and Cost of Food per head for whole period of 222 days.

Pea meal	2,330 lbs.	at 1 cent per lb.		$23 30
Corn meal	504	" 1 " "		5 04
Oil cake	56	" $33 per ton		0 92
Hay	333	" $8 per ton		1 66
Bran	444	" $11 per ton		2 44
Mixed fodder	2,664	" $4.75 per ton		6 20
Roots	16,650	" 9 cents per bushel of 60 lbs.		24 97
				$64 53

There are three ways of presenting this account: (1) The Farmer's, (2) The Commercial, and (3) The Scientific.

1.—The Farmer's,

who says, "my straw, bran and roots have cost me no actual cash; they have come as part and parcel of the material that I do not usually put to market, like my grain, and therefore in feeding them to my animals I do so simply to feed and make manure; I cannot see the sense of charging those against my fattening stock any more than to the horses, milk cows and calves." So, then, the farmer's reckoning takes the following shape:

"1100 lbs. at 4c., when bought, or entered for feeding	$44 00
Meal, cake and hay	30 92
	$74 92
Sold 1477 lbs. live weight at 6c.	88 62
Giving a cash profit of	$13 70

And I have all the manure into the bargain."

2.—The Commercial,

who argues that we must debit and credit everything as any merchant does, whether the farmer is in the habit of selling them or no. Their growth must have cost something, and whatever they would fetch in the market should be debited to the consumer; so, then:

1100 lbs. at 4c.		$44 00
Meal, cake and hay		30 92
Fodder and roots		33 61
		$108 53
Credit 1477 lbs. at 6c	$88 62	
" 7 loads manure	7 00	
		95 62
Showing an apparent loss of		$12 91

3.—The Scientfic.

But a wider view of this question is taken by him who checks his practice by scientific chemical help, who is dissatisfied not only with the farmer's unregistered method of manure making, but cannot even recognize the more careful business man who estimates the value of farm-yard manure by the load, and at a price that is solely regulated by the

farmers themselves. This third party shows that with the facts of soil foods, and that plants require so much of them to produce certain results under certain conditions, we must respond to their teachings and allow value accordingly for any form of materials which are known to possess so much of the properties that go to sustain soils and build up crops, also of known values. Thus we now submit the advanced or modern form of the subject:

Value of animal bought in or home bred			$44 00
Value of materials consumed			64 53
			$108 53
Fattened animal realized		$88 62	
Chemical value of manure, from			
1⅙ ton pea meal at $15.50	$18 08		
¼ ton of corn meal at $7.50	1 87		
1/10 ton of oil cake at $22.50	5 65		
1½ ton fodder at $2.50	3 75		
8 tons roots at $1.00	8 00		
⅛ ton bran at $14.50	2 90		
		40 25	
			128 87
Balance, being clear profit			$20 34

The practical feeder will notice what the general reader may overlook, that the *corn* and *pea* meal cost per bushel what is usually understood to be too high to pay for such a purpose. Indeed, this is correct in the view of any of the three valuators named, though it tells particularly hard on the method of the so-called matter-of-fact farmer. Practically, we (Ontario farmers) have been looking at 45 cents per bushel for corn, and 50 cents for pea meal as the safe figures for cattle-feeding. We could get corn about this two years ago, now nothing under one cent per pound. This difference of, say, one-third represents in the production of flesh and manure by the 100,000 fattening cattle from Ontario, the handsome sum of $250,000.

The five cattle thus illustrated went in on the 1st October at an average weight of 1100 lbs. and came out on 10th May at 1477 lbs., having therefore increased 375 lbs. each during 222 days.

The pure-bred Shorthorn increased at the rate of 2·05 lbs. per day, or 23 per cent. upon his original weight.

The pure-bred Galloway increased at the rate of 1·66 lb. per day, or 24 per cent. upon the original weight.

The three Shorthorn grades increased at the rate of 1·74 lb. per day (one as much as 2·12), or 37 per cent. upon their original weight.

It took 17 cents for food to make one pound of flesh (and its associations) in animals that were pressed or pre-matured at 29 months old.

The food and flesh thus handled gave 11 cents value of manure for every pound of flesh added.

The difference between the cost of additional flesh and the value of manure obtained is exactly equal to the price got for the live animal, or 6 cents per lb.

The value of the manure was equal to one-half the value of the finished animal. Were little or no value placed upon manure, the production of beef, under such circumstances, would lead to serious loss.

But, besides these facts, the food thus used increased the value of the *original* carcass from 4 to 6 cents per lb., making an item of $22 per head.

Thus one pound of new flesh improved every three pounds of the old, and added one-fourth to the whole carcase value.

2.—Fattening of Young Sheep.

One of the important questions of these times with us is, how best to produce the earliest, cheapest, and most choice, mutton for the British market? As an experimental station, we have had considerable experience in testing the various breeds and crosses, with different kinds of food, in view to this end, for the use of the Province, and now feel some confidence in submitting the conclusions that have taken solid shape here of late.

Let us preface by saying that most things to attain the greatest success should be made a specialty of—one thing engaging the whole individual attention. This is the case in sheep-farming, and particularly so in the growth of wool and mutton, for good wool and good mutton are one thing in the same animal, in Canadian economy. We shall, therefore, speak of the fattening of sheep as a particular branch of farming. We know our markets: England will take our mutton, if we offer it at moderate weight, and well mixed, and our own manufacturers will take our wool, if of good quality and medium length. What shall we do to supply these?

It is not the irregular and patchy plan of the feeding of sheep of any sort, in connection with our mixed farming, that will be able to meet the demand or compete with other countries; the work must be brought to a special business on a larger scale, and with the stamp of animal found to produce the two wants named. Of course everybody is not expected to jump into this new line, but I affirm, that unless it is systematized by a considerable proportion of our farmers who have *conditions favourable to its best success*, Ontario need not hope to face the world as she is now doing with her cattle. The regular breeder of pure blood will always take the lead as a breeder, and he must keep what is most in demand, either for ourselves or for the United States. Because the heavy long wools are not so much looked to for the fine mutton and kind of fleece desirable for the subject under treatment, it does not follow that their importance is on the wane. Over the reach of this continent, with its immense variety of physical conditions, the old openings and many new ones will always exist for the Leicester, Lincoln, and Cotswold, whatever comes across the field of other special mutton and wool for particular purposes.

The fact of Europe being mapped out, very clearly, in altitudes and geological areas by thyse breeds of sheep that have, as it were, of themselves made the survey for their own special wants, should be lessons to us in choosing locality for Leicester, Lincoln, Cotswold, or Downs. There is no mistaking the actual value of this point, and it is one with which too few of our leading farmers are conversant. If a farm consists of somewhat heavy soil from alluvial deposit upon the flats of our Province, and is situated at less than 200 feet above sea or lake level, it would be at least unnatural to expect the best results from the introduction of the Southdowns; but, on the other hand, where a lighter character of soil prevails, upon any of our limestone formations, at an elevation over seven or eight hundred feet, then the Southdown may be expected to maintain his peculiarities. The very aspect, colour and smell of the soil has to do with animal success.

So then we say to the general Ontario farmer, choose the breed suitable to your farms, and according to the well known physical characteristics of their respective European habitat, the chances being in favour of larger profits.

We have, let us say, on 1st October, a flock of 100 common grade Canadian ewes, roomy, well wooled, healthy, and averaging 3 shear, that cost $7 each; to them we put two pure bred Southdown shearling rams that cost $30 each; they are fed upon pastures alone, the rams getting meal by special arrangement. They are housed for the winter on 15th November, in two large, airy sheds, with open courts, both open at all times, and are fed upon hay, pea-straw, turnips, pea-meal and bran, as also mangolds previous to lambing, with plenty of water and salt. Lambing begins on 1st March, in a separate apartment adjoining; and now practical knowledge guides fifty per cent. of the whole undertaking. Some deaths of ewes and lambs will occur, whatever the nature of the management. It is presumed you "know the face" of every ewe, that you are well up in the indication of "time" and lambing, that you have the common sense to let well alone when the ewe is in labour, and yet the skill to know what to do when help is needed. Be regulated by the weather as regards confinement, and by the strength of the lamb and disposition of the mother as regards individual crib confinement for a few days. Continue previous

diets, and add mangolds, with some boiled barley; shorten tails and castrate when about twelve days old. Lambs will soon nibble at clover hay leaves, so that when three weeks old, let them have access to places where they can get their own share of everything; thus the "calf" flesh is never lost whatever the condition of the mother. Give early freedom to open air on fine days, but do not put to grass too early, so that the search for a living runs away with the previous management. *Change*, and *change*, and *change*, when on pasture, remembering that it is variety of grasses we need in Ontario, more than the quantity of one thing. Keep your eye on scours and foot sores, and do not grudge some meal to all lambs. Cull and dispose of some of your wether lambs as the market tempts about 1st May. Clip ewes during second week in May, and wean lambs about 1st July. Dip all lambs in "McDougall," so as to clean skin and wool, remove or prevent vermin, remove or prevent itch and scab, soften wool, keep off rain and cold, increase the natural yoke, and give a healthy tone all over, though fortunately Canada is very ignorant of much of these. Put ewes to poor pasture for a week, and the lambs upon the best clover runs, with a touch of meal as before. Should pastures grow scant, treat to a run in the orchard, or to a cut from any of the green fodders; never stint, never allow to go back. An early fall of snow will do no harm to sheep if "foggage" be good, but it is certain that late housing means twenty per cent. less progress during winter. Feeding during the second winter similar to the first, but in larger quantities proportionate to age, will bring our lambs to be made shearlings in end of April. Of course the most careful must be prepared for deaths at any time, but on an average it may be taken as a safe figure to have brought through 1¼ lamb per ewe.

It will now be interesting to make up our Balance Sheet, adopting the common farmer's method of doing so.

The Farmer's Calculation.

He says he should only charge what it costs him in *cash*, or value for stuff he can easily put into cash, for extra food for each sheep for twelve months, and for each lamb until it becomes a shearling.

In addition to this, they get four lbs. pea straw, eight lbs. of roots, and the summer's pasture each per day.

With so many things to handle, fully half the time of one man is taken up with them, so wages amounting to $100 have to be debited.

Four ewes died, and their loss must be charged, as also the value of 10 shearling ewes retained to make good three deaths, and others that may occur ere next winter.

The ewes will give an average of 6 lbs. and the shearlings 9 lbs. of washed wool.

Balance Sheet.

Required for 100 ewes, and 125 lambs:

Ewes, 100:	Pea meal, ½ lb. each per day, from 1st Oct. to 1st May. 210 days = 105 lbs × 100	175	bushels.
	Bran, ½ lb. each per day, for same time	5	tons
	Barley, ½ lb. each " " for 40 days ending 1st May	34	bushels.
	Roots, 210 days—8 lbs. each per day	2,800	"
	Hay, 210 " 4 lbs. each, for half time	21	tons
	Pea-straw, 210 days, 4 " " " "	21	"
Lambs, 125:	Pea-meal, 360 days, ½ lb. from 1st May to 1st May	375	bushels.
	Bran, ½ lb. per day, 360 days	11	tons
	Barley ¼ lb. " 40 days	21	bushels.
	Roots, 210 days, 8 lbs. each	3,500	"
	Hay, 210 " 4 " " for half time	25	tons.
	Pea-straw, 210 days, 4 lbs. each, for half time	25	"

Pasture for both	40 acres.		
Green fodders	5 "	to help pastures.	

TOTAL REQUIREMENTS and value thereof:

Pea-meal	550	bushels,	$ 330
Bran	16	tons,	160
Barley	55	bushels,	33
Roots	6,300	"	
Hay	46	tons,	368
Pea-straw	46	"	
Medicine			10
Dipping			10
Attendance			100
Pasture and green fodders			
			$1,011
Keep of two rams			18
			$1,029
Allowance for deaths			50
			$1,079
Wool	$ 561 00		
Sale of 115 fat shearling wethers and ewes, 180 lbs. at 5c	1,035 00		
Value of 10 shearling ewes kept	80 00		
	$1,676 00		
Balance to credit			597
			$1,676

And the farmer says,—besides this cash balance of $597, I have all the manure left in the yards, as also that upon the pastures, which, if valued similar to what is done in fattening of cattle, is worth, at least another $600.

Well managed pastures will maintain three sheep per acre for the season.

These profits are upon an original invested capital of $760, or, allowing for incidentals, say, $850.

And now, the practical question is, how many cultivated acres does it require to produce enough to maintain this flock? The question is really one of ordinary mixed farming, and not necessarily one of sheep, because we are not to try the making of permanent pasture and purchasing all extra food, but to ascertain what any common farmer may do without any outside help—the cultivation not to overlook the usual wants of the household.

Acreage required in Ontario to produce the necessary food in two seasons:

Peas and pea-straw, 20 acres (10 acres of grain too much) but to be exchanged for bran.

Barley	1 acre.
Roots	5 acres.
Hay	20 "
Pasture	40 "
Green fodder	5 "
	91 acres.
Add $\frac{1}{3}$	31
	122

It will be observed that besides the maintenance of the lambs during the second winter, the ewes (now again in lamb) have also to be provided for; this means one-third more, so that we get at an area of 122 acres as necessary to do well to 100 ewes and 125 lambs during what is practically two years, though only 18 months as shown in detail. We are therefore driven to make another balance sheet to cover the ewes as they stand at next clipping:

Balance brought down		$ 597 00
Food of ewes during second winter	$296 00	
125 lambs, two months old		350 00
Wool from 100 ewes		140 00
Keep of two rams	18 00	
	$314 00	$1087 00
Balance, being cash credit for two seasons	$773 00	

We have then $386 per annum from an original investment of $800, which certainly is a grand outcome, if true. Its truth may be questioned by the regular accountant, who argues that we must debit everything fed and all labour employed, whether by the hands of the farmer himself, his son, or the hired man. There can be no objection to this, if, on the other hand, the actual present and future value of the manure can be ascertained. I have endeavoured, in the reports of this farm, to show this in regard to cattle, but there is not only the greater difficulty of estimating quantity from sheep, but to allow for the greater proportionate chemical value of their droppings. We are not, now-a-days, to be held to so much per load. He who checks his practice by scientific help shows that with the facts of soil food, and that plants require so much of them to produce certain results under certain conditions, we must respond to their teachings, and allow value accordingly for any form of materials which are known to possess so much of the properties that go to sustain soils and build up crops—also of known value.

In submitting a few figures upon this subject I prefer the plain rule arrived at from recent conclusions here and elsewhere in cattle feeding, that the value of the manure during the feeding process is equal to half the value of the finished animal:—

FINAL BALANCE.

Values brought forward	$773 00	
Value of 6,300 bushels roots		$567 00
Pea straw, 46 tons		184 00
Attendance, half time of one man		100 00
Value of manure from fattened shearlings	517 00	
Estimated value of manure from ewes	150 00	
	$1,440 00	$851 00
Balance to credit		589 00
		$1,440 00

In any form, therefore, we obtain a handsome return, even allowing still further for the value of the pasture. Surely such facts ought to impress themselves and bring about a speedy change.

3.—CREAM AND BUTTER FROM DIFFERENT BREEDS OF COWS.

We have all to bow to the fact that it is the machine more than the materials that regulates the quality of the milk of most animals. This seems to hold good practically in all parts of the world, whatever the variations in condition of climate, food and management, with the better known pure breeds of cattle, yet little is known in regard to what certain crosses of these can do under like circumstances. So, having this in view, as well as the checking of the work of others and the establishment of data for ourselves, we undertook an experiment during last winter on this most valuable subject:

The cows set aside for the purpose were—

1.—A pure-bred Ayrshire.
2.—A pure-bred Shorthorn.
3.—A pure-bred Hereford.
4.—A pure-bred Aberdeen Poll.
5.—A Shorthorn grade.
6.—A Hereford grade, 2nd cross.

As the experiment was not a question of quantity of milk, the difference in the condition of the cows or their time since last calving is not so serious an objection as may appear on first thoughts. The food given consisted of :—

Cut :	Oat and Wheat Straw,	6 lbs.
	Corn Stalks	4 "
	Hay	2 "
		12 lbs.
	Turnips and Mangolds (pulped)	60 "
	Pea Meal.....	2 "

in equal quantities to each per head per day in three meals. The times of milkng were at 6.30 a.m. and 6 p.m., by the same hands during the whole course.

In the management, record was kept of

1. Temperature of stables.
2. Quantity of milk by *weight* and *measure*.
3. Specific gravity of milk previous to setting.
4. Temperature of milk before setting.
5. Temperature of dairy.
6. Time of setting.
7. Testing quality of cream by tubes.
8. Manner of setting—shallow or deep.
9. Time given for cream to rise.
10. Weight of cream removed.
11. Condition of cows.

The experiment began on 21st January, and ended the 28th April, 1880, with an interval of students' holidays at Easter.

We shall first tabulate the results from a carefully calculated mean of the various points affecting cream and butter.

Cream and Butter from different Breeds of Cows at the Ontario Experimental Farm.

BREED.	Specific gravity of Milk. Water=0.	Percentage of Cream in 24 hours. (Tubes.)	Weight of Cream from 100 lbs. Milk.	Percentage of Butter from Milk and Cream, by weight.		Percentage of Dried Curds from Skimmed Milk.
			lbs.	Milk.	Cream.	
Ayrshire	1030	6.12				10.00
Shorthorn	860	12.35			30.00	7.50
Hereford	910	7.87	5.43	2.01	50.25	10.60
Angus or Aberdeen Poll...	1110	8.52	7.76	3.72	40.00	10.60
Shorthorn grade	1030	12.65	5.43	2.31	46.00	12.50
Hereford grade	1060	13.71	6.46	2.54	40.50	
Means	1000	10.20	6.27	2.64	41.35	10.24

In analyzing this table it is interesting first to notice the difference in what is called the specific gravity of the milk from animals of different breeds, and for that mattter of it, of different animals in the same breed. If the lactometer is a true indicator of the weight of milk relatively to distilled water, and if weight indicates thickness or creamyness, then the higher the figures in the first column the richer should be the milk in question. In this example we have the following :—

ORDER OF RICHNESS OF MILK BY SPECIFIC GRAVITY :

1.	A. or A. Poll	111
2.	Hereford grade.	106
3.	Shorthorn grade.	103 equal.
4.	Ayrshire.	
5.	Hereford	91
6.	Shorthorn.	86

See Diagram Fig. 1.

But this graduated piece of glass would register the same and higher figures, were certain foreign matters introduced into the milk, or were the milk adulterated with water and these matters, so that no reliance can be placed upon such a form of ascertaining either the purity or richness of milk. Of course, here, all the milk was *pure*, and consequently it may be assumed that the instrument did indicate some sort of relative properties in the milk as compared with pure water. Are we to conclude that the famous beefing Shorthorn used a much larger proportion of the fattening or solid matters of her food in maintaining her constitution by as much as 25 out of 111, and in these respects is there no difference between the milking Ayrshire and beefing Shorthorn grade ?

The Hereford also ranges low in this indication, but its cross with a grade rises to the second place among the six. We may see, as we advance in this inquiry, whether any reliance can be placed on specific gravity.

Another point of much value, especially to those who now send cream in place of the sweet milk to the creameries, is what is shown in the second column of the table. In our plan of work, creamometers were used to test the percentage of cream that would rise during twenty-four hours. The tubes were filled every day for the whole period of three months, and all conditions, such as temperature, were properly attended to. As regards a certain *column*, or body, of cream rising in a given time, I have no doubt of the accuracy of this test of the different breeds, and to illustrate the result I beg to add the following diagram, which shows the relative proportions more strikingly :

See Diagram Fig. 2.

A large volume of cream does not necessarily imply a corresponding quantity of butter, any more than high specific gravity denotes quantity of cream, but when cream is sold by bulk, as is now the increasing practice in the management of creameries, it is evident that some regard should be paid to the kind of animal giving the milk, and the time given the cream to get to the surface. The creamery will not, I presume, object to the farmer allowing his milk to stand over twenty-four hours, so long as its sweetness is not destroyed, because the last cream is always the heaviest and best for the butter maker, but, if there is no corresponding thickness of buttery materials in, for example, the Shorhorn, as compared with the Hereford, then he will soon find that in paying as much for the one as for the other, all the while that the Shorthorn may be, as we shall see, forty per cent. less in the property of giving butter from cream than the Hereford, he is paying sixty-six per cent. more for the Shorthorn milk than he is for the Hereford milk. The milk of the pure-bred Ayrshire is apparently not half so rich as either that from the Shorthorn, Shorthorn grade, or Hereford grade, and is twenty-five per cent. less than the Hereford and Aberdeen Poll, and forty per cent. less than the mean of all. The Ayrshire, then, may not be the best breed for the creamery, and certainly if there is only an approximation to the truth in this matter of cream volume in the different breeds of cattle, the immense difference of 124 per cent. that the Hereford grade shows over the Ayrshire

is enough to give rise to serious thought on the part of both the farmer and the creamery man. Meantime pass to another view of the subject.

See Diagram Fig. 3.

The difference of weight of equal bulk of the like materials is evidence of their containing different proportions of the same constituents, and in our case of milk from various breeds of cattle, should guide us in arriving at cream volume, or value. I am sorry to be unable to submit the Shorthorn and Ayrshire in this respect, because of some irregular conditions at churning times. In the case of the four others we have the Aberdeen Poll in advance with forty-three per cent. over the Hereford and Shorhorn grade (which are equal), with twenty-four per cent. over the mean of all. Observe the exact agreement between the weight of cream and the specific gravity of their milk, as thus illustrated:

See Diagram Fig. 4.

If then, the weight of cream agrees with the produce of butter in each case, we may be led to place some reliance on specific gravity after all—that is to say, when the milk is pure.

What butter then, have we received from the several creams, and what has been its proportion to the original milk.

See Diagram Fig. 5.

There is no agreement, or rather, there is a diverse agreement, between the proportion of butter from a given quantity of milk to that of butter from a given quantity of cream. The Poll, with its $3\frac{3}{4}$ lbs. nearly of butter from 100 lbs. of milk, gives the lowest, or 40 lbs. of butter from 100 lbs. of cream; while the Hereford with only its 2 lbs. fully of butter from 100 lbs. of milk, gives as much as $50\frac{1}{4}$ lbs. of butter from the like quantity of cream.

See Diagram Fig. 6.

It appears, therefore, that in every case where the weight of butter is low relatively to the quantity of milk, the weight of butter from the cream of that milk is correspondingly high. Here then, is valuable guidance for farmers, dairymen, and creamerymen; for example, in sending milk to the creamery the farmer is credited with the average proportion of cream that rises from all the milk, so that if the average be $2\frac{2}{3}$ lbs. of butter from every 100 lbs, of milk, the while that the creamerymen obtain $41\frac{1}{3}$ lbs. of butter from every 100 lbs. of cream, there is something in getting milk from different breeds of cattle.

On an average of breeds we find that

Every 100 lbs. of milk give $6\frac{1}{4}$ lbs. of cream;
Every 100 lbs. of cream give $41\frac{1}{3}$ lbs. of butter;
Every 100 lbs. of milk give $2\frac{2}{3}$ lbs. of butter;

I beg to ask the dairy expert if the quantity of dried curd from skimmed milk is any indication of the cheese value of the milk, and therefore of the particular breed? If it is, we have in our experience, not much extended however, to record merit as follows:

Best,	Shorthorn grade	giving	12.50	per	cent.	of curd.
2nd,	A. or A. Poll	"	10.60	"	"	"
3rd,	Hereford	"	10.50	"	"	"
4th,	Ayrshire	"	10.00	"	"	"
5th,	Shorthorn	"	7.50	"	"	"

Comparative Abstract and Result of Butter and Cream from Different Breeds of Cattle.

We are dealing with what we know to be pure milk from cows of different breeds, and in looking over the various tests used in our winter experiment, I have to acknowledge the great attention given the whole subject by Messrs. Howitt and Holterman, second year students, to whom was intrusted the carrying out of the details. Every part of their work was characterized by punctuality, care, correctness, cleanness, and a thorough in-

terest. No fewer than 4,000 observations had to be actually made and recorded by them in the course of eighty days, and thus the public will be able to appreciate the value and reliability of this experiment, so far as it goes.

It is interesting to note the very large range in the specific gravity of these milks; two such famous beefing breeds as the Shorthorn and Aberdeen Poll differ by as much as 35 in the 100. British experiments give the average of their breeds as 103—water being 0. Using this as a comparison we have our Ayrshires, and Shorthorn grade exactly at their standard, the pure Hereford at 91, and the pure Shorthorn down to 86—the whole five breeds giving a mean of 99⅜ in winter and 99⅜ in summer. Of course we do not forget that individual cows vary much, and that the same cows might give different results under different management in another part of the country. If, however, there be trust in specific gravity, the Aberdeen Poll is 35 per cent. better than the Shorthorn, and considerably over all the others; even the two grades are at and over the British standard, and much superior to the Hereford and Shorthorn. However, specific gravity is but one thing. The next natural test, following that of purity, or, in our case *density*, is the quantity or volume of *cream* from a certain weight or measure of milk—measure in this example. In Britain this is set down at 10.01, that is, every 100 lbs. of milk gives 10 lbs. of cream. At our farm we have the Hereford grade leading, with as much as 13¾ lbs. of cream to every 100 lbs. of milk, the Shorthorn grade second, with 12⅜ lbs., the pure Shorthorn 12⅓ lbs.; the Aberdeen Poll only 8½ lbs.; the pure Hereford 7⅞, and the Ayrshire lowest with, 6⅛ lbs—all over an average of 10.20. The Hereford grade and Shorthorn grade have kept their places well; the pure Shorthorn has advanced a great deal, but the Aberdeen Poll is now far behind—not even up to the mean. We have then clear proof that specific gravity of milk does not necessarily imply *bulk* of cream.

Our third test was the actual weighing of the cream, as a step nearer the butter that may be got from each breed. In this we cannot present the Ayrshire and pure Shorthorn for reasons previously stated. Of the four reliable ones, the Aberdeen Poll again steps in with a lead of 7¾ lbs. of cream from every 100 lbsof milk; the Hereford grade again steadily in its place, and giving nearly 6½ lbs.; with the Shorthorn grade and pure Hereford in the third place, and equal, with nearly 5½ lbs of cream to every 100 lbs. of milk.

Here we are at last in possession of some agreement. The specific gravity of the milk and the actual weight of the cream from the same milk correspond as illustrated in Fig. 4.

But the housewife says,—come to the best possible test, or what weight of butter do you get from a certain weight of cream?

From every 100 lbs. of cream we obtained 50¼ lbs. of butter in the case of the pure Hereford; from the Shorthorn grade 46 lbs. of butter; from the Hereford grade 40½ lbs. of butter, and from the Aberdeen Poll 40 lbs. of butter from every 100 lbs. of cream. This true test of richness and value of milk has considerably changed the places of the respective breeds; the Aberdeen Poll and Hereford grade, that have been so high in previous records, are now at the bottom of the list in this, while the Hereford and Shorthorn grade are very much higher, though they stood lowest in most other things.

Therefore, the *weight* of cream for a certain weight of milk does not imply a corresponding weight of butter. Indeed so exactly are they reversed in our experience that doubts may be entertained of their correctness; but this, I need hardly say, is not the case, as all figures have been carefully checked by the two superintendents, as well as by myself.

It will interest some to know what per cent. of butter by weight we obtained from the milk of each breed. This is shown in Fig. 6—placing the Aberdeen Poll first with 3.72 per cent.; the Hereford grade second, with 2.54; the Shorthorn grade third, with 2.31; and the pure Hereford last, with 2.01 lbs. of butter from every 100 lbs. of milk, or exactly in agreement with the weight of cream from milk, as in Fig. 3.

Finally, we are now in possession of every kind of data, except one, by which to estimate the annual value of a cow of each of these breeds for dairy purposes. We want the average production of milk under like food in a given time. Looking to the future for this, we are able meantime to tabulate the value of one cow of each on the assumption that each will give 4,500 lbs. of milk within the twelve months; price of

butter, say 18 cents per pound. In regard, therefore, to actual value of milk for production of butter, without reference to quantity of milk, we have to conclude meantime, that the Hereford grade is first, the Aberdeen Poll second, the pure Hereford third, and the Shorthorn grade last.

See Fig. 7.

Canadian Experience.

Value of Butter from equal quantities of Milk, from various Breeds of Cattle. Say 4,500 lbs. of Milk per annum, and Butter 18 cents per lb.

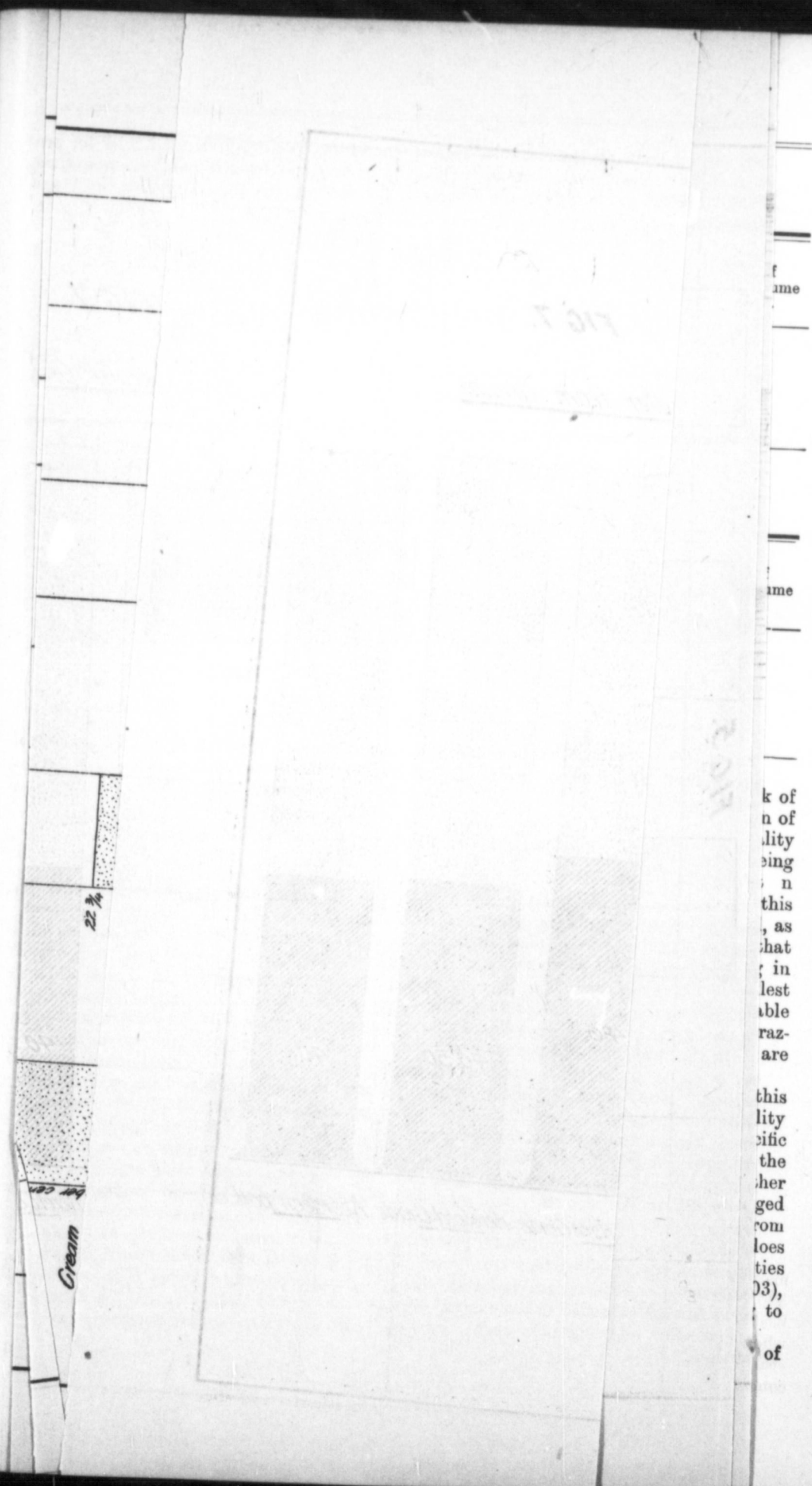
BREED.	Weight of *Cream* from *Milk*.	Weight of *Butter* from *Cream*.	Value of Butter per Annum.
	lbs.	lbs.	
Hereford Grade	290	145	$26 10
Aberdeen Poll	350	141	25 40
Hereford	245	123	22 10
Shorthorn Grade	245	112½	20 70

Any further evidence in favour or against a particular breed, will depend, therefore, upon QUANTITY of milk per annum. Taking the extreme, in a herd of 50 cows, the difference would be $300 in favour of the Hereford grade.

Milk and Cream from "Soiling" and Grazing of Cows.

It was considered well to make a beginning in this in order to gain experience for something more extensive in the future. It being known that the quantity of milk depends upon food and breed, and quality upon breed more than food, the conditions affecting plants and animals, especially in regard to weather, have much ado with such experiments. The lengthy drought we had during June and August would therefore be in favour of "soiling," as the pastures were very much withered and short, while we had, by special arrangement, always a good cut of some kind of green fodder for the housed cows.

On the 6th June the 2nd year students selected six cows from our herds as nearly equal in points as possible—such points having reference to breed, frame, markings, and condition. None were in high milking condition, and hence we had no rush in either in-door or out-door management. The soiling food consisted principally of lucerne, rye (green), clovers and tare and oat fodder, of which they got 110 lbs. per head per day, at three meals, stall-tied, and getting to water and a few minutes' exercise once a day. The dissatisfaction of the three housed cows was very apparent, which could not of course be by reason of want of company, and may then be assigned to the unusual conditions at such a season. Milking was done morning and evening. The three grazed cows had the usual run of cultivated and uncultivated pastures, were driven home for milking, and therefore received no special attentions whatever. Milk was tested with thermometer, lactometer, creamometer, and specific gravity bottle—*i.e.*, weighing in place of floating. The first stage of the experiment extended to forty days,—the second stage to twenty days,—the cows being changed after allowing one week's interval with the view to counteracting previous conditions.


22 %
Cream

SPECIFIC GRAVITY of Milk from different breeds of Cows

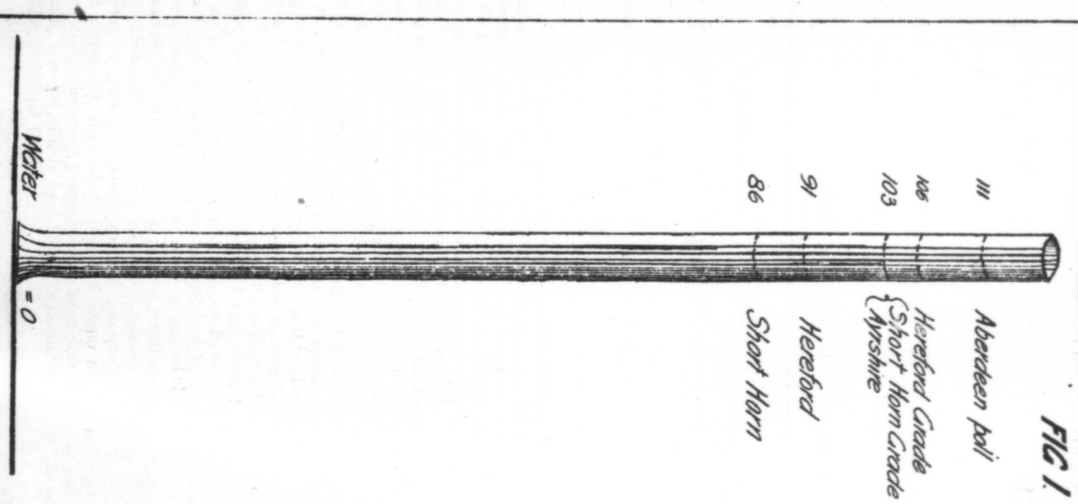
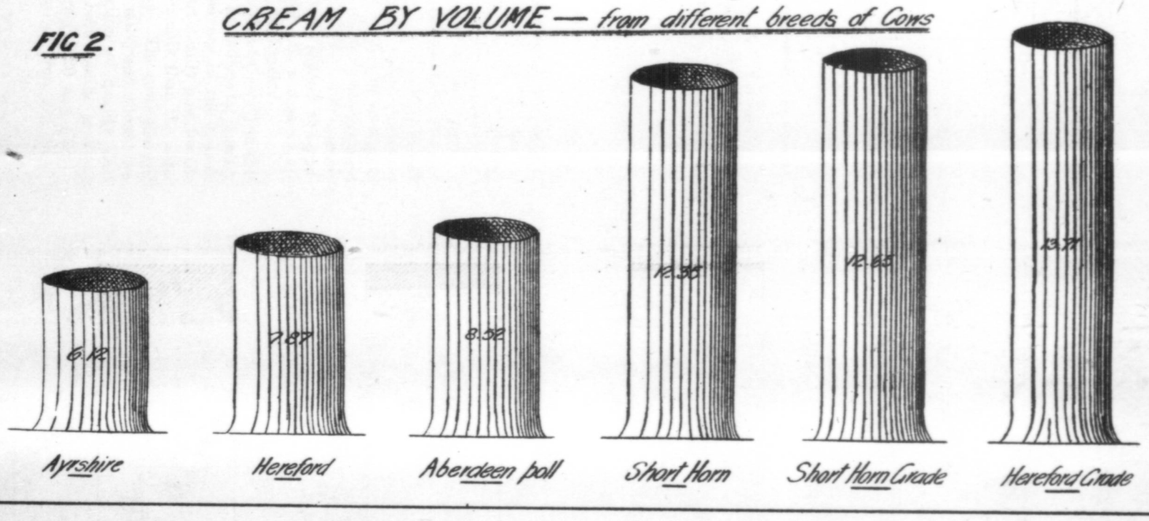


FIG 1.

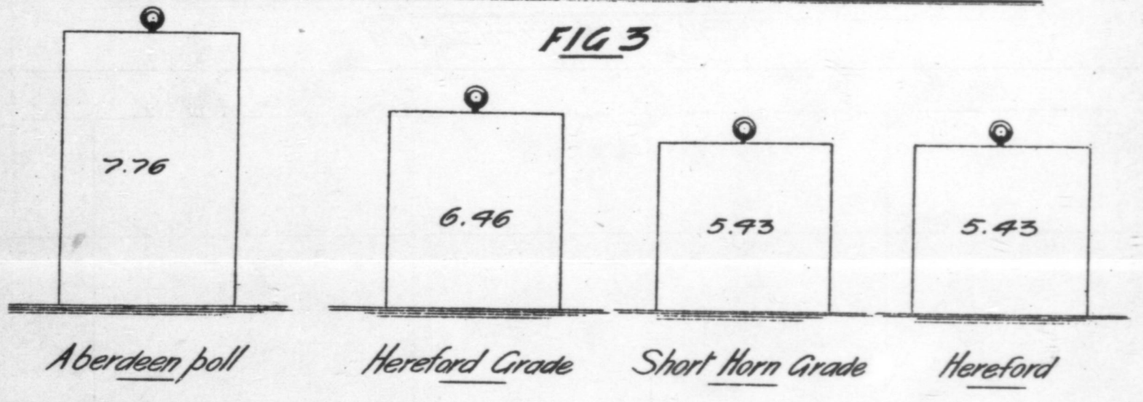
CREAM BY VOLUME — from different breeds of Cows

FIG 2.



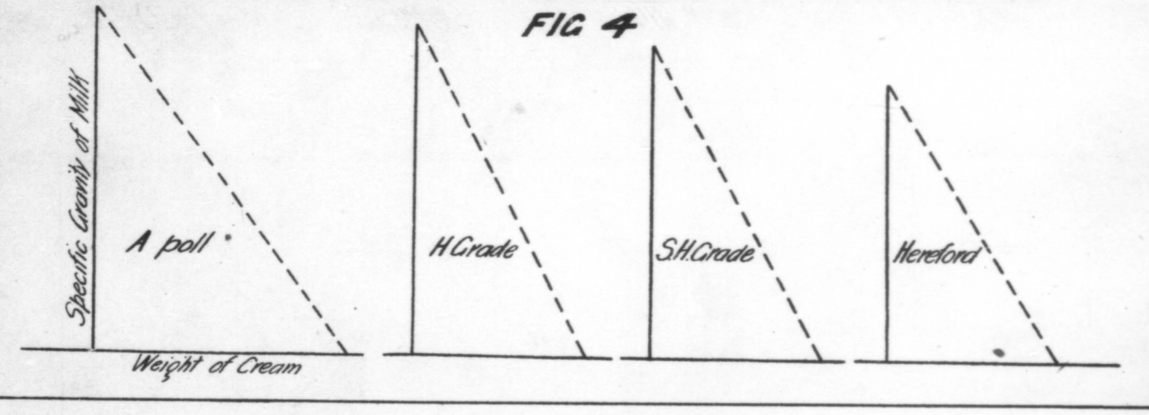
CREAM BY WEIGHT — from different breeds of Cows

FIG 3



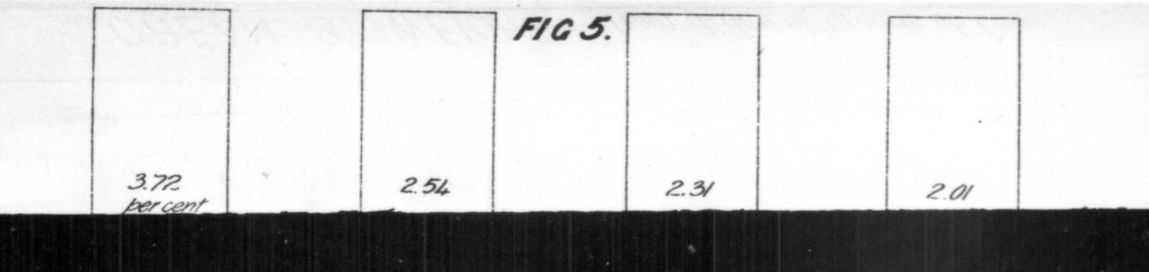
AGREEMENT of Specific Gravity of Milk with actual Weight of Cream

FIG 4



BUTTER — from Milk by Weight

FIG 5.

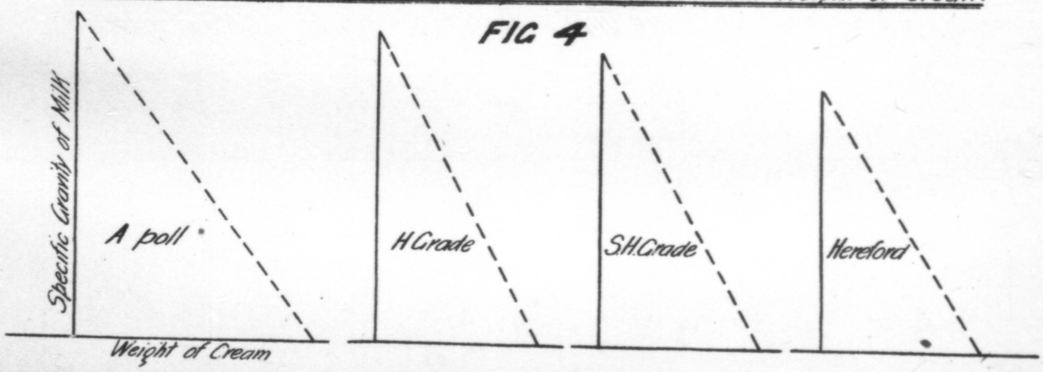


	3.72 per cent		2.54		2.31		2.01	

Aberdeen poll — Hereford Grade — Short Horn Grade — Hereford

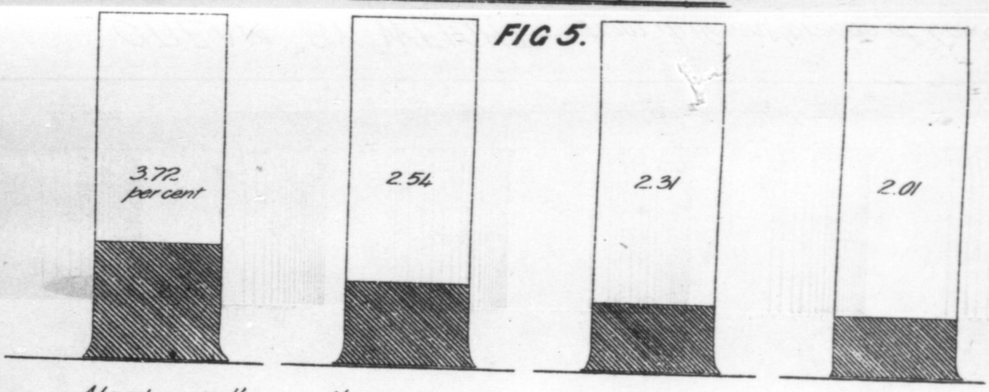
AGREEMENT of Specific Gravity of Milk with actual Weight of Cream

FIG 4



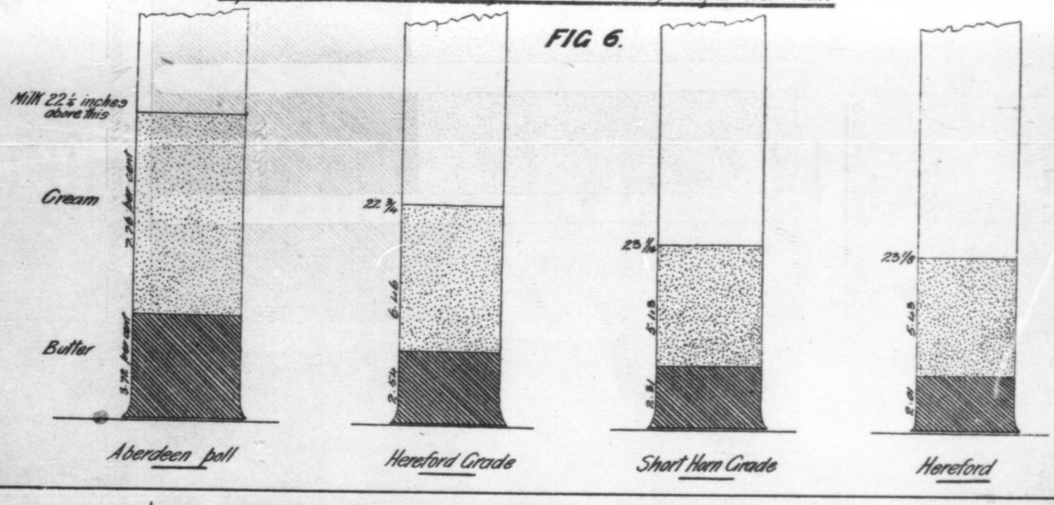
BUTTER-from Milk by Weight

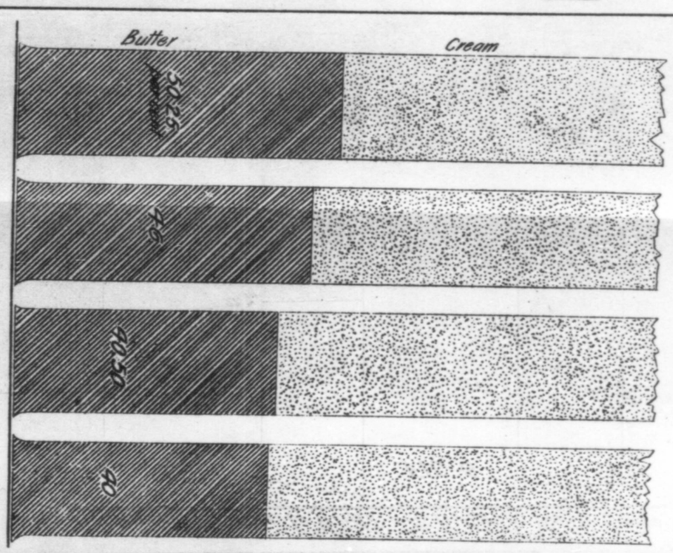
FIG 5.



Agreement of Cream by Weight with Butter by Weight from Milk

FIG 6.

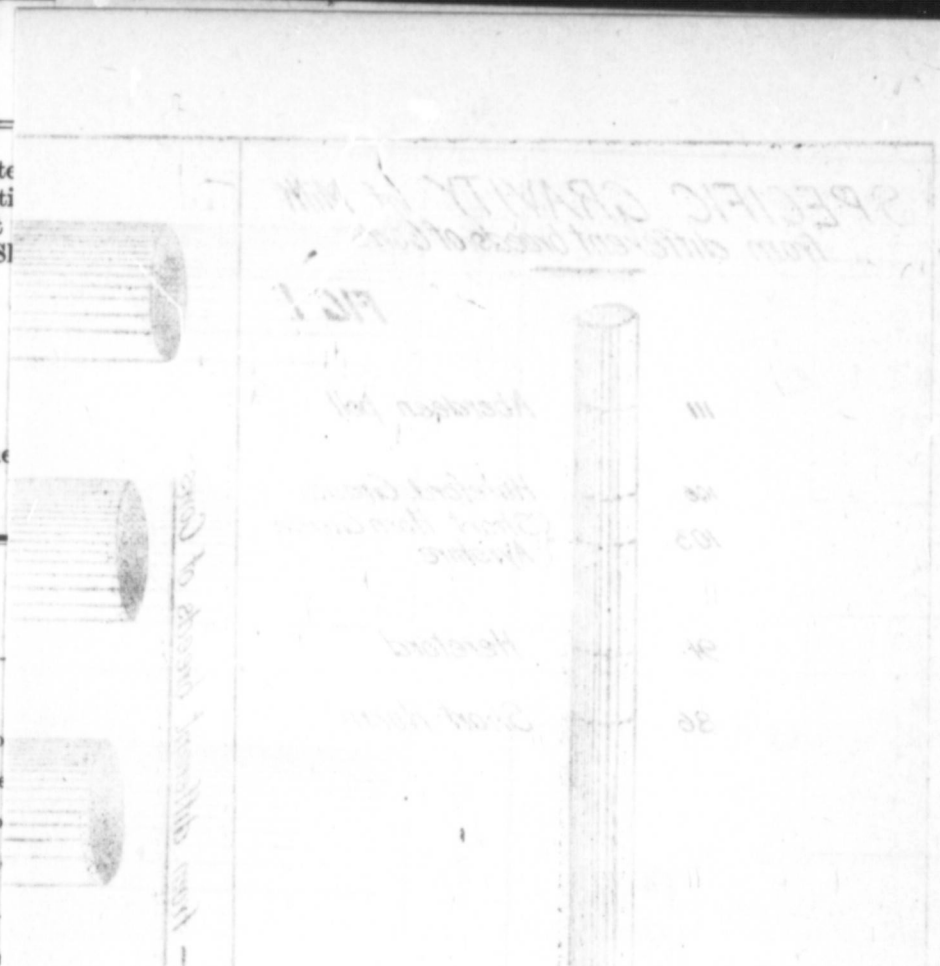




Butter from Cream

FIG 7.

THE BURLAND LITH CO MONTREAL



RESULT FROM 6TH JUNE TO 16TH JULY.

MANAGEMENT.	Milk in Quarts per Day.	Specific Gravity by Lactometer.	Per cent. of Cream by Volume in 24 hours.
Grazing	7 1/16	98.30	10.20
Soiling	6 13/16	101.20	10.03

RESULT FROM 26TH JULY TO 13TH AUGUST.

MANAGEMENT.	Milk in Quarts per day.	Specific Gravity by Lactometer.	Per cent. of Cream by Volume in 24 hours.
Soiling (the cows grazed above)	5 5/16	99.53	9.03
Grazing (the cows soiled above)	5 3/16	99.75	10.26

In this simple statement we have such evidence of great uniformity in the milk of various cross breeds of cattle that the first natural conclusions are in favour of the plan of selection, and that the selection itself was well done; further, that the quantity and quality of the milk are so even, with two exceptions, as to make the question of food influence being little in these examples yet more decisive. The quantity kept so regularly apart n both stages, even by the reversion of the cows, that no doubt need be entertained in this instance of the power of the constitution to digest and regulate on the one hand, as against the kind and quantity of food doing so on the other hand. The same cows that gave the largest quantity by grazing in the first stage, gave also the largest by soiling in the second stage, and those that gave the smallest by soiling in the first, gave the smallest quantity by grazing in the second stage. I do not say that conditions were not favourable to such a result, for the latter part of the second stage (in August) was against the grazing, but then the same cows gave also least under soiling previous to that, and so we are entitled to look at least as much to the machine as the food for this uniformity.

We have elsewhere (see "Cream and Butter from Different Breeds of Cows") in this report, given satisfactory evidence of the value of the lactometer in indicating quality of milk, and so, building upon this, we have to note quite a difference in the specific gravity of the milk during the first stage of this experiment, and practically now for the second, with a slight figure in favour of one set of cows giving richer milk than the other (example, 101.20 and 99.75, as against 98.30 and 99.53 respectively). The cows changed from grazing to soiling, very slightly increased the quality of their milk, and those from soiling to grazing decidedly reduced the quality. But this indication of quality does not necessarily show what *volume* of cream may be produced, for both specific gravities give about the same percentage of cream during twenty-four hours (10.20 and 10.03), which, however, differs by 1.23 per cent. in the case of the cows taken from grazing to soiling (9.03 and 10.26).

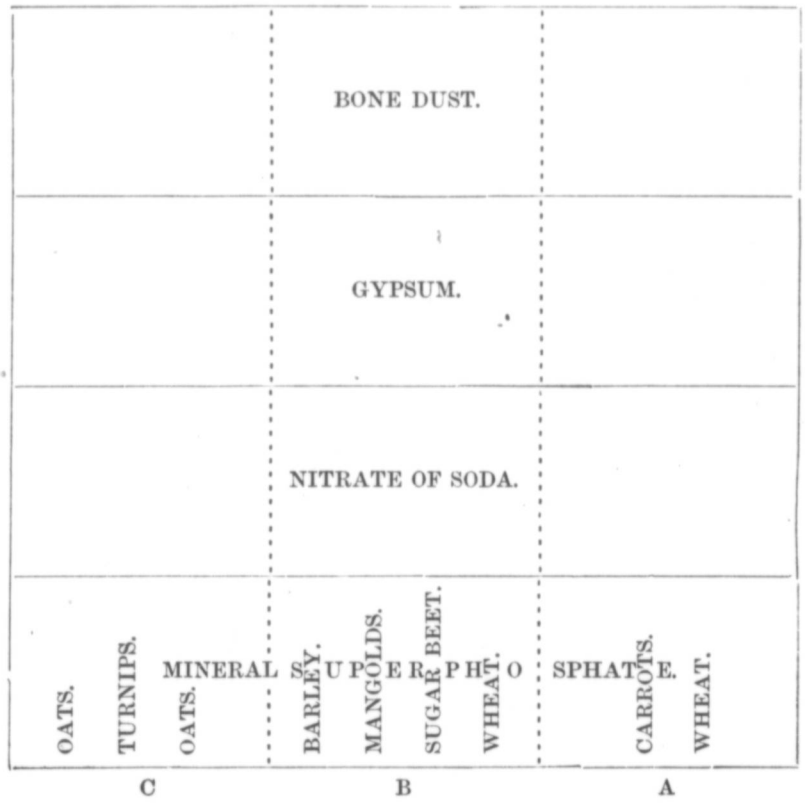
GRAZING then, was slightly superior to soiling in amount as well as richness of produce.

THE EXPERIMENTAL.

B.—The Field.

5.—The effects of Bone Dust, Gypsum, Nitrate of Soda and Mineral Superphosphate applied in 1878. (Plot 29, Field C.)

Our 1878 and 1879 reports should be read before this, although the subjoined cropping list will give an idea of what is being aimed at :—



1876. Bare summer fallow.
1877. Bare summer fallow.
1878. Manures as above supplied to Oats and Barley.
1879. Carrots, Sugar Beets, Mangolds, and Turnips.
1880. Wheat, spring variety, and Oats.

Years 1876 and 1877 were preparatory by bare summer fallowing ; in 1878 the manures were applied, 600 lbs. of each, except nitrate of soda, which was limited to 300 lbs. at same time, with wheat, oats, and barley ; in 1879 crops of carrots, sugar beets, mangolds, and turnips were taken, and this year one of White Russian spring wheat and White Blade oats. In place of following up, in detail, the results of this year's cropping, we will aggregate for the period of three years, and draw some conclusions :—

Three years' cropping after Special Fertilizers—all weights in pounds. (Plot 29, Field C.)

Manures.	1878.				1879.				1880.				Total result in quantities per acre for 3 years.
	Oats.		Barley.		Carrots.	Sugar Beet.	Mangolds.	Turnips.	Wheat.		Oats.		
	Straw	Grain	Straw	Grain	lbs.				Straw	Grain	Straw	Grain	lbs.
Bone Dust ...	2820	382	2760	436	48600	45120	30240	16080	1320	280	2800	840	151678
Gypsum	2400	765	2340	480	37440	27840	22500	13080	760	240	2360	760	110965
Nitrate of Soda	3960	765	3240	552	39360	37680	25360	18000	640	180	2560	1040	133337
Mineral Superphosphate ..	2700	956	2580	600	38160	31440	28800	16080	1040	300	3040	960	126656
	11880	2868	10920	2068	163560	142080	106900	63240	3760	1000	10760	3600	

An examination of this three years' table shows the following financial fact, taking $100 as the standard of the highest produce from bone dust.

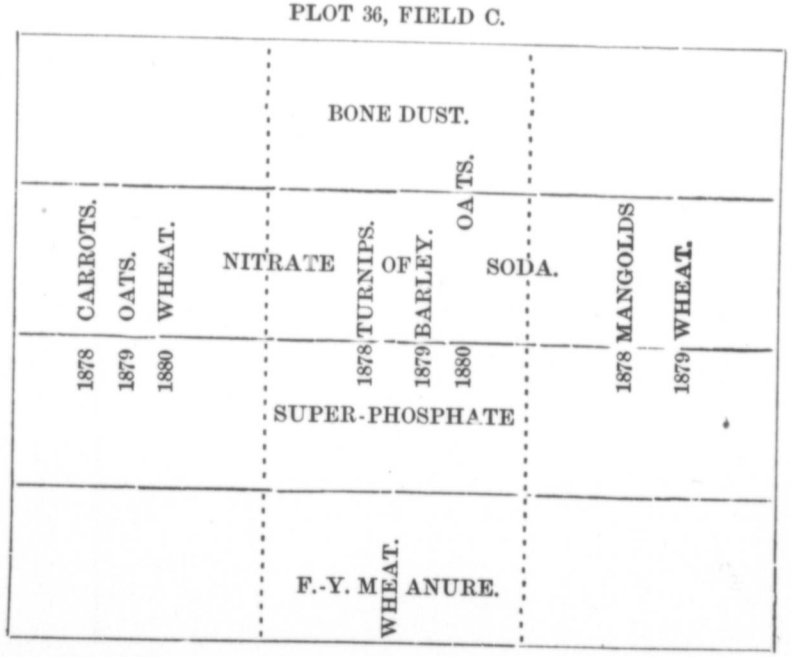
Bone Dust	$100
Nitrate of Soda	87
Mineral Superphosphate	84
Gypsum	73

Bone dust in a three years' trial is, therefore, twenty per cent. over the mean of all the others; or, on an average of crops, seven per cent. per annum.

Three years' cropping, after Farm-yard Manure and three Special Fertilizers. (Plot 36, Field C.)

This is a continuation of an important experiment begun in 1878, and all that can be called for this year is to tabulate and add up for the three-year period.

PLOT 36, FIELD C.



The cropping and manuring has been :—

1876. Turnips, with Farm-yard Manure.
1877. Wheat, no Manure.
1878. Manure as above, with Mangolds, Turnips and Carrots.
1879. Wheat, Barley and Oats.
1880. Wheat and Oats.

Three Years' Cropping after Farm-yard Manure and three Special Fertilizers—all weights in Pounds. (Plot 36, Field C.)

	1878.			1879.						1880.				Total results in quantities per acre for three years.
	Mangolds.	Turnips.	Carrots.	Wheat.		Barley.		Oats.		Wheat.		Oats.		
				Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	
Farm-yard Manure	48,480	19,440	30,480	2,800	780	5,040	1,584	4,400	1,974	1,040	95	2,400	960	119,473
Mineral Superphosphate	45,600	16,560	31,800	2,560	680	2,800	1,360	3,280	1,622	960	140	2,360	880	110,602
Nitrate of Soda	52,200	1,680	33,840	2,640	720	2,960	1,520	4,240	1,785	960	70	2,360	800	105,755
Bone Dust	34,800	1,920	32,400	2,560	720	3,040	1,280	3,840	1,360	560	20	2,040	800	85,340

The examination here shows the financial result, with the highest as $100 for easy comparison, to be :—

Farm-yard Manure	$100
Mineral Superphosphate	91
Nitrate of Soda	88
Bone Dust	71

Farm-yard manure, during a three years' trial, is therefore seventeen per cent. over the average of mineral superphosphate, nitrate of soda and bone dust, or, nearly six per cent. per annum.

The Effect of Manures upon Wheat—Second Year. (Field C, Plots 10, 11 and 12.)

Were the production of crops experimentally a matter of profit, we would hear little about experiments, or were the continuance of experiments to hinge upon large produce per acre, the special profession would be equally barren. When, from a season such as we have passed through, the ordinary farm management has given 19 and 22 bushels of spring wheat per acre, and that from experimental work by the like kind of grain, only an average of 6½ bushels, as in the example now to be considered, the ordinary reader, untaught to value the line of our work, must necessarily doubt the use of its existence.

In order to follow best through this account, it is necessary to gather up from previous reports, where it is shown that these plots were subdivided into eighteen parts, and treated with various manures as follows :—

	X.		XI.		XII.
4 F.-Y. Manure and Superphosphate.	1 F.-Y. Manure and Superphosphate. *a*	4 Salt	1 Bone dust.	4 F.-Y. Manure and Salt.	I F.-Y. Manure and Salt. *a*
5 Superphosphate.	2 F.-Y. Manure.	5 F.-Y. Manure and Bone dust.	2 F.-Y. Manure and Bone dust. *a*	5 F.-Y. Manure and Gypsum.	2 F.-Y. Manure and Gypsum. *a*
6 Nitrate of Soda.	3 No Manure.	6 F.-Y. Manure and Nitrate of Soda.	3 F.-Y. Manure and Nitrate of Soda. *a*	6 Gypsum.	3 Lime Compost.

The plan shows three plots, 10, 11 and 12, of one-tenth of an acre each, sub-divided into eighteen, so that we have to deal with one-sixtieth of an acre in each of these experiments. The manures and quantities used in 1879 were :—

Farm-yard Manure, 26 loads	(of 2,000 lbs.)	per acre.
Superphosphate (mineral)	400 lbs.	"
Nitrate of Soda	200 "	"

Bone Dust	400 lbs. per acre.
Salt	400 " "
Gypsum	400 " "
Compost, 26 loads	(of 2,000 lbs.) "

We have these separately, as also, with the exception of compost, all in duplicate association with farm-yard manure, making seventeen distinct applications—that without any manure completing the list. The farm-yard manure was got from covered hammels where young cattle were being suckled by their dams visiting twice daily, and fed on cut fodder of corn, straw, and hay, with a mixture of bran, corn meal, and a little oilcake; the superphosphate was the ordinary kind from Belleville; bone dust from Toronto manufacture, well ground and not new; salt from Goderich; gypsum (land plaster) from Paris, and the compost of our own making from two years' gathering of experimental vegetable refuse mixed with one of lime to seven of itself.

The duplicating of farm-yard manure with the five purchased fertilizers was primarily for the purpose of testing to what extent they would be affected—for good or bad—by admixture *one month previous to application*, that is on the 1st April, 1879, while the others were left to the 28th, or immediately before ploughing and seeding.

As in 1879, the crop in 1880 was spring wheat, White Russian variety, and we shall first tabulate its conduct during season of growth.

Plot.	Sub-division.	Manure.	Perfection being 10.					
			Condition on July 12th.	Condition at Harvest.	Rust.	Tillering.	Length of Straw.	Strength of Straw.
X.	1	F.-Y. Manure and Superphosphate (*a*)	7	7	7	8	8	8
	2	F.-Y. Manure	8	8	7	8	9	8
	3	No Manure	6	6	6	7	8	8
	4	F.-Y. Manure and Superphosphate	6	7	7	8	8	8
	5	Superphosphate	3	2	6	5	8	8
	6	Nitrate of Soda	4	4	6	6	8	8
XI.	1	Bone Dust	5	5	7	6	8	8
	2	F.-Y. Manure and Bone Dust (*a*)	6	7	7	8	9	8
	3	F.-Y. Manure and Nitrate of Soda (*a*)	6	6	7	7	9	8
	4	Salt	5	5	7	7	8	8
	5	F.-Y. Manure and Bone Dust	4	3	6	5	7	8
	6	F.-Y. Manure and Nitrate of Soda	5	5	6	6	8	8
XII.	1	F.-Y. Manure and Salt (*a*)	5	6	7	8	8	8
	2	F.-Y. Manure and Gypsum (*a*)	5	7	7	9	8	8
	3	Compost	5	8	7	8	9	8
	4	F.-Y. Manure and Salt	8	8	7	8	8	8
	5	F.-Y. Manure and Gypsum	8	8	7	8	8	8
	6	Gypsum	7	8	7	8	8	8

The condition of the crop during the early part of July varied very much, as will be observed. That upon superphosphate and nitrate of soda was particularly poor; very many of the sub-divisions did not show over five marks out of the ten, and only three reached eight. These three were farm-yard manure alone, and farm-yard manure associated with salt and gypsum respectively.

So again, when at maturity, these extremes of condition maintained their own in the case of the best, but fell off in that of the poorest, and when we take the unmanured plot as our guide with its fair mark of 6, there is surely ground for questioning the good from the use of superphosphate and nitrate of soda, as well as others, singly or in combination, upon wheat.

But rust was worst on these poorer crops, as also where no manure was given, and

in the case of the poor result from combinations of farm-yard manure with bone dust and nitrate of soda, this disease seemed to be as bad.

The vigour of a plant is evidenced in one way by sending up numerous shoots from the one seed, or what is called tillering; the best example of this was from farm-yard manure and gypsum combined, and one of the poorest from superphosphate.

Strength and length of straw were most prominent from farm-yard manure, compost, and the association of bone dust and nitrate of soda with farm-yard manure.

Yield of Grain and Straw per acre, with quantity of Small Grain.

Plot.	Sub-division.	MANURE.	Grain.	Straw.	Small grain.
			Bushels.	lbs.	Bushels.
X.	1	Farm-yard Manure and Superphosphates (*a*)	7	1,740	2½
	2	Farm-yard Manure	13½	1,860	3½
	3	No Manure	8¼	1,440	1¾
	4	Farm-yard Manure and Superphosphate	11½	1,470	2¼
	5	Superphosphate	5½	870	1½
	6	Nitrate of Soda	14	960	1½
XI.	1	Bone Dust	16	1,260	2
	2	Farm-yard Manure and Bone Dust (*a*)	19½	1,800	2¾
	3	Farm-yard Manure and Nitrate of Soda (*a*)	23	1,920	1¾
	4	Salt	17½	1,200	2
	5	Farm-yard Manure and Bone Dust	22½	1,200	1½
	6	Farm-yard Manure and Nitrate of Soda (*a*)	23	1,560	2½
XII.	1	Farm-yard Manure and Salt (*a*)	20	1,935	4
	2	Farm-yard Manure and Gypsum (*a*)	21¼	2,190	3½
	3	Lime Compost	20½	2,100	3¾
	4	Farm-yard Manure and Salt	20	2,160	3½
	5	Farm-yard Manure and Gypsum	20½	2,040	3
	6	Gypsum	17½	1,680	3¼
		Means	18½	1,616	

The result, to the average practical farmer, may be called a failure, but to such as ourselves, and therefore to the more careful weigher of causes and effects, the conduct of this second years' crop of wheat upon land manured in 1879, cannot fail to be interesting. If the blight formerly referred to was the main reason for such a small average yield as 6½ bushels per acre, it must be borne in mind that on such a small area as one-tenth of an acre, having one aspect and one physical condition of soil all over, any atmospheric affection would be uniform *unless influenced by conditions brought about by the manures applied.* We start, therefore, with the clear understanding that variations in amount of grain and straw have been caused directly or indirectly by character of manure. There is such a large falling off in produce from 18½ in 1879 to 6½ bushels in 1880, as at once to raise the question whether it is not owing more to climatic causes than to condition of soil, and thus we must look to comparative facts for confirmation of the position I take, that while it is so unquestionably, yet the manurial influences were the strongest.

For example, the lowest produce last year was from farm-yard manure, and that without manure—this year both are second highest among the eighteen examples, the only one a shade better being from compost. Why then does farm-yard manure, and particularly the plot unmanured, give 90 per cent. more grain and straw this year than that (superphosphate 3½) which produced as much as 14 bushels last year? I take the two extremes for the stronger argument.

I must confess, however, to much surprise at the *continued equal position* of the grain and straw from farm-yard manure, and from that which got no manure, thus:

	1879.		1880.	
	Grain.	Straw.	Grain.	Straw.
Farm-yard Manure	13½	3,810	8¼	1,860
Without Manure	13½	3,270	8¼	1,440

Taking, first, the unmanured result as the only safe base for comparison, it is plain that the falling off in its case from 13½ to 8¼ bushels is owing to one of two, or to the two causes combined, of weather, and exhaustion of soil; if more to exhaustion, then why have we a crop in 1880 from the unmanured equal to that from farm-yard manure? Does the farm-yard manure still give straw only and not increase of grain? for as will be readily observed, not only was the straw in 1879 14 per cent. more from the farm-yard manure, but it is also 23 per cent. more in 1880 than the unmanured land.

Another distinct feature of the experiment is the result from pure mineral fertilizers :—

	1879.		1880.	
	Grain.	Straw.	Grain.	Straw.
	Bushels.	lbs.	Bushels.	lbs.
Superphosphate	14	3,120	3½	870
Nitrate of Soda	16	3,840	5¾	960
Salt	17½	3,030	4¾	1,200
Gypsum	17½	3,090	6¼	1,680
Means	16¼	3,270	5⅛	1,178

Here, again we must look to the unmanured returns for comparison with these, and note first that while superphosphate in 1879 gave practically the same result (½ bushel more), it has fallen off to such an extent in 1880 that twice the seeding only was obtained, and hence nearly five bushels less than the unmanured. Why less than the unmanured? Has harm resulted directly, or through combination of weather influences to the crop? because we are surely allowed to argue that if no superphosphate had been applied to this particular plot, which is contiguous to the other, a crop equal to the unmanured one would have been obtained. Harm of some sort must have, or has, resulted from the application of this mineral fertilizer; not only did the first crop not make use of it, but the second has succumbed directly or indirectly to its influence.

The nitrate of soda in 1879 gave a little more grain and a great deal more straw than the unmanured, but the falling off in 1880 of both straw and grain is very large. Indeed, it is evident that the immense rush of straw in 1879 took with it much, if practically not all, the fertilizing properties of this salt, if any was left, it did no good and, probably some harm.

Common salt alone was advantageous last year to the extent of four bushels per acre over the unmanured, with corresponding straw; this year there is neither grain nor straw within 250 per cent. of itself, nor 200 per cent. of last year's unmanured.

Last year gypsum alone stood equal to salt, but this year it is 26 per cent. better, both in grain and straw ; and again I must impress the fact that here is further proof of the weather not having had all to do with these results. Were the salt and gypsum of equal fertilizing powers, in their continuance, the record now would not be so wide as it is with these minerals.

What now of the behaviour of these pure minerals, in *combination* with farm-yard manure?—

	1879.		1880.	
	Grain.	Straw.	Grain.	Straw.
	Bushels.	lbs.	Bushels.	lbs.
F.-Y. Manure and Superphosphate	17	3,770	6	1,605
F.-Y. Manure and N. of Soda	23	4,000	7¾	1,740
F.-Y. Manure and Salt	20	3,420	6¼	2,047
F.-Y. Manure and Gypsum	21¼	3,040	7¼	2,115
Means	20¼	3,532	6¾	1,877

Those least last year hold exactly the same relative position this year, in the order of :

Superphosphate .....17 and 6
Salt .....20 and 6¼
Gypsum.....21¼ and 7¼
Nitrate of Soda.....23 and 7¾

Altogether, however, a very uniform yield in grain, the straw from farm-yard manure and gypsum being superior, and very much reduced in quantity in the cases of superphosphate and nitrate of soda.

The highest result in grain, and one of the best in straw, was from lime compost, which last year also gave one of the best returns.

The most striking fact in all these returns is, that, not only last year, but this year, the yield of wheat from unmanured land was largely over the mean of all the manured ones, in the face of the other fact, that the soil cannot be called rich, naturally or artificially, as evidenced by the average produce of almost 11 bushels of grain per acre (13½ and 8¾).

We are called upon to conclude, at this stage of this experiment, that much of the soils of Canada is yet in no need of special fertilizers, even when they are partially exhausted, and that the best method of recuperation is by systematic rotation of crops, and the liberal use of farm-yard manure.

8.—The effects of 19 Varieties of Manures on Wheat, as applied to Turnips in 1879. (Part of Farm, Field No. 9.)

This, the second year of a very varied experiment to test the permanency of various manures, alone and in combination, by a rotation of cropping, has exhibited results as interesting as last year, meagre as has been all cropping in comparison with the like wheat on the same field by our regular field rotation, which, let me at once say, was 19½ bushels per acre.

Plot.	MANURES.	Grain per Acre.	Straw per Acre.	Small Grain per bushel.
		Bushels.	lbs.	lbs.
5	Farm-yard Manure	9 1/6	1280	4
2*	Gypsum	7 1/3	960	5
19	Salt	6	720	4
1	Gypsum and Mineral Superphosphate	6	700	5
7*	Bone Dust	5 1/2	880	3 1/2
6	Bone Superphosphate and Bone Dust	5 1/2	720	7
10	Bone Dust and Salt	5 1/6	820	6 1/2
9	Bone Superphosphate and Salt	5 1/6	720	14
16*	Bone Superphosphate and Mineral Superphosphate	4 5/6	640	6
14	Mineral Superphosphate and Salt	4 1/3	660	16
20	Nitrate of Soda	4	460	5
18	Lime	3 5/6	540	5
12	Bone Superphosphate	3 1/3	640	4
8	Mixture of all 2, 7, 12, 17 and 19	3 1/2	500	4
17	Mineral Superphosphate	3 1/3	520	2 1/2
4	Bone Dust and Gypsum	2 2/3	480	4 1/2
3	Bone Superphosphate and Gypsum	2 2/3	460	3 1/2
15	Gypsum and Salt	2 2/3	640	8 1/2
13	No Manure	2 1/2	400	4
11*	Mineral Superphosphate and Bone Dust	2 1/3	400	9
	Means	4 2/3	657	6

Ere criticising this table, I beg our readers will peruse the introductory remarks to the chapter herewith on plots 10, 11 and 12 of field C, and be assured that we are looking for something besides weight of produce per acre in this experimental search of finding what certain manures or plant fertilizers do under equal conditions during a series of years.

Here, the story last year, was a crop of turnips, as a start with these nineteen forms, with a result as regards produce in the following order.

ORDER OF MERIT BY AMOUNT OF PRODUCE IN 1879.

Largest—Farm-yard manure.
Mineral superphosphate and gypsum.
Bone dust and salt.
Bone superphosphate and mineral superphosphate.
Mineral superphosphate.
Bone dust and gypsum.
Bone superphosphate and gypsum.
Bone superphosphate and salt.
Bone superphosphate and bone dust.
Mineral superphosphate and salt.
Bone superphosphate.
Mixture of 2, 7, 12, 17, and 19.
Mineral superphosphate and bone dust.
Bone dust.
Gypsum.
Salt.
Lime.
No manure.
Gypsum and salt.
Least—Nitrate of soda.

The first striking fact in the cropping of 1880 is that *Farm-yard Manure* is again far in advance of all others, fully four times the lowest from mineral superphosphate and bone dust, and double the mean of all.

Gypsum is second this year, as against its fifteenth place last year, a result very gratifying, and evidence of more permanency than many of us are inclined to grant to this mineral.

Salt was in the very low position of sixteenth last year—it is now third, and equal to a combination of gypsum and mineral superphosphate. Salt, immediately to roots, has had a much superior effect on a succeeding crop of wheat than upon the roots themselves.

The *Gypsum and Mineral Superphosphate* hold nearly an even position each year—second last year and fourth this year, among nineteen competitors.

Bone Dust alone is now working its way up the permanent scale—from fourteenth last year to fifth this year.

Associated with *Bone Superphosphate*, *Bone Dust* is also advancing steadily, being now sixth as against ninth last year.

Bone Dust and Salt, in the third place last year, has now gone down to the seventh, a combination not equal to the separate results of these fertilizers.

We have *Bone Superphosphate and Salt* in exactly the same place both years.—eighth.

This year *Bone Superphosphate and Mineral Superphosphate* have descended from the fourth to the ninth place in this matter of quantity of produce.

Bone Superphosphate and Salt make very little difference in their story this year as against that of 1879.

Nitrate of Soda came out lowest of all last year, and it will surprise some to note how it has risen nine steps in the making of wheat during 1880. There was no rush of straw, but a comparatively low yield of it.

Lime has followed nitrate of soda as regards advance in relative position—from seventeenth to twelfth.

So again, *Bone Superphosphate* alone gives an even account of itself—on the whole low, but keeping its place.

The *Mixture* (of gypsum, bone dust, bone superphosphate, mineral superphosphate, and salt) is also in agreement with its previous conduct.

Mineral Superphosphate made a good record last year, having stood fifth, as we would expect with roots, but to wheat it is comparatively indifferent, standing as low as fifteenth among nineteen.

Our somewhat prominent fertilizers, *Bone Dust and Gypsum*, in their single effects, do not maintain their record when associated, nor are they nearly up to their first year's place as a combination.

Bone Superphosphate and Gypsum are this year seventeenth, or ten places below that of 1879.

Gypsum and Salt seem to be a poor combination in any case—so much so that the chemist will have to say why.

Last year the plot that received *no manure* was better than gypsum and salt combined, as well as nitrate of soda alone; this year it is not yet at the bottom, being superior to a mixture of mineral superphosphate and bone dust.

Therefore, *Mineral Superphosphate and Bone Dust* have fallen from the thirteenth place to the twentieth, or lowest of all.

9.—*Five Years' Experience of Thirty-Three Forms of Fertilizers.*

Five years' experience should be of some value in this matter. Facts should now be accumulating in our farm practice, and special experiments, from which indications, at least, if not reliable conclusions, ought to be gathered in regard to the fertilizing properties of what are called manures—singly, and in combination with each other. Appended, therefore, find a complete table of what we have realized during the last five years throughout some 2,000 trials from ten of our most common farm crops.

The natural question is, what can be gathered from these for the use of the average farmer? I think several important facts:—

1.—That many varieties of fall wheat with twenty tons per acre of good farm-yard manure have given an average of 41 bushels per acre.

2.—That our ordinary farm practice of sending all manures through the root division

of the rotation has resulted in 18 bushels of spring wheat; 47 of oats; 34 of barley; 1⅛ ton of hay; 836 bushels of mangolds; 705 of turnips; 614 of carrots, and 162 of potatoes.

3.—That farm-yard manure, without any other help, has given us 19 bushels of spring wheat; 48 of oats; 34 of barley; 895 of mangolds; 450 of turnips; 666 of carrots, and 255 bushels of potatoes per acre.

4.—In association with lime, salt, bone dust, nitrate of soda, gypsum, and mineral superphosphate, farm-yard manure produces 20 bushels of spring wheat on an average, but the effects for the second and third years were comparatively little.

5.—Five kinds of mineral fertilizers, in their single effects, made an average of 16 bushels of spring wheat per acre, with a rapidly reducing result after the first year.

6.—Mineral fertilizers gave 22 bushels of barley, and 26 of oats.

7.—In fifteen different forms, singly, and in association, these mineral fertilizers gave 290 bushels of turnips per acre on an average.

And thus, all over, any one may continue this kind of analysis from the table.

Five Years' Experience of Thirty-three Forms of Fertilizers upon Ten Kinds of Crops, Representing over 2,000 Experiments. All Quantities in Bushels.

Manures.	Fall Wheat.	Spring Wheat.	Oats.	Barley.	Hay.	Mangolds.	Turnips.	Carrots.	Sugar Beet.	Potatoes.	
Farm-yard Manure, Fall application	41	20	...	...	...	988	451	724	...	...	
Farm-yard Manure, Spring application	....	18	48	34	...	793	450	608	...	255	
Farm-yard Manure and Lime	...	....	42	....	...	...	...	382	...	...	
Farm-yard Manure and Salt	...	20	...	...	...	...	...	...	...	...	
Farm-yard Manure and Bone Dust	...	22	...	...	...	...	...	...	...	...	
Farm-yard Manure and Nitrate of Soda	...	23	...	...	...	...	...	...	...	...	
Farm-yard Manure and Gypsum	...	21	...	...	...	...	...	...	...	...	Once.
Farm-yard Manure, Salt and Bone Dust	...	....	...	...	...	939	...	...	...	...	
Farm-yard Manure, and Mineral Superphosphate	...	18	...	...	...	275	...	175	...	...	
Farm-yard Manure, Superphoshate, Gypsum and Salt	...	...	...	...	...	365	521	290	...	128	
Farm-yard Manure, Gypsum, Bone Dust and Salt	...	18	47	34	1 4-5 tons.	836	705	614	...	162	Farm practice.
Bone Dust	...	14	26	19	...	521	406	675	752	...	
Bone Dust and Salt	...	....	...	....	...	...	350	...	...	...	
Bone Dust and Bone Superphosphate	...	...	...	...	...	...	300	...	...	...	
Bone Dust and Mineral Superphosphate	....	....	...	....	...	...	245	...	...	...	
Bone Dust and Gypsum	...	11	...	...	...	...	306	...	...	...	
Lime	...	...	...	...	...	...	131	...	...	...	
Lime Compost	...	21	...	...	...	...	...	...	...	...	
Sewage	...	....	...	...	...	978	...	...	1735	...	Two years.
Salt	...	18	...	20	...	755	145	...	...	...	
Mineral Superphosphate	...	17	39	27	...	692	354	583	524	193	
Farm-yard Liquid and Lime	...	17	...	...	...	...	...	...	...	...	
Nitrate of Soda	...	14	38	27	...	646	632	610	628	...	
Gypsum	...	18	23	....	...	541	216	624	464	...	
Gypsum and Leeched Ashes	...	...	41	...	...	...	...	...	...	...	
Gypsum and Salt	...	...	...	...	...	...	67	...	...	...	
Gypsum and Mineral Superphosphate	...	...	...	...	...	...	353	...	...	...	
Gypsum, Bone Dust, Bone Superphosphate, Mineral Sup. and Salt	...	...	...	...	...	...	279	...	...	...	
Bone Superphosphate	...	...	...	...	...	...	275	...	...	...	
Bone Superphosphate and Mineral Superphosphate	...	...	...	...	...	...	333	...	...	...	
Bone Superphosphate and Salt	...	...	...	...	...	...	303	...	...	...	
Mineral Superphosphate and Salt	...	...	...	...	...	...	269	...	...	...	
Apatite	...	...	...	...	...	...	...	...	...	...	1st year.
Detroit Potato Grower	...	....	...	...	...	...	...	...	...	199	Once.

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Farm-yard Manu
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Long Yellow
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" "
Yellow Globe
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" "

10.—*Apatite upon Fall Wheat.*

This was undertaken by desire of the Dominion Government, who sent the material with instructions as to mode of application, per J. Gemmell, Esq., of Ottawa.

Three plots, contiguous, and as nearly equal as possible in all essentials, were laid off in field 8, on the 20th October, 1879.

On plot 1, about 20 tons of farm-yard manure were applied per acre ; on plot 2, on the 29th October, 500 lbs. of apatite per acre, and the like quantity on the 27th May was applied to the crop ; and plot 3 got no manure of any kind ; result as follows :—

Manure.	Produce Per Acre.		Small grain per acre.	Weight per bushel.
	Grain.	Straw.		
	Bush. lbs.	lbs.	Bush. lbs.	lbs.
Farm-yard Manure	33 35	2,015	1 15	59
Apatite	29 15	1,750	.. 45	59
No Manure	29 5	1,740	.. 35	58

The wheat was the Clawson, or Seneca ; previous crop pease, and the soil had received no fertilizer for seven years except 200 lbs. of gypsum to hay in 1876—thus in good trim for such a trial. The small grain is included in the total quantity per acre.

The practical observant reader will note several points in favour of this mineral fertilizer, with a probable better record next year.

11.—*Produce of Roots at Various distances apart on the Drill.*

Many of our most intelligent farmers still doubt the fact, well known to the experimentalist at least, that the nearer bulbs are cultivated to each other the greater the produce per acre, and that there is a limit to this ; the fact is indisputable, but as it is one thing to make the assertion and another to give proof, we have again made a careful trial with a variety of mangolds—the result is thus tabulated :—

——	Distance apart on the Drill.	Average Weight of Bulbs.	Bushels per Acre.
	Inches.	lbs.	
Red Globe	6	1·531	729·20
"	12	1·823	578·40
"	18	2·862	627·40
"	24	3·742	611·20
Long Red	6	1·777	896·00
"	12	2·345	760·40
"	18	2·976	597·20
"	24	2·400	385·20
Long Yellow	6	1·506	805·00
"	12	2·000	620·40
"	18	2·563	562·21
"	24	3·285	536·40
Yellow Globe	6	1·881	851·40
"	12	1·941	613·40
"	18	4·553	998·40
"	24	3·781	564·40

	Distance apart on the Drill.	Average Weight of Bulbs.	Bushels per Acre.
	Inches.	lbs.	
Improved Mammoth Long Red	6	1·915	872·40
" "	12	2·656	830·40
" "	18	3·959	868·00
" "	24	3·785	618·20
Carter's Warden Prize	6	1·651	828·20
" "	12	2·924	672·00
" "	18	2·851	625·20
" "	24	3·343	546·00
Red Intermediate	6	1·771	868·00
"	12	2·144	690·40
"	18	3·170	695·20
"	24	3.114	508·40
Long White Sugar Beet	8	2·523	1148·00
" "	12	4·143	1169·00
" "			
White French Sugar Beeet	42	5·690	531·00

Drills were 28 inches apart in all cases, and of course all were similarly manured and cultivated, on soil as nearly alike as possible.

An examination of the table shows that out of the 31 examples there are but five instances in which there is not a large decrease in produce per acre from the close distances to the wider distances apart between plant and plant up to a certain point. The five exceptions are the Red Globe at 12 inches, the Yellow Globe at 18 inches, the Improved Mammoth Long Red at 18 inches, the Red Intermediate at 18 inches, and the large White Sugar Beet at 12 inches, and these may have been brought about by extra favourable circumstances unknown to us. But before discussing the whole question, let us analyze these figures by another table:

Mean produce at different distances apart—plant to plant.

	Average weight of Bulbs.	Average produce per acre.
	lbs.	Bush.
At 6 inches	1.720	836
" 12 "	2.262	652
" 18 "	3.276	710
" 24 "	3.350	538
Mean	2.652	684

At six inches apart from plant to plant on the drill, therefore, we obtain an average bulb of $1\frac{3}{4}$ lbs. weight and 836 bushels per acre; at 12 inches apart the bulbs attain to $2\frac{1}{4}$ lbs. each, and give only 652 bushels per acre; at 18 inches apart bulbs rise to $3\frac{1}{4}$ lbs. and return 710 bushels per acre; and at 24 inches from plant to plant the bulbs reach the very larger average of $3\frac{1}{3}$ lbs., but produce only 538 bushels per acre.

Now, in the first example, there are but two exceptions to the fact that the produce

per acre is 34 per cent. larger than the mean of all the other forms of production; as much as 30 per cent. over those of 12 inches; as much as 18 per cent. over the large yield of 710 bushels at 18 inches apart; and no less than 56 per cent. more than the 24-inch ones. We had a fine braird of plants all over, and fairly favourable conditions throughout, as evidenced by the good average of 684 bushels per acre.

So, then, the question is, Why thin out to any other distance than that of about 6 inches? All we want is room to cultivate with the horse hoe, and here, permit the remark, that, were it possible to do so safely and thoroughly at 8 or 12 inches between drills, in place of 28 inches as in this case, it is almost safe to say that the produce would be at least *one-third* more, that is to say, the 836 bushels would have been 1,100.

Leaving this latter point for another occasion, it is our duty to note another important fact in this experiment:

We have seen that, between the 6 and 18 inch spaces, there is a large falling off in produce per acre, (not per bulb remember), and that there is a large increase from the 12 to the 18. It is plain from the figures that this increase arose from the weight of individual bulbs, nearly $3\frac{1}{3}$ lbs. each. Had we had this size of bulb at 6 inches apart the yield would have been 1,666 bushels per acre. But very large bulbs, or bulbs that increase gradually in size, as space is allowed between the plants, does not imply a corresponding increase per acre; as to this, note that while at 24 inches the bulbs rise to fully $3\frac{1}{3}$ lbs. each, the produce is reduced to 538 bushels. There is then a limit to *wide* distances between plants; eighteen inches are too much, because at 6 we have 18 per cent. more; if the bulb would increase proportionately at 9 inches apart, as we obtain it from $1\frac{3}{4}$ to $2\frac{1}{4}$, the produce would be 817 bushels; twelve inches are either too much or too little, and thus the question lies between small bulbs and large bulbs. When we are able to tell if there be any difference, and what, if any, in the nutritive value of large as against small bulbs, we will be in a position to choose the growing of either; but until it is shown that the large is superior to the small, to such an extent as to give more feeding value *per acre* than those from 6-inch distances, it is plain that, if we want the *bulk* per acre, we should secure plants at or about 6 inches in the row. It may be that smallness gives more toughness or woodiness than the medium and larger roots, and that *fibre* is not so nutritive as flesh in this case.

The sugar beet cultivation in the first table is not included in the foregoing results. With reference to them it will be noticed that there is practically little difference in weight per acre between 8 and 12 inches plant to plant, the while that the 12 inches give bulbs 80 per cent. larger than the other. Here again *numbers* give weight. A very extravagant extreme is shown in the case of the White French sugar beet. These, thinned out to 42 inches between plant and plant, on drills 28 inches wide, give the very large average of $5\frac{3}{4}$ lbs. per bulb, and the very small produce of 531 bushels per acre.

12.—*An early catch of Mangolds and Carrots.*

On 29th October, 1879, land was manured with twenty tons of farm-yard manure, and ploughed under. On 15th April seeding was well done in drills twenty-eight inches apart. Brairding was irregular on 24th May, by reason of unfavourable weather, and by 22nd June, Mangold leaves from opposite drills were meeting. No late frosts interfered. On 12th July bulbs of Mangolds were three inches in diameter, and Carrots one inch.

Result.

Long Red Mangolds, 1070 bushels per acre.
White Belgian Carrots, 901 " " "

13.—*Grasses and Clovers.*

Italian and Perennial Rye grasses sown in 1878 are now disappearing—white clover taking their place. There has been a self re-seeding to some extent. On the borders of the sewage ditch these grasses are strong and rank, and holding better than anywhere else.

In 1879 we seeded with "Carter's mixture of grasses and clovers for clay soil." The appearance on 1st April, 1880, was very doubtful; on 24th May there was a good show of common trefoil and white clover, but little else. June gave the heaviest sward of alsike, red, white and trefoil clovers in all our experience, with a few plants of the rye grasses, which latter improved very much by November.

Sweet Vernal grass laid down in 1878, is now all off its old site, but some plants from self-seeding have done fairly well in shelter among other grasses.

What we got as *Bent*, variety not named, and seeded in 1878, is doing well, gave a cut of short hay, with little after math.

The Crested Dog's Tail (1878) is practically a failure.

Red Top is equal to timothy—thick and fine, but offers little pasture after cutting.

Meadow Fescue (1878) is also very good, comparable with timothy, gives good pasture, less bunchy and finer than timothy and orchard.

Kentucky Blue grass (1878) is a close sward all over.

Fan-oat grass, (1878). A very fine crop, gives good hay and very good pasture.

14—*Potatoes in Field 17.*

The land was prepared as for sowing mangolds, except that the salt, bone dust, and superphosphate was applied after the drills were made.

Potato sets were planted eight inches apart, in drills twenty-eight inches apart, on May 28. Covered by splitting the drills with a plough.

June 14th.—Harrowed with a light harrow to kill weeds and break down drills.

June 30th.—Hoed with horse and hand hoe.

July 9th.—Earthed up with a horse hoe.

October 15th.—Potatoes taken in and weighed.

VARIETY.	Bushels per Acre.		REMARKS.
	Bus.	lbs.	
Brownell's Vermont Beauty	112	56	Large tubers.
Eureka	199	44	Very good, uniform, medium size.
Brownell's Superior	143	44	Small, unsound.
Compton's Surprise	122	16	Small, poor.
Perfection	112		Small.
Late Rose	161	28	Very fair tubers.
Snowflake	160	32	Small.
Peerless	173	36	Largest and best tubers, fewest small ones
Early Ohio	151	12	Fair size.
Alpha	51	20	Very small.
Extra Early Vermont	179	12	Rough, fair size.
St. Lawrence	193	12	Medium size.
Success	191	20	Rough, medium size.
Average of 13 varieties	150	11	

15.—*Green Fodders.*

Lucerne, Field A.

Laid down in 1877, one-half broad cast and the other half in drills.

May 11th, 1880.—The broadcast starts more rapidly in the spring than the drills; at this date it stands six inches high and we cut three tons per acre. It has been severely upheaved by the frost, about half being killed. It does not grow so strong as last year.

June 12th.—Top-dressed with well rotted farm-yard manure eighteen loads per acre and harrowed in.

July 12th.—Horse-hoed and harrowed the drills and re-seeded broadcast, so as to save labour in keeping the drills clean.

Nov. 11th.—The drills are now much stronger than the broadcast, or the re-seeded part.

July 12th.—Has produced plants four inches high.

Date of Cutting.	Broadcast.	Drilled.
May 20th	6,020 lbs.	3,400 lbs.
September 26th	4,050 "	6,020 "
October 21st	2,970 "	3,240 "
	6½ tons.	6½ tons.

Prickly Comfrey.

Planted in 1879, three feet apart each way. On April 5th, 1880, it was starting to sprout.

April 24th.—This is the first green fodder of the season, being ahead of lucerne. It is not in the least injured by the severe winter.

We took the first cutting on May 11th, and on May 24th it was ready to cut again, and sending out seed stalks.

July 7th.—Top-dressed with rough manure, 15 loads per acre.

Date of Cuttings.	Weight.
May 11th	1¼ tons per acre.
June 1st	2¾ " "
July 2nd	2¼ " "
October 1st	3½ " "
Total	9¾

Spring Rye.

This plot was manured, twenty loads per acre, with farm-yard manure, and fall ploughed in 1879.

April 26th, 1880.—Gang-ploughed, harrowed, and drilled with spring rye, two bushels per acre, and seeded with red clover, forty pounds per acre. On May 24th, it looked very fine, better than tares and oats, and growing very thick.

June 14th.—*Cut ten tons per acre*, green. It could have been used on June 1st.

Oct. 1st.—The clover on this plot looks as well as that on the plot next to it, which was sown without any other crop.

Tares and Oats.

The land for these was prepared the same as for spring rye.

April 26th.—Sowed first batch, equal parts of tares and oats by measure, two bushels per acre in all.

June 14th.—Made second sowing, two bushels per acre.

July 6th.—Cut first sowing as plants were begining to head out, they would have given a fair cut three weeks ago.

Aug. 20th.—Cut second sowing. The oats were poor and rusty.

July 6th.—First cutting $8\frac{1}{4}$ tons per acre.

Aug. 2nd.—Second cutting $2\frac{1}{4}$ tons per acre.

Sainfoin.

The land was prepared the same as for spring rye.

April 28.—Sowed sainfoin thirty pounds per acre.

June 15.—Seed has not germinated well.

July 1st.—The weeds are getting so much ahead of the sainfoin as to threaten the destruction of the sainfoin entirely ; we mowed weeds to keep them from seeding.

Oct. 1st.—The sainfoin is now beginning to push and spread.

Nov. 11th.—It is growing much better now and spreading, and is not yet in the least injured by frost.

Indian Corn.

The land was prepared the same as for spring rye, ploughed and harrowed on June 14th.

June 15th.—Sowed Indian corn with drill, two bushels per acre.

Aug. 11th.—Cut green corn *nine tons per acre*, plants being short.

Rape.

This plot was manured from the farm-yard, and ploughed in the fall of 1879.

June 14th, 1880.—Ploughed and harrowed.

June 18th.—Sowed rape on drills, four pounds per acre.

August 5th.—The rape was long enough to pasture with sheep, and on August 11 was long enough to give a good cutting.

August 19th.—Cut first cutting of rape, $6\frac{1}{4}$ tons per acre.

October 22nd.—Cut second crop of rape, 4 tons per acre, making a total of $10\frac{1}{4}$ *tons per acre.*

Thousand-Headed Kale, or Tree Cabbage.

The land was prepared at the same time and in the same way as for rape.

June 18th.—Sowed kale the same as rape seed ; as soon as the plants were large enough they were singled and cultivated like turnips.

September 25th.—We cut a part of the plot, which gave 4½ tons of green feed per acre.
October 22.—Cut the balance of the plot, which gave 11½ tons per acre.

Lucerne, Field C, Plot 18.

This plot was sown in drills in the spring of 1876 (see former reports).

May 24th 1880.—Two thirds of this crop is gone, either from the severe winter or from natural exhaustion. The plants are heaved four inches and rotten in the centre of the stalk. What plants are left are growing vigorously.

June 25th.—Loosened the soil well with horse hoe, harrowed, and sowed lucerne, forty pounds per acre, broadcast and rolled.

July 10th.—The young plants have made a good start and look well.

October 30th.—This crop has grown wonderfully long, thick and tender, and yielded a cutting of *six tons per acre*, which was fed to sheep; they like it and thrive well on it. When sown broadcast it grows more tender, and stock prefer it better than that cut from the drills. The leaves are more easily injured by frost than red clover.

16.—*Permanent Pasture, Field C., Plot 33.*

The rotation of crops on this plot has been as follows:

In 1876, oats, no manure.

In 1877, wheat, farm-yard manure, 30 loads per acre; and gypsum 200 lbs. per acre.

In 1878, April 23rd, seeded with a mixture of grasses and clovers, that are sown separately on plot 34, forty pounds per acre, and manured with a mixture of all our artificial manures (see 1878-9 reports).

1880, April 5th.—This plot looks well and would make better pasture than any of our other pasture or meadow fields. The clovers, and especially the great strong wedgy roots of lucerne have been badly heaved by the frost.

May 22nd.—Put four rams to graze on one-half of the plot for seven days. They were also fed one quart of grain per day, so that at this date the pasture was able to support eighty sheep per acre, for seven days, along with half a pint of grain per head per day.

May 25th.—From the other half of the plot we took grass equal to one hundred pounds of hay, and this would have kept two sheep for a week.

May 29th.—Removed two sheep and put the other two where the grass was cut. Lucerne grows rapidly and sheep eat it first.

June 5th.—Let two rams have the run of the whole plot.

June 12th.—Took sheep off.

June 22nd.—Put four rams on for four days.

The lucerne shoots ahead of the other clovers and grasses, and grows fine and tender, sheep are very fond of it and eat it down first.

July 10th.—Put four rams on for three days.

Lucerne, white, and trefoil clovers are doing well, also orchard, fan-oat, meadow fescue, English rye, and rib grasses. No doubt there are other kinds that cannot be distinguished among so many.

October 4th.—Put four rams on for two days.

November 12th.—Orchard grass is thriving, and at present is thickest and strongest; lucerne is also doing well, white and trefoil clovers, rib grass and meadow fescue are plentiful, the whole plot is covered with four inches of thick pasturage. Put six sheep on for one day.

The pasturage for the season, then, is equal to 112 days for one sheep, and would have kept four sheep for a week more, making 140 days for one sheep, *or over seven sheep per acre, from May 15th to November 15th.*

17.—*Barley in Field A.*

These plots were manured and ploughed in the fall of 1879, after a crop of oats had been taken off; gang-ploughed this spring, and seeded with barley on May 14th, two bushels per acre; and on May 15th seeded with grasses and clovers, thirty pounds per acre.

Carter's Chevalier, Potter's Prize, and Hallett's Pedigree, are two-rowed varieties, obtained from Carter and Co., London, England, in 1878; they are all very much alike. Russian Hulless is a two-rowed variety with fine, weak straw, got from Centennial Exhibition. Russian and Spring are six rowed varieties from the Centennial Exhibition, both good kinds. Thanet and Probestier are old varieties, the six-rowed is from the Centennial Exhibition, the grain is small and bright; the straw is very good, long and strong.

BARLEY OF 1880 PRODUCE.

VARIETY.	Appeared above	on July 13th.	Harvest.	Straw.	Date	Straw.	Headed	Produce per Acre.	per Acre.

Barley of 1880 Produce.

VARIETY.	Appeared above Ground.	Condition on July 13th.	Condition at Harvest.	Strength of Straw.	Length of Straw.	Date of Harvesting.	Headed out.	Produce per Acre.		Small Grain per Acre.	lbs. per Bushel.	Remarks.
								Straw.	Grain.			
								lbs.	B. lbs.	B. lbs.		
Potter's Prize	May 25th	*10	*9	*8	*9	Aug. 9th	July 13th	2,150	28 6	6 15	51	Two-rowed.
Carter's Chevalier	" 25th	10	9	8	9	" 9th	" 13th	2,750	33 6	6 [illegible]	52	"
Hallett's Pedigree	" 25th	10	9	8	9	" 9th	" 13th	2,775	32 6	7 19	51	"
Russian Hulless	" 23rd	9	8	8	8	July 30th	" 4th	2,420	35 0	1 32	61	"
Russian	" 25th	10	10	10	10	" 31st	" 16th	2,080	30 10	9 8	49	Six-rowed.
Spring	" 25th	10	10	10	10	" 31st	" 8th	1,690	22 14	1 12	49	"
Thanet	" 25th	8	10	10	10	" 31st	" 13th	1,560	31 12	5 0	49	Four-rowed.
Six-Rowed	" 24th	10	9	9	10	" 28th	" 10th	2,060	22 44	10 0	44	Six-rowed.
Probestier	" 25th	10	9	9	9	" 13th	" 11th	1,440	20 40	1 12		Two-rowed.
Average								2,103	28 24½		50¾	

*10 being perfection.

18.—*Oats.*

Any grain kept for four continuous years on the same farm, under the same management, similarly treated in every respect, and carefully judged and weighed every year, should give evidence of reliability or not. I now, therefore, beg to draw the attention of the Ontario farmers to the accompanying table of *thirty* varieties, and sub-varieties, of white and black oats, both branched and side, in which are submitted the condition of the crops when well up in growth in July, also at harvesting; the dates of heading out and of harvesting, with the average length and strength of straw, their conduct under rust and "smut," the quantity of small grain, weight per bushel, and the produce per acre in grain and straw. I repeat, that all these have been thoroughly tested by us, by using our own seed yearly for four years in succession, and accordingly some practical value should be gathered at this stage. One of the best evidences of good oats is thinness of skin, and is a quality particularly desirable in a warm climate; and as thinness of skin and little "point," are equivalent to greater weight per bushel, the column with this latter result deserves particular notice. The standard with us being 34 lbs. per bushel, it will be observed that out of the thirty kinds, but three are under weight, namely, the Swiss, French No. 2, and Poland, all black or brown. We can make nothing of this new "Swiss" oat that has of late made so much noise in Britain; it is always late, gives very poor grain, but is an immense stooler, and has been convenient as a green fodder during drought, by reason of its lateness and leafiness. Observe the prominent place held by the Australian and New Zealand white side oats: in 40 lbs. per bushel, the least of all others by a great deal in having least "smalls," and an average produce of over 34 bushels per acre, and 2,220 pounds of straw. The highest produce of any— over 52 bushels—is from the kind called Fort William, a black-branched oat, of fine quality, weighing 37 lbs. per bushel. Thus, those interested, should go over each in the table, and arn what he may not have in his own practice, and compare with what he does have.

THIRTY VARIETIES OF OATS DURING 1880.

Thirty Varieties of Oats during 1880.

Varieties of Oats.	Condition on July 9th.	Condition at Harvest.	Date of Heading.	Date of Harvesting.	Length of Straw.	Strength of Straw.	Rust.	Smut.	Produce Per Acre.		Small Grain Per Acre.	Weight Per Bushel.	Colour.
									Straw.	Grain.			
									lbs.	bush. lbs.	bush. lbs.		
Sparable	3	8	July 18	Aug. 23	7	10	7	9	2,460	25 0	2 32	36½	Black.
Black Tartarian (Imported), "Side"	7	8	" 20	" 21	10	8	7	9	3,100	32 2	3 28	35	"
Black Tartarian "Side"	7	8	" 20	" 21	10	8	7	9	2,920	28 8	4 4	33	"
Swiss	3	7	" 23	" 23	8	8	5	9	2,970	10 30	2 22	24	Brown.
Bullmans, Charlottetown	7	8	" 13	" 12	9	8	8	9	2,760	41 16	6 16	35	Black.
Pale	8	9	" 13	" 12	10	9	9	9	2,400	26 21	5 5	32	White.
Side "Side"	9	9	" 13	" 12	10	9	10	9	2,780	32 32	4 29	34	"
Russia	6	9	" 23	" 12	9	9	7	9	2,440	34 14	4 24	39	"
Charlottetown	7	10	" 13	" 12	10	9	8	9	2,220	39 24	2 32	39	Black.
French, No. 2	3	7	" 18	" 23	7	10	5	9	1,940	17 22	2 2	33	"
French, No. 1	3	7	" 18	" 20	7	10	5	9	2,030	21 6	2 2	36	"
Norway	6	7	" 20	" 20	7	10	6	9	2,130	31 6	2 32	37	"
Australian "Side"	8	10	" 13	" 12	9	10	9	9	2,470	37 2	0 30	40	White.
New Zealand "Side"	7	10	" 14	" 12	9	10	10	9	1,970	31 6	1 6	40	"
Bullman's Black	7	8	" 12	" 9	9	8	9	9	2,950	39 24	2 2	37	Black.
Polland	7	9	" 18	" 23	9	9	8	9	3,940	33 18	5 30	33½	"
Spanish	9	9	" 8	" 5	9	8	10	8	2,720	35 30	2 32	38½	White.
Halifax	9	8	" 7	" 5	8	7	10	8	2,570	23 8	1 6	40	"
Barley (Ontario) (Birlie)	9	9	" 7	" 2	9	9	8	7	2,550	26 16	2 12	37	"
Barley (Iowa)	9	9	" 7	" 2	9	9	9	7	2,670	35 30	4 4	38	"
White Blade	9	8	" 7	" 2	8	9	10	7	4,600	32 32	2 32	40	"
Colorado	8	9	" 9	" 2	9	10	9	9	2,455	36 11	3 3	38	"
Hopetown, No. 1	6	8	" 9	" 5	8	10	8	9	2,630	44 4	3 18	36½	"
Hopetown, No. 2	9	7	" 9	" 2	9	7	9	6	1,405	34 9	2 7	39	"
Short	8	8	" 9	" 2	8	9	9	6	2,570	29 14	2 2	38	"
Surprise	8	7	" 9	" 2	9	7	9	8	2,990	36 26	2 12	40	"
Somerset	5	9	" 12	" 5	9	10	9	7	3,040	29 24	1 16	38	"
Colorado (Iowa)	9	8	" 9	" 2	8	8	9	9	3,040	41 6	3 8	36	"
White Straw	8	9	" 9	" 5	9	10	7	8	2,670	29 24	2 32	39	"
Fort William	8	7	" 11	" 13	9	8	7	9	3,280	52 7	4 4	37	Black.

Note.—Except those distinguished by "Side," all the Oats are of the "Branched" varieties. Conditions, and columns 6, 7, 8, 9, are judged by using 10 for perfection. The small grain is included in the total produce per acre.

The average produce of all is 33 bushels of grain and 2,683 lbs. of straw per acre, with a mean weight of 36 lbs. per bushel.

The value of each per acre is given in the following list, grain being reckoned at 34 cents per bushel of 34 lbs. and straw $6 per ton.

Value Per Acre of Grain and Straw from Thirty Varieties of Oats.

KINDS.	Grain in lbs.	Straw in lbs.	Value per acre.
1.—Fort William	1,931	3,280	$31 91
2.—White Blade	1,312	4,600	28 79
3.—Hopetown, No. 1	1,606	2,630	26 32
4.—Colorado (Iowa)	1,482	3,040	26 06
5.—Surprise	1,466	2,990	25 72
6.—Bullman's Black	1,467	2,950	25 61
7.—Bullman's (Charlottetown)	1,451	2,760	24 86
8.—Polland	1,123	3,940	24 65
9.—Spanish	1,377	2,720	23 90
10.—Birlie (Iowa)	1,360	2,670	23 55
11.—Australian	1,482	2,470	23 34
12.—Charlottetown	1,545	2,220	23 32
13.—Colorado	1,379	2,455	23 11
14.—Russia	1,340	2,440	22 63
15.—Black Tartarian (Imported)	1,122	3,100	22 12
16.—Somerset	1,126	3,040	21 96
17.—Side	1,120	2,780	21 34
18.—White Straw	1,155	2,670	21 17
19.—Short	1,116	2,570	20 47
20.—New Zealand	1,246	1,970	20 15
21.—Black Tartarian	932	2,920	20 01
22.—Hopetown, No. 2	1,335	1,405	19 46
23.—Norway	1,153	2,130	19 57
24.—Birlie (Ontario)	978	2,550	18 92
25.—Halifax	928	2,570	18 31
26.—Sparable	912	2,460	17 66
27.—Pale	853	2,400	16 95
28.—French, No. 1	762	2,030	14 80
29.—French, No. 2	583	1,940	12 48
30.—Swiss	270	2,970	12 09

Grain does not go by straw, nor straw by grain, necessarily. Observe in some cases, such as White Blade, and Poland, that two, and two and one-third, tons of straw give 1,185 pounds of grain, or only one pound of grain to every three and a half pounds of straw; while others, such as Hopetown No. 2, and New Zealand give as much as one pound of grain to every pound of straw nearly. There is a very long reach from a value of $31.91 to $12.09 per acre; such a reach and such a variety of choice, either for grain or straw, that we are impressed with the fact of how much does lie in choice of the proper plant to get what is wanted. Who, for example, would think of cultivating Hopetown No. 2 for straw, were straw their object, and no one would prefer French No. 2, were bulk of grain the object? It may be considered a very good proportion when one pound of grain is got for every two pounds of straw—that is, thirty bushels of grain for every ton of straw. Examples, Colorado (*Iowa*), Surprise, Bullman's Spanish, and others.

Fort William is of average plumpness and medium skin, and is simply Black Tartarian under a new name, obtained, no doubt, while travelling recently; the head is long, somewhat open below, but grandly clad with grain on top.

White Blade is a beautiful sample of white oats, neither large nor small, though inclining to the small side; not remarkably plump, nor with a large barrel, but having no waste anywhere, and no *doubles;* it has a lengthy, branchy, compact head, standing well up.

Hopetown, No. 1, is more awny than the two described, prolonging the skin too much towards the blade end, and having quite a few doubles; it is the thick and medium lengthened head of this oat that gives the large produce per acre; branches are not long, and twigs not far apart. It is apt to shed its grain.

Colorado (*Iowa*), has a well balanced head, a little lengthy, with grain rather irregular in size.

Surprise is a well-known Canadian oat, short, of average plumpness, very regular in size, with a good length of head, and thick below; the weight per bushel (40 lbs.), is evidence of its fineness.

The two *Bullmans* may be classed together as regards grain, but with a preference to the Charlottetown variety for head; the berries are on the small side.

The oat called *Poland* gives grain very irregular in size, some large for a black kind, and some very small, and as will be seen, has the poorest record in quantity of smalls per acre; the head is of medium length, branches short and not well loaded.

The *Spanish* variety is a beautiful oat in head and grain, the grain is particularly nice, no undue skin, awn, or slack bosom, and but for a few small berries, would top the list.

Birlie (*Iowa*), is small, clean, bright, plump; a strong plant with a well filled head, and is not materially different in any respect from Birlie (*Ontario*).

The *Australian* side white variety of oats is a grand cropper, having medium straw and a compact head, not too long; the grain has not the appearance of weighing forty pounds per bushel, nor of being the best of all in giving least smalls, as the bosom is open and the blade end somewhat lenghty.

The *Charlottetown* side black has a bunchy head and a fair sample of grain.

Colorado, has a more delicate head than the Iowa variety of the same name, though the grain is rather better sampled.

Russia gives a thin branchy head with delicate branches, and a fair sample of grain somewhat small in size.

The *Black Tartarian* from Scotland, has kept up its size of berries well, but gathering more skin and a more open bosom, as the result of a warmer climate; hence it is only one pound over the standard weight; colour is maintained. The head is peculiarly bunchy and very neat. The Ontario variety of the same name (simply of a longer importation I presume) is much lighter in colour, and a very different head, being open and delicate in stalk and branches.

Somerset is one of our finest samples of white branched oats, both in plant and grain; grain even, plump, and bright, weighing well, and giving few smalls, the head strong, roomy, and well balanced.

The *Side*, is a side white, having a longish delicate berry, but a strong medium-sized head.

White Straw gives a plump oat of average length, therefore weighing well; the head is strong and airy with clean bright straw of medium strength and length.

Short, with us, means short plump grain, and a very even sample of good weight, with an average head, and rather delicate straw.

The *New Zealand* grain is better than the head indicates, which, for a side variety is rather delicate in appearance. Berries on the large sample, open bosom but with a fine plump kernel.

Norway is a brown coloured oat well up in sample and plant, and is deserving of more attention.

For beauty in colour, evenness of sample, weight per bushel, and few smalls, the *Halifax* white branched oat has few rivals.

Sparable is short and plump in the grain for a black; the dark is very decided, with white blade tips; head and straw somewhat delicate.

Pale has a lengthy narrow berry, and a long head, grain under the standard weight.

French.—Nos. 1 and 2 are poor varieties of the branched black.

The *Swiss*, as already stated, is as yet a failure, except in straw, the grain is changing in colour from gray to a dull white, and the head is open and badly filled.

19.—*The Growth of Nine Spring Wheats During 1880.*

KIND.	Straw per acre.	Grain per acre.	Weight per bush.	Value per acre.
	lbs.	bushs.		
Lost Nation ..... Bald	3,260	22 1-5	61	$32 30
White Russian ..... "	2,920	20	61	28 96
Rio-Grande ..... Bearded	2,550	19 1-5	60	26 85
Arnautka ..... "	2,340	17½	62	24 90
Champion ..... "	1,840	16⅛	60	21 68
White Fife ..... Bald	1,530	13½	60	18 09
Rice or Goose ..... Bearded	1,630	12½	59	17 27
Farrow ..... Bald	1,510	12 1-5	58	16 50
Gordon ..... "	1,360	10 1-5	59½	14 23

These are from the experimental plots, and have all been under trial since 1877, except Champion, White Fife and Gordon. We have now agreed to place Lost Nation and White Russian together as one wheat in straw, head and grain. Their conduct has been highly satisfactory; true to kind, good croppers under a variety of conditions, no more liable to diseases than others, maturing in good time, tillering well, giving a fair amount of straw, and not bad to feed. Hundreds of farmers throughout the Dominion have bought several thousand bushels from us, and in no case have we heard of disappointment; on the contrary we cannot supply the demand.

The *Rio Grande* is a medium bearded wheat, of good length of head, somewhat open, has been hardy, reliable to kind, with grain of average colour, and sample otherwise.

The *Arnautka* is already well known in some districts of the Province, being admired for its grand bold square head and beard, and grain perfect in colour as regards transparent brightness; berries are large, oblong, with a flat bosom and highly flinty in structure. We have no experience of its milling qualities, but hear of appreciation as a strong one for mixing with others. The plant stools very poorly—not more than two or three per seed—and gives a third-class straw in quality, being pithy and weak at the neck. Its remarkable compact chaffy head is crowned with a thick beard six and seven inches in length.

The *Champion* is Rio Grande in appearance in head and straw, but having a shorter, lighter coloured berry. We still wait its magnificence.

The *White Fife* has a head superior to the size of berry it produces, but the berry is compact, though small, good coloured, and has produced considerably well; the bosom of the berry is too open and deep; it has the appearance of a good miller.

The *Rice or Goose* seems to me to be another name for Arnautka, or the Arnautka may have its origin from the Goose or Rice. The story is, that grain got from the crop of a wild goose, which had fed upon wild rice, was systematically cultivated until it attained its present form. We have had grain direct from the crop of a wild goose, which was long, flinty, bright in colour, and much like overgrown rye that has since by cultivation taken substantially the character of Arnautka, Rice and Goose wheat. The head of this Rice or Goose wheat is a smaller type than the Arnautka we have had from the States, and parts of Ontario.

Farrow or *Red Chaff*, has been a good cropper in Ontario for many years, but not a favourite with the millers. It is a reliable plant, requiring frequent change when off the limestone formations. Grain of a darkish hue, medium in size, and regular.

Gordon may be a renewed Fife—the good old Fife—or a larger form of the White Fife, or indeed but a new name to some such type of plant, set agoing by a pushing speculative party.

Altogether then, we have had much more success in the growth, establishment, and spread of spring wheats than we have had with winter varieties. All our physical conditions are in favour of these, and it is possible our bent has been more in this direction. I may mention that our field result of White Russian spring wheat for 1880 was over twenty-two bushels per acre, and none under sixty-two pounds per bushel.

VIII.—ARBORICULTURAL.

1.—The Ontario Farmers' Text Book.

We took up a text last year on this important subject, the substance of which stood thus :

1. Be your own nurseryman, by setting aside part of the garden to be laid with young trees from your own bush or that of your neighbour.
2. There are as many suitable plants in the uncultivated clearances of the country as would rep'ant every cultivated acre of the old Provinces.
3. Do not grudge a piece of cultivated land for tree planting—the gain will be more than a grain crop, and in any case you can seed down to hay and permanent pasture.
4. The objects of planting, or replanting, are :
    1. Immediate shelter.
    2. Ornament.
    3. To assist in regulating rainfall and general temperature.
    4. As a profitable crop.
5. The best shelter is from fully developed trees standing at proper distances apart—not from a close body of branchless stems.
6. Ornament is secured only by allowing every tree room to grow in accordance with its individual character—never by crowding.
7. To assist in regulating rain-fall and temperature suitable to the wants of the country, we must have a national policy based upon scientific and practical facts in past arboricultural history.
8. Never plant trees upon naturally wet ground (our heaviest swamp sorts—so called—are upon comparatively dry spots).
9. Our native trees require no manuring, trenching, or breaking up of the surface, in preparation for replanting.
10. Spring planting is generally more successful than in the fall.
11. Choose mild, calm weather, between 1st April and 1st June.
12. Select plants from the clearings or unshaded openings in the bush, never from under older ones, and as much as possible from soil and exposure of a similar character to that to which they are to be removed.
13. Hardwood trees are safer to transplant than the pine and spruce.
14. The best sorts are maple, birch, beech, ironwood, ash, elm, butternut, oak, and hickory, with pine, spruce, and hemlock to intermix.
15. To save time and insure better success, remove the plants from the bush, or the public nursery, in October, and trench them close together, but separately, in dry soil, covering firmly with earth.
16. Before trenching, cut off any over-lengthy rough root, and branch, but take care of the small fibres and the top leader.
17. Avoid tall branchless trees that have been growing close together—a two or three feet one will do better than one ten or twelve feet it length.
18. In removing from the bush, dig all round before lifting; do not pull much nor shake off all the earth.

19. Never forget that drought is more dangerous than a little frost.

20. Two men in one day will dig up, waggon home, and trench in the garden nursery, as many as 300 plants from your own bush.

21. Choose calm cloudy weather, when the soil is moist, but not wet, for planting from the nursery.

22. Make the pits one-half wider and deeper than the roots require, and never plant deeper than one inch over the old mark on the stem.

23. Do not plant while water is in the pit.

24. If for a belt, or clump to shelter, plant not farther apart than seven feet in any direction.

25. The object of planting so close as seven feet (900 per acre) is to afford individual shelter, mutual support in several physiological relations, give plenty allowance for failures, and to thin out as required for purposes of profit and individual necessities of trees.

26. Two men should pit and plant 150 trees per day.

27. Spread out all fibrous roots in the pit, fill in the top or best loamy soil first, shaking the plant and gently pulling it up a little; when fully half the earth is in, tramp firmly with the foot, and finish up with the remainder of earth.

28. Use a variety of trees, not one or two species only, as the success will be more certain.

29. During the first season examine after high winds, and toe any openings round the plants.

30. Run no risks from animals or breaking by snowdrifts, and allow no sapplings or growths from the old stumps to interfere with those planted.

31. Sheep may be admitted to graze after ten years,—no cattle for twenty.

32. The second year is the trying one: you may have buds and leaves the first year, and a dead plant the second, if good the third year, congratulate.

33. Make good any deaths for the first three years, not afterwards.

34. Always have a few hundred plants ready in your garden nursery.

35. Never burn the grass among your trees, but use the scythe when too rank.

36. Never allow the drying of clothes on the young plants.

37. Do not prune the pine, spruce, or any of the resinous sorts.

38. Thin out the least valuable sorts, or those you do not wish to retain permanently, whenever they begin to interfere six inches into the branches of each other.

39. It is no over-calculation to say that where the influence of trees is needed, the gain, after fifteen years, will amount annually to $200 over a hundred-acre farm.

40. If you plant at 12 or 15 feet apart you will be ten years behind those at seven feet, when each are 25 years old.

41. We do not deserve well of our country if we cannot establish trees at a cost not to exceed 5 cents each.

42. The cost of planting one acre, irrespective of fencing, which will depend upon form and any advantages from local causes, will be about:—

Lifting and trenching 900 plants in October	$10 00
Opening 900 pits	17 00
Planting	8 00
	$35 00
Keeping for three years	10 00
	$45 00

43. If you purchase from public nurseries, the cost will be about *$100 more.*

44. Get your Township Council to petition Government to institute a regular system of re-planting by statutory enactments.

2.—Re-planting Uncultivated Land with Bush Trees.

Precept without example not being much, you honoured me with instructions to set the example, building upon the recommendations thus paragraphed :

On the south-west of the bush land that lies north-east of the College buildings, one acre was laid off for this experiment. It is simply bush land with its stumps and uncultivated grassy surface, never having been touched by the plough ; three shade trees were left from the clearing up ; the soil consists of a light clay loam with a south-western aspect, is naturally dry, and sheltered from north and east by old trees. Two of the sides were fenced, and the other two had to be erected with the best of old cedar rails, *pro tem.* Pits at 7 feet apart were dug all over, thus making 900 to the acre ; size of pits 18 inches diameter, and one-third deeper than any individual tree required. Planting was overtaken from the 15th April to the 5th May.

With the exception of some European Larch, and a present of several varieties of native trees from D. Nichol, Esq., of Kingston, the trees were got from our own bush seedlings, and those of some of our neighbours within a radius of ten miles; average height of plants about four feet. Pruning of irregular branches was done on 18th May, and on 5th June rough grass was cut to mulch trees. Twice during the season we attended to the advice in number 29.

The trees were principally maple, beech, birch, black ash, black walnut, butternut, oak, elm, balsam, cedar, pine, basswood. Pine and balsam were a failure, owing to over-size and a dry season ; the greater number of the hardwoods have done well, but keeping number 32 advice in view, it will suffice meantime to record the living and dead, with the whole cost of operations.

Trees alive on 31st October	715
" dead " "	185
	900

Cost :—

Clearing and preparing ground	$9 44
Digging pits	8 88
Fencing, labour only	4 75
Planting	11 50
Pruning	75
Mulching	2 25
Taking home trees	18 50
Heeling	50
	$56 57

It is plain that were the farmer not to put any value upon his own labour or that of his horses, the actual cost would not exceed $30 per acre.

3.—Tree Seeds. (Plot 30, Field C.)

This spring, we received a number of tree seeds through the Fruit Growers' Association, to be tried here.

The soil is a clay loam, and dry.

May 18. Sowed the seeds in rows, sixteen inches apart.

The following failed, or have yet failed, to germinate:—

Indian Cedar (Cedrus deodara).

Norway Maple (Acer platanoides).

Scarlet Maple (Acer rubrum).

Sugar Maple (Acer saccharinum).
Common Berberry (Berberis vulgaris).
Sasafras Laurel (Lauras sassafras).
Florida Dogwood (Cornus florida).
Virginian Snow-flower (Chionanthus virginicus).
Cockspur Thorn (Cratagus crus-galli).
American Service Tree (Pyrus americana).
American Elm (Ulmus americana).
Western Plane (Platanus occidentalis).
English Elm (Ulmus campestre).
Narrow-leaved Kalmia (Kalmia angustifolia).
Poplar-leaved Birch (Betula populifolia).
Pliant Birch (Betula buta).

The following have made a good start:—

Tulip Tree (Liriodendron tulipifera), about one-eighth of the seed has grown.
Deciduous Cypress (Taxodium distichum), one-quarter has grown.
American Beech (Fagus ferruginea), one-half has grown.
Panicled-flowering Kolreuteria (Kolreuteria paniculata), very few plants have grown.
Canada Judas Tree (Cercis canadensis), very few have come.
Honey Locust (Gleditschia triacanthos), nearly all are growing well, and at present stand two feet high.

THE SOILING OF CATTLE IN CANADA.

We are accustomed to hear of the different systems of farming called grazing, grain growing, root farming, dairy farming, and mixed farming, in each and all of which the live stock go and come from field to field in summer, according to conditions of cultivation and the various modes of management.

In these examples the animals search for food, and must be satisfied with what they find within a limited area, thus differing from those in the wild state, only in having a more choice bite for a certain time, but with less variety and fewer successions of crops, for nature, after all our combination of science and practice, gives a more regular rotation of grasses and other herbage than the best of our model farming now-a-days.

Were we, therefore, to think of the summer management of cattle on the patriarchal plan of moving from place to place, or having the range of a common bush, we possibly could not improve upon them in the desire for more palatable milk and good beef, in moderate quantity, at the least possible cost. But, comparatively new country though we be, our bounds are becoming keenly outlined, and every foot of land clearly defined. The day is not far off—in Ontario at least—when every fence will have its own place economically, when every open ditch will be grudged, every wide, private lane tightened up, every cairn of stones and swamp corner be greedily reclaimed, and every tree have its proper place on our farms.

As an agent towards such an end, the comparatively new and little understood system of cattle management called "*Soiling*" will have much to say ere long.

To show this in the most practical shape is my present duty. I desire distinctly to confine myself to the produce of certain crops used for this purpose, as against the prevailing summer management of cattle we call "*Grazing.*" It would be easy to bring in

the important story of the use of auxiliaries in both cases, but to do so would complicate and take from the value of the comparison. Soiling, then, is the housing of cattle at all seasons, and distinctively, in our circumstances, from the middle of April to the middle of October, when all their food is taken to them from the fields, in place of their being allowed to search for themselves.

First, what is our position in Ontario as cattle graziers? We cannot secure the rich old pastures of England, rich as our soils are, because we cannot secure variety enough of grasses (which means 15 to 20 kinds) to give a close bottom and offer that *succession of herbage* best for the health and growth of animal life. Our droughts, and especially our winters, are against this; we have rain enough per annum, but it is not distributed sufficiently to give the regular top-dressing so essential to continuous greenness. Here permit the remark that as we have ourselves been the cause of this irregularity of rainfall, and temperature, to a certain extent, so it is left to us to make good the balancing of the things in nature that have been displaced—how and where, the meteorologist and horticulturist will explain by-and-by, for, so sure as we are opening ourselves to the world's public markets, so sure are we bound to leave no stone unturned in view of national eminence among them.

On an average of seasons, on putting a cattle beast to the field, without any grain or cut fodder helps, there is no going back, neither is there much progress in flesh making; there is growth of bone and muscle, but comparatively little finishing on the outside or inside. So, then, we can make the frame in the field, but not complete it for the home or foreign market. In this respect, therefore, we cannot possibly compete, at present, with some other parts of the world. What applies to beef making applies to the making of milk.

With unreliable pastures for *continuous progress* in milk or beef production, the question before us is, how can we better ourselves? We have the soil, or soils; we have the indispensable sunshine, as also the irregular showers, and all the essentials towards the up-keep of fertility. Have we the enterprise, or, shall I call it, the necessary common sense? Indeed, history, past and present, shows that, with such a sunshine as ours, some nations would be in possession of an enormous agricultural wealth, by the simple economy of that sunshine in the production of repeated crops of fodder plants in one season, even from a bed of sand.

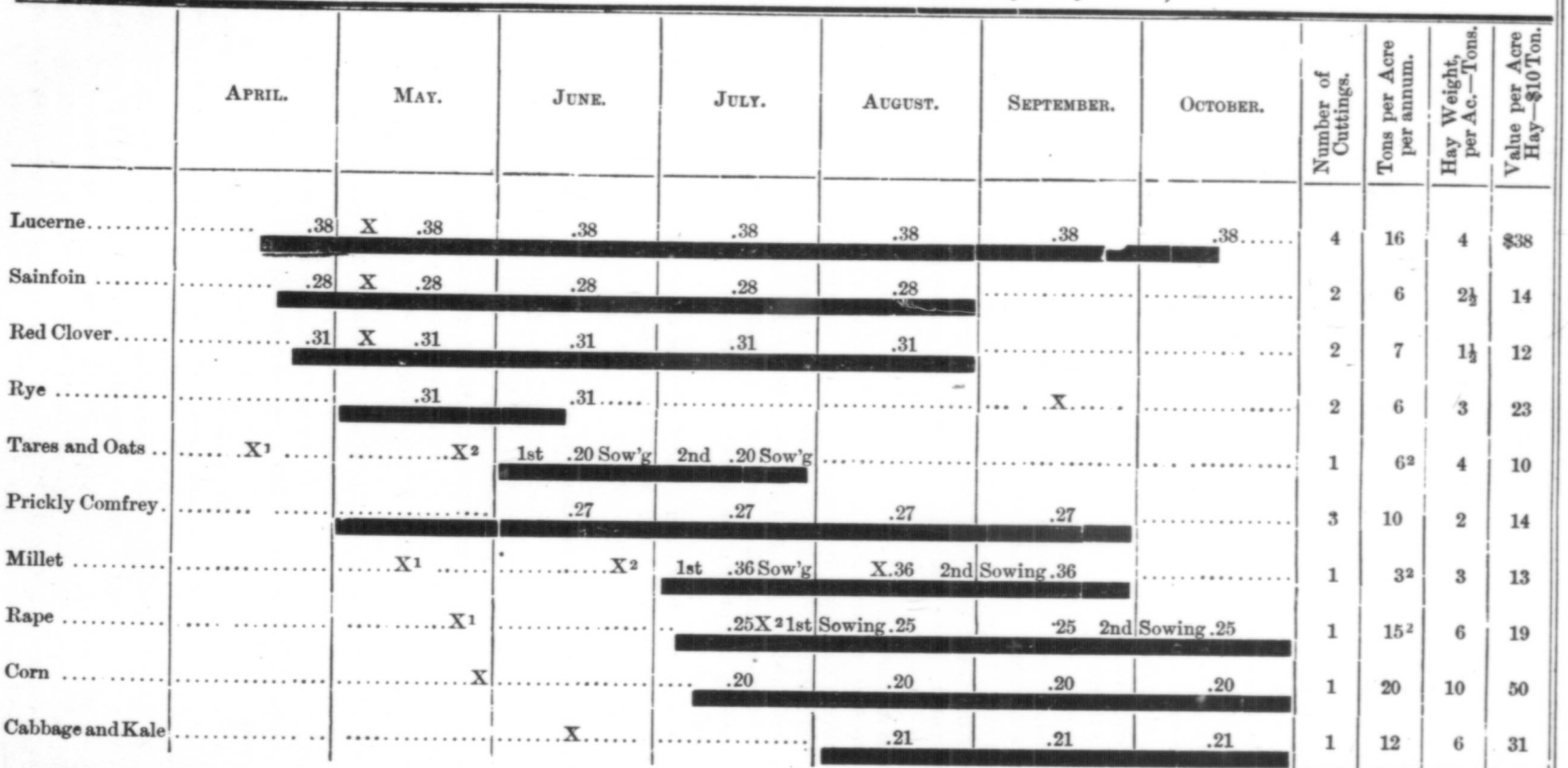
We want then to secure such a succession, or association, of green fodders during six months of the year, as shall secure the following objects:—

1. An early cut.
2. Repeated cuttings of the same plant.
3. A sufficient number to offer an unbroken supply of succulent herbage.
4. Kinds to differ considerably in their constituent elements.
5. The largest possible produce per acre, consistent with good husbandry, (and this implies much).
6. High fattening and milking properties.

I have no desire to lengthen introductory remarks, and shall now submit for your consideration, first, a diagram, showing what crops, in our present knowledge of things, can be cultivated in view of these objects. In this, we have the experience of different parts of Canada, and particularly that of the Ontario Experimental Farm.

Green Fodders for "Soiling" in Canada.

Diagram of experiments with soiling crops at the Ontario Experimental Farm, Guelph, Ontario, 1876–1880. (The X indicates the time of sowing, and the dark bars the time of cutting the fodders.)



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Description of Diagram.

In this we have an exhibition of twelve varieties of plants from the middle of April to the end of October, in the order of earliness. Each horizontal bar represents one acre, and the time during which each plant can be cut and used on an average of seasons. The date of sowing is shown by a cross, and the number of times the same plant can be cut in one season is given in the first column after October. Following the latter information is the quantity of green fodder obtained per acre from any of the kinds all over the season, and adjoining, the weight of these in the dry or hay condition. The last column contains the value per acre of each kind, that value being regulated by the following circumstances:

Good hay from rich pasture is valued at an average of $10 per ton, and the feeding ratio or nourishing properties thereof stands at forty per cent.; taking these as standards —and they are now recognized as such—we would have this calculation, as regards, for example, lucerne:

If hay equals $10 per ton and a feeding value of .40, what is four tons of lucerne, the feeding value of which is .38? The answer is $38 per acre, and thus all over the different kinds we obtain their comparative values—the figures on the horizontal bars being the percentage of nourishing properties in each case.

The management of each crop and the characteristics of the several plants should form subjects for discussion another year.

To recapitulate, by the points sought for, we have, as regards an *early cut*, lucerne coming about the middle of April, followed by sainfoin a week later, and red clover at the end of that month, thus obtaining three tons per acre from three varieties during a time when moisture is plentiful and the temperature rarely below freezing point, the average being about 50° and the maximum 70°. This is the welcome start of the season, after the five months of dry fodders, roots, and grain.

Repeated, or rather, continuous cuttings of the same spot or plants, four from lucerne, twice from sanfoin, twice from red clover, twice from fall rye; and at least thrice from prickly comfrey; two sowings at different dates of tares and oats give other two cuttings; two also by two sowings of rape, two from two sowings of millet, and one each from corn and cabbage, so that in all we have no fewer than twenty-one cuttings from ten varieties of fodder plants.

As many kinds, therefore, as should offer an unbroken supply of succulent herbage during the whole summer months, for without tenderness, freshness and regular supply we are not in a position to impress the value of this system upon the average farmer or dairyman.

On examining the diagram, there is no time of the six months during which there are less than three sorts on hand, and in some months as many as eight; and indeed, in place of any want, the difficulty during July and August is to keep up with the succession of offerings before they become woody or matured.

It would not be difficult to add a few other fodders of less importance to this list, and especially to note a fact that on well arranged farms, where root cultivation is a prominent feature, *mangolds* are generally in such quantity, and have come through the winter so fresh and good, that they are not finished until *June*—thus, then, a very valuable help to, it may be, the scant *early* green fodders.

I cannot reccommend the practice—a very old one—now less necessary, of thinning and feeding the leaves of turnips and mangolds, during their growth, but the systematic and careful use of both bulb and leaves of those removed to make room for the permanent crop, is another thing, and a very important auxiliary to what we are treating upon.

As is well known, all animal life must have a change of food in order to secure health and the best production of flesh and milk, and so we are called upon to examine the nourishing values of these various plants as got month by month.

Rich old pasture, with its many varieties of grasses, is not only one of the most valuable fodders, green or dry, as is well known for milk making, but it also takes a high place as an actual fattener of animals; for these reasons it is used as a standard for comparing other green fooders with, and accordingly we shall adopt it on this occasion.

If then good pasture, with its 40 per cent. of nourishing properties, is a standard of nature's making as improved by man for all the essentials of animal life, it must be im-

portant to see how far our ten kinds of special green fodders come up to this standard from month to month.

Lucerne leads with .38; millet, second, with .36; red clover having .31; and sainfoin, fourth, with .28 per cent.

Three of these in April make a large start, therefore, with an average of 32 per cent., and it will be observed that all the early croppers are very much superior in their feeding values to those that come after June—millet excepted. There is then a range of no less then .18—from .20 in the case of corn, up to .38 in that of lucerne—and the fact of this difference in feeding value implies corresponding differences in the actual elements of the plants, so that we certainly have variety enough. I shall not labour this chapter with any detailed chemical analysis, as I trust it is clear that along with the variety of plants, we have also a variety of elements for all healthy and rapid production of flesh and milk—the man of science says so, and practical experience says so. Of course the mean of 29 per cent. over the season is much below the standard of 40, and this again points to the help wanted by some form of grain, should higher excellence be desirable, although many good managements consider it really unnecessary to give grain for milk where green fodders are plentiful and various.

We have now therefore established two important things :

1st. That Canada can grow the necessary variety and quantity of green fodders.

2nd. That they are well adapted to the sustenance of animal life for the purposes in view.

The next question is, what is the proper position of "*soiling*" in association with grain, root and hay cultivation, and what can be done on a farm, say of 100 acres?

There can be no idea of recommending soiling alone as a separate system of farming in this or any other country; the essentials of life cannot be neglected, nor can the average farmer run the risk of reducing his income by placing all his faith in one or two articles of production only.

There must be provision for horses in hay and grain; pasture for sheep and yearling cattle; and roots, straw, and grain for cattle, sheep and pigs in winter; and grain and potatoes for family use. By grain I mean wheat, oats, barley, and peas; and roots include mangolds, turnips, and carrots. We have to deal with the following classes of crops in our rotation.

1.—Roots.
2.—Grain.
3.—Hay.
4.—Pasture.
5.—Green Fodders.

The green fodders are divisible into—

1.—Cereals, one-half.
2.—Clovers, one-fourth.
3.—Foliage proper, one-fourth.

On soil of an average texture, the best rotation in my opinion is:—

1.—Peas and *grain fodders.*
2.—Wheat and oats.
3.—Roots and *foliage fodders.*
4.—Barley or wheat (seeded) and *clover fodders.*
5.—Hay.
6.—Hay.
7.—Pasture.

The area of each class on 100 acres would be :—

1.—Peas, 5; grain fodders, 9	14 acres.
2.—Wheat, 5; oats, 10	15 "
3.—Mangolds, 3; turnips, 6; carrots, 1; foliage fodders, 5	15 "
4.—Barley, 5; wheat, 3; clover fodder, 6	14 "

5.—Hay	14 acres.
6.—Hay and pasture	14 "
7.—Pasture	14 "
	100 acres.

Of the various green fodder crops there would be:—

Lucerne	3	acres producing yearly	48	tons.
Sainfoin	1	" " "	6	"
Red clover	3	" " "	21	"
Rye	2	" " "	12	"
Tares and oats	2	" " "	12	"
Prickley comfrey	1	" " "	10	"
Milk	1	" " "	3	"
Rape	2	" " "	30	"
Corn	4	" " "	80	"
Cabbage and kale	1	" " "	12	"
	20	acres giving	234	tons per ann.

The system altogether then is practically one of five divisions, having equal parts of 20 acres under roots, grain, hay, pasture and *green fodders.*

Taking a clay loam as the average texture of Canadian soils, it is obvious that a rotation of cropping agreeable to all sound theory and practice, and by which no exhaustion could possibly take place even under careless management, would be what is called the seven course, as laid down in these notes. By this our green fodders would accompany the 1st, 2nd and 4th divisions after sod-breaking, so as to agree, and not interfere with systematic rotation and management over the whole farm.

The sod from one or two years' pasture is broken up and cropped with peas and *grain fodders*, these grain fodders being corn, tares and oats, millet and rye; the second year is wheat and oats in proportion of 5 and 10 respectively; the third in roots with *foliage fodders* in the shape of rape, cabbage and kale and prickly comfrey—all the latter, as with roots proper, admitting of thorough cultivation, manuring and cleaning, upon which rests the backbone of this system. During the fourth year grass seeds (of timothy and clover) are laid down with barley or wheat, and part, if deemed necessary, with *red clover* alone as the green fodder section of this division, and of course the 5th and 6th years are hay, with the exception of, say, one-half of the 6th as *pasture*; 7th year pasture.

In all this there is an *easy and luxurious* cropping, suitable to the best of mixed farming and according with the "soiling" system under consideration. There is no excess of grain and hay, but thorough cleaning and strengthening of soils by root management, with sufficient rest (so called) by depasturing with sheep and young cattle.

The 20 acres devoted to green fodders, will on an average, give, under the best management, 234 tons per annum.

What can be done with this amount of Green Fodders.

Allowing for waste, one cattle beast of average size, age and circumstances as regards fattening, breeding, or milking, will consume daily 100 lbs. of these green materials, along with such dry fodders and grain as may be considered desirable—more or less, of course according to objects. For the six months named, this means the maintenance of 26 head, or nearly one and one-third ($1\frac{1}{3}$) animal per acre. Now, it is well-known in Canadian experience that it takes fully three acres of ordinary pasture—not poor pasture remember, but well laid down timothy and clover, to keep one of such cattle in a full progressive condition—either laying on fat decently well, or milking well over the average, no stinting or having the animals walking two miles a day over and over a twenty acre field in search of a bellyfull.

We have, then, the striking difference of four (4) to one (1) meantime, in favour of "*soiling*," as against grazing, without allowing for any other facts, for or against. Were one-tenth of dry fodders—such as hay or straw—added to the green ones, six more ani-

mals can be maintained, but our present purpose is to follow the exact value of the soiling crops alone.

It is rare in these times to find more than 15 head of cattle beasts in all on a hundred-acre farm, summer and winter. So supposing that one-half of the soiled animals, in our example case, were for the butcher, and the other half supporters of the dairy, there would be an additional five head of yearlings and five calves, with one bull, and one score of sheep. The sheep and yearlings would be grazed, but the calves and bull housed and receiving part green fodders; these would be equal to four (4) additional average sized cattle, and so reducing the 26 to 22 head that can be maintained from 20 acres of soiling materials. Still additional to this would be what would, or should, be used for horses and pigs, so that altogether we arrive at the safe standard of 20 cattle, or one to each acre.

Soiling in Canada then is as 3 to 1, and by the system which I have thus sketched it is plain that by simply setting aside 20 acres from the 100, so as not to interfere with the reliable and profitable farming called mixed, or alternate, we can fatten, or dairy, 20 cattle in place of 7 during the six months of spring, summer and autumn.

What now is the financial position in the system?

To this, sketch first the general management that would be adopted: Upon a hundred-acre farm such as I have introduced, one man with horse and cart can easily undertake the attendance in every respect of these 10 fattening cattle, 10 cows, 5 yearlings, 5 calves, 1 bull and 20 sheep. Any of the yearlings intended for breeding would be grazed during their second summer, but those for fattening should be systematically housed—getting one hour's exercise daily; the calves would also be under cover, the sheep on pasture of course. At the most then, the cattle man would have 30 head to be soiled. After feeding and cleaning up in the morning he has to cut and cart home 2,500 lbs. of green fodder, in two loads, for the evening use, and as all green fodders are better to be slightly "wilted," not heated, ere offered, he would thus have to secure another cut in the evening to be used for next morning's meal.

FINANCIAL RESULT OF SIX MONTHS "SOILING" FROM TWENTY ACRES.

10 Fattening cattle: 108 tons green fodders at $2.15. (See diagram)		$232
Proportion of attendance		50
		$282
10 milk cows: 86 tons	$184	
Proportion of attendance	40	
Milking	20	$244
Total debit		$526
Increase on 10 fattening cattle $5 per head per month	$300	
Manure (bedding inclusive) 60 tons	50	
		$350
Milk from 15 cows; 180 days, 10 quarts at 1¼cts.	$225	
Manure 50 tons	40	
		$265
40 tons green fodder supplied to other cattle	86	
Total credit		$701
Balance to credit		$175

Twenty acres under ordinary good pasture and seasons, will graze seven head of cattle:

Rent or value of 20 acres at $3		$60
Proportion of management		7
		$67
3½ fattening cattle for five months	$50	
3½ milk cows, 150 days, at 8 quarts	60	
Estimate value of manure left	10	
		— $120
Credit balance		$53

In the case of "soiling," a clear profit of $175—and in that of grazing $53—the one equal to nearly *three rents* per acre, the other hardly one rent.

I am handling a strict debit and credit account, and not speaking of so much flesh or milk revenue per acre, without charging, what very few farmers do charge, in estimating profits. All this, remember, without any help from bush or stubble pasture, and any roadside pickings—no meal, bran, or slops of any sort, but the plain produce of the soil in each case.

Again, then, let us note that "soiling" in Canada means fully three times the profits of grazing, in addition to other considerations now to be examined.

Some of the Advantages and Disadvantages of Soiling.

1. Where land is a consideration, there is a great saving of it by being enabled to maintain at least one cattle beast per acre, in place of having to calculate on allowing three acres to graze one.

2. Were we to reckon by the amount of fodder produce (soiling, or pasturing), there a large saving of food in avoiding destruction by cattle traffic.

Where we have apparently useless quantities of any kind of straw, chaff, and hay—good or poor in quality—they can be safely used in association with the moist green fodders.

4. We obtain fully double the quantity, and proportionately much more value, of manure by soiling than by allowing it to have its own way in the field, the roadside, and the court. I am of opinion, that were we able correctly to estimate the value of farm-yard manure in connection with this matter of soiling of cattle, there would be no concern on the part of the farmer as to any other form of profit. He would simply be so independent as to be able to throw all beef and milk into the bargain, or allow them to stand as the mere overflowings of a system that puts him in possession of all the past and future wealth of his fields. Would the day were here when we all knew how to *make*, how to *preserve*, and how to *apply* our cattle droppings.

5. The larger produce of flesh and milk on an average.

6. Gives greater variety of materials, allows uniformity in management, which gives greater comfort and health, and less liability to accidents.

7. But it requires greater care and intelligence to establish and maintain such a variety of crops; so, if this is to be put up as an objection to the system, we had better say beat at once. When any farmer begins to speak about "troubles," and first expense, and too much looking after of things, then the sooner he falls into the ditch the better. Let him continue his successive crops of wheat, and give his cattle the range of all the farm, so as the earlier to convince him of the high life he is leading—an extravagant, selfish life, as well as a dangerous one.

8. It is well known in soiling experience that cows give a greater flush of milk from good early pasture than from having the food taken home to them. The change from winter confinement to the rich and plentiful crop of grass, along with the easy conditions under which they obtain it, does this. Were this grass rush to continue, there would certainly be much less in favour of housing; but it does rarely keep up, and, while there is not so much milk in April, May, and part of June, there is a continuous flow, with no falling off, through July, August and September.

Requisites in Cropping of Green Fodders.

1—*Soils:* Depth, dry, *rich sub-soil.*
2—*Seed:* Lucerne, 20 lbs.; Sainfoin, 3 bushels; Red Clover, 20 lbs.; Rye, 2 bushels; Tares and Oats, 2 bushels and 1 bushel; Millet, 1 bushel; Corn, 3 bushels; Rape, 8 lbs.
3—*Cultivation:* Broadcast, drilling, horse-hoeing.
4—*Manuring:* Liquid, Special, Farm-yard Manure.
Essentials: A rich soil, moisture, and heat.

THE PRACTICAL APPLICATION OF SCIENTIFIC KNOWLEDGE TO THE FEEDING AND FATTENING OF LIVE STOCK.

We tried to throw some light upon this subject in last year's report. It is surely time the ordinary farmer were shown a few steps in such a valuable ladder. I mean the *actual use* in practice of what the chemist says, and what experience says, is the feeding property of each of our animal foods. He has hay, straw, grain, and some special preparations, which he is told are good for certain purposes, but is not given any reasons for their particular use. In place of being only the agent in their transfer, he should also be the *regulator* according to the requirements of each class of animals, whether for (1) ordinary growth in youth, (2) rapid growth in youth, (3) production of milk, (4) production of beef or mutton under various conditions, (5) working animals, and (6) breeding animals.

In applying what we know of this subject to our own case at The Ontario Experimental Farm, I beg to submit first of all, the list of classes of animals in the order in which, in my opinion—opinions differ no doubt—they should be fattened or fed, beginning with those requiring most flesh and fat forming materials, and gradually ranging into those that should receive the least.

Order of Requirement of Fattening Properties in Food for Various Classes of Live Stock, at the Ontario Experimental Farm, during Winter, 1880-81.

1.—Fattening old oxen, — most fat required.
2.—Three-year-old fattening steers.
3.—Two-year-old " "
4.—Fattening wethers.
5.—Driving horses.
6.—Farm horses (winter).
7.—Bulls.
8.—Rams.
9.—Breeding cows.
10.—Yearling steers.
11.—Heifers.
12.—Ewes.
13.—Dairy Cows.
14.—Lambs.
15.—Calves, — least fat required.

Second.—We must be in possession of the

Order of Fattening Properties in Food to be used this Winter.

1.—Oil-cake contains 82 per cent of fat and flesh materials.
2.—Barley " 80 " " " " "
3.—Corn " 79 " " " " "
4.—Oats " 75 " " " " "
5.—Pease " 73 " " " " "
6.—Bran " 64 " " " " "
7.—Hay " 59 " " " " "
8.—Pea straw " 41 " " " " "

9.—Oat straw contains 41 per cent of fat and flesh materials.
10.—Corn fodder " 37 " " " " "
11.—Wheat straw " 33 " " " " "
12.—Roots (mean) " 9 " " " " "

Cattle Fodder.

1 of hay —59.
1 of oats —41.
1 of corn —37.
1 of wheat—33.

Mean 42½

Sheep Fodder.

Half hay —59.
" pease—41.

Mean 50

From these we can now make a

Tabular List or Guide to the Feeding and Fattening of our Live Stock during Winter, 1879-80.

No animal to get more than 15 lbs. fodder or hay, 12 lbs. of meal, 90 of roots, 3 of oil-cake, 5 of oats, 2 of pease, or 3 lbs. of bran.

CLASS OF ANIMAL.	Food and Daily Allowance Per Head in lbs.										Parts of flesh and fat formers per head per day.	Percentage of flesh and fat to other parts of food	Total quantity per head per day.
	Cattle Fodder.	Sheep Fodder.	Hay.	Bran.	Roots.	Oats.	Corn meal.	Barley meal.	Pea meal.	Oil-cake.			
Horses—													
Farm	.....	....	12	½	1	5	....	....	....	....	11.56	60	18½
Buggy	.....	...	10	¼	1	7½	....	....	...	...	11.93	65	18¾
Cattle—													
Oxen Fattening	15	...	....	2	90	....	12	....	....	3	27.69	23	122
Steers, 3 years "	12	....	....	2	60	...	10	....	....	2	21.32	22	86
Steers, 2 years "	10	....	....	2	50	....	8	....	....	2	17.94	25	72
Steers, 1 year	8	..	..	2	40	....	....	....	2	....	9.10	17	52
Bulls	9	....	....	2	50	....	....	2	....	....	11.23	18	63
Breeding Cows	9	...	....	2	50	....	....	1	....	....	10.10	17	62
Dairy Cows	8	....	....	2	40	....	....	½	....	....	8.48	16	50½
Heifers	8	....	....	2	40	....	....	1	....	....	9.08	17	51
Calves	6	....	....	1	20	....	....	½	....	....	5.19	19	27½
Sheep—													
Wethers Fattening	5	....	....	1	8	....	....	....	1	½	5.00	32¼	15½
Rams	5	....	....	½	6	....	....	....	1	....	4.09	32	12½
Ewes	5	....	....	½	5	....	....	....	1	....	4.00	35	11½
Lambs	3	....	....	¼	3	....	....	....	¼	....	2.11	33	6½

Consecutive Order of Animals in Feeding, with Total Values or Feeding Ratio for Each.

	Feeding Ratio.	Per cent. of fat.
1.—Fattening Oxen	27.69	23
2.— " three year old Steers	21.32	22
3.— " two " "	17.94	25
4.—Driving Horses	11.93	65
5.—Farm Horses (winter)	11.56	60
6.—Bulls	11.23	18
7.—Breeding Cows	10.40	17½
8.—Yearling Steers	9.10	17¼
9.—Heifers	9.08	17
10.—Dairy Cows	8.48	16
11.—Calves	5.19	19
12.—Fattening Wethers	5.00	32¼
13.—Rams	4.09	32
14.—Ewes	4.00	35
15.—Lambs	2.11	33

Example of method of calculation :—

Breeding cows,	9 lbs.	fodder	@ 42 cts.	=	3.82 of flesh and fat.	
	2 "	bran	@ 64 "	=	1.28	" "
	50 "	roots	@ 9 "	=	4.50	" "
	1 "	barley meal	@ 80 "	=	.80	" "
					10.40	

Now, 10.40 to the total quantity of 62 lbs. consumed is equal to 17½ per cent. of fattening properties. Thus, then, we say the farmer can easily make up for himself a yearly guide to the winter management of his live stock, with particular regard to the making of bone, muscle, blood, milk, flesh and fat. If he has old working oxen to be fattened off, the mean of the fodder, and of bran, roots, corn and oil-cake may safely reach as high as 27.69 per cent. in fattening materials, according to quantity consumed, and having due regard to the more cautious up-bringing of calf life, the ratio of fat to other materials in the kind and quantity of food to be given, should range about 5.19 per cent. Between these probable extremes, we have, in our own case this winter, as thus illustrated, *nine* others, all distinct in themselves by reason of class, age, and purpose. The sheep, in four classes, are similarly treated.

HAND-BOOK TO CANADIAN CEREALS.

In pursuance of the resolution and plan proposed and begun in my Annual Report for 1879, under this heading, I take pleasure in sketching the character of some sixty varieties of *Bald Winter Wheat* that have been cultivated by us during the past five years. It will be difficult to avoid repetition of terms, so the more nice readers will have to give way meantime to those who look mostly for practical information.

Large value in small space should be our first idea of a typical wheat plant of any variety; to secure this the head, or ear, should be compact, having the most possible number of berries in the length and breadth, and covered or protected by the minimum quantity in thickness and length of chaff, or awn. Berries can be too close on the head in certain climates, and may be too heavily overlaid with covering so as to hinder ripening and confine their individual bulk. The form of head best calculated to carry the largest number of berries with sufficient air room for proper maturing is that which, in whatever way it is presented to the eye, will appear of almost equal breadth, whether by the side or by the face, the face being somewhat broader than the side; the florets should alternate and overlap each other to about one-third of their height, should stand out from the stalk at an angle of forty-five degrees, and never have less than two berries in each bunch or floret, some having as many as three or four. A thick-set head has five sets of florets to the inch, a thin one two.

In judging the grain of wheat, the points are so important that it will be best to number and describe separately:

1.—The first thing that strikes the eye is colour. Formerly wheat was classified by *white* and *red*, but now when we speak of colour as a point of merit in any variety it means that sort of transparency or brightness which reflects light, as opposed to dulness, or having a bleached appearance. This should be uniform and not parti-coloured.

2.—*Size*, or evenness of sample, refers to uniformity of berries to each other, not some large and others small, but nearly all alike—whether large, medium, or small-sized.

3.—*Structure* characterizes the gritty, hard, or flinty kinds from those that are soft and meally.

4.—The *Skin* may be thick or thin, rough or fine, and should always be smooth, unless when curly from its natural fineness.

5.—The *Form*, or outline, of the berries should be alike, whether long, short, or round.

6.—The *Bosom* may be full and close, that is, with a well sprung rib, or an open and flat one.

7.—*Plumpness* has no reference necessarily to one uniform outline like a bag of flour, but that the berry is well filled-out, of whatever form, showing no slackness of skin from want of food—not shrivelled.

8.—*Smell* should not be musty or sour.

9.—The *Taste* should be nutty, sweet, and mellow, not sour or bitter.

10.—The *Germinating* points should be distinct; the base, or root end prominent, and the blade end slightly hairy.

Miscellaneous qualities:

11.—Hardy, productive, and a good miller.

12.—Weighing, after cleaning, not under sixty pounds per bushel.

13.—Comparative freedom from diseases—whether animal or vegetable.

14.—To tiller, or stool, well—that is, to produce five or more perfect plants from one seed, under good management.

15.—To have sufficient strength of straw to carry the head.

16.—The straw to be of good quality as regards freedom from pith.

Bald Winter Varieties of Wheat.

Arnold's Hybrid (Philadelphia).—Head strong and thick, with well-set florets; straw also strong, and of good quality. The grain sample obtained was not first-class, being small, moderately filled, and of a dark colour; crop of 1878 became inferior—smaller, darker, and shrivelled; that of 1879 was much improved, or about equal to the original, with longer berries, and produced thirty bushels per acre. The crop of 1880 was inferior to 1879,—grain not being so evenly filled.

Arnold's Hybrid (Washington).—Head short and moderately thick, with good straw. The sample got was large, plump, of a dark red, and parti-coloured. The crop of 1878 was much inferior, smaller, shrivelled, and darker in colour, while that of 1879 was good, though not so well filled as the original; 1880 gave somewhat better than 1878.

Arnold's Victor (Paris, Ont.).—This hybrid has head and straw resembling Gold Medal. The crop of 1877 was good in colour, nice and plump, though a little irregular in size

and form; 1878 was poor in every respect, but 1879 gave a much improved sample, unequal, however, to that of 1877. Produce in 1879—39⅔ bushels per acre, weighing sixty pounds per bushel. The plants of 1879-80 were entirely winter-killed.

Bull Forward.—A very fine sample from the Centennial Exhibition of 1876. The produce in 1878 was much inferior, delicate-looking, small berries, well coloured. That of 1879 was larger, but irregular, becoming darker in colour, and the crops of 1880 is not so deficient as many others. The head is too narrow, being, however, long and fairly set.

Blue Stem.—This is not unknown in Ontario. What we got of it in 1877 was a good dark colour, irregular in sample, and all of a small size. The cropping of 1878 was much inferior, but improved in 1879, though not equal to original—producing 40 bushels that year.

Bush's Prolific is an American variety of medium size, and somewhat dark coloured. The crop of 1878 was practically a failure—shrunken, miserable-looking stuff. 1879 gave a large improvement, and 34 bushels per acre, lighter in sample, not so well filled, more irregular; and 1880, though not equal to 1879, kept up well, considering. The head is poor—tight, narrow and short.

Bush's Satin Chaff, also from the States, was originally of fair size and plumpness, but parti-coloured and of a dark red tinge. In 1878 we had a much smaller and poorer sample, with some improvement in 1879—holding its colour, but shrunken, and 1880 brought about its failure for the present. The head is of fair length, but too open; straw strong; chaff slightly velvety.

Bush's Large White.—Of good colour, but small and shrivelled in 1878, and up to date is a failure, being too tender. Straw good; head too open, but otherwise good.

Bush's Mammoth.—The sample from the Centennial looked mixed, was large, plump, and of average colour. Our produce of 1878 was very inferior—dark and shrunken. There was a decided improvement in 1879 over 1878, the darker colour increasing, however; 1880 was a failure. The head of this is very long, yet fairly clad, the chaff being a white velvet; straw was much subject to rust.

Cook's White.—Grain of medium size, nicely coloured, regular and plump. 1878 gave a darker and smaller grain, but altogether not so bad, considering the season. 1879 was very good, of fair size, well filled, but darker than the original. It was winter-killed during 1879-80. Head short and thick, with strong red chaff and good straw.

Clawson Club.—A very good sample of the ordinary Clawson, or Seneca, under a slightly new name, the berry being slightly smaller. The crop of 1878 wanted a little better filling to make it a good one. 1879 was not equal to the original, but good in size of grain; it was shrivelled and unfed in 1880. The ear is a Clawson one in size, colour and form.

Canada Winter No. 1.—The growth of 1878 and up to 1880 inclusive was practically nothing—even that of favourable 1879 being medium; head narrow and tight.

Canada Winter No. 2.—The original grain of this was a little irregular, but otherwise good; colour dark; 1879 gave the only fair sample—the head being an average specimen.

Canada White.—Original sample large, regular, very plump and fine in colour; 1878 gave a very poor, shrivelled, small, dark-coloured grain; 1879 was much improved, indeed, almost up to first sample in size and form, though darker in colour and not quite so plump, yet well filled, and giving 25½ bushels per acre; 1880 was not so good; the straw is strong and clean; the head a little short, square, however, and thick set.

Clawson (or Seneca).—I think it may be safely assumed that the millers' account of this wheat is now over the jealous stage and into the fastenings of their purse. The fact of non-controversy is evidence of this. Our 1876 experience was not first-class—berries irregular, somewhat parti-coloured, small sized, and not well-filled. Those of 1877 were much improved, larger, better coloured, but not a very bright sample; 1878 was much inferior—fairly coloured, however. One-third of the berries very small, badly filled, and shrunken. The head was much too open and thin, yet with plenty of straw. The crop of 1879 gave a very fine head in size, compactness—long, strong and close; 44⅔ bushels per acre, weighing 61½ lbs. per bushel. We cannot speak of any success during 1880.

Diehl.—It must be remembered that for some of our best Canadian fall wheats, our position with its large exposure and high elevation is not the best adapted to their thorough growth and maturing; for example, we cannot show a sample of the Diehl or Soule equal in plumpness and colour to the Galt and Hamilton districts by reason of these climatic peculiarities, not by reason of unsuitable soil. Here we find the Diehl with a medium-sized head, close set, dark and strong however, the grain not taking on the right colour or size all over, many of the berries being small.

Diehl Fife.—Is but the old Diehl under a new name apparently, with which we have made no progress, except in growing a good balanced head all over.

Excelsior.—The original sample of this had a nice bright colour, flat bosom, and the berries over the medium size. Though we obtained forty-seven bushels per acre in 1879, the grain was not equal to the start, yet fair, and 1880 even gave a good sample, wanting filling; a long fairly balanced head.

France.—The original of this resembled a medium sample of Soule. While the produce of 1878 was "nothing," that of 1879 maintained its old points in most respects, and even better in colour; the head is chubby.

Fultz (*Kansas*).—The grain of this cannot be called plump, the berries are pointed, parti-coloured, and a fair medium sample all over; the head is narrow, pointed, and somewhat open; 1879 sample was superior to that of 1880, yet the colour improved through the latter year.

Fluke (*Illinois*).—This has all along been the earliest maturing wheat in our extensive experience; the head is small, of medium closeness; the grain has improved in colour but not in form or size.

Gold Medal.—Our five years experience of this hybrid has been very satisfactory. In 1876 the grain was comparatively poor, being irregular, badly filled, but good in colour, that of 1877 was very good all over except colour; 1878 though not down to 1876 was little superior; 1879 gave us a better fed berry, with a darker colour, and a yield of 36 bushels per acre. Winter 1879-80 proved too much for this, as it did for most other *hybrids*; the head is short, thick, and strong.

Kentucky.—A good bright coloured wheat of fair size, which in 1878 kept up in size, did not mature sufficiently, giving straw at the expense of grain. 1879 improved upon the original, and even in 1880 with its blight and rust, the size was maintained but not filled correspondingly. The head is longish, a little open, but otherwise good.

Lennie's White.—Direct from England, and one of the best of its flour makers, does not withstand our winter, though hardier than the Essex Red under like conditions.

Mexican.—From the American Centennial of 1876, had a dark grain unevenly coloured, of medium size, but fairly filled. The colour inproved in 1878, but otherwise the sample was altogether inferior; 1879 brought a delicate whiteness, berries being somewhat narrower and not so even in sample; again, 1880 made a darker shade, not well filled, but yet even in its irregularity. It is a good tiller, straw rather weak, close head, shortish (resembling Gold Medal), and takes a medium place in hardiness.

May Red.—Long berries, pointed, and from 1879 made as good as that from the Centennial. Head too open, narrow, and having a delicate caste, not characteristic enough.

Mediterranean.—The original was poor, dark and unequal; 1878 did not improve the sample, except in colour; the colour continued to improve in 1879, and the whole sample was much superior, even as against the original. Head compact, a fair size, with a tendency to over closeness.

Nursery.—Characterized by a round, tight head, a form of head most objectionable in any case, and otherwise a plant of little importance apparently.

Rust Proof.—A good average wheat, not rust-proof however; 1879 gave 25½ bushels per acre; better colour than Centennial sample, and equal in evenness of grain. Head about medium in size, and well up in points.

Reid's Giant Red Chaff (hybrid).—A pointed berry, not large and not plump. While very poor all over in appearance from 1880, it gave 24½ bushels per acre. The head and straw resembles the Clawson.

Red Velvet.—An oval shaped berry of a good dark colour. Head narrow, tight and hide-bound in appearance.

Red Winter.—Not unlike the Scott, and in our best season of 1879, gave a good sample, hardly plump enough, which did not deteriorate so much in 1880 as others. The head is rather short, but nice and compact, though somewhat pointed.

Reid's Golden Kernel (hybrid).—A medium coloured, open bosomed wheat, having a slight resemblance to Clawson, that gave us 25½ bushels in 1879.

Russia.—A hardy variety of a darkish colour that has not improved with us. The head is long and open, and inclined to beard.

Russia Nos. 2, 6 and 9.—In some respects resembling the Russia, as above, with thicker chaff and better at tillering; all hardy, and particularly too long and open in the head, thus reducing their cropping qualities.

Scott (Glasgow ?).—A dark, even sampled grain, with short, compact head, having a tendency to beard.

Silver Chaff.—This once famous wheat has almost refused to do anything here. In 1876, the sample was fair, though irregular, not well enough filled, nor perfect in colour. In 1877, berries were large, well filled, of a nice bright colour, and that gave the very large yield, for that year, of 57½ bushels per acre; 1878, fell off, poor in colour, shrivelled and uneven. In 1879, we had 30 bushels per acre (57 lbs. per bushel), but in most essentials a very poor sample. The straw has been good; heads, long, strong and well set.

Soule.—As elsewhere remarked, we cannot grow a first-class sample of this very fine old Canadian winter wheat. The quantity has averaged 32 bushels per acre, and the weight 61 lbs. per bushel; but colour has not been satisfactory, berries are too tight and irregular, as if unequally matured. Head has been good in form and size, with average straw.

Tasmania.—The original was a good sample in most respects, but our experience has proved it to be too tender.

Treadwell (bald).—Grain seems to be mixed; a bald head, not close nor yet open; somewhat resembling Soule, with a tendency to beard; colour good; berries well filled.

Turcana.—Has a long, open head, with a large, plump, dull-coloured berry. Tender, and has largely deteriorated in sample.

White Velvet.—Has a head with velvety chaff, of fair length, strong and compact. Good straw; subject to rust Sample has not improved with us as yet, being also tender.

Washington—Nos. 1 to 17.—These, out of many others similarly distinguished, have done best with us during the last four years. The average produce has been 34½ bushels per acre, with a distinct want of feeding over all the berries, which are generally large and lanky. Heads are also generally of the small open class with a tendency to fineness or want of boldness. The largest cropper was No. 13, the smallest, No. 17.

Thus, as yet, we have made no great discovery in any new winter wheat suitable to Ontario, nor, I presume, can we hope to do so, without more trials, more failures, more perseverance, more extensive gatherings, more systematic inquiry and collection, and more attention in every possible respect. This is a great field in truth, and one deserving the whole attention of one man, specially authorized and provisioned—an enthusiast of no mean parts, appointed by Government—keen to catch, safe at handling and experimenting, and reliable in reporting. While the Ontario Experimental Farm has not re-clothed the Province with another spring wheat equal to the grand old *Fife*, or the equally valuable winter Soule and Diehl, it has already given an interest to the subject, and a prominence to some varieties that, some men tell us, goes a long way to meet the necessarily heavy draft on the Legislative purse in its up-keep. We have it from not a few quarters, that what we have done in the establishment and scattering of the *White Russian* spring wheat throughout the Province, marks the fact of a valuable chapter in our history. If we do not know how to labour and wait, we need expect little success.

OUR 1880-1 CATTLE FEEDING EXPERIMENT.

Many of our breeders and fatteners of live stock, are in the practice of giving old fodder and roots unprepared, that is the hay and straw are not cut, nor are the roots cut or pulped. As many others are believers in everything being cut and pulped, and given separately, or in the shape of a pudding. The advocates of either plan cannot of course

speak of definite comparative results under exactly similar conditions, and so we have thought it desirable to conduct an experiment this winter, having in view the elucidation of such a very valuable point.

We have been fortunate in securing, four two-year old Shorthorn grade steers, of precisely similar breeding, almost exact in age, that were bred and have been under the same management all along.

Along with these, as additional data for evidence, we have set aside four yearling cross-bred steers of our own, two of which, with two of the others, will be kept upon whole fodder and roots up to May next, and the four others will be treated to the same kinds of food, prepared by cutting and pulping. During the same period all will receive corn meal and bran. Everything will be weighed as dealt out, animals weighed weekly, and all attendant circumstances carefully noted. The handling of this experiment will be conducted by Mr. John Leask, one of our leading second year students, and it is my duty to record here that every second year student is taking a keen interest, and has all along advised with me in the object, the purchasing, and the regulation of this experiment.

THE PRESENT IMPORTANCE OF DIFFERENT GRADES OF WOOL.

We cannot too often impress our farmers with the difference in value between various samples of the like article as produced by themselves, whether it be beef, mutton, wool, grain or any other crop; indeed, while the Government looks to the more active of us to be stirring up such matters, there yet rests the duty upon all Legislators of pointing forward when any branch of their economy is making true indications.

As one of these, not yet sufficiently clear among us all, and that is, however, making loud calls upon our enterprise, note some facts with reference to different grades of wool in this Province.

The British Colonies pay more attention to the quality of wool than she does herself, and up to a recent date, this aim was correct, but now, in addition to quantity, the world wants quality and a certain grade suitable for certain purposes. The market of three years ago, and many years previous, was weight of fleece along with weight of mutton, with out particular regard to sample in either article, but that market has changed; the world now wants quality, as represented mainly by fineness and medium length, along with the quantity. In addition to this change in wool, there is also a very decided preference for another class of mntton; hitherto the most of us were asked to grow size of carcass without regard to quality as indicated by fineess of grain and proper admixture of fat and lean, but now we are told to produce an average weight having the quality referred to.

Weight of carcass and weight of fleece have been, and are still, obtained from Lincolns, Cotswolds and Leicesters, or by their crosses. These give the heaviest mutton, and the longest and heaviest wool, so that while at present there are many special fields for these breeds, both for flesh and wool, the great market for the million is bidding them good-bye, for a time at least.

On the other hand, the average weight of carcass and fleece, with quality as now required by the great market of the world, are obtained from any of the Down breeds of sheep—Southdown, Shropshire Down, Hampshire Down, and Oxford Down, or by their crosses.

The question is not one only of supplying two classes of goods most in demand: It is most clearly one of larger returns under any circumstances; take, for example, the case of two shearling wethers ready for market (and by the way all our mutton should be finished at this age), one the ordinary grade of the country, what may be called a Canadian wether, possessing part Leicester, Lincoln and Cotswold blood, and the other the first cross of any of the pure-bred Downs named, upon such a Canadian ewe.

Difference in value between a common Canadian, and a Down-Cross, Shearling Wether.

	Canadian.	Down Cross
	$ cts.	$ cts.
Canadian Wool, 4½ lbs. at 30c.	1 35	.....
Down Cross Wool, 7 lbs. at 35c	.....	2 45
Canadian Mutton, 145 lbs. at 4c	5 60	.....
Down Cross Mutton, 170 lbs. at 5½c.	.....	9 35
	6 85	11 80
Difference in favour of Down Cross	4 95	.....

This remarkable difference should come home very forcibly to us all; we take it to ourselves at this farm, though, of course, being obliged to maintain a variety of breeds for educational purposes, we cannot change as the ordinary farmer may, but, supposing we could, and taking our 1880 clip for illustration, there is the following striking evidence:

1880 Clip of Wool at The Ontario Experimental Farm.

Long Wool—95 fleeces, 8 lbs. each, 760 lbs. at 30c.	$228 00
Medium Wool—(Oxford Down, and Oxford and Southdown cross upon Canadian ewes) 22 fleeces, 7 lbs., 154, at 35c	53 90
Short Wool—21 fleeces, 5 lbs., 105 lbs. at 40c.	42 00
In all, 138 fleeces, weighing 1,019 lbs. (7⅜ each).	$323 90

If the 95 fleeces of long wool had been from common Canadian sheep in place of heavy pure-bred Cotswolds and Leicesters, the average weight would not have exceeded 4½ lbs. each, which would have fetched $128.10, and had the 95 sheep been improved by Down-crossing, the wool would have weighed 665 lbs. and brought $232.75, or a difference in *wool alone* of $1.10 per head per annum. But, further, had these been a flock of 95 shearling wethers shorn in May and shortly afterwards sold for shipment to England, the accounts would stand thus:—

	Canadian.	Down Cross.
	$ cts.	$ cts.
427 lbs. Wool	128 10	.....
665 lbs. Wool	.....	232 75
13,775 lbs. Mutton, live weight	551 00	.....
16,150 lbs. Mutton, live weight	.....	888 25
	679 10	1121 00
Difference	441 90	.....

If this is not proof enough to convince and convert, then we needs must despair in all truth. The cost of keep is alike for both classes, and all that would have to be extra debited to the improved wool and mutton is interest on the extra value of a pure-bred Down ram.

Nationally, this subject is all important. Canada should easily raise and dispose of 20,000 head of shearling wethers annually; the *difference* in favour of the improved animal would give $22,000 for wool and $75,000 for Mutton, or $97,000 of a gain to the country.

X.—ESTIMATES AND RECOMMENDATIONS FOR 1880–81.

First—We require the new live stock as detailed in the introduction herewith.

Second—The extra team of horses for instruction and fallowing, as explained under the heading "Farm Instruction."

Third—Drainage has been neglected for two years, and must be continued, and should be completed during next two years.

Fourth—So also in fencing, we have done nothing for some time, by reason of large expenditure upon the College buildings, and now it must be overtaken.

Fifth—As yet we have no cover for our implements and machinery.

Sixth—A small sum is required for new implements.

Seventh—Cottages for the Farm Foreman and Gardener are already on the card from last year's estimates.

Eighth—We shall be glad to continue the tree-planting experiments so well begun, in addition to those in the hands of the Fruit Growers' Association.

Ninth—We have not completed the number of tools for instruction purposes in the Mechanical Department.

These may be estimated thus:—

Live Stock	$15,200
Instruction Horses	300
Drainage	1,000
Fencing	1,000
Implement Shed	500
Implements and Tools	1,500
Tree Planting	100
Experimental Preparations as usual	900
	$20,500

The Ontario Agricultural and Experimental Union.

It affords me much pleasure to draw your attention to the Society under this title, as recently formed by our own students. It comes more immediately under my report than that of the President, because of practical farming being its largest field, and of my position as President thereof for the current year. The accompanying note of Mr. C. S. Dickinson, Editor, saves explanation by me, and, in addition, the constitution as copied herewith will explain fully. We had a very hearty and profitable meeting of officers, students and ex-students at last Easter, when, of course, much was initiatory; and now, being thoroughly organized, we trust, ere long, to make our union a felt power throughout the Dominion.

To the Honourable the Commissioner of Agriculture:

Sir,—Since the above-mentioned Union has been formed in connection with this College, we deem it but due to the position you hold to inform you as to its origin and the aims of its promoters.

Some three years ago it occurred to a Mr. Toole—one of the most successful of our students—that it would enhance the value of our education, and tend to our mutual improvement if, in connection with this College, some sort of a union were established wherein matters pertaining to agriculture might be discussed and the results of our experience interchanged.

In pursuance of this idea a meeting was convened, and some twenty or thirty members were enrolled. The matter was then allowed to fall into abeyance until a further accession of members should justify us in drafting a constitution and electing the necessary officers.

Last Easter the subject was again brought to the fore, ex-students were notified, and meetings were held on two successive days within the College buildings. Some very valuable information was given by the old students present, and letters were received from others who were unable to attend; officers were elected, and a committee was appointed to draft the appended constitution.

We have now on our roll some 120 acting members, who form the nucleus of what may be, we hope, one of the most successful Agricultural Societies in the Dominion.

In conclusion, I would remark that the College authorities are unanimous in their support of the Union, not only on account of its intrinsic merit, but also because they view it as a means of keeping sight of the students after they leave the College, and of proving to the country at large that this institution turns out not nincompoops but successful farmers and intelligent men.

Hoping that you will see fit to accept the accompanying invitation to join us as an Honorary Member,

I am, Sir, on behalf of the Union,

Your obedient servant,

C. S. DICKINSON, *Editor.*

(*Second Year Student.*)

CONSTITUTION OF THE ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

Objects of the Union.

The objects of the Association are to form a bond of union among the officers and students, past and present, of the Ontario Agricultural College and Experimental Farm, to promote their intercourse with the view to mutual information, to discuss subjects bearing upon the wide field of agriculture, with its allied sciences and arts, to hear papers and addresses delivered by competent parties, and to meet at least once annually for these purposes.

Admission of Members.

All officers and students, of whatever time, shall be entitled to become members of the Union on paying their subscription.

The Hon. the Commissioner of Agriculture for the Province of Ontario, for the time being, shall be an honorary member of the Union.

Subscriptions and Privileges.

Members shall pay the sum of 50 cents annually. They are eligible to all the offices of the Union, and shall receive gratuitously any reports of the same which may be published after the date of such payment. For any reports previous to their admission, they shall have to pay the sum of 25 cents.

Every ex-officer and ex-student who is in regular accord with the Union shall be considered as a Corresponding Member thereof. Each shall be entitled to the privilege of receiving, for experimental purposes, at least five samples annually of such agricultural seeds as may be on hand for distribution at the Ontario Experimental Farm. He shall report to the Union the results of such experiments, and also give his experience on such subjects as come within the scope of the Association. Ex-officers and students, who are members, shall be entitled to receive, by correspondence, if necessary, such information on the work of the Union, or that of the Ontario Agricultural College and Experimental Farm, as may be deemed reasonable by the Executive Council.

Meetings.

The Union shall meet annually at the Ontario Agricultural College, for one day or more, beginning two days previous to the Easter closing exercises of the Institution.

Officers and their Duties.

The officers of the Union shall consist of a President, Vice-President, Recording Secretary, Corresponding Secretary, Treasurer, and Editor of Transactions, who shall be appointed annually by the general meeting, and hold office for the ensuing twelve months.

The President, as chief officer of the Union, shall be *ex officio* a member of all committees or councils thereof during his term of office.

The Vice-President shall have powers similar to the President, but only in his absence.

The Recording Secretary shall keep the minutes of the general meetings of the Union.

The Corresponding Secretary shall conduct all business in connection with the Union in regard to membership, general meetings, and all the business of the Executive Council, for which purposes he shall be *ex officio* a member of that Council.

The Treasurer shall collect all fees, and keep account of all receipts and disbursements of the Union as may be authorized by the general meeting and Executive Council.

The Editor shall receive, revise, and attend to the publication of such addresses, articles, or papers as may be authorized for publication in the transactions of the Union.

Executive Council.

The Executive Council shall consist of the officers of the Union for the time being. Its duties shall be to prepare a programme for annual general meetings, invite and arrange with parties for the reading of papers, to appoint reception and sectional committees, and such other work as has been indicated for it in this Constitution, or which may be authorized by the general meetings.

Accounts.

The accounts of the Union shall be audited annually by the Auditors appointed by the general meeting.

Alteration of Constitution.

No part of the Constitution to be altered except at an annual general meeting of the Union, and then only by giving at least three hours' notice of such intended alteration.

XI.—CONCLUDING REMARKS.

Is the education of the farmer in his own profession still a problem? May it be said that his case has been, and still is, largely one of compulsion—that the bettering of his condition has been forced upon him by outsiders; that he has been petted and even dragged to the doors of his own school?

This question is of general application—European and American. The Britisher has long had a dream of more produce and greater profits by chemical knowledge disseminated through schools and experiments, and he is still a deep scientist. The guano fever of twenty years ago helped to carry him into the present insolvent gutter, and it seems to me to be as clear as noon-day that if he continues to place a similar reliance upon this chemical footing, his chances of a new lease of the virtues of mother earth

are as wide as ever. His schools of practical agriculture have also been a clean failure, and ever will be, until they are actually made practical in every detail. With all his long experience and natural advantages, the British farmer is no longer able to meet the foreign farmer in the same market, and it is very unlikely that more schooling will make up the want. The reasons are deeper and more private.

The continental European farmer has been more cautious, more conservative and more frugal than the Britisher. He has also called in the aids of science, but, while searching and trying, he has not built upon anything until long practice in the field has more than doubled the proofs. Neither has he aimed at much in teaching the field practical, because, it may be, of the same caution that accompanies his conservatism, so that he has not failed where others have, in this respect.

Australia and New Zealand are now trying to obtain more agricultural light, by the establishment of agricultural schools and experimental stations in association. It will be gratifying to hear of their success, and having the advantage of the trials, failures and successes of others, we may look for something very good ere long.

Agricultural education has already a history of a quarter of a century in the United States, and such has been the varied results among its many establishments, that all we can do is to sympathize, and advise to try again. There is plenty of push, and were there more of steadiness and keeping on the proper track, our neighbours would lead the world in agricultural education, as much as they do in most other professions.

And what of our own progress? Have five years helped to solve the problem of agricultural education in Canada? If expression of public opinion is always reliable, we are doing well; if Legislative support is much, we need not be ashamed of the record; and if patronage by the young men of the country is everything, then our success is very large, but are all these certain evidence of a want fully met and of work thoroughly done? May not a high popularity be one of the most dangerous and false positions in a state, especially from a previous history of considerable odium?

Evidence, above all these questions, is the cue to our value. Farmers' sons, and the sons of men not farmers, who are all making for farming, and who have been, or are now, with us from England, Scotland, Ireland, Switzerland, the United States, and most of our own Provinces, are telling in various way what we have done for them. It is because of doing one thing only that success is ours; we teach *agriculture*—not the languages, nor military tactics, nor even the higher mathematics or mechanics; it is also because we teach practically. Soil is what we find and handle—not what a book tells; manures must be tested, crops thoroughly judged; cultivation a thing of individual *doing* on the part of every student, and an animal is one only when seen, handled, and compared with others in every detail. It is also because labour is compulsory, and not optional, on the part of students requiring it; and part of our success, I think, is due to the fact that we *teach*, and do not *lecture*.

Coming here, a young man sees at once that everybody is in earnest; saddle horses, buggy-driving, city-idling, or *looking-on*, are not part of the curriculum, and consequently he either bids us good-bye, or acts the *man*. In his progress through the initiatory stages of out-door duties, he is sharp enough to see that the sooner he is out of them the better for himself in the matter of debit and credit—for instruction means no pay. Once past this, there is keen competition for excellence, for superintendence of others, for teachers' confidence, and honour in all things; and as he gradually masters the science and practice of his profession, he finds he can obtain a situation as farm manager, and ere long will manage to find his own farm.

As a whole, therefore, I consider the problem of agricultural education is being gradually and surely unfolded in our case.

I have the honour to be, Sir,

Your obedient servant,

WM. BROWN.

APPENDIX.

INVENTORY AND VALUATION OF OUTSIDE DEPARTMENTS.

FARM,—LIVE STOCK.

HORSES.

12 Working Horses	$1,450 00	
		$1,450 00

CATTLE.

Shorthorns:		
1 Two-year-old Bull	200 00	
5 Cows	1,125 00	
2 Two-year-old heifers	200 00	
2 One-year-old heifers	100 00	
2 Calves—Heifers	75 00	
		1,700 00
Herefords:		
1 Five-year-old bull	400 00	
2 Cows	800 00	
1 Two-year-old heifer	300 00	
1 One-year-old heifer	175 00	
1 Heifer calf	100 00	
		1,775 00
Devons:		
1 Five-year-old bull	175 00	
1 Cow	150 00	
1 One-year-old heifer	175 00	
1 Heifer calf	50 00	
		450 00
Aberdeen Polls:		
1 Five-year-old bull	200 00	
3 Cows	750 00	
2 Two-year-old heifers	250 00	
1 Heifer calf	40 00	
		1,240 00
Galloways:		
1 Cow	90 00	
		90 00
Ayrshires:		
1 Five-year-old bull	100 00	
4 Cows	400 00	
1 yearling heifer	50 00	
1 Calf	30 00	
		580 00
Grade Shorthorns:		
13 Cows	520 00	
3 One-year-old heifers	60 00	
4 Steer calves	100 00	
1 Short-horn Ayrshire, cross calf	10 00	
2 Heifers—Calves	25 00	
1 Galloway Shorthorn calf	10 00	
1 Aberdeen Poll cross calf	20 00	
		745 00

Grade Herefords:		
1 Steer	$20 00	
1 Calf	10 00	
		$30 00
Fattening Stock:		
5 One-year-old steers	160 00	
2 Aged oxen	150 00	
		310 00
SHEEP.		
Cotswolds:		
1 Three-shear ram	120 00	
40 Breeding ewes	1,200 00	
8 Ewe lambs	160 00	
7 Ram lambs	175 00	
		1,655 00
Shropshire Downs:		
5 Ewes	250 00	
1 Three-shear ram	150 00	
		400 00
Leicester:		
1 Five-shear ram	75 00	
18 Breeding ewes	540 00	
3 Ewe lambs	60 00	
2 Ram lambs	50 00	
		725 00
Southdowns:		
1 Three-shear ram	150 00	
19 Breeding ewes	480 00	
3 Ram lambs	90 00	
5 Ewe lambs	100 00	
		820 00
Oxford Downs;		
1 Two-shear ram	150 00	
6 Breeding ewes	300 00	
1 Ewe lamb	20 00	
1 Ram lamb	35 00	
		505 00
Merino:		
1 Two-shear ram		150 00
Grades:		
13 Breeding ewes	100 00	
3 Ewe lambs	15 00	
		115 00
Grades, feeding:		
20 Wether lambs	120 00	
		120 00
PIGS.		
Berkshires:		
1 Imported boar	100 00	
1 Boar	50 00	
5 Brood sows	200 00	
1 Imported sow	65 00	
2 Seven month boars	60 00	
		475 90
Prince Albert Windsor:		
2 Brood sows	100 00	
		100 00

Dogs.		
3 Dogs—Scotch collies	$85 00	
		$85 00
Total		13,530 00
Implements.		
4 Waggons	$180 00	
1 Democrat	45 00	
2 Carts	49 00	
8 Sets of double-trees	15 00	
4 Neck-yokes	4 00	
3 Pair of bob-sleighs	67 50	
1 Long sleigh	18 00	
1 Pleasure sleigh	36 00	
2 Seed drills	99 00	
1 Broadcast seeder	15 00	
2 Reapers	115 00	
4 Mowers	160 00	
1 Pea-harvester	18 00	
3 Horse rakes	40 00	
2 Cultivators	34 00	
1 Horse-power	35 00	
1 Jack	15 00	
1 Separator	80 00	
4 Shafts	12 00	
1 Drag sawing machine	60 00	
3 Fanning mills	50 50	
1 Circular Saw	30 00	
Wheelbarrows, curry combs, brushes, oil cans, wrenches, saws, hammers, axes, mallets	40 00	
4 Iron ploughs	72 00	
4 Iron beam ploughs	50 00	
1 Metal beam plough	10 00	
I Wooden plough	10 00	
		1,36000
1 Double mould-board plough	28 00	
2 Gang ploughs	35 00	
1 Sub-soil plough	20 00	
3 Ploughs, with wheel and skimmer	35 00	
1 Turnip drill	10 00	
4 Sets iron harrows	60 00	
2 Sets wooden harrows	10 00	
1 Wooden roller	25 00	
Shovels, spades, forks, and stone-boat	60 00	
5 Sets of team harness	135 00	
6 Sets of plough harness	55 00	
2 Sets of cart harness	20 00	
1 Barn truck	4 00	
1 Set of weigh scales	20 00	
1 Platform scales	90 00	
Half-bushel measures, horse-blankets, bags, chains, picks, baskets, scythes, grain cradles, hoes, hooks, etc	110 00	
5 Hay racks	35 00	
1 Water cart	68 00	
1 Straw-cutter and belts	53 00	
2 Grain crushers	75 00	

1	Cake crusher	$20 00	
3	Root slicers and pulpers	75 00	
70	Cattle chains	28 00	
4	Bull leaders	4 00	
2	Feed boilers	25 00	
	Sheep racks, troughs	75 00	
2	Cross-cut saws	6 00	
1	Vertical 6 horse-power boiler	190 00	
1	Portable steam engine	750 00	
1	Thresher	450 00	
		———	$2,571 00

GARDEN.

1,500	Flower pots	$60 00	
4	Rakes	4 00	
16	Spades	20 00	
7	Shovels	10 00	
10	Draw hoes	6 00	
5	Dutch hoes	3 00	
1	Scythe and snaith	1 50	
2	Garden ploughs	20 00	
1	Cultivator	8 00	
2	Wheel-barrows	6 00	
5	Screens	5 00	
2	Trowels	1 00	
5	Pruning saws	4 00	
4	Manure forks	3 00	
5	Potato forks	4 00	
2	Garden reels and lines	3 00	
2	Tree scrapers	0 50	
5	Hammers	3 00	
2	Pair of edging shears	4 00	
2	Pair hedge shears	4 00	
6	Watering pots	7 50	
2	Pair of pruning shears	4 00	
1	Syringe	5 00	
8	Pruning knives	4 00	
16	Hot-bed lights	30 00	
3	Picks	3 50	
	Knife, bill, hook, dibble	5 00	
1	Set cart harness	8 00	
1	Garden cart	40 00	
1	Gravel screen	15 00	
1	Set garden harrows	10 00	
1	Garden roller	10 00	
2	Garden sickles	0 50	
2	Edging knives	2 00	
4	Spuds	1 00	
1,000	Greenhouse plants	800 00	
1	Stove	13 00	
3	Potato dusters	1 00	
1	Seed drill	7 00	
1	Steel square	2 00	
	Compass, plyers	1 00	
6	Baskets	1 50	
3	Thermometers	1 50	
10	Marking irons	10 00	
2	Axes	3 50	

16	Hyacinth glasses	$4 00	
1	Office desk	2 50	
6	Pick handles	1 50	
4	Hay rakes	0 50	
3	Markers	0 75	
1	Crow-bar	1 50	
4	Hand glasses	4 00	
2	Brooms	0 60	
1	Working horse	100 00	
2	Hand lawn mowers	22 00	
1	Single set of harness	14 00	
			$1,307 35

MECHANICAL DEPARTMENT.

9	Hand cross-cut saws	$9 00	
4	Rip saws	7 00	
3	Fine cross-cut saws	4 75	
1	Compass	1 00	
3	Draw-knives	3 00	
3	Braces	7 50	
1	Set of Bits	10 00	
1	Boring machine	6 00	
20	Gimlet bits	2 50	
3	Oil-stones	1 25	
6	Smoothing-planes	5 40	
1	Jointer	2 50	
6	Half-jointers	9 00	
7	Jack-planes	5 00	
1	Iron circular plane	4 50	
1	Set hollow and round No. 16	0 50	
1	" match $\frac{1}{2}$ inch	0 85	
1	" " $\frac{7}{8}$ "	1 25	
1	Centre bead $\frac{7}{8}$ inch	0 75	
1	Side bead 1 "	0 40	
1	" $\frac{3}{4}$ "	0 40	
1	" $\frac{5}{8}$ "	0 40	
1	" $\frac{1}{2}$ "	0 40	
1	Rabbit plane $1\frac{1}{2}$ inch	1 00	
1	" $\frac{3}{4}$ "	1 00	
11	Hammers	10 00	
3	Bench axes	4 00	
1	Broad axe	3 50	
1	Screw wrench	2 00	
2	Cold chisels	0 50	
3	Spoke-shaves	1 00	
5	Try squares	1 60	
1	Framing square	1 25	
1	Panel square	1 25	
4	Mallets	0 40	
1	Level	1 25	
2	Framing saws	2 50	
2	Trowels	1 00	
6	Screw drivers	2 40	
1	Chalk line	0 40	
1	Common line	1 25	
2	Tool bags	0 80	
1	Wire-tightener and apparatus	10 00	
1	Bench-brush	0 40	

5 Carpenter's benches	$35 00	
6 Ladders	6 00	
2 Scratchawls	0 10	
4 Paint brushes	3 00	
4 Five gallon oil-cans, and glue pot	4 50	
3 Gimlets	0 45	
1 Grindstone	5 00	
1 Stove	6 50	
Fencing tools, spade, spar, pick, mauls	10 00	
Block and tackle	12 00	
1 Ratchet drill and set of bits	6 00	
		$219 30

ABSTRACT OF INVENTORY AND VALUATION:

Farm—Live Stock	$13,530 00	
" Implements	3,931 00	
Garden	1,307 35	
Mechanical	219 30	
		$18,987 65