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APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

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HORTICULTURIST - - - - - - -	W. T. MACOUN
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" " " INDIAN HEAD, N.W.T.	ANGUS MACKAY
" " " AGASSIZ, B.C. - -	THOS. A. SHARPE

FOR

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APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, December 1, 1903.

SIR,—I beg to submit for your approval the seventeenth annual report of the work done, and in progress, at the several experimental farms.

In addition to my report, you will find appended, reports from the following officers of the Central Experimental Farm: From the Agriculturist, Mr. J. H. Grisdale; from the Horticulturist, Mr. W. T. Macoun; from the Chemist, Mr. Frank T. Shutt; from the Entomologist and Botanist, Dr. James Fletcher, and from the Experimentalist, Dr. C. E. Saunders. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms there are reports from Mr. R. Robertson, Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head, and from Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical and scientific work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several experimental farms; also of scientific research in the chemical laboratory bearing on many branches of agricultural and horticultural work, and of information gained from the careful study of the life histories and habits of injurious insects and the methods by which noxious weeds are propagated and spread, together with the most practical and economical measures for their destruction. In the report of the Entomologist and Botanist will also be found particulars of the experiments and observations which have been made during the past year in connection with the Apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms, the rapidly extending correspondence and readiness shown by farmers everywhere to co-operate with the work of the farms in the testing of new and promising varieties of cereals furnish gratifying evidence of the desire for information and improvement among this class of the community, also of the high esteem in which the work of the farms is held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit-grower and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,
Your obedient servant,

WM. SAUNDERS,
Director of Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

OF THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR, WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.

The results of farm operations in Canada in 1903 have, on the whole, been encouraging. While the wheat crop in the Canadian North-west has been reduced in volume, and the grade somewhat lowered by unfavourable weather, the higher prices which have prevailed have done much to make up both for the shortage and the injury. In the eastern provinces the returns have been larger, and most of the more important crops have given more than an average, and in the output of live stock and dairy products the increase has been general. The area of land under crop is increasing rapidly and the volume of agricultural exports becoming larger from year to year.

During the past seven years the exports of farm products have more than doubled. The articles in which the larger part of this increase has occurred are wheat, flour, pease, cattle, pork, poultry, cheese, butter and fruits. Along these lines the resources of Canada for the extension of trade are practically unlimited. With suitable climates, an enormous area of fertile land and a body of intelligent farmers earnest in their desire to improve their condition, and with an aptitude for acquiring practical information in all lines of farm work we may safely look for continued advancement.

It should, however, never be forgotten that we shall always have much to learn; and a striving for improvement in quality of product, in methods to economize the cost of production and to increase the output should never cease. There are competitors on every hand, and the search for new outlets for Canadian products should ever continue and we should always be ready to do our best to meet the wants and wishes of those who are willing to trade with us.

Canada has for many years been making steady progress, but in no branch of work has this been so evident as in that great national industry, agriculture. The governments of this country have been liberal in their efforts to assist the farmers to a better knowledge of their business, and to-day, as a whole, no farmers are better informed than those in Canada, and the results of the efforts which have been made for the farmers' advancement have laid the foundations for a prosperous condition of agriculture of which as yet we see only the beginning.

The efforts which have been made in connection with the experimental farms in the past, to help farmers to solve some of the problems and to successfully meet the difficulties common to farming, have been much appreciated and the work of the past year, as recorded in the pages of this seventeenth annual report, will, it is believd, furnish additional facts of great value. New matter is presented from every department, and continued efforts have been made to give to all the information gained, an application, as practical as possible, looking always to the improvement of agriculture and the making of the noble work of the farm more attractive and profitable.

THE LEADING CEREAL CROPS IN CANADA.

OATS.

The oat crop is the most important of all cereal crops in the eastern provinces. In Ontario it occupies a larger area than all other cereals combined. While the area devoted to fall and spring wheats in this province is gradually lessening, the oat acreage is constantly going up. In Quebec, next to hay it is much the most important of all crops. The area in barley also in Ontario is steadily increasing. The explanation of this probably lies in the fact that these two cereals which were at one time largely exported but are now almost entirely consumed on the farm have been found most economical and suitable for the feeding of dairy cows and swine, and for the fattening of steers. In Manitoba also the acreage in oats is increasing. In 1903 it amounted to 855,431 acres, with a total yield of 33,035,774 bushels, an average of 38·62 bushels per acre. In all the other provinces and territories it is also an important crop.

The increase in the acreage of oats has been associated with a considerable increase in the average crop. For the 19 years from 1882 to 1901 the average crop of oats in Ontario was 34 bushels 27 pounds per acre, while the crop for the past two years has averaged 42 bushels 5 pounds per acre. This is an average increase of 7 bushels 12 pounds per acre, which estimated at the value of 1 cent per pound, has added nearly two million dollars a year to the profits of oat growing in this province. This is a very good showing. Comparing Ontario with the States which border on either side, we find that in the state of New York the average for the ten years ending in 1900 was 28 bushels 27 pounds per acre, and for 1902 and 1903 an average of 37 bushels. In Michigan the average for the ten years ending with 1900 was 29·7, and for 1902 and 1903 an average of 35·2. In Wisconsin the average for the ten years ending with 1900 was 32·9 and for 1902 and 1903, an average of 36·4. From these figures it will be seen that Ontario is well above its neighbours in the yield obtained from the land devoted to oats.

To gain information as to the most productive and profitable oats to grow, promising sorts have been brought together for test from all countries. About 60 varieties have been under trial during the past eight or nine years at each of the experimental farms, where they have been grown side by side under practically uniform conditions, and their relative earliness, productiveness and quality ascertained. From year to year the records of the results of this work are carefully gone over and any varieties which may have fallen for some years below a certain high standard of average productiveness are dropped from the list, thus bringing more prominently before the farmers of Canada those sorts which have been found to be most productive. The best of those on the list are grown in considerable quantities every year to supply the samples which are sent free to every farmer who applies.

At the experimental farms larger crops have been grown than the average reached by the several provinces.

At the Central Farm, at Ottawa, the average yield of all the varieties tested in 1903 on the experimental plots was 62 bushels 9 pounds, and the best twelve sorts gave an average of 73 bushels 6 pounds per acre; on a field of 39 acres of Banner oats 57 bushels 9 pounds per acre were obtained.

At the Nappan Experimental Farm, in Nova Scotia, the average yield of all the varieties tested on experimental plots was 81 bushels 18 pounds per acre, and that of the best twelve varieties 94 bushels 27 pounds. The field crops on that farm have run from 65 to 70 bushels per acre.

At the experimental farm at Brandon, Manitoba, the average yield on experimental plots of all the varieties tried was 97 bushels 4 pounds per acre, and that of the best twelve varieties 110 bushels 28 pounds. In field crops the yields have varied from 73 bushels 18 pounds to 86 bushels 18 pounds per acre.

At the experimental farm at Indian Head, North-west Territories, the average of all the varieties on experimental plots was 117 bushel 23 pounds and that of the best twelve sorts 128 bushels 26 pounds per acre.

In field crops, 5 acres of Banner gave an average of 119 bushels 2 pounds per acre, and 3 acres of Abundance, an average of 106 bushels. The other varieties under field culture varied from 98 bushels 14 pounds to 82 bushels 3 pounds per acre. Taking into account the whole of the field crops (36 acres) the average yield has been 95 bushels 8 pounds per acre.

At the experimental farm at Agassiz, British Columbia, the average crop of all the varieties tested in experimental plots was 66 bushels 4 pounds per acre, and that of the best twelve sorts 77 bushels 12 pounds per acre.

Among the varieties which have given the heaviest crops are the Banner, Wide Awake, Improved Ligowo, Abundance, Tartar King, Waverley and Thousand Dollar and provision has been made to give these varieties a wide distribution during the coming season.

The Banner oat is a variety which has done remarkably well. During the past nine years it has given an average on the experimental plots on all the farms of 78 bushels 25 pounds per acre and in all the field crops at all the farms during the same period an average of 71 bushels 10 pounds per acre.

The Banner oat is also attracting attention in Great Britain. In 1899, in response to a request from Prof. Patrick Wright, Principal of the Agricultural College of Glasgow, samples of some of the best sorts of oats cultivated in Canada were sent to him from the experimental farm to be grown for comparison with the best sorts cultivated in Scotland. Prof. Wright's reports show that from the outset the Banner oat took a leading position among the many varieties he was growing, and the next year a request came from him for twelve bushels for further trial, and in the year following for fifty bushels more. These were distributed among a number of leading farmers in different parts of Scotland, and the reports published were so favourable that a great demand was created for the seed and several large orders were received by seed firms in Canada last year for these oats for use in Great Britain. In a recent letter from Prof. Wright, he says: 'It may interest you to know that the Banner oat has now taken an assured position among the oats cultivated in Britain, and has proved itself to be equal to, if not better, than any other oat we have.'

Another of the varieties sent to Scotland from here is also attracting notice. This is the 'Wide-awake.' Of this variety in a recent letter Prof. Wright speaks as follows: 'In our last season's trials a remarkably good result is shown in our tables by the 'Wide-awake' oat of which we also got the original seed from you. It has done so well that I am writing you now to ask if you would be good enough to get sent to me without delay twenty quarters (160 bushels) to be used as seed this season.' I succeeded in getting fifty bushels, which were sent in good time for sowing. In a letter of March 17, he says: 'If this oat does as well with us next year as last, it is also likely with the Banner, to pass into general cultivation here.' It is gratifying to know that we are thus helping farmers in the mother country with Canadian varieties of a very productive and valuable character.

In estimating the value of an oat the relative weight of kernel and hull must be considered. This will vary with the variety and with the weight per bushel of the sample. The lighter the weight per bushel the larger is the proportion of hull. In a very light sample, weighing about 20 pounds to the bushel, the proportion of hull has been found to be over 50 per cent, whereas the same variety of the standard weight (34 pounds per bushel) would only have about 30 per cent of hull.

The Banner is generally regarded as a thick-hulled oat, but in our experience it is only medium in this respect. In the following table the varieties which were most largely distributed from the Central Experimental Farm in 1903, are referred to, and their place of growth, weight per bushel and proportion of hull given. The Tartar

King, Waverley and Goldfinder are varieties recently introduced by Garton Bros., England:—

Name of Variety.	Where grown.	Weight per Bushel.	Proportion of Hull.
		Lbs.	Per cent.
Banner	Ottawa	42⅓	28·6
"	Indian Head	44½	29·7
Improved Ligowo	Ottawa	44⅓	26·6
"	Indian Head	46½	26
Wide Awake	"	46½	28
Tartar King *	Ottawa	37½	34·3
"	Indian Head	46¾	28
"	As imported from England.	39¼	30·9
Waverley	Ottawa	41	26·3
"	Indian Head	46½	26·7
Goldfinder	Ottawa	39	28·6
"	Indian Head	42	28·1
"	As imported	35	24·9

In some instances there seems a tendency to produce a somewhat thicker hull in this country; in others a thinner one. Investigations have not yet gone far enough along this line to permit of any decided opinion on this subject. One point which our examinations seem to prove is this: that as a rule the actual weight of hull in a given number of kernels of any one variety of oats is practically the same, whether the oat weigh 30 or 40 pounds per bushel, and the difference in weight is made up in the size of the kernel. This, after all, is not a matter of much surprise, when we look carefully into the subject. When an oat during its growth heads out, the husk is of full size, and the framework for holding the kernel is all there. The covering for the future oat is fully developed, the flower is produced in the cavity prepared for it, fertilization takes place, followed by the growth to maturity of the kernel. The plumper the kernel, the heavier is the oat.

ANALYSIS OF HULLS AND KERNELS.

What gives to this subject the greatest importance is the fact that the hull contains a very small proportion of nutritive matter. The quantity of albuminoids or flesh-forming constituents and of fat in oat hulls is not much more than half of what is found in oat straw. Oat hulls, according to Henry, contain 3·3 per cent of total albuminoids. Mr. Shutt, the Chemist of the experimental farms, finds this to be only 2·6 per cent in Canadian oats, while in oat straw the average of six analyses gives 4·1, and for the kernel of the oat, 14·51, showing the immense difference in feeding value between the husk or hull and the kernel, and pointing to the importance of growing the plumpest and most productive sorts. The proportion of fat in the hull is relatively less. While the kernels contain 6·24 per cent of fat and the oat straw 2·1 per cent, the proportion of fat, as given by Henry, is 1 per cent in the hull, and by Shutt, ·78 per cent (a trifle over ¾ of 1 per cent). I append the results of Mr. Shutt's analysis, which is of the Banner oat grown in Ottawa in 1902.

* The Tartar King has a stiff straw and evidently has a larger proportion of hull than most other oats which we have tested.

CROP OF 1902, C.E.F.

Proportion of kernels to hulls:

Kernels	71·92
Hulls	28·08
	100·00

—	Moisture.	Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash.
Oats (whole grain)	12·74	11·22	4·82	58·84	9·47	2·91
Kernels	12·03	14·51	6·24	63·15	1·93	2·14
Hulls	10·19	2·60	0·78	49·63	31·63	5·17

From the facts submitted it will be seen that heavy oats are worth a higher price than light oats, as in buying them the purchaser gets a larger proportion of the highly nutritious kernels. The kernel contains nearly six times as much albuminoids as the hulls and eight times as much fat. It will also be noted that judging from the crops produced at the experimental farms a further increase in the average yield of oats per acre in the provinces and territories may be looked for when the conditions involved in the production of good crops are more carefully and fully complied with.

WHEAT.

While the oat is so highly important among the crops in the east, wheat holds a corresponding position of importance in the west, where much the larger area is occupied by this crop.

The wheats grown throughout the world consist mainly of five different species and their varieties. *Triticum vulgare,* in which are included most of the spring and winter wheats cultivated in America, Great Britain, in many of the European countries, and in Australia, for the making of bread. *Triticum durum,* a class of wheats which are hard and rice-like, represented in this country by such varieties as Goose wheat, Kubanka, Gharnovka, Velvet Don and others. These are valuable wheats for macaroni and pastry, and are used in some countries for bread. Large quantities of these wheats are grown in Southern Europe, and recently they have been introduced into some of the western United States, where they have been grown with some success. They have also been tested in Canada. They are less liable to rust than other wheats, but their cultivation has been discouraged by millers, on the ground that they are of inferior quality and unsuitable for bread-making.

A third species is known as *Triticum polonicum* or Polish wheat, which produces large kernels and large loose heads. The grain is hard and flinty, resembling in this respect the macaroni wheats.

The fourth group of wheats are known as Emmers *Triticum dicoccum* and the fifth as Spelts *Triticum spelta.* These five groups include all the varieties grown.

The origin of the wheat plant is unknown. There does not appear to be any reliable records of any of the varieties having been found growing in a wild state, but some of them have been in cultivation since very early times. The earliest mention of wheat in the Bible is in Genesis, chap. 30, v. 14. The Spelt wheats were grown by the ancient Egyptians and are still much cultivated in some of the mountain districts in Europe. The importance of the wheat crop may be gathered from the quantity produced and consumed in the world. It is certainly the most important of all the world's crops and the most valuable to mankind of all cereals. The total crop for the entire world in 1903 is given as 3,258,688,000 bushels.

The season of 1903 has not been quite so favourable to the farmers of Manitoba and the North-west Territories as those of the past two years. In 1903 the total area of wheat sown in Manitoba was 2,442,873 acres, which returned a crop of 40,116,878 bushels, the average yield being 16·42 bushels per acre. This is 12,960,389 bushels less than was produced in 1902. In the North-west Territories the acreage under wheat was 837,234, and the average crop, 19 bushels, representing a total output of 16,029,149 bushels. This added to the crop of Manitoba, makes a total wheat crop for 1903 of 56,146,027 bushels, a decrease in wheat yield, when compared with the crop of 1902, of 10,888,090.

In Ontario the land devoted to winter wheat in 1903 was 665,028 acres, which produced a total crop of 17,787,169 bushels, being an average of 26·7 bushels per acre. Spring wheat occupied 248,518 acres which produced 4,797,274 bushels, an average of 19·3 bushels per acre. Total area in wheat in Ontario, 913,576 acres, total crop, 22,584,443 bushels. The wheat crop in Quebec, the Maritime provinces and British Columbia, although growing in volume, occupies as yet only a small proportion of the acreage under cultivation.

The higher prices realized this season for wheat have done much to make up for a shortage in yield, and a larger area of land than ever before has been prepared for the crop of the coming year.

While the eastern provinces will probably always have surplus wheat to export, it is to the north-west country we must look for the greater volume of exports of this valued cereal, since the area suitable for wheat culture there is enormous, and owing to advantages in soil and climate the wheat grown there is of higher quality and commands a higher price than that grown in the east.

SOME OF CANADA'S VAST AREAS OF FARM LANDS.

The area of land suitable for the growing of agricultural crops in Canada is so vast that when presented in figures the mind needs much training before their full significance can be grasped. The civilized world is gradually awakening to a somewhat hazy perception of the immense wealth laid up in the many millions of acres of fertile lands unoccupied here and large numbers of immigrants are flocking to our shores. The great North-west country is a huge field for future enterprise, as yet very imperfectly understood even among our own people.

The following figures as to the quantity of land fit for settlement in the province of Manitoba and the three provisional territories, Assiniboia, Saskatchewan and Alberta, have been obtained from official sources and may be accepted as approximately correct for the areas in question:—

——	Total Area exclusive of Water.	Estimated Proportion suitable for Cultivation.	
	Acres.		Acres.
Manitoba	41,000,000	Two-third equal to	27,000,000
Assiniboia	57,000,000	Seven-eighths "	50,000,000
Saskatchewan	70,000,000	Three-fourths "	52,000,000
Alberta	64,000,000	Two-thirds "	42,000,000
		Total	171,000,000

It is thus estimated that there are within the limits referred to, after making allowance for lands unfit for agriculture, about 171 million acres suitable for cultivation, by which is meant land of such a degree of fertility as to admit of profitable farming. While referring here only to the possibilities of agricultural progress within this area, where the quality of the soil and the conditions of climate are fairly well known, we should not deal justly were we to pass over the great north country lying beyond the boundaries of Saskatchewan and Alberta without a few words of explanation.

The 155 million acres of land in Athabaska, and the 340 million acres in Mackenzie, will no doubt prove important factors in the future development of Canada; but what proportion of these vast districts will be capable of the profitable growing of crops is as yet a matter of conjecture. There are, however, some proofs available showing that it is possible to grow cereals to some extent in portions of these remote districts of which our knowledge is so fragmentary.

The writer has received samples grown at Dunvegan, on the Peace river, in Athabaska, 414 miles by latitude north of Winnipeg, of Ladoga wheat plump and well matured, weighing 64 pounds per bushel. From Fort Vermillion, further down the Peace river, also in Athabaska, 591 miles north of Winnipeg, Ladoga wheat has been raised weighing 60 pounds per bushel.

Considerable quantities of wheat have of late been grown by settlers in the Peace river valley, especially near Vermillion, where there is said to be a considerable area of land suitable for wheat growing. The Hudson's Bay Company have built a good roller mill at Vermillion, with a capacity of twenty barrels of flour per day, and have paid $1.50 per bushel for all the wheat grown in that vicinity this year. This has been done with the hope of being able to supply their northern posts with flour from this district. The quantity of wheat grown there this year is estimated at 7,500 bushels. One of the settlers, Mr. F. S. Lawrence, of Vermillion, claims to have had this season about 40 bushels per acre from 50 acres of his wheat land.*

From Fort Simpson, in Mackenzie, 818 miles north of Winnipeg, by latitude, Ladoga wheat has been obtained which weighed 62½ pounds per bushel. In this instance a small percentage of the grain was injured by frost. This is the furthest point north from which samples of wheat have been received. The time between sowing and harvesting in these far northern districts is in some instances less than it is at the experimental farm at Ottawa. At Dunvegan the wheat was sown May 7, and harvested August 21, giving a growing period of 101 days. The same sort of wheat grown at Ottawa, taking the average of three years, requires 106 days. At Fort Vermillion the time between sowing and harvesting was also 101 days, and at Fort Simpson the wheat was sown June 7, and harvested September 22, giving a growing period of 107 days.

The long days are an important factor in bringing about this result, the influence of increased periods of light hastens the ripening of cereals very much. This view is supported by facts brought together during a careful series of observations made some years ago by a distinguished Russian investigator, Kowalewski. He experimented with spring wheat and oats, growing them in different parts of Russia, from the far north, at Arkangelsk to the southern province of Kherson. He found that in the higher latitudes the grain ripens in a shorter period than in the more southern districts, the difference varying at different points from 12 to 35 days. This author attributes the earlier ripening in the north largely to the influence of light during the long summer days. He also believes that the short seasons of quick growth have gradually brought about in these cereals an early ripening habit. In our experience with early ripening cereals, this habit is a permanent characteristic which they continue to manifest when grown in localities where the summer season is longer.

Returning again to the smaller and better known districts, Manitoba and the three provisional territories in which are included the 171 million acres which are said to be suitable for cultivation, we find that a very small proportion of this land less than four per cent, has yet been brought under crop. It does not follow that all the land fit for settlement within the area referred to is suitable for wheat growing. There are some

*I am indebted to Mr. J. M. Macoun, of the Geological and Natural History Survey, who has recently returned from exploring parts of the Peace river valley, for these items of information.

localities where the season is too short to make wheat a sure crop and farmers in such districts will find it more profitable to carry on mixed farming; but from the good crops which have been harvested during some years past in most of the settled or partly settled regions, within this area, it is evident that the greater part of the country is well suited for the growing of wheat of high quality.

Another consideration which would reduce the area annually available for wheat is that the land, to get the best results, should be summer-fallowed every third season. Further, while many excellent farmers advocate the growing of two crops of wheat in succession, one on fallowed land, the second on stubble, to be followed by fallow, it may be found more profitable in some localities to grow wheat in rotation with other crops.

Making allowances for all these requirements, the fact still remains, that the resources of Canada in wheat lands are enormous.

The total wheat crop of the United States for 1903 was 637,821,835 bushels, sufficient to feed a population of about 80 millions and leave a margin of about 235 million bushels for export. This wheat was all grown on less than 50 million acres of land. Furthermore the yield per acre of wheat in Canada is larger than it is in the United States. In 1902 and 1903 the average crop given for the whole of the United States, including winter and spring wheat, is about 14 bushels per acre. That this yield for the past two years is not abnormal is shown by the fact that the average for the past ten years has been 13·53 bushels per acre.

Ontario and Manitoba are the only two provinces for which statistics are available for these periods. In 1902 and 1903 the average crop of winter wheat in Ontario was 26·4 bushels, and of spring wheat 19·3 bushels per acre, and for the same years in Manitoba where only spring wheat is grown an average of 21·21 bushels.

The average of a ten years' record tells much the same story. The average yield of winter wheat in Ontario for the past ten years was 21·52 bushels per acre, and of spring wheat 16·64 bushels. In Manitoba the average for the past ten years has been a little over 20 bushels per acre. Comparing this with the states bordering on Manitoba we find that the average yield per acre of wheat in Minnesota for the past ten years has been 14·33 bushels, in North Dakota 12·87 bushels and in South Dakota 10·67 bushels per acre. This larger yield in Canada is no doubt partly due to the land being more productive and partly to a more favourable climate, and in some measure to better farming. Were one-fourth of the 171 million acres said to be suitable for cultivation in Manitoba and the three provisional territories under crop with wheat annually, and the average production equal to that of Manitoba for the past ten years, the total crop would be 855 million bushels annually, which would place Canada in the position of being much the largest wheat producing country in the world. These figures deal only with a portion of the west, and do not take into account the wheat-growing areas in the large eastern provinces.

Under the climatic conditions which prevail in the Canadian North-west, wheat of excellent quality is grown, which is much sought after by millers to mix with the flour of wheat of lower grades, so that a desirable and uniform strength may be maintained in the flour they produce. This strength in flour, which is so highly developed in that made from No. 1 Hard wheat grown in the North-west, is due to the presence of a large proportion of gluten of high quality. The relative proportions of the more important constituents in wheat will depend on the character and tendencies of the individual variety, the climatic conditions under which it is grown, and the fertility of the soil. The chief constituents of wheat are gluten, starch and fat, all highly nutritious in their character. Starch forms the larger portion of the substance of the grain, ranging in spring wheat from 65 to 68 per cent; gluten from 11 to about 15; and fat from about 1¾ to 2¼ per cent. Winter wheat contains a larger proportion of starch, from 70 to 74 per cent, and a smaller proportion of gluten, from 6 to 9 per cent. The proportion of fat is much the same in both classes of wheat. When a number of different sorts of wheat are grown side by side and under the same conditions, some will be found to contain a larger proportion of gluten, others a more abundant deposit of starch. In the better sorts of spring wheat, when grown in northern latitudes, where the summer season is short and the growth rapid, the proportion of gluten is usually increased and under such conditions the grain improves in quality. The gluten exists in the kernel in the form of an irregular frame-work, which extends throughout the substance of the grain, firmly packed with clusters of starch granules. The frame-work of glutinous matter is formed in the early stages of the growth of the berry, and the starch granules are subsequently deposited in the interspaces. In the preparation of flour the berry is crushed, the exterior is separated as bran or shorts, while the interior contents form the fine flour for bread-making. The starch in flour may be separated from the gluten by the simple process of washing with water, whereby the starch granules are removed and the gluten remains as a sticky mass. By working this with the fingers under a gentle stream of water, the starch may be entirely removed and the proportion of moist gluten determined. The starch contains no nitrogen, but the gluten is highly nitrogenous and a most excellent nutrient and flesh-former.

Chemical analyses of gluten have shown that it consists of two different principles, known as gliadin and glutenin, and it is from the combination of these in the best proportion that the highest quality of gluten results. Hence, while the percentage of gluten may be regarded in a general way as indicating the quality of a wheat, a high percentage of this substance is not always a sure indication of the milling value of the sample. Both the percentage and quality must be had to produce a flour which will give to bread made from it that tenacity which results in a light, porous white loaf of the most highly esteemed character. The best spring wheats grown in the Canadian North-west are noted for the high quality of gluten they contain and hence are in great demand.

REVIEW OF THE WORK WITH WHEAT AT THE EXPERIMENTAL FARMS.

At the experimental farms persistent efforts have been made from the outset to bring together from different countries the best and most promising sorts of wheat for trial, the qualities particularly sought being productiveness, earliness, and strength of flour. These varieties have been grown side by side, under similar conditions, so that their relative value might be determined.

Among the spring wheats commonly grown at the time the farms were established none was so highly or justly esteemed as the Red Fife, and the position it still holds is a pre-eminent one. It is remarkable for its productiveness, for its high quality, and for its power of adapting itself to varying conditions of soil and climate. This wheat originated about sixty years ago, as a chance discovery with Mr. David Fife, of Otonabee, Ontario, and hence has been in cultivation for more than half a century, and it does not show any tendency to deterioration. It gives as large a crop and is as high in quality as it ever was. It was taken from Ontario to Manitoba and the North-west Territories, where it is believed to have improved in quality, and as grown there, stands probably higher in the estimation of millers for the making of flour than any other known variety.

To preserve Red Fife in a state of purity by hand-picking in the field, has been one of the lines of work carried on persistently at the experimental farms.

While the Red Fife has so many points of excellence, it is open to one objection, which sometimes proves a very serious drawback to its cultivation. It is rather late in ripening and during the past fifteen or twenty years there have been several seasons when early frosts in the North-west have injured the grain so as to reduce its value very materially. Whenever this has occurred an outcry has been made by the farmers who have suffered, for an earlier ripening wheat.

In the endeavour to meet this demand varieties of wheat have been brought to Canada from many different countries, and grown for many years at all the experimental farms, alongside of the Red Fife and other well known sorts and their periods of ripening and weight of crop carefully recorded. Some wheats have been brought from the colder districts in Northern Russia, verging on the Arctic circle, some from other countries in the northern parts of Europe, others from different altitudes in the Himalaya mountains, in India, from 500 to as high as 11,000 feet, which is about the limit for wheat-growing in that range. Other wheats have been obtained in the northern United States, from Australia, Japan and elsewhere.

Both the Russian and Indian wheats have usually ripened earlier than the Red Fife, but some have been inferior in quality, and others have given such small crops that the growing of most of them has been abandoned. Those we have had from Australia, also those from the North-western States, have been as late as, and many of them later than the Red Fife, and show no advantages over that variety. Every promising sort obtainable has been tested under the different climatic conditions existing in Canada, without finding a single earlier-ripening sort in cultivation elsewhere having the high quality and productiveness of the Red Fife.

THE BREEDING OF NEW WHEATS.

Another method by which we have sought to obtain the desired end has been by the cross-breeding of wheats, with the object of combining the good qualities of two or more varieties. It was on July 19, 1888, when the first experiments were begun in the cross-breeding of wheat on the experimental farm and since that time several hundred new sorts have been produced and tested. In originating many of these new productions the Red Fife has been chosen as one of the parents. One of the earlier importations from Northern Russia was the Ladoga, a wheat which after a thorough test proved on an average to be about a week earlier in ripening than the Red Fife; it was also fairly productive, but the colour of the flour made from it was not so white as that made from the Red Fife. It has, however, served a good purpose in the far northern districts, where its earliness of ripening has commended it to the settlers. The slightly yellow colour of the flour, which was the chief objection to its use here, was no drawback to it there, since it makes excellent bread. Samples of this Russian importation were early sent from the experimental farm to settlers in the Peace river district, and the Ladoga is said to be the only variety of wheat now grown in all that country. A considerable number of crosses were also produced between Ladoga and Red Fife, the most promising of which were multiplied until plots of considerable size could be grown. These were subject to rigid inspection from year to year, the less desirable sorts being promptly discarded, so as to keep the number of varieties under trial within reasonable bounds.

Among the most promising of the numerous progeny from this parentage are the varieties known as Preston and Stanley. The Preston is a bearded sort. The Stanley is beardless. Taking the average yield obtained on the experimental plots on all the experimental farms for a period of nine years, the Preston has given a crop of 34 bushels 41 pounds per acre, while the Red Fife has given 33 bushels 7 pounds per acre, a difference of 1 bushel 34 pounds in favour of the Preston. The Preston has also ripened uniformly earlier, the gain in time of ripening averaging from four to six days.

The Stanley is a twin wheat with the Preston, both having had origin in the one kernel. The plant grown from the cross-bred kernel the first season produced heads which were uniformly bearded; but when the seed from this was sown the year following, some plants produced bearded heads and others beardless. Subsequently these two varieties were bred to type by discarding all the variations produced until the types became fixed. Stanley, during a nine years' test, has given an average crop of 32 bushels 2 pounds per acre, which is 1 bushel 5 pounds less than Red Fife for the same period. In earliness of ripening this variety is about the same as the Preston.

The White Fife, which has averaged 8 pounds per acre more than Red Fife, during a nine years' trial, is grown to a considerable extent in some parts of Manitoba and the North-west Territories; but, although highly esteemed by some, it is not held to be equal in quality to the Red Fife. This variety was also crossed with the Ladoga and the best results obtained were Huron and Percy. Huron is a bearded variety which has also proven productive and early. During a nine years' test it has given a slightly larger crop than Red Fife, exceeding that variety by 4 pounds per acre. It has also matured from four to five days earlier. Percy has given an average crop during the nine years' trial of 31 bushels 30 pounds per acre, which is 1 bushel 37 pounds per acre less than Red Fife for the same time. This also ripens earlier than Red Fife by from four to five days.

Another variety, known as Early Riga, was obtained by crossing one of the East Indian wheats, named Gehun, brought from a high elevation in the Himalayas, 11,000 feet, with a Russian wheat known as Onega. The Onega was brought from near Archangel, one of the most northerly wheat growing districts in Rusisa. These were both early varieties, but were not very productive. The Early Riga was the best sort produced from this cross and has proved to be one of the earliest ripening wheats known. During the five years it has been under trial it has ripened on an average from eight to nine days earlier than Red Fife. It is also fairly productive, having given an average crop for five years at all the experimental farms of 31 bushels 2 pounds per acre, being 2 bushels 5 pounds less than Red Fife for the same.

MILLING TESTS OF WHEAT.

The next point to consider is the quality of these cross-bred wheats and how they compare with Red Fife. To gain information on this point, three lots of samples were put up, consisting of two of Red Fife carefully cleaned and of the very best quality, with two each of Preston, Stanley and Percy. One of these was grown at Ottawa, Ont.; the other at Indian Head, N.W.T. One lot of samples was submitted to Mr. Julicher, the well known wheat expert of the Pillsbury-Washburn Flour Mills Co., of Minneapolis, Minn. A second lot was sent to Lord Strathcona, High Commissioner for Canada, London, England, with a request that they be submitted to one of the best English wheat experts. The third lot was handed to the Chemist of the experimental farms, Mr. F. T. Shutt, for analysis.

I am much indebted to Mr. L. P. Hubbard, of the Pillsbury-Washburn Flour Mills Company, Limited, for the privilege of sending samples of Canadian wheats to be tested by their expert, Mr. J. H. Julicher. The samples sent were all forwarded under numbers, and no information was given as to the varieties submitted. In presenting Mr. Julicher's report, I have placed the names of the wheats after the numbers under which the samples were forwarded, so that the readers of the report may know to which they refer.

—	Dough.		Gluten.		Quantity.	Quality.
	Quality.	Action in Washing.	Density.	Colour.		
					p.c.	
No. 7 (Red Fife, Ottawa)	White	Excellent.	Excellent.	White	11·8	101
" 3 (Red Fife, Indian Head)	White	Excellent.	Excellent.	White	11·9	101
" 6 (Preston, Ottawa)	Creamy	Good	Good	Creamy white.	11·9	100
" 2 (Preston, Indian Head)	Yellow	Good	Good	Creamy	11·9	100
" 8 (Stanley, Ottawa)	Creamy	Good	Good	Creamy white.	12·9	100
" 4 (Stanley, Indian Head)	Yellow	Good	Good	Creamy	12·4	100
" 5 (Percy, Ottawa)	Yellow	Good	Fair	Creamy	13·3	100
" 1 (Percy, Indian Head)	Yellow	Good	Good	Creamy	12·4	100

The samples marked 1 (Percy), 2 (Preston, I.H.) and 4 (Stanley, I.H.) are good wheats, but the others are better. I would favour 3 (Red Fife, I.H.) and 7 (Red Fife, Ottawa). In my opinion 3, 7 and 8 (the two Red Fifes and Stanley, Ottawa) would be excellent for milling, and bread made from flour of these would be very hard to match for quality, colour and strength.

J. H. JULICHER.

March 24, 1903.

These were all classed, as to condition, as very dry.

By reference to the table, it will be seen that the Red Fife from Indian Head and the Red Fife grown at Ottawa are graded exactly in the same terms, which was a matter of surprise to me as I had understood that the Red Fife grown in the east was not equal in quality to that grown in the north-west. I am told, however, that the season of 1902 was somewhat exceptional in that respect, and that the difference in quality between Red Fife grown in the west and that grown in the east was less that year than usual, the conditions having been such as to give to eastern samples a relatively higher quality.

While the dough of the flour of the Red Fife was pronounced white, and the gluten white and excellent, that from the Preston from Ottawa was rated as creamy and good, with good creamy white gluten. The dough from the Preston from Indian Head is said to be yellow and good, and the gluten as good and creamy, indicating a slightly better quality in the Ottawa-grown sample.

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The samples sent to Lord Strathcona were submitted by him to Mr. William Halliwell. In a letter received from his Lordship he says: 'I now forward you the report of Mr. William Halliwell on the eight samples of wheat which you sent me. Mr. Halliwell is the technical editor of *The Miller*. He is lecturer on flour milling to the London County Council, registered teacher of milling technology at the city and Guilds Institute, and may therefore, I think, be regarded as a competent authority. He has, moreover, had twenty-five years' experience of practical flour milling and wheat buying.

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Mr. Halliwell writes as follows:—

'ROOKWOOD, ROMFORD, May 22, 1903.

'W. L. GRIFFITH, ESQ.,

'DEAR SIR,—I beg to forward you the result of my examination of the eight samples of Canadian wheat you were good enough to send me some days ago.

'I have given them special attention from a practical miller's point of view, and I hope you will find the results to be of benefit to Canadian wheat-growers generally. There is an unlimited market for the best sorts of wheat in this country and when my report is published I hope proper emphasis will be laid upon this point. Pure high-class samples will be preferred to those from any other source, as these wheats from the Canadian North-west are constantly growing in favour with the millers of this country.

'Yours faithfully,

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Mr. Halliwell's report is as follows:—

'Critical examination of eight samples of Canadian wheat:

'For strength, as viewed from the outside, from cutting the grains, and from reducing them to powder, I find they come out as follows: The samples are numbered 1 to 8. Four of them (1 to 4) are from Indian Head Farm and are called regular samples of No. 1 wheat. The other four (5 to 8) are from the Government Experimental farm at Ottawa. One to four are almost equal and may be classed as their numbers indicate, there being a just perceptible difference—but not enough I should say, to make a difference in the general selling price on our English markets. Following these I put the experimental samples (from Ottawa) in the following order, namely: 6, 5, 8, 7, and I might add that their general excellence is much better than one would expect to find from their outside appearance alone. In no case, however, would the latter numbers be sold for the price of those numbered 1 to 4. In making this statement, I am bearing in mind that the chief ingredient required in Canadian wheat is gluten or strength, given that the nature of the wheat also guarantees a maximum of the other attributes which millers expect to find and do find in well developed Canadian grown grain. Speaking as a miller, I also am of opinion that the Indian Head samples (1 to 4) will yield more middlings, of larger and more even size, and of better shape and all round quality than those grown on the experimental farm at Ottawa. There would also be less break flour—a thing all millers try to avoid making, seeing that this quality of breaking flour is only akin to the lowest grade. I may explain this more clearly by saying that the object of all millers is to make middlings first and flour afterwards. Middlings can be purified and so prepared for conversion into the highest grades of patent flour, whereas if the structure of the wheat does not lend itself quite so readily to this performance, but is apt to be too easily disintegrated on the break rolls, the result means flour, and that of a much lower quality, seeing that it cannot be sent to the purifiers at all, therefore I say that according to my judgment, the break flour would be less in the first four samples. Going a step farther, I am of the opinion that the middlings made from the Indian Head samples would grade better—would be more even in size, in texture and in gravity. These are the three primary considerations which govern the successful milling operations, and they are ever present when buying high class wheat for milling purposes. Wheat particles—middlings—which grade well, are always found in the largest quantity at the head of the mill, where the highest priced patent flour is made. The wheats from the experimental farm at Ottawa do not, in my opinion, possess all these qualifications in the highest degree. They are not quite so compact in their structure, or in other words, they are of a slightly more mellow nature and are rather more inclined to break up more quickly, and also into more sizes, smaller sizes in fact, and thus there would be a tendency towards them being conveyed lower down the milling system before being converted into flour. This, of course, means that the larger percentage would be graded as second patents. To my mind, it appears as if the Indian Head wheats were grown under the better natural conditions and in quite different soil.'

'In the simple matter of flour yield, however, the Ottawa wheats are undoubtedly first, but, as I may be permitted to remark, mere flour yield is not the sole consideration regarding the buying of Canadian wheats. What we require first of all is strength, and given this, yield and colour follow as a natural consequence. When examining the various samples as intended for the purifiers, I still pin my faith to the Indian Head samples. They—as broken up by the millers break rolls—are more free from bran snips, more free from adhering bits of the branny coating, and are thus more easily operated upon, giving to the purifiers a slightly larger constant capacity, and, as I have already pointed out, this capacity is needed on account of the larger quantity of middlings made, yet at the same time, it is the highest recommendation because this larger quantity is to be made into patent or high class flour. Having been through the purifiers, the more compact middlings (Indian Head samples again) go straight to the reduction rolls, and are immediately reduced to flour, whereas whenever there is the slightest mellowness—or weakness I may call it—the flour does not get to the sack quite so quickly. Strictly, however, it is a question of strength, pure and simple, and I have endeavoured to point out my conclusions on that head particularly. Whichever wheat is strongest will get to the flour sack quickest. Patent flour is made where the strength is supposed to be, and when buying strong wheat, millers look to the points I have enumerated.

'I have also compared the eight samples with others on the London Corn Exchange at the present time (May 21). I have been at the trouble to work them side by side in the examination just given, and I find that for strength (the ruling characteristic) Nos. 1, 3 and 4 would sell off Mark Lane stands at 34s. 3d. per 496 pounds; No. 2, 34s.; Nos. 5 and 7 at 33s. 9d., and Nos. 6 and 8 at 33s. 6d. A comparison with Canadian shippers' figures may be interesting. This will be best made by those more intimately interested.

'In order to put my meaning in concise form I append a small table of the various constituents compared with what I find already on the English Exchange.

Numbers.								English Sample.	Maximum Price.	Maximum Marks.
1.	2.	3.	4.	5.	6.	7.	8.			
Colour Marks.										
10	9	10	10	9	10	9	10	9	s. d. 34 3	10
Strength.										
10	9	10	10	9	8	8	8	9	....	10
Appearance.										
10	10	10	10	8	8	8	8	8	....	10
Milling Structure.										
10	10	10	10	9	9	8	9	9	....	10

'In conclusion, I should just like to add that not nearly enough of the first quality reaches our principal markets. This may of course arise from the fact that most of it is milled in Canada. Our regular samples do not on the whole reach up to the maximum, but may be said to be a shade better than what I found when I mixed several together. It would also be to the general advantage if the grades were kept more distinct and a stricter line drawn between the best No. 1 sorts and No. 1 ordinary. The best is always welcome, will always fetch the highest price, while mixing of any kind whatsoever spoils them for one or other of the points I have just enumerated.

(Signed 'WILLIAM HALLIWELL.'

Mr. Halliwell says that samples Nos. 1 to 4, inclusive, that is Red Fife, Preston, Stanley and Percy, grown at Indian Head, are almost equal, 'There being a just perceptible difference, but not enough, I should say, to make a difference in the general selling price on our English markets.' The four samples of the same wheats grown at Ottawa he ranks somewhat lower in value, but says that their general excellence is much better than one would expect from their outside appearance alone. In no case, however, would the latter numbers be sold at the price of those numbered 1 to 4. He puts these Ottawa grown samples in the following order of merit:—'6' Preston, '5' Percy, '8' Stanley, '7' Red Fife.

Further on in his report he seems to reach a slightly different conclusion and alters the relative position of these numbers, when he comes to speak of the price they would bring that day on the London market. He says: 'I have also compared the eight samples with others on the London Corn Exchange, May 21. I have been at the trouble to work them side by side in the examination, and I find that for strength (the ruling characteristic) Nos. "1," Percy, "3," Red Fife, and "4," Stanley, would sell at Mark Lane at 34s. 3d. per 496 pounds; No. "2," at 34s.; Nos. "5," Percy, and "7," Red Fife, at 33s. 9d., and Nos. "6," Preston, and "8," Stanley, at 33s. 6d.

The results of these tests and criticisms show that the two cross-bred wheats, Percy and Stanley from Indian Head are, in the opinion of Mr. Halliwell, in every respect equal to Red Fife, taking into account colour, strength, appearance and milling structure. The Preston stands equal to Red Fife in appearance and milling structure, but falls slightly below in point of strength. In the first part of his report Mr. Halliwell speaks of this as a 'just perceptible difference, not enough, I should say, to make a difference in the general selling price on our English markets.' But when dealing with the actual values of the samples on the London Corn Exchange, Percy, Stanley and Red Fife are given as being worth 34s. 3d. for 496 pounds, and Preston as worth 34s., which is equivalent to a difference in value of ⅗ of one cent per bushel.

Again, in his valuation of the samples grown at Ottawa, he puts the Percy and Red Fife first, instead of putting the Preston first, as in the early part of his report, placing these at 1½ cents a bushel less in value, and Preston and Stanley at 2¼ cents less per bushel in value than the same wheats grown in the North-west. These estimates of the relative value of these wheats in the London market, coming from so high an authority and a man of so much experience, are, no doubt in every way worthy of confidence. The differences, however, in actual value are less than one would suppose, judging from the relative prices of eastern and western wheats in this country.

ANALYSES OF WHEATS BY THE CHEMIST OF THE EXPERIMENTAL FARMS.

The analyses made of the eight wheats referred to, by Mr. F. T. Shutt, Chemist of the Dominion Experimental Farms, were reported on as follows:—

'CENTRAL EXPERIMENTAL FARM,
OTTAWA, May 2, 1903.

'Report on Wheats—Percy, Preston, Red Fife, and Stanley—Grown on the Experimental Farm, Indian Head, N.W.T., and the Central Experimental Farm, Ottawa, 1902.

Number.	Variety.	Locality Grown.	Weight per bushel.	Weight of 100 kernels.	Moisture.	Albuminoids.	Fat.	Crude Fibre.	Ash.	Carbo-hydrates.	Gluten.	
											Wet.	Dry.
			Lbs.	Grams.								
1	Percy	Indian Head	62	2·828	11·50	12·50	2·26	1·79	1·47	70·48	38·10	14·78
2	Preston	"	63½	3·022	11·48	11·63	2·25	1·85	1·68	71·11	31·68	12·34
3	Red Fife	"	62½	3·164	11·44	12·44	2·48	1·86	1·36	70·42	34·68	13·43
4	Stanley	"	62½	3·019	11·08	12·41	2·42	1·88	1·44	70·77	37·48	14·18
5	Percy	Ottawa	62	3·551	12·05	13·56	2·14	2·09	1·91	68·25	41·59	16·64
6	Preston	"	63	3·680	12·22	12·22	2·46	1·83	1·88	69·39	35·93	14·26
7	Red Fife	"	61	3·302	12·79	12·41	2·43	2·02	1·84	68·51	34·35	13·55
8	Stanley	"	62	3·551	12·23	12·34	2·44	2·08	1·71	69·20	33·95	14·22

'These wheats have been submitted to a careful chemical analysis, which included a determination of all the important constituents. The results are given in the accompanying table, which also presents certain data of a physical character, usually taken into consideration in determining the relative values of wheats.

'In certain important features, well marked differences are to be observed between the wheats grown at Indian Head and Ottawa. These may be briefly alluded to as follows:—

'Moisture: Invariably, the Indian Head wheats have the smaller water-content. Their average is 11·37 per cent, while that of the Ottawa grown samples is 12·40 per cent.

'Albuminoids: As the analyses stand, two varieties—Percy and Preston—as grown at Ottawa, show a somewhat higher proportion of albuminoids than the same wheats grown at Indian Head; in the case of the other two, Red Fife and Stanley—the percentages of this constituent, as obtained from the Ottawa grown samples, do not materially differ from those of Indian Head. The average obtained from the four varieties at Indian Head is 12·24 per cent, and of the same wheats, grown at Ottawa, is 12·64 per cent.

'It has already been remarked that the Ottawa grown wheats contain the larger percentage of moisture; it is, therefore, evident that calculated to a water-free basis, they would all show a higher percentage of albuminoids than those from Indian Head.

'Gluten—Wet and Dry: Though intimately allied to the albuminoids present these results being obtained by mechanical means, do not furnish as accurate a guide to the nutritive values of the wheats as those obtained by chemical analysis. It is of interest and importance, however, to note that they follow closely the albuminoid content, and thus furnish corroborative data as to the greater value, both from the milling and nutritive standpoint, of the Ottawa grown wheats. The analyses are as follows:—

'Ottawa Samples: Wet gluten, 36·45 per cent; dry gluten, 14·67 per cent.

'Indian Head Samples: Wet gluten, 35·48 per cent; dry gluten, 13·68 per cent.*

'The foregoing results as to albuminoids and gluten are not such as we should have predicted. Our own investigations in the past have almost invariably indicated that wheats grown in the North-west are richer in this respect than the same varieties grown in Ontario or the eastern provinces, and our results in this matter have received corroboration from those of Professor Richardson, late of the Division of Chemistry, Department of Agriculture, Washington, D.C., U.S., who some years ago made a very thorough investigation into the character of wheats as grown in the several States of the Union, and who was successful in showing that environment—soil, climate, and cultivation—had a great effect upon the composition of wheats. Wheat, of all the cereals, is the most susceptible to the influences of environment, and consequently we may well suppose as a result of an unfavourable season a wheat decidedly inferior to that usually obtained in the locality. These considerations lead the writer to conclude that the present data are somewhat abnormal, and are not to be interpreted as indicating that the environment as at Ottawa is invariably more favourable to a high protein-content than that of the North-west. The probability is that the seasonal or climatic influences last autumn at Indian Head, and probably other parts of the North-west, were not so favourable to the maturation of the grain as usual.†

'Oil or Fat: The data showing the percentage of this constituent do not call for any special or detailed comment. The average for the Indian Head samples is 2·35 per cent; that for the Ottawa samples, 2·37 per cent.

*In comparing these gluten data with those obtained by the miller, the former will invariably be found higher, since they have been obtained upon the whole wheat meal, and consequently contain the elements of the bran and shorts absent in the flour.

† In discussing these conclusions with an experienced grain buyer and miller, I am informed that the wheat of last year's crop from certain districts of the North-west is somewhat inferior in quality to that usually produced, and that this may be attributed to a check in the ripening of the wheat, which occurred a few weeks before harvesting, due to low temperatures; in some parts the freezing point was almost reached.

'Crude Fibre: This constituent practically represents the bran elements. The Ottawa grown wheats show a somewhat higher proportion, but the difference is slight. The averages are: Indian Head, 1·84 per cent; Ottawa, 2·01 per cent.

'Ash: As regards mineral matter, the Ottawa grown wheats show slightly higher percentages than those from Indian Head. The average for the former is 1·83 per cent; for the latter, 1·49 per cent. This may be an additional indication of the more complete ripeness of the Ottawa grown samples.

'In making a comparison between the varieties, judging of excellence chiefly from the albuminoids and gluten content, it is first to be noted that all these wheats are of the same general character, in many particulars almost identical, and would be designated as of first class quality. The amount and character of the gluten indicate clearly their high value for bread making purposes. There are, however, certain differences, and if placed in order of merit, Wheat No. 5, Percy, Ottawa, would stand first, with the same wheat grown at Indian Head (No. 1) a close second. Of the other three wheats, those grown at Indian Head, the order would probably be Red Fife and Stanley, equal, followed closely by Preston. In the Ottawa grown samples these three wheats show extremely small differences—the albuminoid data slighly favouring the Red Fife, while the dry gluten content similarly favour the Preston and Stanley.

(Sgd.) 'FRANK T. SHUTT,
'Chemist, Dominion Experimental Farms.'

FURTHER MILLING TESTS AND ANALYSES.

A second lot of samples was sent to Mr. Julicher, of Minneapolis, numbering six in all, two of White Fife, one of which was from Ottawa and one from Indian Head; one of Early Riga grown at Indian Head, this being the very early ripening wheat to which I have already referred, a cross of Onega with Gehun, another was a sample of Laurel from Ottawa, a cross between Red Fife and Gehun, and two samples of Goose wheat, one from Ottawa and one from Indian Head. The Laurel was sent because it had given an average yield of 33 pounds per acre in excess of Preston on a four years' test, and 2 bushels 16 pounds per acre more than Red Fife.

Mr. Julicher's report on this second lot of samples is as follows:—

MINNEAPOLIS, Minn., April 6, 1903.

	Dough.		Gluten.			
	Quality.	Action in Washing.	Density.	Colour.	Quantity.	Quality.
					p.c.	
No. 9 (White Fife, Ottawa)	Creamy white.	Excellent.	Excellent.	White....	11·8	101
" 12 (White Fife, Indian Head) .	Creamy	Good....	Good.....	Creamy ..	11·1	100
" 14 (Early Riga, Ottawa)......	Creamy white.	Excellent.	Excellent.	White....	14·2	101
" 11 (Laurel, Ottawa)..........	Creamy white.	Good.....	Good.....	White....	11·1	100
" 10 (Goose, Ottawa)	Dark.........	Poor	Ductile...	Dark.....	11·4	90
" 13 (Goose, Indian Head)......	Dark yellow..	Poor	Ductile...	Yellow ...	12·8	95

The samples marked 9 (White Fife, Ottawa) and 14, (Early Riga) are of excellent quality; Nos. 11 (Laurel, Ottawa) and 12 (White Fife, Indian Head) are of good quality; but Nos. 10 (Goose, from Ottawa) and 13 (Goose from Indian Head) are of very poor quality for milling and bread making; of these two I would favour Nos. 13 (the Indian Head sample).

In this examination, Mr. Julicher puts the Early Riga in point of quality, higher than either of the samples of Red Fife, except that he makes the dough creamy white instead of white. He says it is excellent in the dough, excellent in the density of the gluten, white in colour of gluten, 101 in quality of gluten, and 14·2 per cent in quantity. This gives it about 20 per cent more gluten than the sample of Red Fife from Indian Head. Here then we have a wheat which is eight and a half days earlier and higher in quality than Red Fife. It is possible that the season of 1902 may have been specially favourable to the Early Riga, but it is scarcely possible that any difference in season favourable to the production of a high proportion of gluten in the Early Riga would at the same time be unfavourable to the gluten content of Red Fife. This result as to the quality in Early Riga is most encouraging, and a gain of eight and a half days in ripening is of the greatest importance, as it may permit of the extension of the area for successful wheat growing a considerable distance northward.

A sample of the Early Riga wheat was also sent to Mr. F. T. Shutt, Chemist Dominion Experimental Farms, for analysis, on which he reports as follows:

'CENTRAL EXPERIMENTAL FARM,
'OTTAWA, May 14, 1903.

'Report on Early Riga wheat, grown at Experimental Farm, Indian Head, N.W.T., 1902.

'Analysis.

Moisture	11·09
Albuminoids	13·72
Fat	2·13
Crude fibre	1·90
Ash	1·40
Carbo-hydrates	69·76
	100·00

'Physical Data.

Weight per bushel	64 lbs.
Weight of 100 kernels	2·438 grams.
Wet gluten	44·07
Dry gluten	16·70

'Comparing these results with those of the eight samples reported on May 2, 1903, it will be noted:

'1. That as regards moisture-content this wheat is very similar to those from Indian Head already examined. Their average was 11·37 per cent as against 11·09 per cent in the present instance.

'2. That in albuminoids this wheat is slightly superior to the best of the series previously reported on, viz., the Percy. The figures are as follows:—

Early Riga (N.W.T.)	13·72
Percy (Ottawa)	13·56
Percy (N.W.T.)	12·50

'As might be expected, the data for the wet and dry gluten are similarly higher than those of the Percy.

	Wet Gluten.	Dry Gluten.
Early Riga (N.W.T.)	44·07	16·70
Percy (Ottawa)	41·59	16·64
Percy (N.W.T.)	38·10	14·78

'Not only is the gluten satisfactory as to quantity, but also as to quality. In noting the character of the wet gluten, it was found to be slightly creamy in colour, firm, elastic, and of uniform texture—denoting a 'strong' flour and one eminently suitable for bread making purposes.

'FRANK T. SHUTT,
'*Chemist, Dominion Experimental Farms.*'

Mr. Shutt does not find in the chemical analysis quite as large a difference in the proportion of gluten in the Early Riga, when compared with the Percy, as Mr. Julicher gives, but the difference is only a fraction of one per cent. It should be noticed here that Mr. Shutt in each instance has analysed the whole wheat finely ground whereas Mr. Julicher's examinations were of the flour only.

DEDUCTIONS FROM ANALYSES OF WHEATS.

From the facts submitted, it seems clear that the eight samples first sent to these experts, of Red Fife, Preston, Percy and Stanley, whether grown at Indian Head or Ottawa, are all good wheats for milling and for bread. Mr. Julicher puts the two Red Fife samples first, very closely followed by Stanley, which is a twin wheat with Preston, and contains a higher percentage of gluten than either of the Red Fife samples. Preston stands equal to Red Fife in proportion of gluten, but drops below it a little in point of colour of the dough, the Ottawa sample of Preston standing a little higher in that respect than that from Indian Head in Mr. Julicher's report.

From the chemical analyses of these samples, Mr. Shutt puts Percy first in point of merit. It is shown to be richest in gluten, which accords also with Mr. Julicher's statement, whilst Mr. Halliwell puts it as just equal with Red Fife. Between Preston and Red Fife, while the Red Fife is graded as higher in quality, the difference is small and the advantage the Preston has of ripening on a average fully four days earlier may possibly make up for any slight difference in the grade. Its earlier ripening habit is a great inducement to the farmer to put this variety in as part of his crop, provided he can get about the same price for it. A difference of two-thirds of a cent per bushel, the actual difference in value on the English market, according to Mr. Halliwell, would not weigh with the farmer to any appreciable extent.

If a settler has a large acreage of wheat and has only limited help he must begin cutting part of the crop before it is quite ready or his wheat will shell badly before he reaches the end of his harvesting. The part of the crop which is cut first will shrivel more or less, which involves a loss in weight and sometimes in grade, to which must be added such loss as may arise from shelling. If by having a portion of the crop of an earlier sort, these difficulties can be overcome and there will be a large gain in the quality and character of the wheat grown.

With reference to the high quality and early maturing habit of the Early Riga wheat, the information presented is most encouraging. If this wheat on further trial maintains its earliness, quality and productiveness, its general introduction may largely influence the future of wheat-growing in Canada. The outlook is most encouraging, and the result a triumph of the skill of the hybridizer.

The few varieties here referred to constitute only a small proportion of the new sorts which have been produced. There are on hand many others of more or less promise which have been several years under trial. These with a considerable number of varieties of more recent production demand more care and attention than it has been possible for the Director to give them.

In view of the great importance of this branch of the work at the experimental farms, and to provide for its continuance in a larger way, the Minister of Agriculture has authorized the formation of a special division of cereal breeding and experimentation, in charge of an officer known as the experimentalist, who will devote his whole time to it. The first report of the experimentalist will be found in this Annual Report of the Experimental Farms.

SPECIAL EXPERIMENTS WITH FERTILIZERS.

In the annual report of the experimental farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which were carried on during the previous five or six years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important farm crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn, and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued, and a summary of the results obtained has been given each year, taking the average yield of crops from the beginning, adding the results for the current year, and then giving the average yield for the full time. These tests were undertaken on virgin soil, on a piece of land which was cleared for the purpose. For particulars regarding the clearing and preparing of the land for crop in 1887-88 and its subsequent treatment the reader is referred to the earlier issues of this report.

OBJECT IN VIEW IN CONDUCTING THESE EXPERIMENTS.

In establishing and conducting this series of experiments, the object in view has been to gain information as to the effects produced by certain fertilizers and combinations of fertilizers on particular crops. They were never intended to serve as model test plots such as farmers could copy with advantage in their general practice. On the contrary, to gain the information desired, it has been found necessary to use some fertilizers in unusual quantities, and in other instances to more or less exhaust the soil by a succession of crops of the same sort, practices which in ordinary farming would be extravagant or detrimental. From this long conducted series of tests much useful information has been gained, which appeals to the mind with greater force as experience accumulates from year to year.

VALUABLE INFORMATION GAINED.

These trials have shown that barn-yard manure can be most economically used in the fresh or unrotted condition; that fresh manure is equal, ton for ton, in crop-producing power to rotted manure, which, other experiments have shown, loses during the process of rotting about 60 per cent of its weight. In view of the vast importance of making the best possible use of barn-yard manure, it is difficult to estimate the value of this one item of information.

When these experiments were planned, the opinion was very generally held that untreated mineral phosphate, if very finely ground, was a valuable fertilizer, which gradually gave up its phosphoric acid for the promotion of plant growth. Ten years' experience has shown that mineral phosphate, untreated, is of no value as a fertilizer.

The use of sulphate of iron, which at the time these tests were begun, was highly recommended, as a means of producing increased crops, has also been proven to be almost useless for this purpose.

Common salt, which has long had a reputation with many farmers for its value as a fertilizer for barley, while others disbelieved in its efficacy, has been shown to be a most valuable agent for producing an increased crop of that grain, while it is of much less use when applied to crops of spring wheat or oats. Land plaster or gypsum has also proven to be of some value as a fertilizer for barley, while of very little service for wheat or oats. Some light has also been thrown on the relative usefulness of single and combined fertilizers.

CHANGES MADE IN THE EXPERIMENTS.

After ten years' experience had demonstrated that finely-ground, untreated mineral phosphate was of no value as a fertilizer, its use was discontinued in 1898. Prior to this it had been used in each set of plots in Nos. 4, 5, 6, 7 and 8, in all the different series of plots, excepting roots. In 1898 and 1899, similar weights of the Thomas' phosphate were used in place of the mineral phosphate, excepting in plot 6 in each series. In this plot the Thomas' phosphate was used in 1898 only.

After constant cropping for ten or eleven years, it was found that the soil on those plots to which no barn-yard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened, and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In 1899 the experiments were modified and an effort made to restore some proportion of the humus and at the same time gain further information as to the value of clover as a collector of plant food. In the spring of that year ten pounds of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats. The clover seed germinated well, and after the grain was cut the young clover plants made rapid growth, and by the middle of October there was a thick mat of foliage varying in height and density on the different plots, which was ploughed under. The growing of carrots and potatoes on one-half of the cereal plots has been discontinued since 1898, and each plot of the wheat, barley and oats has occupied the full tenth of an acre.

In 1900, 1901, 1902 and 1903 clover was again sown on all the grain plots, and was ploughed under in October. In 1900 and 1901 a good growth of clover was obtained, but in 1902 a severe frost in the spring destroyed a large proportion of the young plants so that the crop available for ploughing under in the autumn was very light. In 1903 the crop of clover ploughed under in the autumn was fairly good.

APPLICATION OF FERTILIZERS DISCONTINUED.

Another direction in which information was sought was in reference to the length of time which a liberal application of barn-yard manure would continue to affect subsequent crops, and in 1899 on plots 1, 2 and 6 the barn-yard manure, which had been used for ten or eleven years in succession, was discontinued. The phosphate fertilizer was also omitted on plot 6 in each series.

In 1900 all the fertilizers on all the plots were discontinued, and since then the same crops have been grown on all these plots from year to year without fertilizers, sowing clover with the grain each season. In this way some information has been gained as to the value of clover as a collector of plant food, and also as to the unexhausted values of the different fertilizers which have been used on these plots since the experiments were begun.

SPECIAL TREATMENT OF PLOTS OF INDIAN CORN AND ROOTS.

As it was not practicable to sow clover with the Indian corn and root crops, the sowing of these latter crops was discontinued in the spring of 1900 and clover sown in their place in the proportion of 12 pounds per acre. The clover on these plots made strong growth, so strong as to necessitate twice cutting during the season, the cut clover being left on the ground in each case to decay and add to the fertility of the soil. The clover was left over for further growth in the spring of 1901, and ploughed under for the roots about May 10, and for corn about the middle of that month. Then roots and Indian corn were again sown. In 1902 crops of Indian corn and roots were grown on these plots, but in 1903 the land was again devoted to clover.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of $1\frac{1}{2}$ bushels per acre, excepting in 1894; and the varieties used were as follows:—In 1888-89-90 and 1891, White Russian, and in 1892-3, Campbell's White Chaff. In 1894, the Rio Grande wheat was used, when, owing to lack of germinating power in the seed, a larger quantity was required. From 1895 to 1903 inclusive Red Fife wheat was used in the usual quantity of $1\frac{1}{2}$ bushels per acre. In 1903, the Red Fife was sown April 22, and was ripe August 20.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fifteen Years.			16th Season, 1903, Variety Red Fife.			Average Yield for Sixteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then....	22	$22\frac{10}{15}$	4,053	22	40	3,550	22	$23\frac{12}{16}$	4,022
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then....	22	$44\frac{9}{15}$	4,083	21	10	3,600	22	$38\frac{11}{16}$	4,053
3	Unmanured from the beginning....	11	26	1,957	14	30	2,300	11	$37\frac{8}{16}$	1,978
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' Phosphate was used. No fertilizers have been applied since then....	11	51	2,094	15	20	2,300	12	$4\frac{1}{16}$	2,107
5	Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then....	12	43	2,824	16	50	2,000	12	$58\frac{7}{16}$	2,773
6	Barn-yard manure, partly rotted and actively fermenting, six tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898, 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.	19	$28\frac{8}{15}$	3,354	17	50	2,755	19	$22\frac{6}{16}$	3,317
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then....	13	$20\frac{1}{15}$	2,336	18	10	2,170	13	$38\frac{3}{16}$	2,607

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fifteen Years.			16th Season, 1903. Variety, Red Fife.			Average Yield for Sixteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs. wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then........	11	$23\frac{3}{15}$	2,195	14	25	2,560	11	$34\frac{9}{16}$	2,218
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then...........................	12	$13\frac{12}{15}$	1,965	14	35	2,305	12	$22\frac{11}{16}$	1,986
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	13	$8\frac{10}{15}$	2,951	15	15	2,985	13	$27\frac{4}{16}$	2,953
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. No fertilizers have been applied since then..........	14	25	2,909	14	20	2,765	14	$24\frac{11}{16}$	2,900
12	Unmanured from the beginning..........	10	$25\frac{5}{15}$	1,940	12	10	1,985	10	$31\frac{14}{16}$	1,943
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	12	$33\frac{3}{15}$	2,056	14	55	2,805	12	$42\frac{1}{16}$	2,103
14	Bone, finely ground, 500 lbs.; wood ashes unleached, 1,500 lbs. per acre; used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	15	20	2,648	17	10	3,180	15	$26\frac{14}{16}$	2,681
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	14	1	2,462	17	45	3,010	14	15	2,496
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	15	$44\frac{8}{15}$	2,240	15	35	2,925	15	$43\frac{15}{16}$	2,282
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	12	$57\frac{3}{15}$	2,403	14	10	2,870	13	$1\frac{11}{16}$	2,432
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	12	$51\frac{5}{15}$	2,007	12	45	2,207	12	$50\frac{15}{16}$	2,019
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..............	13	$51\frac{4}{15}$	1,640	12	50	2,069	13	$47\frac{7}{16}$	1,667
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..........................	12	$50\frac{8}{15}$	1,977	13	45	2,173	12	$53\frac{14}{16}$	1,989
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been used since then..........................	13	$10\frac{9}{15}$	1,969	14	45	2,208	13	$16\frac{8}{16}$	1,934

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889, 1890 and 1891, 1½ bushels in 1892 and 1893, and 2 bushels from 1894 to 1903, inclusive. Two-rowed barley has been used for seed throughout until 1902, when Mensury, a six-rowed sort was tried. The varieties used were as follows: 1889, 1890 and 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and in 1894, 1895, 1896, 1897, 1898, 1899, 1900 and 1901, Canadian Thorpe, a selected form of the Duck-bill. In 1902 and 1903 Mensury was sown. In 1903 it was sown April 22, and was harvested on July 28.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fourteen Years.			15th Season, 1903. Variety, Mensury.			Average Yield for Fifteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then......	35	$5\frac{2}{14}$	3,086	41	22	2,695	35	$25\frac{7}{15}$	3,060
2	Barn-yard manure, fresh, 15 tons per acre, each year to 1898, inclusive. No manure has been applied since then............	35	$8\frac{7}{14}$	3,253	37	9	2,975	35	$14\frac{14}{15}$	3,234
3	Unmanured from the beginning..........	13	$43\frac{7}{14}$	1,543	23	36	1,454	14	$28\frac{13}{15}$	1,537
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used, no fertilizers have been applied since then..................	15	$12\frac{10}{14}$	1,505	25	10	1,579	15	$44\frac{8}{15}$	1,510
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then............	20	$47\frac{4}{14}$	2,220	24	18	2,214	21	$10\frac{2}{15}$	2,219
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	28	$15\frac{11}{14}$	2,403	31	37	2,293	28	$26\frac{2}{15}$	2,396
7	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	25	$46\frac{4}{14}$	2,380	30	25	2,335	26	$12\frac{13}{15}$	2,377

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY $\frac{1}{10}$ ACRE EACH—*Concluded.*

No. of plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fourteen Years.			15th Season, 1903, Variety, Mensury.			Average Yield for Fifteen Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then............	21	3 $\frac{1}{14}$	1,821	31	32	2,032	21	37	1,835
9	Mineral superphosphate, No. 1, 500 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then....................	21	8 $\frac{11}{14}$	1,757	26	32	1,333	21	26 $\frac{5}{15}$	1,729
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..................................	28	3 $\frac{2}{14}$	2,369	28	16	2,219	28	4	2,359
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	26	39 $\frac{12}{14}$	2,488	29	38	2,377	27	1 $\frac{5}{15}$	2,481
12	Unmanured from the beginning..........	13	32 $\frac{1}{14}$	1,224	22	24	1,290	14	12 $\frac{5}{15}$	1,228
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	14	34 $\frac{11}{14}$	1,415	23	26	1,505	15	15	1,421
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	23	41 $\frac{10}{14}$	2,074	26	12	2,292	24	1 $\frac{5}{15}$	2,089
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	22	10 $\frac{6}{14}$	2,284	21	17	2,084	22	7 $\frac{10}{15}$	2,270
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	22	41 $\frac{2}{14}$	1,861	22	34	1,825	22	40 $\frac{10}{15}$	1,859
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	19	15 $\frac{12}{14}$	1,943	20	25	1,792	19	16 $\frac{7}{15}$	1,933
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	18	36	1,673	21	22	1,419	18	44 $\frac{10}{15}$	1,656
19	Common salt (sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..............................	27	36 $\frac{7}{14}$	1,895	22	14	1,849	27	19	1,892
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then......................	20	14 $\frac{9}{14}$	1,605	23	11	1,391	20	24	1,591
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then............................	20	46 $\frac{11}{14}$	1,783	24	23	1,592	21	9 $\frac{9}{15}$	1,770

OAT PLOTS.

The quantity of seed sown per acre on the oat plots, was 2 bushels in 1889 and 1890; $1\frac{1}{2}$ bushels in 1891, 1892 and 1893, and 2 bushels from 1894 to 1903, inclusive. The varieties used were as follows: In 1889, Early English; in 1890, 1891, 1892, 1893, Prize Cluster; and from 1894 to 1903, inclusive, the Banner. In 1903 the Banner was sown April 22 and the plots were harvested August 17.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, $\frac{1}{10}$ ACRE EACH.

Number of Plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fourteen Years.			15th Season, 1903. Variety, Banner.			Average Yield for Fifteen Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year, to 1898, inclusive. No manure has been applied since then.....	51	$13\frac{2}{14}$	3,241	50	25	3,015	51	$11\frac{10}{15}$	3,226
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then............	55	$22\frac{7}{14}$	3,422	53	13	2,605	55	$17\frac{5}{15}$	3,368
3	Unmanured from the beginning..........	34	$5\frac{1}{14}$	1,689	37	2	2,076	34	$11\frac{10}{15}$	1,715
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then......................	34	$7\frac{2}{14}$	1,832	42	32	2,008	34	$26\frac{14}{15}$	1,844
5	Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.	49	$13\frac{10}{14}$	2,667	39	14	2,580	48	$25\frac{1}{15}$	2,661
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898, 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then..	48	$15\frac{7}{14}$	2,720	43	33	2,984	48	$5\frac{5}{15}$	2,738
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.....................	49	$7\frac{11}{14}$	3,152	47	27	3,010	49	$4\frac{8}{15}$	3,143
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then...........	43	$4\frac{11}{14}$	2,469	50	30	2,899	43	$22\frac{5}{15}$	2,498
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been used since then..........................	37	$16\frac{9}{14}$	1,972	47	22	2,038	38	$5\frac{10}{15}$	1,976

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS $\frac{1}{10}$ ACRE EACH—*Continued.*

No. of Plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fourteen Years.			15th Season, 1903. Variety Banner.			Average Yield for Fifteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	47	$17\frac{10}{14}$	2,693	38	28	2,505	46	32	2,680
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre used each year from 1888 to 1897, inclusive. No fertilizers have been applied since then......	38	$29\frac{8}{14}$	2,416	40	30	2,581	39	$\frac{9}{15}$	2,427
12	Unmanured from the beginning..........	23	$4\frac{6}{14}$	1,398	33	23	1,820	23	$28\frac{5}{15}$	1,426
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	34	$26\frac{7}{14}$	2,035	35	20	1,850	34	$28\frac{5}{15}$	2,023
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then...	41	$10\frac{4}{14}$	2,273	45	—	2,630	41	$18\frac{10}{15}$	2,297
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	47	$22\frac{5}{14}$	2,759	40	15	2,560	47	6	2,746
16	Muriate of potash, 150 lbs. per acre, used each year from 1898 to 1899 inclusive. No fertilizers have been applied since then...	38	$26\frac{3}{14}$	2,207	44	24	2,375	39	$5\frac{10}{15}$	2,218
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	45	$11\frac{11}{14}$	2,820	46	1	2,425	45	$13\frac{5}{15}$	2,794
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then...	38	$13\frac{1}{14}$	2,018	47	32	1,525	39	$-\frac{11}{15}$	1,985
19	Common salt (Sodium chloride) 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..........................	37	$25\frac{3}{14}$	1,956	49	4	1,545	38	15	1,929
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then...........	34	$25\frac{6}{14}$	1,959	37	22	2,070	34	32	1,966
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then	35	19	1,860	34	24	1,854	35	17	1,859

INFLUENCE OF CLOVER, PLOUGHED UNDER, ON FARM CROPS.

The ploughing under of clover has been found most effective as an additional source of fertility. It increases the store of available plant food by the addition of nitrogen obtained directly from the atmosphere. It adds also to the mineral plant food available, potash and phosphoric acid by gathering these from depths not reached by the shallower root systems of other farm crops. It also serves as a catch crop during the autumn months, retaining fertilizing material brought down by the rain, much of which would otherwise be lost. Further it supplies the soil with a large addition of humus whereby it is made more retentive of moisture, and results in a deepening and mellowing of the soil. Humus also furnishes material in which those minute forms of germ life which act so beneficially on the soil can thrive and propagate freely.

Marked benefits have been observed from the use of clover on all the plots referred to. A few examples may be cited, taken from all the series.

On plot 7, of the oat series, 500 pounds of fine ground mineral phosphate untreated was used per acre for nine years, and during the two following years 500 pounds of the Thomas phosphate, in place of the untreated mineral phosphate. There was also used on these plots yearly for 11 years, 200 pounds of nitrate of soda and 1,000 pounds of unleached wood ashes per acre. With this large annual application of artificial fertilizers the crop of oats had averaged for ten years 44 bushels 30 pounds per acre. With the discontinuance of the fertilizers and the use of clover the crop in bushels and pounds per acre for the five succeeding years was 58·18; 65·15; 56·31; 57·27, and 47·27. These figures show an average increase in the crop of oats for the five years of 12 bushels 14 pounds per acre, or more than 25 per cent.

On plot 11 in the oat series there were used annually for ten years 350 pounds of mineral superphosphate, 200 pounds of nitrate of soda and 1,500 pounds of unleached wood ashes. The crop during this period gave an average of 36 bushels 5 pounds per acre. With the discontinuance of the fertilizers and the use of clover, the crops for the past five years in bushels and pounds per acre were 37·2; 45·20; 49·29; 51·6, and 40·30, an average increase in crop of 8 bushels 26 pounds, or more than 22 per cent.

On plot 14 in this series fine ground bone was used annually in the proportion of 500 pounds per acre, with 1,500 pounds of unleached wood ashes. At the end of ten years the crop of oats had averaged 37 bushels 6 pounds per acre. With the discontinuance of the bone and ashes and the use of clover the crops for the five succeeding years in bushels and pounds per acre have been as follows: 42·27; 62·2; 49·14; 50·25, and 45, an average increase in crop for the five years of 12 bushels 28 pounds per acre, or more than 30 per cent.

On plot 3 in this series, oats had been grown for ten years in succession without the application of any fertilizer whatever. The crops for the ten years had averaged 30 bushels 23 pounds per acre. With the subsequent use of clover they have stood for the past five years as follows: 29 bushels 2 pounds; 47·2; 48·3; 46·11, and 37·2, an average increase for the five years, of 10 bushels 28 pounds, more than 31 per cent. This is an astonishing increase in view of the fact that oats had been grown every year on the same land for the whole period, and that during the five years when this increase occurred clover was the only fertilizing agent used.

Taking the same series of plots in wheat, which have received the same fertilizers in the same quantities, but for eleven years instead of ten, we find :

On plot 7 of the wheat series the crop for eleven years under the annual fertilizing mentioned under oats averaged 12 bushels 43 pounds per acre. With the discontinuance of the fertilizers and the annual use of clover the crops for the five succeeding years were 12 bushels 50 pounds; 13·20; 16·50; 17·5, and 18·10, an average increase for the five years, of 2 bushels 56 pounds per acre, more than 23 per cent.

In plot 11 in the wheat series the average crop for the eleven years during which the fertilizers were applied was 13 bushels 31 pounds. With the discontinuance of the fertilizers and the annual use of clover the crops for the five succeeding years were 18·30; 18·20; 16·5; 14·40, and 14 bushels 20 pounds per acre, an average increase for the five years of 2 bushels 52 pounds per acre equal to 22 per cent.

On plot 14 the influence of the clover is not so marked, the increase being a little over 10 per cent.

On plot 3, on which wheat was grown for 11 years without the use of any fertilizer the crops during this period averaged 10 bushels, 16 pounds per acre. With the subsequent use of clover they have stood for the past five years as follows: 10·35; 13·45 17·20; 16·50, and 14 bushels 30 pounds, an average increase for the five years of 4 bushels 20 pounds per acre, more than 40 per cent.

On plot 7 of the barley series the crop for ten years averaged 22 bushels 26 pounds per acre, with the discontinuance of the fertilizers and the annual use of clover the crops for the five succeeding years were 35·15; 32·2; 27·24; 42·34, and 30 bushels 25 pounds, an average increase for the five years of 11 bushels 3 pounds per acre, equal to more than 48 per cent.

On plot 11 of the barley series the increase in crop from clover has been less. During the ten years when the fertilizers were used the crop averaged 25 bushels 33 pounds. With the discontinuance of the fertilizers and the annual use of clover the crops for the five years following were 30·45; 26·32; 19·8; 41·42, and 29 bushels 38 pounds per acre, an average increase for the five years of 4 bushels per acre, somewhat over 15 per cent.

On plot 14 during the ten years when the fertilizers were used the crop of barley averaged 22 bush. 1 lb. per acre. With the discontinuance of the fertilizers and the annual use of clover the crops for the five years following were 26·2; 25·35; 21·2; 41·2, and 26 bush. 12 lbs. per acre, an average increase for the five years of 6 bushels per acre, more than 25 per cent.

On plot 3 on which barley was grown for 10 years without use of any fertilizer, the crop during this period averaged 13 bush. 32 lbs., but the crop on the tenth year was reduced to 8 bush. 6 lbs. per acre. With the subsequent use of clover the crops have stood for the past five years as follows: 10·40; 9·33; 10·15; 27·4; and 23 bush. 36 lbs. per acre, an average increase for the five years of 2 bush. 32 lbs. per acre, nearly 20 per cent.

The results were still more marked with Indian corn. This crop on plot 3, after 10 years' test, was reduced to about 2 tons per acre. With one crop of clover, turned under, the yield of Indian corn was increased to over 8 tons per acre. On plot 11 the average of 10 years was 13 tons 1,090 pounds per acre. The ploughing under of a single crop of clover raised this the following season to 26 tons 505 pounds per acre.

On field roots, the beneficial action of clover ploughed under was also very striking. The turnips grown on plot 3 with no fertilizer for the 10 years ending with 1899, averaged 6 tons 1,863 pounds per acre, with one crop of clover ploughed under the average for the two years following was 10 tons 1,560 pounds, an average increase of 3 tons 1,697 pounds per acre; more than 50 per cent.

The mangels on plot 3 had given an average to 1899, of 8 tons 1,587 pounds. The two years following the turning under of clover the crop averaged 10 tons 1,560 pounds, an increase of 2 tons per acre, or nearly 25 per cent.

Many similar instances could be given, but enough has perhaps been presented to establish the fact that the ploughing under of clover gives a large increase to the crop which follows, and in addition to the fertilizing material contributed by the clover the humus thus added to the soil conserves moisture and enables the rootlets of the growing plants to utilize a larger proportion of the plant food which the soil contains.

INCREASED CROPS FROM THE PLOUGHING UNDER OF CLOVER.

The following tests were planned in 1900 when sufficient plots were sown with grain, on one-half of which clover was sown at the same time, in the proportion of 12 pounds of seed per acre, leaving alternate plots on which no clover was sown.

GROUP NO. 1, DIVISION 1.

On this series of six plots, side by side Banner oats were sown in 1901, Everett potatoes in 1902 and Selected Leaming corn in 1903. The following table shows the increased crops, resulting from one crop of clover, the first, second and third years after ploughing under.

Results obtained from alternate plots with and without clover.	1901. Banner Oats. Yield of Grain per acre.		1901. Banner Oats. Weight of Straw per acre.	1902. Everett Potatoes. Yield per acre.		1903. Selected Leaming Corn. Yield per acre.	
	Bush.	lbs.	Lbs.	Bush.	lbs.	Tons.	lbs.
1 Crops in 1901-2-3 after clover in 1900	49	14	3,440	293	20	13	1,760
2 " 1901-2-3 on plot where no clover was grown	47	2	2,480	274	40	12	800
Gain from use of clover	2	12	960	18	40	1	960
3 Crops in 1901-2-3 after clover in 1900	42	12	2,640	272	..	10	960
4 " 1901-2-3 on plot where no clover was grown	37	22	1,920	270	40	9	1,040
Gain from use of clover	4	24	720	1	20	..	1,920
5 Crops in 1901-2-3 after clover in 1900	40	..	3,040	353	20	12	1,440
6 " 1901-2-3 on plot where no clover was grown	35	10	2,240	333	20	10	800
Gain from use of clover	4	24	800	20	..	2	640

In Division 1, the three plots of Banner oats after clover, show for the first year an average gain per acre from the use of clover of 3 bush. 31 lbs. of grain and 827 lbs. of straw. The same plots in potatoes the second year show an average gain of 13 bush. 20 lbs., and the same plots planted with Indian corn the third year an average gain from the use of clover of 1 ton 1,173 lbs. per acre.

DIVISION NO. 2.

In this series of six plots, side by side, Everett potatoes were sown in 1901, Selected Leaming corn in 1902, and Banner oats in 1903, and the following results obtained:—

Results obtained from alternate plots with and without clover.	1901. Everett Potatoes. Yield per acre.		1902. Selected Leaming Corn. Yield per acre.		1903. Banner Oats. Yield of Grain per acre.		1903. Banner Oats. Weight of Straw per acre.
	Bush.	lbs.	Tons.	lbs.	Bush.	lbs.	Lbs.
7 Crops in 1901-2-3 after clover in 1900	440	..	19	..	62	12	3,200
8 " 1901-2-3 on plot where no clover was grown	396	40	16	1,600	50	20	3,080
Gain from use of clover	3	20	2	400	11	26	120
9 Crops in 1901-2-3 after clover in 1900	420	..	16	640	60	..	4,200
10 " 1901-2-3 on plot where no clover was grown	396	..	15	880	54	4	2,160
Gain from use of clover	24	..	..	1,760	5	30	2,040
11 Crops in 1901-2-3 after clover in 1900	411	20	20	200	65	30	4,200
12 " 1901-2-3 on plot where no clover was grown	381	20	16	1,600	44	24	2,800
Gain from use of clover	30	..	3	600	21	6	1,400

In Division No. 2 the three plots of Everett potatoes after clover show, for the first year, an average gain per acre from the use of clover of 19 bushels 7 lbs. The same plots in Indian corn the second year show an average gain of 2 tons 253 lbs and the same plots sown the third year with Banner oats show an average gain from the use of clover of 12 bush. 32 lbs. of grain and 1,187 lbs. of straw.

GROUP NO. 2.

In each of the three divisions in this group there were three plots. In the upper one in each table the crops were sown after clover ploughed under in the autumn of 1900, and in the lower one clover was also sown in the spring of 1900 and allowed to grow for two seasons and was ploughed under in the autumn of 1901. On the middle plot no clover was grown. It will be seen that considerable gains were made by the use of clover in both cases.

Division No. 1.	1901. Corn, Selected Leaming. — Yield per Acre.		1902. Banner Oats. Yield of Oats per Acre.		1902. Banner Oats. Weight of Straw per Acre	1903. Potatoes, Everett. — Yield per Acre.	
	Tons.	Lbs.	Bus.	Lbs.	Lbs.	Bus.	Lbs.
1 Crops in 1901-2-3, after clover in 1900	25	1,600	70	20	3,840	195	20
2 Crops in 1901-2-3, on plot where no clover was grown in 1900.	20	160	58	28	3,120	175	20
Gain from use of clover	5	1,440	11	26	720	20	00
3 Crops in 1902-3, on plot where clover was allowed to grow two seasons	....		65	30	4,400	221	20
Gain from use of clover	....		7	2	1,280	45	40

Division No 2.	1901. Corn, Selected Leaming. — Yield per Acre.		1902. Banner Oats. Yield of Oats Per Acre.		1902. Banner Oats. Weight of Straw per Acre	1903. Carrots. — Yield per Acre.	
	Tons.	Lbs.	Bus.	Lbs.	Lbs.	Tons.	Lbs.
4 Crops in 1901-2-3, after clover in 1900	27	880	70	20	3,920	31	960
5 Crops in 1901-2-3, on plots where no clover was grown in 1900	15	1,600	47	2	2,000	20	640
Gain from use of clover	11	1,280	23	18	1,920	11	320
6 Crops in 1902-3, on plot where clover was allowed to grow two seasons	....		72	32	3,760	21	600
Gain from use of clover	....		25	30	1,760		1,960

Division No. 3.	1901. Corn, Selected Leaming. — Yield per Acre.		1902. Banner Oats. Yield of Oats per Acre.		1902. Banner Oats. Weight of Straw per Acre	1903. Sugar Beets. — Yield per Acre.	
	Tons.	Lbs.	Bus.	Lbs.	Lbs.	Tons.	Lbs.
7 Crops in 1901-2-3, after clover in 1900	27	1,760	75	10	4,160	22	600
8 Crops in 1901-2-3, on plot where no clover was grown in 1900	19	1,280	51	26	2,320	8	1,200
Gain from use of clover	8	480	23	18	1,840	13	1,400
9 Crops in 1902-3, on plot, where clover was allowed to grow two seasons	....		68	8	4,080	*	
Gain from use of clover	....		16	16	1,760		

* Did not germinate.

Group No. 3.

Division 1.	1902. Banner Oats. Yield of Oats Per Acre.		1902. Banner Oats. Weight of Straw Per Acre.	1903. Turnips. Yield Per Acre.	
	Bush.	Lbs.	Lbs.	Tons.	Lbs.
1 Crops in 1902-3, after clover in 1901	70	20	4,720	25	
2 Crops in 1902-3, on plot where no clover was grown in 1901	58	28	3,120	20	1,920
Gain from use of clover	11	26	1,600	4	80

Division 2.	1902. Potatoes Everett. Yield Per Acre.		1903. Carrots. Yield Per Acre.		1902. Corn, Selected Leaming. Yield Per Acre.		1903. Potatoes Everett. Yield Per Acre.	
	Bush.	Lbs.	Tons.	Lbs.				
3 Crops in 1902-3, after clover in 1901	392	40	20	1,400	.....	......		
4 Crops in 1902-3, on plot where no clover was grown in 1901	358		18	280	....			
Gain from use of clover	34	40	2	1,120	....			
					Tons.	Lbs.	Bush.	Lbs.
5 Crops in 1902-3, after clover in 1901	....		....		20	800	202	
6 Crops in 1902-3, on plot where no clover was grown in 1901	....		....		15		154	40
Gain from use of clover	....		....		5	800	47	20
7 Crops in 1903, on plot where clover was allowed to grow two seasons	....		....		....		200	40
8 Crops in 1903, on plot where no clover was grown in 1901	....		....		....		134	40
Gain from use of clover	....		....		.. ..		66	00

Division 3.	1902 Banner Oats. Yield of Oats Per Acre.		1902 Banner Oats. Weight of Straw Per Acre.		1903 Mangels. Yield Per Acre.		1902 Potatoes Everett. Yield Per Acre.		1903 Sugar Beets. Yield Per Acre.	
	Bush.	Lbs.	Lbs.		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.
9 Crops in 1902-3, after clover in 1901	70	20	4,960		30	1,000	..	..		
10 Crops in 1902-3, on plot where no clover was grown in 1901	61	6	2,720		27	320	..	..		
Gain from use of clover	9	14	2,240		3	680	..	..		
11 Crops in 1902-3, after clover in 1901	..	..	..	..	..	..	386	20	20	680
12 Crops in 1902-3, on plot where no clover was grown in 1901	..	..	..	..	..	..	346	40	16	1,040
Gain from use of clover	..	..	..	..	..	.	39	40	3	1,640

GROUP No. 3—*Concluded.*

Division 4.	1902 Corn, Selected Leaming. Yield Per Acre.		1903 Corn, Selected Leaming. Yield Per Acre.		1902 Banner Oats. Yield of Oats Per Acre.		1902 Banner Oats. Weight of Straw Per Acre.	1903 Preston Wheat. Yield of Wheat Per Acre.		1903 Preston Wheat. Weight of Straw Per Acre.
	Tons.	Lbs.	Tons.	Lbs.	Bush	Lbs.	Lbs.	Bus.	Lbs.	Lbs.
13 Crops in 1902-3, after clover in 1901.	23	1,200	18	1,440	..	..	.. ..	..	..	
14 Crops in 1902-3, on plot where no clover was grown in 1901	17	720	14	1,200	..	..	.. ..	..	..	
Gain from use of clover	6	480	4	240	..	..	.. ..	..	..	
15 Crops in 1903, on plot where clover was allowed to grow two seasons	..	..	15	1,600	..	..	.. ..	..	..	
16 Crops in 1902-3, on plot where no clover was grown in 1901	..	..	7	..	..	..	.. ..	..	..	
Gain from use of clover	..	..	8	1,600	..	..	.. ..	..	..	
17 Crops in 1902-3, after clover in 1901.	..	..	..	..	72	32	5,280	16	..	1,760
18 Crops in 1902-3, on plots where no clover was grown in 1901	..	..	..	..	63	18	3,280	14	40	1,400
Gain from use of clover	..	..	..	..	9	14	2,000	1	20	360

Division 5.	1902 Potatoes Everett. Yield Per Acre.		1903 Mensury Barley. Yield of Barley Per Acre.		1903 Mensury Barley. Weight of Straw Per Acre.	1902 Corn Selected Leaming. Yield Per Acre.		1903 Banner Oats. Yield of Oats Per Acre.		1903 Banner Oats. Weight of Straw Per Acre.
	Bus.	Lbs.	Bus.	Lbs.	Lbs.	Tons.	Lbs.	Bus.	Lbs.	Lbs.
19 Crops in 1902-3, after clover in 1901	396	..	51	32	2,640	..	..	..	..	
20 Crops in 1902-3, on plot where no clover was grown in 1901	353	20	50	..	2,520	..	..	..	..	
Gain from use of clover	42	40	1	32	120	..	..	..	..	
21 Crops in 1902-3, after clover in 1901.	..	..	..	..	.. ..	22	1,600	82	12	3,920
22 Crops in 1902-3, on plot where no clover was grown in 1901	..	..	..	..	.. ..	16	800	76	16	3,240
Gain from use of clover	..	..	..	..	.. ..	6	800	5	30	680
23 Crops in 1903, on plot where clover was allowed to grow two seasons	.	..	..	..	.. ..	..	..	87	2	4,880
24 Crops in 1903, on plot where no clover was grown in 1901	..	..	..	..	.. ..	..	..	74	4	4,080
Gain from use of clover	..	..	..	..	.. ..	..	..	12	32	800

In all these examples also there are gains from the use of clover and on some of the plots they are so large as to be quite remarkable.

EFFECTS OF FERTILIZERS ON SPRING WHEAT, OATS, CLOVER AND BROME GRASS.

During the season of 1900, two series consisting in each case of sixteen one-eightieth acre plots were laid out, twelve of which in each set were treated with different fertilizers, and the remaining four left as check plots which received no fertilizers.

One set of these plots was sown with spring wheat of the variety known as Preston, another with a variety of oats known as Improved Ligowo. Two other series each consisting of nine plots were planned, one to be used for experiments with common red clover, and the other for the Awnless Brome grass *(Bromus inermis)*.

The object in view in these tests is to gain information as to the effects on crops sown on land in a fair average condition of fertility, of superphosphate of lime and Thomas' phosphate both used singly, also of superphosphate of lime with kainit and with kainit and nitrate of soda, and of Thomas' phosphate with kainit, and with kainit and nitrate of soda. In the several series of plots planned provision was also made for testing the relative value of barn-yard manure fresh and rotted, fresh slaked lime and of nitrate of soda alone in the proportions of 100 and 200 pounds per acre with a check plot between them.

The land chosen for this test was in a fairly good condition of tilth. The soil was a sandy loam which has been under cultivation since 1887, and has been cropped each year since with a suitable rotation of crops, and has received a dressing of barn-yard manure about once in four years. The last application of manure was in 1897, when it received about 12 tons per acre. The land was cropped in 1899 with experimental plots of grain, mostly barley.

It is proposed to grow the same crops on this land for some years, using the same fertilizers in the same quantities every second year. In this way it is hoped that some further information may be gained as to the effect of these different fertilizers when used singly and in combination on the important crops named. As this land was at the start in a fair average condition as to fertility, it may be regarded as representing in a general way average sandy loams on farms properly worked. The fertilizers were first applied in the spring of 1900, and a second time in the spring of 1902.

RESULTS OF THE APPLICATION OF FERTILIZERS TO SPRING WHEAT.

Sown April 27, Ripe August 15, 1903.

No. of plot.	Name of Variety, Preston.	Yield of Grain per acre.		Yield of Straw per acre.
		Bush.	Lbs.	Lbs.
1	Superphosphate, 400 lbs. per acre	18	—	2,840
2	Thomas' phosphate, 400 lbs. per acre	16	40	2,400
3	Thomas' phosphate, 800 lbs. per acre	20	—	3,040
4	Check	16	—	1,760
5	Thomas' phosphate, 400 lbs., kainit, 200 lbs. per acre	20	—	3,280
6	Superphosphate, 400 lbs., kainit, 200 lbs., per acre	16	40	3,400
7	Check	14	40	1,400
8	Thomas' phosphate, 400 lbs., kainit 200 lbs., nitrate soda 100 lbs. per acre	20	—	3,600
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	16	—	3,600
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre	11	40	1,720
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons per acre	13	40	1,980
12	Check	9	20	1,140
13	Fresh slacked lime, 1,000 lbs. per acre	11	40	1,460
14	Nitrate soda, 100 lbs. per acre	6	40	840
15	Check	12	—	1,480
16	Nitrate soda, 200 lbs. per acre	10	—	1,560

RESULTS OF THE APPLICATION OF FERTILIZERS TO OATS.

Sown April 27, Ripe August 17, 1903.

No. of plot.	Name of Variety, Improved Ligowo.	Yield of Grain per acre.		Yield of Straw per acre.
		Bush.	Lbs.	Lbs.
1	Superphosphate, 400 lbs. per acre	43	18	2,280
2	Thomas' phosphate, 400 lbs. per acre	52	32	2,480
3	Thomas' phosphate, 800 lbs. per acre	47	2	2,720
4	Check	42	12	1,960
5	Thomas' phosphate, 400 lbs., kainit, 200 lbs. per acre	44	24	2,080
6	Superphosphate, 400 lbs, kainit, 200 lbs. per acre	48	8	2,600
7	Check	43	18	2,280
8	Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	44	24	3,160
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	54	4	3,080
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre	57	22	3,760
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons per acre	64	24	3,560
12	Check	63	18	3,840
13	Fresh slacked lime, 1,000 lbs. per acre	77	22	3,960
14	Nitrate soda, 100 lbs. per acre	69	14	3,560
15	Check	62	12	3,280
16	Nitrate soda, 200 lbs. per acre	68	8	4,280

RESULTS OF THE APPLICATION OF FERTILIZERS TO AWNLESS BROME GRASS (*Bromus inermis*).

Crop cut July 9, 1903.

No. of Plot.	Fertilizers used.	Height of Brome Grass	Yield per Acre.			
			Green.		Cured.	
		Inches.	Tons.	lbs.	Tons.	lbs.
1	Superphosphate, 400 lbs. per acre	38—42	8	1,360	3	1,600
2	Thomas' phosphate, 400 lbs. per acre	36—40	6	1,360	2	1,600
3	Thomas' phosphate, 800 lbs. per acre	34—38	4	240	1	1,440
4	Check	28—32	2	1,600	1	160
5	Thomas' phosphate, 400 lbs.; kainit, 200 lbs. per acre	31—35	3	400	1	400
6	Superphosphate, 400 lbs.; kainit, 200 lbs. per acre	31—35	3	400	1	480
7	Check	34—38	4	—	1	1,200
8	Thomas' phosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	34—38	3	520	1	680
9	Superphosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	36—40	4	720	1	1,600
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre	36—40	4	1,760	2	80
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons p. acre	36—40	3	800	1	800
12	Check	30—34	2	800	—	1,840
13	Fresh slacked lime, 1000 lbs. per acre	25—29	1	1,760	—	1,440
14	Nitrate soda, 100 lbs. per acre	25—29	3	1,200	1	800
15	Check	30—35	2	1,920	1	640
16	Nitrate soda, 200 lbs. per acre	33—38	4	640	1	1,680

RESULTS OF THE APPLICATION OF FERTILIZERS TO CLOVER.

First cutting July 9, second Sept. 3, 1903.

No. of Plot.	Fertilizers used.	Height of Clover. 1st Cutting.	Height of Clover. 2nd Cutting.	Yield per Acre. 1st Cutting. Green. Tons.	lbs.	1st Cutting. Cured. Tons.	lbs.	2nd Cutting. Green. Tons.	lbs.	2nd Cutting. Cured. Tons.	lbs.
		Inches.	Inches.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Superphosphate, 400 lbs. per acre	18—23	19—24	8	160	2	400	8	1,920	2	640
2	Thomas' phosphate, 400 lbs. per acre	18—23	19—24	9	1,120	2	1,200	10	80	2	1,280
3	Thomas' phosphate, 800 lbs. per acre	20—25	20—25	9	1,240	2	1,120	9	440	2	720
4	Check	18—23	18—23	8	1,880	2	760	9	1,240	2	1,080
5	Thomas' phosphate, 400 lbs.; kainit, 200 lbs. per acre	20—25	18—23	8	960	2	960	9	80	2	640
6	Superphosphate, 400 lbs.; kainit, 200 lbs. per acre	18—23	17—22	7	1,040	2	240	9	640	2	560
7	Check	16—21	18—23	7	640	2	80	9	1,520	2	1,120
8	Thomas' phosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	18—23	20—25	6	1,600	2	—	9	560	2	960
9	Superphosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	18—23	20—25	6	1,200	1	1,760	10	—	2	1,440
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre	18—23	20—25	6	480	1	1,200	11	1,360	3	320
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons per acre	18—23	20—25	7	80	2	1,200	10	160	2	1,120
12	Check	16—21	18—23	4	1,440	1	1,840	9	80	2	640
13	Fresh slacked lime, 1,000 lbs. per acre	18—23	20—25	7	1,040	2	560	11	1,280	2	1,840
14	Nitrate soda, 100 lbs. per acre	18—23	20—25	6	1,600	1	1,600	8	1,600	2	640
15	Check	18—23	18—23	7	1,600	2	—	8	1,920	2	480
16	Nitrate soda, 200 lbs. per acre	20—25	20—25	8	1,920	2	880	11	320	2	1,840

CORRESPONDENCE.

A large correspondence has been maintained during 1903 between the farmers of Canada and the officers of the experimental farms.

CENTRAL EXPERIMENTAL FARM.

The following is a summary of the letters received and sent out at the Central Experimental Farm from December 1, 1902, to November 30, 1903; also the number of reports, bulletins and circulars forwarded by mail during the same period.

	Letters received.	Letters sent.
Director	40,490	17,081
Agriculturist	3,251	2,815
Horticulturist	1,237	1,266
Chemist	1,234	1,163
Entomologist and Botanist	3,059	2,664
Experimentalist (part of year)	386	372
Poultry manager	1,587	1,145
Accountant	824	799
	52,068	27,305

A large number of the letters received by the Director are applications for samples of grain or for the publications of the farms a considerable proportion of which are answered by sending the correspondents the material asked for, accompanied by circular letters. This explains why the number of letters received so much exceeds the number sent out..

Circular letters including circulars sent with samples of seed grain	32,074
Reports and bulletins mailed	248,673

BRANCH EXPERIMENTAL FARMS.

The correspondence with the Superintendents of the branch experimental farms is also large, as is shown by the following figures:—

	Letters received.	Letters sent.
Experimental Farm, Nappan, N.S.	1,840	1,685
Experimental Farm, Brandon, Man.	3,767	2,848
Experimental Farm, Indian Head, N.W.T.	4,926	4,980
Experimental Farm, Agassiz, B.C.	2,767	2,570
	13,300	12,083

Much additional information has also been sent out from the branch farms in printed circulars.

By adding the correspondence conducted at the branch farms to that of the central farm it will be seen that 65,365 letters were received and 39,358 sent out during the year.

A large proportion of these letters are from correspondents who seek information on all sorts of subjects relating to farm work, stock raising, dairying, fruit growing, poultry raising, &c. For the first two years after the experimental farms were established the letters received averaged 9,300 each year, whereas during the past six years the annual average has amounted to 64,411, showing the great growth of this branch of the service.

During the same period the number of reports and bulletins sent out each year has averaged 214,691. Thus a constant stream of information is going out from the experimental farms, helpful to farmers in their endeavours to make their calling more profitable.

CO-OPERATIVE EXPERIMENTS BY CANADIAN FARMERS.

The Dominion experimental farms were established in 1887 and in the spring of 1888 the useful work of assisting farmers with samples of high class seed grain for test was begun; hence they have co-operated with the experimental farms from the start in the endeavour to find out which varieties of the several cereals were the earliest to ripen and the most generally productive under the many different climatic conditions found in this country. In 1888 the number of samples distributed was 2,760. Every year since then this useful branch of the work has been continued, it rapidly assumed large proportions, and is much appreciated by farmers everywhere. The greatest pains are taken to send the grain out perfectly clean. Sometimes with the most approved cleaning apparatus this cannot be thoroughly done and in all such cases he grain is hand-picked. Many thousands of pounds are thus treated every year. Every effort is also made to have the samples true to name and of the most productive strains.

During the past ten years the number of samples distributed annually has averaged 35,030 and the total number sent out from 1888 to the end of 1903 is 421,312, which has involved the use of over 638 tons of first class material. Of these samples 368,245 have been sent out from the Central Farm at Ottawa and 53,067 from the branch farms. Hundreds of letters are received every year from farmers expressing their gratitude for the samples sent, as in this way they obtain at no cost beyond their own labour, pure seed of the choicest quality. There is no doubt that the quality, character and productiveness of the grain raised throughout the entire Dominion has been influenced very largely by the placing of these samples in the hands of so many good farmers.

During the season of 1903 the distribution was somewhat modified. While in the past the greater part of the samples distributed have weighed three pounds each, for the last three years there have been sent to a limited number of farmers who have taken a special interest in this work enough of the leading cereals to sow one-tenth of an acre. To these parties 8 pounds of oats or 10 pounds of wheat or barley have been sent. These larger samples have been very much appreciated, but since in some instances it produced dissatisfaction on the part of those who received the smaller samples, it has been thought best to put all the applicants on the same footing, and send to all who apply for samples of these cereals 4 pounds of oats and 5 pounds of wheat or barley, which would be enough in each case for a twentieth acre plot. The samples of pease, Indian corn and potatoes weigh 3 pounds each, as heretofore.

The samples sent from the Central Experimental Farm during the early months of 1903 have been distributed as follows:—

Name of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	Northwest Territories.	British Columbia.
Oats	508	1,083	990	3,228	2,079	519	539	84
Barley	127	336	177	1,362	676	185	227	38
Wheat	245	496	571	1,859	558	304	380	54
Pease	24	165	179	740	163	100	93	22
Indian Corn	30	178	145	512	794	104	81	25
Potatoes	138	757	579	3,687	2,648	715	959	173
Total	1,072	3,015	2,641	11,388	6,918	1,927	2,279	396

Total number of samples distributed, 29,636.
Number of applicants supplied, 29,592.

Total number of packages of each sort distributed:—

Oats	9,030
Barley	3,128
Wheat	4,467
Pease	1,486
Indian corn	1,869
Potatoes	9,656
Total	**29,636**

The following list shows the number of packages which have been sent out of the different varieties:—

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
OATS.		INDIAN CORN.	
Tartar King	1,667	Selected Leaming	512
Waverley	1,597	Longfellow	325
Banner	1,263	Early Mastodon	321
Improved Ligowo	1,256	King of the Earliest	273
Goldfinder	920	Eureka	161
Wide Awake	902	North Dakota White	102
Abundance	893	White Cap Yellow Dent	62
Black Beauty	532	Angel of Midnight	54
		Cloud's Early Yellow	30
Total	9,030	Early Butler	29
BARLEY.		Total	1,869
Mensury	1,008	POTATOES.	
Odessa	752		
Rennie's Improved	673	Early Sunrise	1,303
Sidney	302	Early Harvest	1,117
Canadian Thorpe	210	Carman No. 1	994
Standwell	183	Everett	861
		Early Andes	652
Total	3,128	Rochester Rose	593
		Maggie Murphy	582
WHEAT.		Surprise	548
		Honeoye Rose	403
Preston	967	Vigorosa	379
Percy	912	American Wonder	319
Stanley	874	Early White Prize	298
Red Fife	840	Bovee	275
Wellman's Fife	750	New Queen	247
Emmer (Spelt)	124	Sir Walter Raleigh	203
		Uncle Sam	196
Total	4,467	Prize Taker	181
		Canadian Beauty	178
PEASE.		Wonder of the World	165
		Early Rose	162
Canadian Beauty	463		
Black Eyed Marrowfat	360	Total	9,656
Prussian Blue	381		
Wisconsin Blue	282		
Total	1,486		

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

Samples of three pounds each were also distributed from the branch experimental farms as follows:—

Experimental Farm, Nappan, N.S.—		Experimental Farm, Indian Head, N.W.T.—	
Oats	212	Oats	411
Wheat	68	Barley	196
Barley	62	Wheat	278
Pease	42	Pease	232
Buckwheat	16	Flax, Rye, &c	41
Winter Rye	1	Potatoes	497
Potatoes	354		
Total	755	Total	1,655

Experimental Farm, Brandon, Man.—		Experimental Farm, Agassiz, B.C.—	
Samples of grain of all sorts	161	Oats	163
Potatoes	241	Barley	128
		Wheat	217
Total	402	Pease	148
		Potatoes	310
		Total	966

These samples added to the number distributed by the Central Experimental Farm make a total of 33,413. It is gratifying to find so large an army of co-experimenters willing to engage in this good work.

TESTS OF THE VITALITY OF SEED GRAIN AND OTHER SEEDS.

The number of samples of seeds tested during the season of 1902-3 to find out the proportion which would germinate was 2,091.

This useful work has been carried on every year since the experimental farms were established. For the first four years the average number of samples tested was 790 per annum, but for the past twelve years the average number has been 2,015 each season. They have consisted largely of samples of cereals, the vitality of which was doubtful owing to bad harvest weather or to some other unfavourable condition. Many samples of timothy, clover and other seeds which farmers buy and want to know whether they were good, have also been sent for test. The total number of samples which have been tested and reported on since this work was begun is 29,451. Farmers are invited to send in every year any samples which may be of doubtful vitality through injury in harvesting or storing or from any other cause, so that their germinating power may be determined and their usefulness for seed purposes ascertained.

Closely associated with this branch of work is the study of the length of time during which grain and seeds of different sorts will hold their vitality. In many instances the decrease in vitality with age is much more rapid than is generally supposed. In 1898, some experiments were begun in this direction by the selection of twelve samples, all vigorous growing sorts and all from the crop of 1897. Each of these samples was placed in a cotton bag and stored on an open shelf, on the shady side of the room in an ordinary office building, midway between the floor and ceiling, where they would get as equal conditions of temperature as could be had. They were kept in this way and tested every year. The samples consisted of three different sorts of wheat, four of oats, two of barley, two of pease, and one of flax seed. The wheats were samples of Red Fife grown at Indian Head, and Preston and Red Fern, both grown at Ottawa. The oats were Banner, grown at Ottawa and Indian Head, one sample of Prize Cluster, grown at Ottawa, and one sample of Scottish Chief. This was grown at Indian Head.

In wheat the average percentages of vitality for the three varieties taken from the crop of 1897, during the six years' test stand as follows : in 1898, the samples averaged 80 per cent of vitality; in 1899, they averaged 82·3 per cent, a slight increase; in 1900, they dropped to 77·3 per cent; in 1901, to 37 per cent; in 1902, to 15 per cent, and in 1903, to 6 per cent. The average of 6 per cent in 1903 is entirely due to a remnant of vitality of 17 per cent in the Red Fern, the Red Fife and Preston having lost their germinating power entirely. It is evident then that the growing of wheat which has been taken from mummies cannot be true.

In oats the average percentage of vitality for the four samples during the six years' test stood as follows: in 1898, it was 90·2 per cent; in 1899, 93 per cent; in 1900, 78·2 per cent; in 1901, 67 per cent; in 1902, 54 per cent, and in 1903, 29·5 per cent. In no instance have oats entirely lost their vitality during this period. Of barley, two varieties were chosen, one a two-rowed sort known as Canadian Thorpe, grown at Indian Head, and the other, a six-rowed variety, Mensury, grown at Ottawa. The average percentage of vitality of these two barleys during the time they have been under trial has been as follows: 1898, 97 per cent; 1899, 91 per cent; 1900, 78·5 per cent; 1901, 36 per cent; 1902, 19·5 per cent, and in 1903, 7·5 per cent. The two-rowed variety entirely lost its vitality by 1902, while the six-rowed has retained 15 per cent of vitality to the end of the six years' test.

Two varieties of pease were tested, Daniel O'Rourke and Large White Marrowfat. The average percentage of vitality shown by these two varieties was as follows: In 1898, 94 per cent; 1899, 95 per cent; 1900, 88 per cent; 1901, 64 per cent; 1902, 64 per cent, and in 1903, 6 per cent. A sample of flax was also tested, a single example. This gave, in 1898, 81 per cent; 1899, 82 per cent; in 1900, 75 per cent; in 1901, 49 per cent; in 1902, 26 per cent, and in 1903, 24 per cent.

From these tests we gather, that when any of the varieties of grain or seed referred to are kept over for sowing, they may be expected to be about as high in germinating power and in vigour of growth the second year as they were the first. In the third year there is a slight falling off, and in the fourth, fifth and sixth years, a rapid decline in proportion of vitality.

RESULTS OF TESTS OF SEEDS FOR VITALITY, 1902-03.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	677	100·0	26·0	83·9	3·8	87·7
Barley	359	100·0	28·0	87·6	5·4	93·0
Oats	516	100·0	5·0	85·2	4·8	90·1
Rye	2	82·0	81·0	77·0	4·5	81·5
Pease	126	100·0	14·0	....	....	79·6
Grass	106	98·0	5·0	....	....	78·7
Clover	207	97·0	1·0	....	....	70·3
Corn	4	80·0	14·0	....	....	43·0
Vetches	2	53·0	24·0	....	....	38·5
Beans	2	92·0	90·0	....	....	91·0
Onions	19	93·0	0·0	....	....	56·4
Celery	9	83·0	6 0	....	....	49·5
Carrots	2	27·0	4·0	....	....	15·5
Radish	8	80·0	39·0	....	....	46·2
Lettuce	16	93·0	1·0	....	....	53·5
Cabbage	7	75·0	8·0	....	....	44·8
Parsley	3	34·0	1·0	....	....	12·3
Tobacco	2	45·0	21·0	....	....	33·0
Cauliflower	3	59·0	53·0	....	....	56·3
Squash	2	72·0	12·0	....	....	42·0
Turnip	1	56·0	56·0	....	....	56·0
Spinach	1	9·0	9·0	....	....	9·0
Cress	1	38·0	38·0	....	....	38·0
Kohl Rabi	1	23·0	23·0	....	....	23·0
Leeks	1	64·0	64·0	....	....	64·0
Brussels Sprouts	1	20·0	20·0	....	....	20·0
Flax	1	60·0	60·0	....	....	60·0
Endive	1	29·0	29·0	....	....	29·0
Water Cress	1	1·0	1 0	....	....	1·0
Parsnips	1	76·0	76·0	....	....	76·0
Salsify	1	85·0	85·0	....	....	85·0
Beets	1	50·0	50·0	....	....	50·0
Rhubarb	1	64·0	64·0	....	....	64·0
Mustard	1	59·0	59·0	....	....	59·0
Ash Seed	1	16·0	16·0	....	....	16·0
Maple Seed	1	4·0	4·0	....	....	4·0
Total number of samples tested, highest and lowest percentage.	2,088	100·0	0·0	....	....	....

TABLE showing Results of Grain Tests for each Province:—

ONTARIO.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	233	100·0	26·0	77·7	4·8	82·6
Barley	125	100·0	52·0	85·7	6·5	92·2
Oats	142	100·0	52·0	92·8	3·9	96·8
QUEBEC.						
Wheat	79	100·0	63·0	87·1	2·6	89·7
Barley	72	100·0	28·0	86·5	5·4	91·9
Oats	64	100·0	60·0	91·8	2·8	94·6
MANITOBA.						
Wheat	62	100·0	58·0	85·0	3·7	88·7
Barley	15	98·0	63·0	88·0	3·2	91·2
Oats	54	100·0	5·0	76·9	5·7	82·7
NORTH-WEST TERRITORIES.						
Wheat	141	100·0	39·0	84·2	4·0	88·2
Barley	65	100·0	83·0	91·6	3·1	94·8
Oats	126	100·0	12·0	68·6	8·6	77·3
NOVA SCOTIA.						
Wheat	51	100·0	60·0	88·2	3·0	91·2
Barley	52	100·0	52·0	85·0	7·8	92·5
Oats	33	100·0	78·0	91·0	3·6	94·6
NEW BRUNSWICK.						
Wheat	61	100·0	61·0	89·9	2·7	92·7
Barley	12	100·0	84·0	91·5	3·5	95·0
Oats	35	100·0	89·0	93·2	2·6	95·9
PRINCE EDWARD ISLAND.						
Wheat	40	100·0	82·0	93·1	2·3	95·5
Barley	18	100·0	85·0	94·9	1·6	96·5
Oats	50	100·0	92·0	95·3	2·3	97·6
BRITISH COLUMBIA.						
Wheat	10	100·0	86·0	94·0	1·4	95·4
Oats	12	100·0	79·0	88·4	4·2	92·6

(Signed) WILLIAM T. ELLIS.

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1903; maximum and minimum temperatures, with date of occurrence, and mean temperature for each month, also rainfall and snowfall and total precipitation.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	F°	F°	F°	F°	F°		F°		in.	in.	in.		in.	
January...	20·29	2·29	17·99	11·28	38·0	30th	—29·8	19th	0·36	22·50	2·61	18	0·40	11th 21st
February..	24·62	7·95	16·66	16·28	41·8	28th	—22·2	18th	1·29	27·00	3·99	16	0·60	8th
March.....	41·68	25·66	16·02	33·67	62·3	19th	0·5	3rd	1·69	0·50	1·73	13	0·60	23rd
April......	55·55	32·03	23·51	43·78	82·2	30th	14·0	5th	0·85	3·00	1·15	8	0·50	7th
May......	74·03	43·90	30·12	58·96	90·8	19th	22 5	2nd	0·24	....	0·24	8	0·09	4th
June......	73·95	51·09	22·85	62·51	88·0	6th	41·8	1st	7·30	.....	7·30	15	2·03	12th
July.......	77·19	58·29	18·90	67·74	89·8	8th	44·5	27th	4·02	......	4·02	17	1·40	2nd
August ...	71·99	51·29	20·70	61·64	81 8	22d	43·6	8th	4·31	......	4·31	18	1·39	20th
September.	70·78	47·52	23·26	59·15	86·8	13th	33·5	30th	2·25	......	2·25	7	1·40	17th
October ...	57·53	38·68	18·84	48·10	70·5	1st	20 5	28th	3·50	......	3·50	15	1·05	10th
November.	37·63	22·35	15·27	29·98	61·0	4th	—0·1	26th	0·62	4·50	1·07	11	0·33	5th
December .	20·40	0·84	19 55	10·61	37·0	13th	—23·6	27th	......	27·50	2·75	18	0·40	20th
									26·43	85·00	34·92	164		

Rain or snow fell on 164 days during the 12 months.

Heaviest rainfall in 24 hours, 2·03 inches on June 12.

Heaviest snowfall in 24 hours, 6 inches, on February 8.

The highest temperature during the 12 months was 90·8°, on May 19.

The lowest temperature during the 12 months was —29·8°, on January 19.

During the growing season rain fell on 8 days in April, 8 days in May, 15 days in June, 17 days in July, 18 days in August, and 7 days in September.

September shows the lowest number of days with precipitation, viz., 7.

Total precipitation during the 12 months, 34·92 inches, as compared with 36·10 inches during 1902.

Rainfall, Snowfall and Total Precipitation from 1890 to 1903, also the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation.
	In inches.	In inches.	In inches.
1890	24·73	64·85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71·50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	35·97
1899	33·86	77·25	41·63
1900	29·48	108·00	40·27
1901	29·21	97·25	38·91
1902	25·94	101·75	36·10
1903	26·43	85·00	34·92
Totals for 14 years	375·93	1,245·10	500·42
Yearly average for 14 years	26·85	88·93	35·74

RECORD of Sunshine at the Central Experimental Farm, Ottawa, for the Years 1898 to 1903.

Months.	1898.				1899.				1900.			
	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.
January	21	10	97·4	3·14	18	13	91·2	2·94	18	13	76·4	2·46
February	15	13	67·5	2·41	19	9	102·1	3·64	20	8	110·2	3·93
March	26	5	171·5	5·53	17	14	124·1	4·00	26	5	177·9	5·73
April	29	1	233·8	7·79	26	4	228·8	7·62	26	4	212·7	7·09
May	30	1	186·3	6·01	27	4	225·4	7·27	27	4	241·6	7·79
June	29	1	184·9	6·16	29	1	257·1	8·57	27	3	282·2	9·40
July	30	1	272·8	8·80	29	2	271·3	8·75	29	2	225·1	7·26
*August	....	....	....	.....	31	0	271·2	8·74	30	1	270·7	8·73
September	27	3	166·9	5·23	22	8	128·9	4·29	22	8	164·4	5·48
October	21	10	106·0	3·41	23	8	120·4	3·88	26	5	148·7	4·79
November	21	9	91·3	3·04	17	13	77·0	2·56	18	12	71·7	2·39
December	15	16	54·3	1·75	17	14	50·1	1·61	16	15	34·0	1·09

Months.	1901.				1902.				1903.			
	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.
January	20	11	94·6	3·05	21	10	97·2	3·13	18	13	57·5	1·85
February	20	8	120·9	4·31	20	8	93·3	3·33	19	9	94·0	3·35
March	19	12	82·4	2·62	25	6	136·2	4·39	24	7	121·4	3·91
April	18	12	137·1	4·57	26	4	161·9	5·39	25	5	181·7	6·05
May	25	6	200·8	6·47	27	4	229·8	7·41	31	0	278·3	8·97
June	29	1	269·4	8·98	29	1	185·6	6·18	24	6	157·7	5·25
July	29	2	245·8	7·92	31	0	239·9	7·73	30	1	230·1	7·42
August	29	2	226·1	7·29	31	0	252·0	8·12	25	6	206·4	6·65
September	26	4	202·3	6·74	25	5	145·0	4·83	28	2	174·4	5·81
October	27	4	126·3	4·07	24	7	99·2	3·20	26	5	125·9	4·06
November	19	11	72·4	2·41	21	9	82·5	2·75	23	7	96·4	3·21
December	16	15	45·4	1·46	16	15	58·4	1·88	20	11	53·2	1·71

* Instruments out of order.

(Sgd.) WILLIAM T. ELLIS,
Observer.

VISIT TO THE EASTERN EXPERIMENTAL FARM.

A visit was paid to the experimental farm at Nappan, N.S., August 3 to 6. The weather was very fine; the hay harvest was then being rapidly pushed and the crop was saved in excellent condition. The severe drought which had prevailed during May and up to June 23 had resulted in a stunted growth in the crops, but after the drought was broken by copious rains they all improved rapidly; the growth of hay thickened considerably at the base and the crop which earlier promised to be almost a failure resulted in about two-thirds of an average yield. The hay produced on the upland was better than that on the marsh.

At the date of my visit the crops in general looked well. In the uniform trial plots of grain the wheat promised about an average yield, the oats and barley above an average. Indian corn was growing well, but was not so far advanced as usual owing to the cold backward season. Turnips were looking remarkably well. A considerable area of additional land had been brought under crop. The dairy cattle were looking well and milking fairly well. The horses, swine, sheep and poultry were all in good condition. Inspection was made of every branch of the work, and the general condition of the farm was very satisfactory and showed evidence of careful supervision. The buildings also and implements were found in good order.

The orchards had made good progress and many of the apple trees were well laden with fruit; the vegetable garden was in a thriving condition, and the flower beds full of bloom. The trees and shrubs planted about the grounds, notwithstanding the drought, had made a satisfactory growth.

A JOURNEY TO THE WEST.

THE EXPERIMENTAL FARM AT BRANDON, MAN.

Leaving Ottawa August 14, Brandon was reached on the 16th, where several days were spent in inspecting the buildings and crops and everything was found in excellent order. The field crops promised a good harvest, some of them were already cut and the weather was fine for harvest purposes. Wheat cutting began here on August 17, and subsequently made rapid progress. The different varieties of wheat, oats and barley were carefully examined and notes taken on their growth, condition and character. The oat crop was very heavy. The many varieties of Indian corn, field roots and potatoes under trial here were found to have made strong and healthy growth. When cut green for ensilage, Indian corn subsequently gave, in experimental plots, as high as 28 tons per acre. The heaviest yielding sort of mangel gave over 40 tons per acre. The plots of different varieties of flax were also interesting and promising.

The orchards of cross-bred and seedling crab and apple trees are being rapidly extended and many of the seedlings earlier planted were bearing heavy crops, and some of the cross-bred apples were bearing their first fruits. Many of these are attracting much attention and some progress has been made in propagating and distributing them. Many of the native seedling plums were in fruit and several of the earlier sorts ripened before frost occurred. Some of the earlier ripening sorts of good quality will be propagated. The trees and shrubs forming the Arboretum are doing well, and each season adds to their growth and their number. The Arboretum is now one of the most attractive spots on the farm.

The horses, cattle, swine and poultry were all in good condition and showed evidence of constant and intelligent care.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

This farm was next visited in time to see most of the more important crops before they were harvested. The yields of grain were heavy, especially those of oats. The experimental plots were most remarkable for weight of crop; the heaviest yielder was the Banner, which gave at the rate of 136 bushels 26 pounds per acre. The best twelve varieties in these plots gave the unprecedented average yield of 128 bushels 26 pounds per acre. Barley also gave excellent crops of very plump grain. On the plots one of the two-rowed sorts gave 80 bushels, 40 pounds, and one of the six-rowed varieties at the rate of 71 bushels 12 pounds per acre. Among the highest yielding wheats was the Preston, which gave a crop of 43 bushels 10 pounds per acre. The best field crop was from Huron, one of the cross-bred wheats produced at the experimental farms; this gave 40 bushels 24 pounds per acre.

The cold and backward weather retarded the ripening of the grain and it became necessary to cut some of it before it was fully matured, and most of the grain so treated was more or less shrunken. Several of the late ripening sorts of wheat which were not cut when the frost came on September 5, were touched with frost. Pease were not fully ripened at that time, and consequently most of the varieties were more or less injured. Flax was a fair crop.

Good returns were had from Indian corn cut green for ensilage, field roots also gave very good crops. The yield of potatoes was larger than ever known before, the heaviest crop, that of Carman No. 1, in the experimental plots being at the rate of 711 bushels 28 pounds per acre. The cool season seems to have been favourable to the growth of the potato.

The early ripening varieties of wheat under trial have this year shown themselves relatively earlier than usual. The Preston, which has averaged during the past nine years from four to six days earlier than the Red Fife, was this year from ten to twelve days earlier, and in some instances the advantage in earliness was fully two weeks in favour of Preston. The same may be said of other early ripening sorts. This was no doubt due to the cool and backward weather; the earlier sorts probably having the power of maturing more rapidly under lower temperatures.

In the orchards of Siberian crabs and cross-bred apples, the crab trees were well laden. The fruit makes excellent jelly although it is too small for most other purposes. The cross-bred apple trees, the fruit of which is large enough to be serviceable for domestic use, are young and only beginning to fruit. The trees seem to be equally hardy with those of the crabs. Trees and shrubs for shelter and ornamental purposes have been largely propagated and distributed among settlers all over the Territories, who are using them to advantage and thus making their home surroundings more attractive.

The horses, cattle, swine and poultry were all in good condition and everything in connection with the buildings, implements, &c., was in good order, indicating careful management.

REGINA AND PRINCE ALBERT DISTRICTS.

After leaving Indian Head, the Regina district was visited, also the country from Regina to Prince Albert. This was during the last week in August and the first in September, at which time the crops were very promising. By September 1 a considerable part of the wheat had been cut and harvesting was progressing rapidly. In Prince Albert several farms were visited, but the grain was not fully matured. At Rosthern the season appeared to be further advanced and a drive of over fifty miles was taken over that district and a number of farmers seen, some of whom had from 100 to 200 acres of wheat. Three years ago very little wheat was brought in at this point and the town had no elevators. Now there are six elevators built and it is said that in 1902 500,000 bushels of wheat were marketed at this point, and it was expected that 600,000 bushels would be brought to Rosthern during the season of 1903.

EXTENSIVE SETTLEMENT.

Settlement has progressed very rapidly along this line of railway and the homesteads for many miles back have nearly all been taken up. About 60 miles south-east of Rosthern, on the Hoodoo plains towards the Quill lakes a very large tract is being taken up by a body of German Catholics from the United States. In conversation with one of their priests, met at Rosthern, it was learned that about 2,000 of these people had gone into that district this spring, that many more were expected during the autumn, and a still larger number next season. It is expected that this settlement will occupy the greater part of forty to fifty townships. The line of the Canadian Northern Railway now being built will run through this part of the country.

Many of the towns from Regina to Prince Albert have doubled and some of them trebled their population within the past three years, and many new towns have sprung up and are growing rapidly, which at that time had no existence. Twenty-five elevators were counted at different points along this line of railway.

JOURNEY TO BATTLEFORD.

On returning to Saskatoon, a drive of 200 miles was taken in looking over the country between this point and Battleford. A very large proportion of the land seen was of excellent quality, especially much of that along the proposed line of the Canadian Northern Railway on the north side of the Saskatchewan river.

Arriving at Battleford on the day fixed for the holding of the Annual Agricultural Fair, an opportunity was afforded of seeing a good collection of the agricultural products of that district. The grain shown at that time was not fully ripe, but was fairly well advanced.

COLONY OF NESTORIANS.

Among other nationalities exhibiting on this occasion were the Nestorians, from Persia, who have taken land within a few miles of the town. They made a very creditable display of vegetables. In an interview with one of their chief men I was told that these people were very well satisfied with this part of Canada and expected a larger influx of settlers from their country next year.

BARR COLONISTS.

About Saskatoon and along the road to Battleford, also in Battleford itself, many of the Barr colonists were met with. The land chosen for this colony begins about forty miles north-west of Battleford and extends in the same direction to a distance of ninety miles from Battleford, and near that point the town of Lloydminster has been founded. Of the 1,200 people who came out who were entitled to homesteads, about 400 have taken up land in the British settlement. The others have distributed themselves among other settlers all over the country and have taken up homesteads in proximity to places where they could obtain employment. They are engaged in many different lines of work, in the towns, among the farmers, and on the railways. All those we had the opportunity of talking to seemed satisfied with the country, and most of them expected to go on their land to begin their settlement duties next spring.

There is much difficulty in obtaining lumber in many parts of the North-west this year for the many new buildings required. A part of what is used in the Battleford district has been brought in from British Columbia and hauled up from Saskatoon, while a part has been floated donw the north Saskatchewan river, in barges, from Edmonton.

DOUKHOBOR VILLAGES.

During these journeys opportunity was afforded for visiting several villages of the Doukhobors. Each village consists of a number of houses, one for each family, neatly built with logs and plaster, with, in some instances, an attempt at ornamentation on the plaster work. Their houses are very clean and neat inside, but they appear to have little idea of ventilation, as no provision seems to be made in any of the houses visited for opening the windows. They all have gardens about their houses, in which the leading vegetables are grown. Sunflowers and poppies are also always abundant. Young and old eat quantities of the seeds of both these plants. In the neighbourhood of these villages a large quantity of land was broken and under crop. Belonging to one village was 400 acres of flax, which promised a very good yield. The crop of wheat belonging to the Doukhobors were the poorest seen anywhere and it was evident that their preparation of the land was very crude, although their oat crops were better. They will doubtless soon improve in this particular. The villages visited are now well supplied with cattle and horses. These people are evidently making progress.

VISIT TO THE EXPERIMENTAL FARM AT AGASSIZ, B.C.

Returning to Regina, the train was taken for Agassiz, B.C., where a week was spent in looking into the many details connected with the experiments in progress there with fruits, cereals and fodder plants. The yields of hay and grain had been heavy, but, owing to wet weather, not much threshing had been done up to that time. The yields of the barley plots, however, had been determined and the best of them ranged from 70 to 80 bushels per acre. The fodder corn was very heavy and almost fit to cut. The root crop, also, was very promising.

The fruit crop at the Agassiz Farm was rather below the average, although some varieties were bearing well. This is the general condition throughout the coast climate and has probably been due to very wet weather in the spring, which prevented the fruit from setting. On Vancouver island, where there was less rain, the crop is much better. Plums have yielded well, but the 'plum rot' has destroyed a considerable proportion of the fruit in the orchards on the mainland. This troublesome pest has proved a discouragement to plum growers in the coast climate. In the drier interior country, fruit trees have yielded abundant crops and there the 'plum rot' causes very little loss.

Among the large number of different sorts of fruits under trial at the experimental farm at Agassiz, while some are of excellent quality, others have proved inferior. These latter are being discarded and a list of them will be published for the information of fruit growers. Selections have been made of those of the highest quality and productiveness—and, in plums, of those most free from rot—for planting in commercial orchards, where instead of having one or two trees, from five to ten trees of each sort are being planted.

A general inspection was made of the field crops, the stock, buildings, &c., and all were found in good condition.

New Westminster and Victoria were also visited and arrangements made for a fine display of the products of the Agassiz Farm at each of the large exhibitions to be held at these points.

CALGARY AND EDMONTON DISTRICTS.

On the return journey, a few days were spent in looking over the country from Calgary to Edmonton. The progress in settlement all along this line during the past three or four years has been marvellous. Many flourishing towns were seen along the line, some of them only two or three years old. Nearly all the older towns have increased in size and population very much of late. The homesteads are nearly all taken up for from twenty to thirty miles on both sides of the railway and for nearly the whole distance. At Edmonton they are all disposed of for nearly seventy miles east and from thirty-five to forty miles west. Fully 14,000 settlers have gone into the Edmonton district within the past three or four years, a large proportion of whom are

Americans and Galicians. The people who have come in from the United States make excellent settlers and are well trained to the work devolving on new settlers in this western country. The Galicians are making good progress, are fast adapting themselves to the conditions in which they are placed, and are learning English. A number of schools have been established among them.

The town of Edmonton has made phenomenal growth and the prices asked for property there are in some instances more than could be realized in cities in the east with five times the population which Edmonton now has.

Returning, a day was spent at the thriving town of Innisfail, where a drive was taken through a part of that district and some fine farms seen. An opportunity was also afforded of meeting some of the leading farmers of that locality at the prosperous and well equipped creamery which has been established there.

VISIT TO SOUTHERN ALBERTA.

A trip was made to Macleod, Pincher and Cowley, where some fine fields of fall wheat were seen; also to Lethbridge, and thence to the Mormon settlements south-east of that place, the towns visited being Stirling, Raymond, and Magrath. Each of these places has increased considerably in population during the past year, but the most remarkable growth has been at Raymond. Two years ago I visited the spot on which this town now stands, when a surveyor's tent was the only thing to be seen on the wide expanse of prairie. Now there is a town of about 1,500 inhabitants, possessing a very large brick school, a meeting house, hotel, stores, bank and numerous dwellings.

BEET SUGAR FACTORY.

There is also an extensive beet sugar factory nearly completed at a cost of about $400,000, which will have a capacity for working up 350 tons of beets a day. This factory is very complete and modern in all its appliances. Some good fields of beets were seen in the neighbourhood, but in many instances the land on which they had been grown had not been sufficiently worked to give the best results. Some of the better fields were expected to give from 10 to 12 tons per acre. The beets grown there are said to be very rich in sugar. The total crop is estimated at from 10,000 to 12,000 tons, which will be sufficient to keep the factory running from thirty to forty days. Another year, under improved conditions, it is expected that a better and larger crop will be produced.

QUALITY OF WHEAT SEEN AT ELEVATORS.

Returning eastward, some time was spent at Regina, Indian Head, Virden and Brandon. Threshing was being pushed rapidly along and large quantities of wheat were being delivered at the elevators. Most of that being received was grading No. 1 and No. 2 Northern, with an occasional lot of No. 2 Hard. This wheat was coming mainly from the crops grown on stubble land, since they were the earliest to ripen. At all the localities named, excepting Indian Head, the wheat crop was averaging about 20 bushels per acre, and at Indian Head from 20 to 25 bushels. The crops on summer-fallowed land are expected to be heavier; but, since they were later in ripening, they are likely to grade somewhat lower.

The prices being paid this year for wheat grading No. 1 and No. 2 Northern are higher than were paid last season for No. 1 Hard. Hence, the farmers in the wheat growing districts of the North-west country are well satisfied with the results of the season.

Although a few days of wet weather have delayed threshing in some quarters, the quantity of wheat handled by the Canadian Pacific Railway and Canadian Northern Railway from September 14 to October 7, and inspected at Winnipeg, was 4,939 cars, aggregating nearly 5,000,000 bushels, and the fine weather which prevailed at the time of leaving Winnipeg would soon greatly accelerate the moving of the crop.

ADDITIONS TO THE STAFF.

During the past year a new division of the work has been established known as the 'Division of Cereal Breeding and Experimentation.' In this are included two important branches of work which hitherto have been under the personal charge of the Director. These are the production of new varieties of cereals by cross-breeding and selection and the comparative tests of new and established sorts. The work of general supervision of all the farms now claims so much of the Director's attention that it was not possible for him to give the time necessary to do justice to these special branches. The great grain growing interests of Canada are so important that every effort should be made to improve existing varieties and to produce such new ones as are needed, by judicious crossing, so that varieties may be had suited to the various climatic conditions found in this country. Much good work has already been done which is creditable to the Department and to the Dominion, but the field is a boundless one and the possibilities of improvement are great. The Experimentalist, who has been appointed to take charge of this division is Dr. C. E. Saunders, who has had special training in this direction and has done considerable work in cross-breeding at the Central Farm during the past seven years.

An assistant has also been appointed to the poultry manager, Mr. Victor Fortier, of St. Jérome, Quebec, having been chosen for this position. Mr. Fortier is a man of much experience in poultry matters, and is specially acquainted with the needs of the province of Quebec in connection with her poultry interests. Through Mr. Fortier's energy and his intimate knowledge of poultry breeding and management it is hoped to extend the usefulness of the poultry division.

PUBLICATIONS ISSUED DURING THE YEAR.

During 1903 three bulletins have been published, No. 41 gave the 'Results obtained in 1902 from trial plots of Grain, Fodder Corn, Field Roots and Potatoes.' This is the eighth bulletin dealing with this subject, prepared by the Director. While dealing primarily with the crops on the experimental plots on all the experimental farms in 1902, it contains also the average results had from the growing of these important farm crops for a series of years. The information thus given has been very useful to the farmers of Canada, showing what varieties have been most productive in different parts of the Dominion.

The second bulletin, No. 42, on 'The Rape Plant, its Culture, use and Value,' was prepared by Mr. J. H. Grisdale, Agriculturist. In this bulletin the usefulness of rape for forage purposes for most classes of stock is demonstrated. The most approved methods of cultivation are given and the cost of growing this crop. Some particulars are also submitted of the results obtained at the Central Experimental Farm in the feeding of this plant to swine and steers.

The third bulletin, No. 43, was on 'Plum Culture, with Descriptions of Varieties,' in which are submitted district lists of plums suitable for Ontario and Quebec. This has been prepared by Mr. W. T. Macoun, Horticulturist, and includes an account of the different classes of plums grown, with some particulars of the experiments which have been carried on with plums at the Central Experimental Farm for many years past. Methods of preparing land for orchard are given, with particulars as to their subsequent planting and care. The methods of propagation of the plum by budding and grafting are referred to and explanations given as to the subsequent pruning and care of the trees; also the spraying of them to control insect enemies and to prevent injuries to which they are liable from various diseases which affect the trees and fruit. Reference is also made to the manner of picking and marketing of the fruit.

PREPARATIONS FOR THE LOUISIANA PURCHASE EXPOSITION AT ST LOUIS.

From each of the experimental farms contributions of material have been made for the Louisiana Purchase Exposition at St. Louis. These consist of large quantities of grain in the straw, as well as of cleaned grain; also collections of grasses, millets and other fodder plants. Large quantities of fruit and vegetables have been put up in bottles in preserving fluids and forwarded to the exhibition branch of the Department of Agriculture. While all have assisted in every department, the largest contributions to the cereal display have come from the experimental farms at Indian Head, N.W.T., Brandon, Manitoba, and from the Central Experimental Farm at Ottawa. The larger portion of the fruit display has been sent from the experimental farms at Agassiz, B.C., Nappan, N.S., and Ottawa, Ont.

ACKNOWLEDGMENTS.

I desire to tender grateful acknowledgments to those who have rendered me special service during the past year. To the United States Department of Agriculture for samples of seeds of cereals, fodder crops and vegetables for test from foreign countries. To the Director of the Royal Gardens, Kew, England, for many sorts of seeds of trees, shrubs and plants from Great Britain and abroad. To the Director of the Arnold Arboretum, Jamaica Plains, Mass., for seeds of many different sorts of trees and shrubs of much interest, from foreign countries. To Prof. John Macoun and Mr. J. M. Macoun, both of the Geological and Natural History Survey of Canada, for much practical information and for seeds of rare Canadian plants.

I also tender my best thanks to the officers of the Central and Branch Experimental Farms, for their faithful services and for their earnest co-operation in carrying out the different branches of the work. My sincere thanks are also due to those members of the staff who have rendered me help in those branches of the work of which I have had personal charge; to Mr. John Fixter, the farm foreman, who has taken special charge of the tests made with fertilizers and taken notes thereon, who has also helped me with practical suggestions; to Mr. George Fixter, to whom I am indebted for careful management of the work connected with the distribution of samples of seed grain to the farmers of Canada; and to Mr. Wm. T. Ellis, who has done much careful work in testing the vitality of seeds, the management of the plants in the greenhouse and in the propagation of many useful species for outside decoration. Mr. Ellis has also rendered useful service in the taking of the Meteorological Records.

I am also pleased to bear testimony to the faithful services of my secretary, Mr. Malcolm C. O'Hanly. The employees also of all the farms have my thanks for the interest they have taken in their work, and the care with which they have discharged their respective duties.

WM. SAUNDERS,
Director of Experimental Farms.

REPORT OF THE AGRICULTURIST.

(J. H. Grisdale, B. Agr.)

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith reports upon the horses, cattle, sheep, swine and farming operations under my supervision during the past year.

As in previous years much of my time has been taken up in attending agricultural and live stock meetings in various parts of Canada.

I have to report a fairly successful year in the different branches of my division and in this connection I wish to acknowledge my indebtedness for assistance and earnest co-operation in their various positions of the farm foreman, Mr. John Fixter, of the herdsman, Mr. Chas. Brettell, and of the dairyman, Mr. J. Meilleur.

From December 1, 1902, to November 30, 1903, 3,003 letters were received and 3,339 despatched by the agricultural division.

I have the honour to be, sir,
Your obedient servant,

J. H. GRISDALE,
Agriculturist.

LIVE STOCK.

The live stock now (Dec. 1, 1903) occupying the different stables and pens under my charge includes horses, cattle, sheep and swine.

HORSES.

The horses are used for labour exclusively. They number 19, made up of:—

13 heavy draught horses of Clydesdale and Percheron blood.
5 heavy driving horses.
1 light driver.

CATTLE.

There are representatives of four breeds of cattle, viz.: Shorthorn, Ayrshire, Guernsey and Canadian. There are besides a number of grade cattle and steers.

Pure Bred Breeding Cattle.

The pure bred cattle are as follows:—

11 Shorthorns, including 2 bulls and 9 females.
13 Ayrshires, including 2 bulls and 11 females.
12 Guernseys, including 5 bulls and 7 females.
7 Canadians, including 2 bulls and 5 females.

GRADE CATTLE.

There are 17 grades, including 5 Shorthorn grades, 5 Ayrshire grades, 6 Guernsey grades and 1 Canadian grade.

Steers.

Sixty-seven steers are now being fed in the barns; this includes:—

15 three-year-olds.
21 two-year-olds.
17 yearlings.
14 calves.

SHEEP.

Thirty-four head are in the pens, including 20 Shropshires and 14 Leicesters. The Shropshires are:—

4 rams; 1 old and 3 lambs.
16 ewes; 12 old and 4 lambs.

The Leicesters are:—

3 rams; 1 old and 2 lambs.
11 ewes; 8 old and 3 lambs.

SWINE.

One hundred and eighty-eight pigs of all classes are being fed. This number is made up as follows:—

31 Yorkshire, including
- 12 breeding sows.
- 2 stock boars.
- 3 young sows.
- 8 young boars.
- 6 sucklings.

5 Berkshires, including
- 4 breeding sows.
- 1 young sow.

6 Tamworths—
- 3 breeding sows.
- 3 young sows.

4 Large Blacks.
- 3 breeding sows.
- 1 boar.

142 feeding pigs of various ages and breeds.

HORSES.

There are 19 horses in the stables. These horses are expected to do the work in the various departments during the year. The work on 'The 200 Acre Farm' is but a part of their duties, about 33⅓ per cent of all the work they perform. They work in addition for the horticultural and experimental departments, as well as upon the lawns and in the Arboretum. In addition a large amount of hauling in connection with the different departments as well as roadmaking and messenger service takes up much of their time.

During the 12 months, December 1, 1902, to November 30, 1903, the 19 horses consumed 145,900 lbs. hay (almost 73 tons), 105,432 lbs. oats, bran and oil meal, and 5,000 lbs. roots.

This food was valued at $1,552.10. To care for them cost $560.00, making a total cost of $2,112.10 for 19 head, or $111.16 to feed and care for one horse for the year, or 37 cents per day, counting 300 working days in the year.

The driver received $1.41⅔ per day, hence 10 hours (day's work) work with a team costs $2.16.

In estimating the cost of horse labour further on in this report $2.50 per day is allowed. This leaves a margin of 32 cents per day for wear and tear on harness and for replacing horses as they grow old. Since the daily allowance of 16 cents per horse amounts to $48 in the year of 300 working days, it is evident that all possible contingencies are amply provided for.

Since the stock of horses is 19 head, and the average working life has been about 10 years, there is allowance made for a sinking fund of $9,120 in the ten years, or sufficient to replace the horses and harness twice over.

DAIRY CATTLE.

The herd of dairy cattle during 1903 consisted of 38 females, all told. They were:—

Canadian grades	
Ayrshires	1
Guernseys	8
Canadians	6
Shorthorn grades	4
Ayrshires grades	4
Guernsey grades	6
Canadian grade	5
	1

FEEDING THE DAIRY CATTLE.

The roughage ration fed to the dairy cows consisted of ensilage, mangels, clover hay and some chaff. The amount of roughage fed varies considerably, since the milch cows vary in weight from 800 lbs. to 1,600 lbs. The approximate roughage ration fed per 1,000 lbs. weight is 35 lbs. corn ensilage, 20 lbs. mangels, 5 lbs. clover hay and a little chaff.

The meal or grain ration fed consisted of different mixtures at different times and to different cows. The meals or grains used were oats, barley, bran, pease, gluten and oil meal. Gluten meal formed the basis of the ration during the winter, while oat chop took its place in summer.

No very heavy grain ration was fed to any cow. A careful study was made of each cow's requirements, and she was fed accordingly.

SUMMER FEEDING.

The cows were, as usual, pastured during the first summer months on part of the fifth year of the rotation; that is, on land from which one year's hay had been cut. In August and September they were allowed to have the clover meadow aftermath of the fourth year of the rotation. In addition, some soiling crops were fed, and some green corn. The meal ration in the summer was a light one. It consisted of oats and barley ground and fed in proportion to the yield of milk, save in the case of heifers with first calves, when a somewhat heavier ration proportionately was fed.

COST OF FEEDING.

In estimating the cost of feeding, the following prices were charged for feed stuffs, being the average local market rates for the same during 1902, save in the case of ensilage and roots, which are charged at the usual values affixed in experimental work:—

	Per month.
Pasture	$ 2 per cow
Bran	16 per ton
Gluten meal and oil meal	25 "
Oats and barley	21 "
Clover hay	7 "
Chaff	4 "
Roots and ensilage	2 "

In estimating the value of the product, 20 cents per pound is allowed for the butter, and 15 cents per hundred pounds for the skim milk and butter milk. The butter is manufactured in the farm dairy and sells on the market at from 22 cents to 30 cents per pound, an average of about 25 cents per pound during the year. This leaves about 5 cents per pound for cost of manufacture.

The following tables give in detail the particulars concerning each cow, herd statements for each of the pure-bred and grade herds, and monthly statements for all the herds combined.

The monthly statements for the whole milking herd show the total yield of milk for each month, its butter fat content, the amount of butter produced, the number of pounds of milk required for a pound of butter, and the average yield of milk per cow per diem. The highest average per cent of fat was recorded in October, and the lowest in February.

In presenting the following 'Herd Reports' some few words of explanation are necessary.

DAIRY CATTLE REPORTS.

During the year 38 different cows were milked for shorter or longer periods, as indicated on the first page of my report on dairy cattle, whereas in the subjoined 'Herd Reports' only 22 animals are reported upon.

In almost any dairy herd of any size some cows will be found that for some reason have given milk during only a very small part of any given year. Where a large number of cows are being considered one or two such cases introduced in estimating the average does not materially affect the same, but where the herds to be compared are small the consideration of one or two such cases in one herd and no such cases in another makes an unjust difference in favour of the latter herd. To overcome this difficulty as far as possible, the records of three of the best cows in each herd, and of cows that had been in milk for the greater part of the year, have been taken, and the averages estimated from these records, rather than from the records of all cows of that particular breed that happened to calve during the year.

REPORT 1 is a summary of the more important points in connection with the year's work with the dairy herd.

REPORT 2 contains the individual records of all cows that gave any milk during the year.

REPORTS 3, 4, 5, 6, 7, 8, 9 and 10 give the herd records of the several pure bred and grade herds under test.

REPORT I.

GENERAL SUMMARY.

—	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Totals.
No. of cows giving milk for month.	23	23	22	20	24	28	32	33	30	28	29	29	
Lbs. of milk in month..	11,898	11,402	9,838	10,571	15,503	21,263	26,938	25,634	21,932	17,474	18,747	19,282	209,482
Average for 1 day......	396·6	367·7	317·3	377·5	500·1	708·8	869	854·4	707·5	563·7	624·9	622	573·9
Daily average per cow.	17·25	16·54	15·13	21·14	23·85	26·58	26·94	25·63	23·08	19·41	20·83	20·30	21·63
Per cent fat.	4·32	4·36	4·35	4·08	4·29	4·29	4·29	4·26	4·24	4·22	4·31	4·40	4·30
Lbs. butter fat........	513·48	497·01	428·02	431·78	665·06	908·04	1154·24	1092·31	929·35	736·63	808·92	849·10	9013·94
Lbs. butter..	604·09	584·73	503·55	507·88	782·42	1068·23	1357·71	1285·07	1093·33	866·59	951·67	998·94	10604·21
Lbs. milk for 1 lb. butter.	19·70	19·49	19·54	20·81	19·82	19·91	19·84	19·95	20·07	20·15	19·69	19·29	19·75

REPORT 2.

INDIVIDUAL COW RECORDS.

Name of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds butter produced in year.	Value of butter at 20 cts. per lb.	Value of skim milk at 15 cts. per 100 lbs.	Total value of product.	Amount meal eaten, valued at 1 c. per lb.	Amount of roots and ensilage eaten, valued at $2 per ton.	Amount hay, valued at $7 per ton.	Months on pasture at $2 per month.	Total cost of feed for year.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, labour neglected.
			Days.	Lbs.	Lbs.	p.c.	Lbs.	$	$	$	Lbs.	Lbs.	Lbs.	Mos.	$	Cts.	Cts.	Cts.	$
Queenie .... (G.G.)	5	Mar. 10, '03	290	22·8	6,629	5·93	466·57	93·31	9 24	102 55	1,468	8,430	1,815	5	39 46	59·52	8·4	11·6	63 09
Polly .... (G.C.)	8	Jan. 30, '03	325	26·13	8,493	4·55	454·24	90·84	12 04	102 88	1,712	8,290	1,815	5	41 76	49·17	9·4	10·6	61 12
Zamora .... (C.)	7	Apr. 18, '03	320	24·04	7,694	4·96	448·80	89·76	10 80	100 56	1,566	9,455	1,707	5	41 08	53·40	9·1	10·9	59 48
Jessie A .... (A.)	9	Feb. 16, '03	265	35·2	9,330	3·78	415·16	83·03	13 36	96 39	1,729	8,021	1,400	5	40 21	43·09	9·60	10·40	56 18
Laura .... (G.A.)	6	Dec. 12, '02	324	32·3	10,490	3·25	412·80	82·56	15 10	97 66	2,058	6,790	1,630	5	43 77	41·72	10·36	9·64	53 89
Itchen Lady ..... (G.)	6	May 2, '03	290	23·76	6,892	4·85	394·08	78·81	9 73	88 54	1,368	7,700	1,837	5	37 81	54·86	9·6	10·4	50 73
Countess .... (G.A.)	5	Feb. 12, '03	275	31·5	8,674	3·97	405·15	81·03	12 39	93 42	1,769	9,658	1,815	5	43 69	50·36	10·70	9·30	49 73
Bellflower .... (G.G.)	5	Mar. 10, '03	285	25·7	7,339	4·48	387·03	77·40	10 42	87 82	1,484	9,910	1,815	5	41 10	56·00	10·6	9·4	46 72
Fortune .... (C.)	7	Nov. 30, '02	300	21·45	6,436	4·70	356·00	71·20	9 08	80 28	1,542	6,510	1,425	5	36 91	57·34	10·3	9·7	43 37
Maggie .... (A.)	7	Apr. 18, '03	275	27·5	7,562	3·87	344·75	68·95	10 81	79 76	1,293	8,830	1,810	5	38 09	50·37	11·04	8·96	41 67
†Miss Molly ..... (S.)	13	Sep. 4, '02	250	25·7	6,429	4·53	330·67	66·01	9 13	75 14	1,339	8,780	1,815	3	34 69	53·96	10·5	9·5	40 45
Marchioness ..... (S.)	9	Mar. 6, '03	300	23·9	7,182	4·14	350·14	70·03	10 25	80 28	1,641	8,800	1,815	5	41 56	57·72	11·9	8·1	38 72
Bloomer .... (A.)	4	Mar. 31, '03	325	21·8	7,087	4·12	343·78	68·75	10 11	78 86	1,625	9,640	1,815	5	42 24	59·60	12·20	7·80	36 62
Flossy Lyons ... (G.)	3	Feb. 4, '03	260	19·39	5,041	5·13	304·54	60·90	9 07	67 99	1,103	6,270	1,767	5	33 48	66·41	10·9	9·1	34 51
Denty .... (A.)	4	Mar. 29, '03	320	20·36	6,515	4·27	327·05	65·41	9 27	74 68	1,597	9,590	726	5	41 91	64·3	12·8	7·2	32 77
Exile .... (C.)	8	May 10, '03	170	31·12	5,291	3·78	236·52	47·30	7 50	54 80	885	1,070	682	5	22 30	42·14	9·4	10·6	32 50
Deanie .... (G.)	6	Aug. 21, '03	300	18·70	5,631	4·94	327·52	65·46	9 95	83 41	1,394	9,140	1,837	5	41 81	73·18	12·6	7·4	32 10
Bloom .... (G.G.)	9	May 3, '03	290	23·05	6,682	3·96	311·65	62·33	9 55	71 88	1,218	11,310	1,922	5	40 21	60·17	12·92	7·08	31 67
Sadie .... (G.S.)	3	Sep. 11, '03	322	18·00	5,799	4·58	312·58	62·51	8 26	70 77	1,373	9,040	1,865	5	39 29	67·75	12·50	7·50	31 48
Annie .... (G.G.)	3	Apr. 1, '03	214	21·63	4,629	4·22	229·72	45·93	6 60	52 55	886	1,120	777	5	22 71	49·06	9·8	10·2	29 84
Flecky .... (A.)	4	Mar. 28, '03	291	21.64	6,299	3·97	294·24	58·84	9 00	64 84	1,498	9,270	633	5	39 78	63·15	13·5	6·5	28 06
Cherry .... (G.S.)	3	July 18, '03	326	18·55	6,047	4·31	306·60	61·32	8 61	69 93	1,744	9,320	1,815	5	43 11	71·20	14·06	5·94	26 82
Alma .... (G.G.)	2	Jan. 19, '03	284	16·33	4,638	4·73	258·78	51·75	6 57	58 32	1,252	5,160	583	5	32 78	70·67	12·6	7·4	25 54
†Honoria .... (G.)	7	Oct. 1, '02	208	21·17	4,425	4·19	229·89	45·97	6 28	52 25	1,182	9,543	720	.....	27·66	62·28	12·03	7·97	24 59
Aggie .... (G.G.)	2	Apr. 1, '03	214	17·50	3,747	4·74	209·2	41·84	5 27	47 09	886	5,040	313	5	22 71	60·6	10·8	9·2	24 38
†Darlington Lass. (S.)	10	Apr. 10, '03	180	25·2	4,547	4·17	223·12	44·62	6 48	51 10	813	11,500	1,815	1	28 15	61·90	12·6	7·4	22 95
Alice .... (G.A.)	2	Mar. 19, '03	220	20·2	4,449	3·76	197·16	39·43	6 37	45 80	886	2,570	965	5	24 80	55·74	12·60	7·40	21 00
Gurta .... (A.)	3	....	295	18·57	5,479	3·96	255·43	51·08	7 83	58 91	1,242	9,170	726	5	37 94	69·24	16	4	20 97
Alvina .... (G.A.)	2	May 17, '03	167	24·55	3,416	4·08	164	32·80	4 87	37 67	672	120	93	5	17 65	51·7	10·7	9·3	20 02
Dora .... (G.A.)	11	Mar. 8, '03	295	22·55	6,645	3·21	251·01	50·20	9 58	59 78	1,656	8,840	726	5	41 75	62·84	16·6	3·4	18 03
Rosy .... (G.S.)	4	Oct. 5, '03	304	18·47	5,615	3·8	251·64	50·32	8 04	58 36	1,448	9,590	746	5	40 59	72·29	16·1	3·9	17 77
Amy .... (G.A.)	2	May 18, '03	165	18·54	2,960	4·28	148·58	29·71	4 21	33 92	660	120	93	5	17 53	59·22	11·8	8·2	16 39

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten, valued at $2 per ton	Amount hay, Valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Costs to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, labour neglected.
Ruby .... (G.)	6	Oct. 5, '03	283	14·93	4,226	5·68	271·11	54·22	5 92	60 14	1,310	9,685	735	5	49 24	$1·16	18·1	1·9	10 93
Denise Reine .... (C.)	3	....	259	10·09	2,615	4·83	148·7	29·74	3 68	33 42	831	5,390	534	5	28 35	$1·07	19	1	5 07
Clatford Spot.... (G.)	9	Jun. 11, '03	304	12·12	3,687	4·5	199·56	39·91	5 22	42 32	1,617	9,723	735	5	42 32	$1·14	21·2		2 81
Illuminata. .... (S.)	4	Mar. 21, '03	286	9·6	2,752	4·26	138·05	27·61	3 91	31 52	926	8,645	726	5	34 25	$1·24	24·08	....	*2 73
†Norah's Last.... (A.)	9	Mar. 20, '03	92	6·65	612	4·15	29·91	5·98	0 87	6 85	289	6,820	360	.....	12 86	$2·10	43	....	*6 01

†Dead. *Loss.

SHORTHORNS.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten, valued at $2 per ton	Amount hay, Valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Costs to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, labour neglected.
			Days.	Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.
Marchioness..	9	Mar. 6, 03	300	23·9	7,182	4·14	350·14	70 03	10 25	80 28	1,641	8,800	1,815	5	41 56	57·72	11·9	8·1	38 72
Miss Molly.............	13	Sept. 4, 02	250	25·7	6,429	4·53	330·07	66 01	9 13	75 14	1,339	8,780	1,815	3	34 69	53·96	10·5	9·5	40 45
Darlington Lass..........	10	Apr. 10, 03	180	25·2	4,547	4·17	223·12	44 62	6 48	51 10	813	11,500	1,815	1	28 15	61·90	12.6	7·4	22 95
Average.	....	....	243	24·9	6,053	4·22	301·11	60 22	8 62	68 84	1,294	9,693	1,815	3	34 80	57·49	11·56	8·44	34 04

AYRSHIRES.

Names of Cows.	Age.	Date of dropping last calf.	Days.	Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.
Jessie A................	9	Feb. 16, 03	265	35·2	9,330	3·78	415·16	83 03	13 36	96 39	1,729	8,021	1,400	5	40 21	43·09	9·60	10·40	56 18
Maggie.....	7	Apr. 18, 03	275	27·5	7,562	3·87	344·75	68 95	10 81	79 76	1,293	8,830	1,810	5	38 09	50·37	11·04	8·96	41 67
Bloomer.	4	Mar. 31, 03	325	21·8	7,087	4·12	343·78	68 75	10 11	78 86	1,625	9,640	1,815	5	42 24	59·60	12·20	7·80	36 62
Average.	....	....	288	27·7	7,993	3·91	367·89	73 57	11 42	85 00	1,549	8,830	1,675	5	40 18	50·26	10·92	9·08	44 82

GUERNSEYS.

Names of Cows.	Age.	Date of dropping last calf.	Days.	Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.
Itchen Lady............	6	May 2, 03	290	23·76	6,892	4·85	394·08	78 81	9 73	88 54	1,368	7,700	1,837	5	37 81	54·86	9·6	10·4	50 73
Deanie................	6	Aug. 21, 03	300	18·70	5,631	4·94	327·32	65 46	7 95	73 41	1,574	9,140	1,837	5	41 31	73·18	12·6	7·4	32 10
*Flossy Lyons..........	3	Feb. 4, 03	260	19·39	5,041	5·13	304·54	60 90	7 09	67 99	1,103	6,270	1,767	5	33 48	66·41	10·9	9·1	34 51
Average..........	....	....	283	20·7	5,855	4·96	341·98	68 39	8 25	76 64	1,348	7,702	1,813	5	37 53	64·09	10·9	9·1	42 45

* Flossy Lyons calved for first time in February, 1903.

CANADIANS.

Names of Cows.	Age.	Date of Dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten valued at $2 per ton.	Amount hay valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, cost of labour not included.
			Days.	Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.
Zamora..................	7	Apr. 18,'03	320	24·04	7,694	4·96	448·80	89 76	10·80	100·56	1,566	9,455	1,707	5	41 08	53·40	9·1	10·9	59·48
Fortune.................	7	May 10,'03	300	21·45	6,436	4·70	356·00	71 20	9·08	80·28	1,542	6,510	1,425	5	36 91	57·34	10·3	9·7	43·37
* Exilee................	8	Nov.30,'02	170	31·12	5,291	3·78	236·52	47 30	7·50	54·80	885	1,070	682	5	22 30	42·14	9·4	10·6	32·50
Average.............	....	....	263	24·48	6,440	4·58	347·10	69 42	9·12	78·54	1,331	5,678	1,271	5	33 43	51·90	9·6	10·4	45·12

* Exilee was purchased in March and gave no milk till May 10, 1903, when she calved.

SHORTHORN GRADES.

Bloom	9	May 3,'03	290	23·05	66·82	3·96	311·65	62 33	9 55	71 88	1,218	11,310	1,922	5	40 21	60·17	12·92	7·08	31·67
Sadie	3	Sept.11,'03	322	18·00	57·99	4·58	312·58	62 51	8 26	70 77	1,373	9,040	1,865	5	39 29	67·75	12·50	7·50	31·48
Cherry	3	July 18,'03	326	18·55	60·47	4·31	306·60	61 32	8 61	69 93	1,744	9,320	1,815	5	43 11	71·20	14·06	5·94	26·82
Average.............	...	....	312	19·79	61·76	4·27	310·27	62 05	8 80	70 86	1,445	9,890	1,867	5	40 87	66·15	13·17	6·83	29·99

AYRSHIRE GRADES.

Laura..................	6	Dec. 12,'02	324	32·3	10,490	3·35	412·80	82·56	15 10	97 66	2,058	6,790	1,630	5	43 77	41·72	10·36	9·64	53·89
Countess	5	Feb. 12,'03	275	31·5	8,674	3·97	405·15	81·03	12 39	93 42	1,769	9,658	1,815	5	43 69	50·36	10·70	9·30	49·73
Alice..................	2	Mar.19,'03	220	20·2	4,449	3·76	197·16	39·43	6 37	45 80	886	2,570	965	5	24 80	55·74	12·60	7·40	21·00
Average.............	...	....	273	28·8	7,871	3·65	338·37	67·67	11 28	78 96	1,571	6,339	1,470	5	37 43	47·54	11·05	8·95	41·54

IMPORTED AYRSHIRE HERD AT CENTRAL EXPERIMENTAL FARM.

GUERNSEY GRADES.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten, valued at $2 per ton.	Amount hay, valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, labour neglected.
			Days.	Lbs.	Lbs.	p.c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.
Queenie....	5	Mar. 10, 03	290	22·8	6,629	5·93	466·57	93 31	9 24	102 55	1,468	8,430	1,815	5	39 46	59·52	8·4	11·6	63·09
Bellflower..	5	Mar. 10, 03	285	25·7	7,339	4·48	387·03	77 40	10 42	87 82	1,484	9,910	1,815	5	41 10	56·00	10·6	9·4	46·72
* Annie	3	Apr. 1, 03	214	21·63	4,629	4·22	229·72	45 95	6 60	52 55	886	1,120	777	5	22 71	49·06	9·8	10·2	29·84
Average............	....	....	263	23·2	6,199	4·95	361·11	72 22	8 75	80 97	1,279	6,153	1,369	5	34 42	55·51	9·5	10·5	46·55

* Annie calved for first time April 1, 1903.

CANADIAN GRADE.

Polly	8	Jan. 30, 03	325	26·13	8,493	4·55	454 24	90 84	12 04	102 88	1,712	8,290	1,815	5	41·76	49 17	9·4	10·6	61·12

DAILY RECORDS.

The effort to interest dairymen in the returns from their individual cows has been continued, and many farmers seem to be awakening to a knowledge of the fact that the improvement of the whole herd demands the study of the unit; that is, a close acquaintance with the expenditure upon the individual cow and the returns from the same.

This can be determined in no other way than by keeping an exact record of the daily milk yield and the daily food consumption.

Forms, similar to the following, for keeping a record of the milk yield are still supplied free on application.

DAILY MILK RECORD.

Herd belonging to ....
Post Office ....
Record for week ending..

(This form supplied free by Live Stock Division, Central Experimental Farm, Ottawa, Ont.)

COWS.

Day.	Time.																	Total for Day.
Sunday	Morning																	
	Evening																	
Monday	Morning																	
	Evening																	
Tuesday	Morning																	
	Evening																	
Wednesday	Morning																	
	Evening																	
Thursday	Morning																	
	Evening																	
Friday	Morning																	
	Evening																	
Saturday	Morning																	
	Evening																	
Total	Week																	

(Reverse.)

CENTRAL EXPERIMENTAL FARM.

WM. SAUNDERS, *Director*. J. H. GRISDALE, *Live Stock and Agriculture*.

MILK RECORDS.

1. The profitable dairy cow must give over 5,000 pounds of milk each year. To know the value of a cow her total annual yield of milk must be known. The only way to know this is to keep a record of her daily milk yield.

2. The form on the other side of this sheet is intended to help progressive dairy farmers by supplying them with a simple and convenient sheet for the keeping of the milk records of their individual cows. A study of such records will soon indicate which cows should go to the butcher. We would be pleased to receive a summary of your record. If you have no summary forms write us.

3. Such records are being kept by hundreds of successful dairymen to-day. Many of these men attribute their success to the keeping of such records. Why not give the thing a trial if you are a dairyman? It will increase your milk product. It will lighten your labour, since your interest will be increased in your work, and 'interest lightens

labour.' It will show you the unprofitable cow the 'boarder.' You cannot get rid of her too quickly.

4. For weighing the milk a simple spring balance may be secured for from one to three dollars. If your local dealer cannot supply you, write the undersigned for particulars. A small platform scale is fairly convenient, but we find the spring balance preferable.

5. Many farmers keep records of the amount of food fed to individual cows. If you would like to do so, sample forms would be sent free on writing J. H. Grisdale, Agriculturist, Central Exeprimental Farm, Ottawa, Ont.

BEEF PRODUCTION.

EXPERIMENTS IN 1902-3.

The experiments in the winter of 1902-3 have been similar to those in 1901-2. The prices charged for feeds are the same as those mentioned in connection with feeding dairy cows.

It will be observed that in every case where steers were bought in for feeding purposes in 1902-3 there was a loss. In 1901-2 the difference between the cost price when steers were bought in for feeding in the fall and the selling price when they were sold out fat the next spring was nearly double the cost of the feed required to fatten them. In 1902-3 the difference between the buying price and the selling price falls short of the cost of feed at the prices charged.

As stated in my report for 1902, such favourable conditions as maintained in 1901-2 for the beef producer seldom occur. I think I may just as safely say now that such disastrous years as 1902-3 for the feeder are seldom seen. Throughout Canada and the United States cattle bought in the fall of 1902 for feeding left a very small margin to pay for feed and care. Judging by the prices paid for feeding cattle and the market prices for prime beef in the spring, I am certain that an average of $15 per head increase in value is the outside. Such a sum is considerably short of sufficient to pay all expenses let alone leave any profit.

Of course, it must not be forgotten that a large part of the food consumed would be roughage of such a character that it could not be sold off the farm, and, in addition, the manure obtained from cattle fed would be a most valuable and really indispensable by-product of all such feeding operations.

LOOSE *vs.* TIED.

The feeding of steers loose as contrasted with similar steers fed tied has been continued during the past year, and, as was the case last year, the scope of the experiment slightly enlarged to include the comparison of steers fed loose allowed a large area of floor space with similar steers fed loose allowed a more limited area of floor space.

The steers fed tied occupied 56 square feet of floor space each; one lot fed loose occupied 84 square feet of floor space for each steer, while another lot fed loose occupied only 38 square feet of floor space for each steer.

In 1901-2 both lots fed loose made greater and more economical gains that did the lot fed tied, the lot having the smaller floor space making the greatest gains of the three.

To compare :—

LOTS FED IN 1902-3.

Lot 1.—Tied, 9 steers, 56 sq. ft. per steer, average gain, 284 pounds in 180 days, or 1·58 pounds per steer per day.

Lot 2.—Loose, 9 steers, 84 sq. ft. per steer, average gain, 337 pounds in 180 days, or 1·87 pounds per steer per day.

Lot 3.—Loose, 9 steers, 38 sq. ft. per steer, average gain 274 pounds in 180 days, or 1·52 pounds per steer per day.

A combining of the results of 1902 with those of 1903 shows a somewhat different standing, as follows:—

Lot 1.—Tied, 9 steers, 56 sq. ft. per steer, average gain 591 pounds in 366 days, or 1·62 pounds per steer per day.

Lot 2.—Loose, 9 steers, 84 sq. ft. per steer, average gain, 666 pounds in 366 days, or 1·82 pounds per steer per day.

Lot 3.—Loose, 9 steers, 38 sq. ft. per steer, average gain, 619 pounds in 366 days, or 1·69 pounds per steer per day.

Below are detailed statements of the different lots discussed, which were fed in the winter of 1902-3.

LOT 'A.'

TIED (3 YEARS OLD, NOT DEHORNED).

Each steer occupied 56 square feet floor space.

Number of steers in lot	9	
First weight gross	11,420	lbs.
First weight average	1,269	"
Finished weight gross	13,980	"
Finished weight average	1,553	"
Total gain in 180 days	2,560	"
Average gain per steer	284	"
Daily gain for lot, 9 steers	14·22	"
Daily gain per steer	1·58	"
Gross cost of feed	$180 69	
Cost of 100 pounds gain	7 05	
Cost of steers, 11,420 lbs. at $4.90 per 100 lbs.	559 58	
Total cost to produce beef, $559.58+$180.69	740 27	
Sold, 13,980 lbs. at $5.25 per 100 lbs., less 5 per cent	697 25	
*Loss on lot	43 02	
Net loss per steer	4 78	
Average buying price per steer	62 17	
Average selling price per steer	77 47	
Average increase in value	15 30	
Average cost of feed per steer	20 08	
Amount of meal (Gluten meal) eaten by lot of 9 steers	4,815	lbs.
Amount of ensilage and roots	90,719	"
Amount of hay	8,514	"

LOT 'B.'

LOOSE (3 YEARS OLD, DEHORNED.)

Each steer allowed 84 feet floor space.

Number of steers in lot	9	
First weight gross	8,950	lbs.
First weight average	994	"
Finished weight gross	11,985	"

Finished weight average	1,331 "
Total gain in 180 days	3,035 "
Average gain per steer	337 "
Daily gain for lot, 9 steers	16·86 "
Daily gain per steer	1·87 "
Gross cost of feed	$161 62
Cost of 100 lbs. gain	5 32
Cost of steers, 8,950 lbs. at $4.90 per 100 lbs,	438 55
Total cost to produce beef, $438.55+$161.52	600 17
Sold, 11,985 lbs. at $5.25 per 100 lbs., less 5 per cent	577 77
*Loss on lot	22 40
Net loss per steer	2 49
Average buying price per steer	48 73
Average selling price per steer	64 19
Average increase in value	15 46
Average cost of feed per steer	17 95
Amount of meal (Gluten meal) eaten by lot of 9 steers	4,086 lbs.
Amount of ensilage and roots	81,537 "
Amount of hay	8,239 "

LOT 'C.'

LOOSE (3 YEARS OLD, DEHORNED).

Each steer allowed 38 square feet floor space.

Number of steers in lot	9
First weight gross	8,955 lbs.
First weight average	995 "
Finished weight average	1,269 "
Finished weight gross	11,425 "
Total gain in 180 days	2,471 "
Average gain per steer	274 "
Daily gain for lot, 9 steers	13·73 "
Daily gain per steer	1·52 "
Gross cost of feed	$161 62
Cost of 100 pounds gain	6 58
Cost of steers, 8,955 lbs. at $4.90 per 100 lbs.	438 79
Total cost to produce beef, $438.79+$161.62	600 41
Sold, 11,425 lbs. at $5.25 per 100 lbs., less 5 per cent	569 34
*Loss on lot	31 07
Net loss per steer	3 45
Average buying price per steer	48 75
Average selling price per steer	63 26
Average increase in value	14 51
Average cost of feed per steer	17 95
Amount of meal (Gluten meal) eaten by lot of 9 steers	4,086 lbs.
Amount of ensilage and roots	81,537 "
Amount of hay	8,289 "

*In each case where a loss is apparent, it is understood that had all foods been bought at prices indicated then there would have been an actual loss. In the case of lot 'A' for instance, where a loss of $43.02 on 9 steers, or $4.78 on each steer of the lot is indicated, the actual money outlay was $60.19, the balance of the estimated cost of feeding the 9 steers being the value placed upon the ensilage or roots and the hay.

INFLUENCE OF AGE ON COST OF BEEF.

COST OF PRODUCING BEEF WITH

Three-year-olds, Two-year-olds, Yearlings, Six Months' Calves and New-born Calves.

The experiments to gain some data as to the influence of age upon the cost of producing a pound of beef have been continued.

Lots of animals of as nearly uniform type and breeding as possible were selected and fed such rations as were found to suit them best. The roughage ration in each case consisted of roots, ensilage and hay, the concentrates fed to 3-year-olds, 2-year-olds, and yearlings was gluten meal. The calves were fed a meal ration made up of oats, pease, barley, oil meal and gluten mixed in different proportions at different periods.

Full statements of the particulars in connection with each lot will be found below. A few of the more important particulars are grouped for comparison as follows:—

Ages.	Daily Gain.	Gain in 180 days.	Cost 100 lbs. Gain.
	Lbs.	Lbs.	$
Three Year Olds	1·58	284	7.05
Two Year Olds	1·65	298	6.03
Yearlings	1·65	298	5.54
Six Month Calves	1·46	263	5.33
Skim Milk Calves, New Born	1·48	273	2.16

In cost of production there is a quite remarkable gradation in favour of the younger classes.

LOT 'D'—THREE-YEAR-OLDS.

Number of steers in lot	9	
First weight, gross	11,420	lbs.
First weight, average	1,269	"
Finished weight, gross	13,980	"
Finished weight, average	1,553	"
Total gain in 180 days	2,560	"
Average gain per steer	284	"
Daily gain for lot, 9 steers	14·22	"
Daily gain per steer	1·58	"
Gross cost of feed	$ 180 69	
Cost of 100 pounds gain	7 05	
Cost of steers, 11,420 lbs. at $4.90 per 100 lbs	559 58	
Total cost to produce beef, $559.58 + $180.69	740 27	
Sold, 13,980 lbs. at $5.25 per 100 lbs., less 5 per cent	697 25	
Loss on lot	43 02	
Net loss per steer	4 78	
Average buying price per steer	62 17	
Average selling price per steer	77 47	
Average increase in value	15 30	
Average cost of feed per steer	20 08	

Amount of meal (gluten meal) eaten by lot of 9 steers....	4,815 lbs.
Amount of ensilage and roots....	90,719 "
Amount of hay....	8,514 "

LOT 'E'—TWO-YEAR-OLDS.

Number of steers in lot..	9
First weight gross....	9,775 lbs.
First weight average....	1,079 "
Finished weight gross....	12,395 "
Finished weight average....	1,377 "
Total gain in 180 days....	2,680 "
Average gain per steer....	298 "
Daily gain for lot, 9 steers....	14·89 "
Daily gain per steer....	1·65 "
Gross cost of feed....	$161 62
Cost of 100 pounds gain..	6 03
Cost of steers, 9,775 pounds at $4.90 per 100 pounds..	479 97
Total cost to produce beef, $447.49+$161.59..	651 59
Sold, 12,395 pounds at $5.25 per 100 pounds, less 5 per cent..	618 24
Loss on lot..	33 35
Net loss per steer..	3 70
Average buying price per steer..	53 33
Average selling price per steer..	68 69
Average increase in value..	15 36
Average cost of feed per steer..	17 95
Amount of meal (gluten meal) eaten by lot of 9 steers....	4,086 lbs.
Amount of ensilage and roots....	81,537 "
Amount of hay....	8,289 "

LOT 'F'—YEARLINGS.

Number of sters in lot..	9
First weight gross....	8,685 lbs.
First weight average....	965 "
Finished weight gross....	11,370 "
Finished weight average....	1,263 "
Total gain in 180 days....	2,685 "
Average gain per steer....	298 "
Daily gain for lot, 9 steers....	14·90 "
Daily gain per steer....	1·65 "
Gross cost of feed....	$148 97
Cost of 100 pounds gain..	5 54
Cost of steers, 9,685 pounds at $4.90 per 100 pounds..	474 56
Total cost to produce beef, $474.56 + $148.97..	623 53
Sold, 11,370 pounds at $5.25 per 100 pounds, less 5 per cent..	596 92
Loss on lot..	26 61
Net loss per steer..	2 95
Average buying price per steer..	52 73
Average selling price per steer..	66 10
Average increase in value..	13 37
Average cost of feed per steer..	16 55
Amount of meal (gluten meal) eaten by lot of 9 steers..	3,649 lbs.
Amount of ensilage and roots....	74,349 "
Amount of hay....	8,289 "

LOT 'G.'—CALVES (6 MONTHS' OLD).

Number of steers in lot	6
First weight gross	2,290 lbs.
First weight average	382 "
Finished weight gross	3,870 "
Finished weight average	645 "
Total gain in 186 days	1,580 "
Average gain per steer	263 "
Daily gain for lot, 6 steers	8·77 "
Daily gain per steer	1·46 "
Gross cost of feed	$ 84 17
Average cost of feed per steer	14 03
Amount of meal (oats, pease, barley and oil meal) eaten by lot of 6 steers	4,070 lbs.
Amount of ensilage and roots	32,316 "
Amount of hay	2,016 "

LOT 'H.'—SKIM MILK CALVES (NEW BORN.).

Number of steers in lot	6
First weight gross	791 lbs.
First weight average	113 "
Last weight gross	2,702 "
Last weight average	386 "
Total gain in 184 days	1,911 "
Average gain per steer	273 "
Daily gain for lot, 7 steer	10·36 "
Daily gain per steer	1·48 "
Gross cost of feed	$ 41 34
Amount of meal (oats, pease, barley and oil meal) eaten by lot of 7 steers	2,020 lbs.
Amount of ensilage and roots	5,558 "
Amount of hay	420 "
Amount of skim milk	9,485 "

BABY BEEF *vs.* LONG FEED BEEF

Since May, 1900, an experiment has been carried on having for aim the securing of information as to comparative costs and profits of producing beef, (1) by feeding a heavy ration from birth to block, and (2) by feeding in the usual way, that is, giving only a limited growing ration from birth till five or six months before it is desired to slaughter.

The two lots started in 1901 as well as the two started in 1900 have been sold, and therefore, the whole four lots are reported upon below. The important findings are arranged to facilitate comparison below. Since averages of work with a number of steers is always more interesting and more valuable as a guide than findings from single steers, each column means the average of 5 steers, save in the columns headed 'Average,' one under 'Baby Beef' and one under 'Long Feed Beef,' each of which so named columns is the average of ten steers fed as indicated by the heading 'Baby Beef' or 'Long Feed Beef.'

Particulars for comparison (1 steer considered always).	Baby Beef.			Long Feed Beef.		
	1900. Lot of 5 steers.	1901. Lot of 5 steers.	Average of 10 steers.	Average of 10 steers.	1901. Lot of 5 steers.	1900. Lot of 5 steers.
	Lbs.	Lbs.	Lbs,	Lbs.	Lbs.	Lbs.
Number of days on feed	670	730	700	913	730	1,095
Weight when put on experiment	150	95	122½	107	95	119
" " slaughtered	1,300	1,295	1,297½	1,235	1,100	1,370
Gain during feeding period	1,150	1,200	1,175	1,128	1,005	1,251
Daily rate of gain	1·72	1·64	1·68	1·26	1·37	1·14
Amount meal eaten	3,018½	4,600	3,809	1,405	1,057	1,752
" roots and ensilage eaten	15,852	15,755	15,793	19,529	14,212	24,846
" hay eaten	1,096	1,213½	1,150	1,315	786	1,843
" straw	....	....	....	....	....	112
" skim milk	1,505	1,755	1,645	1,592	1,679	1,505
" pasture	....	....	....	9 mos.	6 mos.	12 mos.
" rape	....	740	70	....	....	....
Cost of feed from birth to block	$54 28	$71 85	$63 06	$59 66	$43 53	$75 80
" 100 lbs. increase live weight	4 72	5 98	5 35	5 29	4 33	6 06½
Sold for per 100 lbs. live weight	5 75	5 50	5 62½	4 78	4 50	5 25

The following table shows the amount of each kind of meal or other food consumed by the average steer in each lot from birth to block and the valuation put upon the different kinds of food in estimating the cost of production.

Lot.	Skim Milk.	Gluten.	Oil Meal.	Calf Meal	Oats.	Barley.	Pease.	Bran.	Shorts.	Corn.	Roots.	Ensilage.	Hay.	Pasture.	Rape.
1900.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.
Fattening	1505	905	392	....	620	....	....	610	....	491	4775	11077	1096		
1901. Fattening	1784	1102	315½	18	2427½	....	14	518	10½	194	4970	10785	1213½	....	149
1900. Limited	1505	752½	171½	....	281½	17½	....	299½	117½	....	9009	15837	1843	12 mos.	
1901. Limited	1679	405½	131½	....	178½	....	....	252	89½	....	4893	9319	786	6 mos.	
Price charged per 100 lbs $	0 15	1 25	1 33½	2 20	1 00	1 00	1 25	0 75	0 98	1 25	0 10	0 10	0 35	$2 per m.	0 10

This line of work is being continued and below are reports up to date upon the steers now under experiment.

YEARLINGS.

The lots started out in May, 1902, are as follows:—

FULL FATTENING RATION.

Calves Dropped in 1902.

Number of steers in lot	6
First weight, gross, November 1, 1902	2,290 lbs.
First weight average, November 1, 1902	381 "
Last weight, gross, November 1, 1903	4,875 "
Last weight, average, November 1, 1903	812½ "
Total gain in 165 days	2,585 "
Average gain per steer	431 "
Daily gain per steer	1·18 "
Gross cost of feed	$ 157 54
Cost of 100 pounds gain	6 13
Average cost of feed per steer	26 26
Amount of meal eaten by lot of 6 steers	5,382 lbs.
Amount of ensilage and roots	33,526 "
Amount of hay	7,098 "
Each steer was on pasture	3 mos.

One steer consumed in 365 days:—

Gluten meal, 274½ lbs; calf meal, 66½ lbs.; oil meal, 62 lbs; oats, 462½ lbs.; bran, 31½ lbs.; roots, 2,659 lbs.; ensilage, 2,929 lbs.; hay, 1,183 lbs.; pasture, 3 months.

LIMITED GROWING RATION LOT.

Calves Dropped 1902.

Number of steers in lot	6
First weight gross, November 1, 1902	2,065 lbs.
First weight average, November 1, 1902	344 "
Last weight gross, November 1, 1903	4,165 "
Last weight average	694 "
Total gain in 365 days	2,100 "
Average gain per steer	350 "
Daily gain per steer	0·96 "
Gross cost of feed	$ 130 67
Cost of 100 pounds gain	6 22
Average cost of feed per steer	21 78
Amount of meal eaten by lot of 6 steers	525 lbs.
Amount of ensilage and roots	43,470 "
Amount of hay	2,880 "
Each steer was on pasture	6 mos.

One steer consumed in 365 days :—

Gluten meal, 24½ lbs.; oats, 63 lbs.; roots, 3,470 lbs.; ensilage, 3,775 lbs.; hay, 480 lbs.; pasture, 6 months.

CALVES.

The calves from birth till about six months old are fed quite similar rations and make similar gains; therefore only one lot is reported upon

FULL FATTENING RATION LOT.

Calves Dropped April, 1903.

Number of steers in lot	5
First weight gross	565 lbs.
First weight average	113 "
Last weight gross	1,930 "
Last weight average	386 "
Total gain in 184 days	1,365 "
Average gain per stweer	273 "
Daily gain per steer	1·48 "
Gross cost of feed	$ 29 53
Cost of 100 pounds gain	2 16
Average cost of feed per steer	5 90¾
Average gain per steer	273 "
Amount of meal eaten by lot of 5 steers	1,442½ lbs.
Amount of ensilage and roots	3,970 "
Amount of hay	300 "
Amount of skim milk	6,775 "
On pasture	1 mo.

One calf consumed in 184 days :—

Shorts, 22½ lbs.; oats, 134 lbs.; bran, 74 lbs.; oil meal, 58 lbs.; ensilage or green feed, 794 lbs.; skim milk, 1,355 lbs.; hay, 64 lbs.; pasture, 1 month in day time.

CROP ON 200-ACRE FARM.

Up to the present no concise summary of the crops upon the 200-acre farm each year has been published. Such a summary of the crop each year for the last five years, 1899 to 1903 inclusive, would no doubt be interesting to many, and is accordingly submitted herewith.

COMPARATIVE Statement of Crops on '200 Acre Farm' from 1899 to 1903, inclusive—(200 Acre Farm includes 7 Acres of Roads).

Year.	Grain.		Hay.		Roots and Corn.		Pasture.		Soiling Crop.		Pig Pasture.		Remarks.
	Area in Acres.	Yield in Pounds.	Area in Acres.	Yield in Tons.	Area in Acres.	Yield in Tons.	Area in Acres.	Number of Cattle.	Area in Acres.	Disposition of Crops.	Area in Acres.	Crops Grown for Pasture.	
1899........	73	118,466	39	93	40	326½	40	36	1	Fed to dairy cows	....	....	Generally considered a good year for all crops.
1900........	80	126,621	53	138	40	743	20 and aftermath	49	....	....	....	... .	Season very favourable for most crops.
1901........	79	114,472	58	210	40	702	16 and aftermath	52	....	....	....	....	Season very favourable for most crops.
1902........	74	144,914	60	216	39	665	20 and aftermath	62	....	....	5	Clover, rape and aftermath.	Season favourable for hay, bad for corn.
1903........	69	126,619	62	154	34	473	16 and aftermath	96	5	Dairy cows, bulls and calves.	6	Clover and rape.	Season very unfavourable for most crops, particularly adverse to corn and roots. No second crop hay.

The variety of crops grown and the varying areas under each crop each year make it quite difficult to make a comparison of the returns of the different years, so to simplify matters I would suggest that a fixed valuation be put upon the products and the returns of each year valued accordingly.

Fixing prices as follows: Grain, $1 per 100 lbs.; roots and ensilage, $2 per ton; hay, $7 per ton; pasturing cattle, $8 per season; and area under pigs, $15 per acre; the returns from the '200 Acre Farm' for the years mentioned may be said to have been worth $2,776.66 in 1899; $4,110.21 in 1900; $4,434.72 in 1901; $4,787.14 in 1902; $4,148.19 in 1903.

UTILIZATION OF FEED.

An examination into the supply of feed produced on the 200-acre farm, the experimental plots of roots and corn, and the meal or grain purchased for use in the barns, together with a detailed statement of the disposal thereof and a statement of the kinds of grain and meal consumed from July 1, 1902, to June 30, 1903, follows:—

SUMMARY of Feed of all kinds used in connection with Stock on 200 Acre Farm from July 1, 1902, to June 30, 1903.

———	Grain or Meal.	Roots and Ensilage.	Hay
	Lbs.	Lbs.	Lbs.
Grown on 200 Acre Farm (Crop of 1902)	144,914	1,330,000	432,000
Received from Experimental Dep't	....	294,000	
Purchased	209,730	....	
Total	354,644	1,624,000	432,000
Value	$3,546.44	$1,624.00	$1,512.00

DISPOSITION of Feed harvested on, and bought for use of Live Stock on 200 Acre Farm.

Class Fed.	Hay.	Grain and Meal.	Corn and Roots.	
	Lbs.	Lbs.	Lbs.	
19 horses	145,900	105,432	5,000	Hay weighed at intervals and amount calculated. All grain and meal weighed. Roots estimated.
94 steers	69,429	45,909	661,085	All feeds weighed.
87 milch cows, all breeds	65,585	47,837	322,696	All feeds weighed.
47 young stock and bulls, all breeds	65,999	21,646	240,252	Partly weighed and estimated from said weighings.
64 sheep	19,500	3,590	4,000	Meal weighed. Hay and roots estimated.
425 swine	....	97,904	46,500	Meal weighed. Roots partly weighed, balance estimated from weighings.
Loss by experimental curing	10,000	....		
On hand, July 1, 1903	20,000	9,500		
Total accounted for	396,413	331,818	1,279,533	
Am't harvested and received	432,000	354,644	1,624,000	
Shrinkage	35,587	22,826	344,467	
Percentage shrinkage	8·24%	6·43%	21·21%	

The meal consumed consisted of oats, 148,782 lbs.; barley, 10,919 lbs.; bran, 45,281 lbs.; oil meal 13,879 lbs.; glutten meal, 43,755 lbs.; pease, 3,110 lbs.; shorts, 50,779 lbs.; mixed crop (oats, pease, barley), 14,073 lbs.; feed flour, 700 lbs. Total. 331,818 lbs.

BALANCE SHEET OR FINANCIAL STATEMENT OF LIVE STOCK FEEDING OPERATIONS ON 200 ACRE FARM, JULY 1, 1902, TO JUNE 30, 1903.

In compiling the following table, the figures in the columns headed 'Value' in both 1902 and 1903 represent either the cost price of the animals included, where recently bought or the fair merchantable price of the same at the date of valuation.

Under the heading 'Returns' are included values of products and services during the year.

In the case of horses the services of the 19 head are valued at $3,061.80, but since the labour of six horses is required to do the work on the 200 acre farm, only $2,041.20 or two-thirds of the value of their labour is credited to them.

COMPARATIVE STATEMENTS.

—	July 1, 1902.		July 30, 1903.			Gross returns made up of increase in value, value of products and animals sold.
	Number on hand.	Value.	Number on hand.	Value.	Returns.	
		$ cts.		$ cts.	$ cts.	$ cts.
Horses	19	....	19	....	2,041 20	2,041 20
Shorthorns—Pure bred and grade	16	2,155 00	20	3,410 00	627 77	1,882 77
Ayrshires—Pure bred and grade	21	1,650 00	30	2,410 00	911 80	1,671 80
Guernseys—Pure bred and grade	17	1,516 00	23	1,956 00	804 40	1,244 40
Canadians—Pure bred and grade	6	725 00	9	895 00	394 62	564 62
Steers	94	3,351 65	94	4,951 06	....	1,599 41
Sheep	33	790 00	64	935 00	38 00	183 00
Swine	185	1,480 00	255	2,040 00	1,987 00	2,547 00
Total	391	11,667 65	514	16,597 06	6,804 79	11,734 20

SUMMARY.

RETURNS.

Gross returns from animals of all classes, including value of products, value of services and increase in value of young stock	$11,734 20
Manure, 950 tons at $1.00 per ton	950 00
	$12,684 20

EXPENDITURE.

Value of Food Consumed.

Meal, 354,644 lbs.	$3,546 44	
Hay, 432,000 lbs.	1,512 00	
Roots and ensilage, 1,624,000 lbs.	1,624 00	
Whole milk, 26,550 lbs.	265 50	
Skim milk, 170,000 lbs.	255 00	
Total	$7,202 94	
Value of straw for litter—95 tons at $4.00	380 00	
Cost of labour in connection with care of horses, cattle, sheep and swine:—		
Herdsman	600 00	
Two men at $480 each	960 00	
Three men at $432 each	1,296 00	
Total expenditure	$10,438 94	
		$10,438 94
Balance of returns over expenditure		$2,245 26

STAVE SILO.

In August, 1903, a round silo was erected 20 feet in diameter and 35¾ feet high, capacity about 250 tons.

The soil was excavated to a depth of 3 feet 8 inches, and the silo was built of cement to a height even with the surface of the surrounding earth. On top of this a stave silo 32 feet high was erected. The cost was as follows :—

COST OF SILO.

Labour—Woodwork	$ 55 70
" Foundation	47 31
Lumber	126 00
Hardware	6 87
Tarring	14 65
Painting	20 00
Iron bands	86 00
Cement	11 72
Total cost	$368 25

No roof was built in order to gain some information as the inconvenience or loss that would arise from snow and rain falling at will upon the surface during the winter.

The cement section was, of course, a matter of local convenience, and the cost of that part may be estimated as raising the cost of the silo about $75 above the cost of a stave silo of similar capacity with a common ring foundation.

ESTIMATING COST OF PRODUCTION.

The importance of determining cost of production of our grain and forage crops is scarcely questionable. The climatic and soil factors must, however, always be of primary importance, and on that account all estimates must be more or less particular in their bearing rather than general.

In the estimates which are included in the following reports on the different crops, rent, manure, labour, material (seed, twine, &c.) and wear and tear are considered. The item of supervision, of considerable moment on such farms as this, has been omitted, since most farmers in Canada do much of their own work, as well as direct the labour of such men as they employ.

The digestibility of a feed is another factor which must enter materially into any consideration of its economy of production, since, as is well known, the digestibility of our feeding stuffs ranges from about 25 per cent of the dry matter to practically 100 per cent. of the whole thing.

In dividing the cost of production of a grain crop between the straw and grain, however, where the digestible dry matter of the one part is so different in composition and value from that of the other, some additional standard is necessary. Since protein is that part of any ration the most expensive to supply, it was decided to make the digestible protein the basis of value. It is, of course, well understood that protein is not the only important constituent of straw, frequently it is of very minor consideration, indeed, as when used for litter.

CROP ON 200 ACRE FARM, 1903.

OATS

Five varieties of oats were grown. They were Banner, Improved Ligowo, Tartar King, Waverley and Goldfinder. They were sown on land that had been in roots or corn or meadow the preceding year. As the land was not of uniform character, the results will not indicate the comparative productivity of the different varieties.

The particulars of the plots sown are as follows:—

1. *Banner.*—39 acres, sown April 15, 2 bushels per acre; matured in 124 days, August 17. Yielded 2,233 bushels, or 57 bushels 9 lbs. per acre. Measured bushel weighed 41¼ pounds.

	Lbs.
Total weight of straw and grain	168,205
Weight of grain	75,922

Grain constituted 45·1 per cent of the whole crop.

2. *Improved Ligowo.*—3 acres, sown April 21, 1¾ bushels per acre; matured in 116 days, August 15. Yielded 126 bushels 13 pounds or 42 bushels 4 pounds per acre. Measured bushel weighed 38 pounds.

	Lbs.
Total weight, straw and grain	11,860
Weight of grain	4,297

Grain constituted 36·2 per cent of the whole crop.

3. *Tartar King.*—3 acres, sown April 21, 2 bushels per acre ; matured in 118 days, August 17. Yielded 104 bushels, or 33 bushels 23 lbs. per acre. Measured bushel weighed 37½ pounds.

	Lbs.
Total weight, straw and grain	14,935
Weight of grain	3,570

Grain constituted 24 per cent of the whole crop.

4. *Waverley.*—2 acres, sown April 23, 1¾ bushels per acre; matured in 122 days, August 23. Yielded 84 bushels 12 lbs., or 42 bushels 6 lbs. per acre. Measured bushel weighed 38½ pounds.

	Lbs.
Total weight, straw and grain	10,095
Grain weighed	2,868

Grain constituted 28·4 per cent of the whole crop.

(Photo. by C. E. Saunders.)

STEERS FATTENED AT CENTRAL EXPERIMENTAL FARM AND READY FOR BRITISH MARKET.

5. *Goldfinder.*—3 acres, sown April 23, 2 bushels per acre; matured in 125 days, August 25. Yielded 126 bushels 11 pounds, or 42 bushels 4 pounds per acre. Measured bushel weighed 36 pounds.

	Lbs.
Total weight straw and grain	13,980
Weight of grain	4,295

Grain constituted 30·8 per cent of the whole crop.

6. *Banner.*—2 acres. See mixed crop experiment.

COST OF GROWING 52 ACRES OF OATS.

Rent of land, 52 acres at $3 per acre	$156 00
Gang ploughing in autumn, 29 acres at $1 per acre	29 00
Cultivating and ribbing in autumn, 11 days at $2.50 per day	27 50
Cultivating and harrowing in spring, 9½ days at $2.50	23 75
One-fifth manure at the rate of 15 tons per acre, applied in root and corn year at $1 per ton	156 00
Seed, 104 bushels at 50 cents per bushel	52 00
Sowing five days at $2.50 per day	12 50
Use of machinery, 20 cents per acre	10 40
Shocking, 11 days at $1.33⅓	14 67
Loading and unloading, 24 days, $1.33⅓	32 00
Teams drawing, 8½ days at $2.50	21 25
Threshing, 2,782 bushels at 2½ cents per bushel	69 55
Total cost	$604 62

Cost to produce one bushel oats, value of straw neglected	21·7 cts.
Cost to produce one bushel oats, value of straw neglected and no allowance made for rent or manure	10·6 "

ANALYSIS OF COST.

Fifty-two acres produced 228,765 lbs. crop. The grain was weighed as it was threshed, but not so the straw. There was threshed 94,928 lbs. of grain, leaving 133,837 lbs. to be made up in chaff or straw. If 10 per cent be allowed for loss by drying out, etc., there would still remain about 120,000 lbs., or 60 tons of straw.

One ton oats contains about 184 lbs. digestible protein.

One ton oat straw contains about 24 lbs. digestible protein.

Hence we may arrive at the relative values of the two parts of the crop as follows:

94,828 lbs. oats contains 8,724 lbs. digestible protein.

60 tons straw contains 1,440 lbs. digestible protein.

The cost of production, $604.62, divided in this proportion, allows $518.96 for the grain and $85.66 for the straw. We might say, therefore, that the cost of production was 18·7 cents per bushel for the oats, and $1.43 per ton for the straw.

MIXED CROP EXPERIMENT.

Side by side on the second year of the rotation field, that is, on what had been pastured the preceding year, were sown seven plots of two acres each, the aim being to get some data as to the comparative yields of crops grown as mixtures and as pure grain. The mixtures and pure grains are as follows, with the yield of the respective crops of both grain and straw in column 1 and the yield of grain in column 2 :—

	1. Grain and Straw. Lbs.	2. Grain. Lbs.
Plot 1.—Pure barley, Mensury, yielded	9,230	3,686
Plot 3.—Pure oats, Banner, yielded	9,690	4,320
Plot 3.—Pure pease, Prussian blue, yielded	*	3,010
Plot 4.—Pease, 1 bushel; oats, 2 bushels	7,930	2,867
Plot 5.—Oats, 1½ bushels; barley, 1 bushel	8,670	3,578
Plot 6.—Wheat, ¾ bushel; oats, 1 bushel; pease, ¾ bushel; barley, ¾ bushel	9,800	3,140
Plot 7.—Oats, 1 bushel; pease, 1 bushel; barley, 1 bushel	8,380	2,090

*Not weighed.

INFLUENCE OF AMOUNT OF SEED AND SPACES BETWEEN ROWS OF GRAIN UPON QUALITY AND QUANTITY OF GRAIN HARVESTED.

A four acre field of land of as nearly uniform soil character as possible was divided into four 1 acre plots and sown as follows:—

Plot 1.—Waverley oats, in drills 7 inches apart.

Plot 2.—Waverley oats, in drills 14 inches apart.

Plot 3. Canadian Thorpe barley, in drills 14 inches apart.

Plot 4.—Canadian Thorpe barley, in drills 7 inches apart.

In quality no difference was perceptible in the case of the Waverley oats, and the measured bushel for each plot weighed 38½ lbs.

In the case of the Canadian Thorpe barley, however, the grain from the 7-inch apart drill plots was noticeably superior to that from the 14-inch drills plot.

Plot 1.—Waverley oats, sown April 23, drill set at 1¾ bushels per acre; matured in 122 days. Yielded 45 bushels 15 lbs. per acre. Measured bushel, 38½ lbs.

This plot was sown the ordinary way with seed drill, drills 7 inches apart and sowing 14 gallons seed per acre.

	Lbs.
Total weight straw and grain	5,073
Weight of grain	1,545

Grain constituted 30·4 per cent of the whole crop.

Plot 2.—Waverley oats, sown April 23, drill set at 1¾ bushels per acre; matured in 122 days, August 23. Yielded 45 bushels 5 pounds per acre. Measured bushel weighed 38½ lbs.

This plot was sown with the same drill as Plot 1, but had every alternate spout blocked, making the drills 14 inches apart and sowing 7 gallons per acre.

	Lbs.
Total weight straw and grain	5,300
Weight of grain	1,535

Grain constituted 28·9 per cent of the whole crop.

Plot 4.—Canadian Thorpe Barley (two-rowed), 1 acre sown April 22, 2 bushels per acre; matured in 110 days, yielded 32 bushels 9 lbs. per acre. Measured bushel weighed 52¼ lbs.

This plot was sown in the usual way with a force feed seed drill, rows 7 inches apart, sowing 2 bushels per acre.

	Lbs.
Total weight of grain and straw	4,190
Weight of grain	1,545

Grain constitued 36·8 per cent of the whole crop.

Plot 3.—Canadian Thorpe Barley, sown April 22, seeder set to sow 2 bushels per acre; matured in 110 days. Yielded 28 bushels 31 lbs. per acre. Measured bushel weighed 51¾ lbs.

This plot was sown with same drill as above, but every alternate spout blocked, making drills 14 inches apart, sowing 1 bushel per acre.

	Lbs.
Total weight of grain and straw	4,530
Weight of grain	1,375

Grain constituted 30·5 per cent of the whole crop.

SOILING CROPS.

Mixed crop, 11 acres oats, pease, barley, equal parts by weight, 2½ bushels per acre, and clover 10 lbs. per acre.

This mixture was sown at intervals from April 14 to June 7, cut for green feed for cattle and hogs, in some parts two crops were cut and an excellent growth of clover was afterwards pastured.

HAY.

Hay was harvested off 66 acres. Owing to the long spring drought the yield was only small. There was no second crop off the first year meadows for the same reason.

The total crop off 66 acres was 154 tons 1,480 lbs., making an average yield of 2 tons 689 lbs. per acre.

COST OF GROWING 66 ACRES OF HAY.

Rent of land at $3 per acre	$198 00
One-fifth manure at the rate of 15 tons per acre, $1 per ton	198 00
Half cost of seed	50 16
Seven days' cutting with mower at $2.50 per day	17 50
Seven and one-half days' raking at $1.75 per day	13 12½
Six days' teddering at $1.75 per day	10 50
Rent of farm machinery, oil, &c., at 20 cents per acre	13 20
Cocking, loading and unloading, 48½ days at $1.33⅓ per day	64 75
Thirteen days' drawing to barn at $2.50 per day	32 50
Four days' team on horse fork at $2.50 per day	10 00
	$607 93½

Total hay, 154 tons 1,480 lbs.
Cost to produce 1 ton in barn, $3.93.

EXPERIMENTS WITH GRASSES AND CLOVERS.

To gain some information as to the value of the more common grasses and clovers, as hay and pasture crops when sown together in different proportions, the following experiment was conducted:—

In 1902 that 40 acre field of the 200 acre farm which had been under corn in 1901, was sown to Banner oats. Beginning at one side of the field, it was laid off in 5 acre plots, each plot extending clear across the field, and including in its area sandy, loamy and peaty soils. The plots were similar in the variety of the soils they included, and under the usual hay and pasture mixture of 10 lbs. timothy and 8 lbs. clover would have been expected to give similar returns, with possibly a slight advantage in favour of plots 1 and 2.

Particulars of seeding and returns in hay are as follows:—

—	Grasses.	Lbs.	Clovers.	Lbs.	Yield per acre.		Total Yield.	
					Tons.	Lbs.	Tons.	Lbs.
Plot 1, 5 acres	Timothy	10	Common Red	8	1	1,502	8	1,510
Plot 2, 5 acres	Timothy Bromus Inermis Orchard Grass	4 8 8	Alfalfa Common Red	8 6	1	1,184	7	1,920
Plot 3, 5 acres	Timothy Bromus Inermis Orchard	4 8 8	Alsike Common Red	2 6	1	836	7	180
Plot 4, 5 acres	Timothy Orchard	5 16	Alsike Common Red	2 6	0	1,504	3	1,520
Plot 5, 5 acres	Timothy Bromus Inermis	5 15	Alsike Common Red	2 6	1	934	7	670

The early part of the growing season was particularly unsuitable for grasses and clovers on account of the dry weather. The following notes are submitted, however, and may serve to modify to some extent the teachings of the above report.

Plot 1.—Both Clover and Timothy made a strong rapid growth on each of the various kinds of soil.

Plot 2.—Timothy and Brome grass made good growth on all soils. Alfalfa did exceedingly well on sand and loam, but was utterly lacking on the peat. Red clover grew all over. Orchard grass very weak growth.

Plot 3.—Timothy, Brome and Orchard, as in plot 2. Alsike lacking and Red clover a fair growth all over.

Plot 4.—Timothy good growth for seed sown. Orchard a poor tufty growth due no doubt in large measure to adverse weather conditions. Alsike clover lacking. Red clover fair growth all over.

Plot 5.—Timothy and Brome good crop all over. Alsike lacking. Red clover fair growth all over.

VALUE AS PASTURE MIXTURES.

It was of course quite impossible to estimate the exact amount of pasturage available from the aftermath of each plot, but the following notes may be of some value.

Plot 1.—Fairly thick growth, apparently palatable to cattle.

Plot 2.—Excellent growth, not favoured by cattle at first, but when taste for alfalfa was once acquired, this plot became the favourite grazing plot, and appeared to furnish much more food than any one other of the plots.

Plot 3.—Poor aftermath. Cattle not very fond of same, and grazed thereon only after plots 2, 1 and 5 were eaten close.

Plot 4.—Poor aftermath. Not liked by cattle.

Plot 5.—Fair aftermath. Cattle seemed to like it best next after plots 2 and 1.

LOSS OF WEIGHT.

IN HAY.

To gain some information as to the amount of loss of weight in hay in mows, the following experiment has been conducted :—

On August 15, 1903, two small mows were filled with well cured hay from the same field from 1 till 5 o'clock in the afternoon.

Mow No. 1—Held 4 tons 800 lbs. new hay. This hay when weighed December 7, 1903, was found to contain 4 tons 800 lbs., a loss of 375 lbs. or 4·3 per cent in 113 days.

Mow No. 2—Held 4 tons 80 lbs. new hay. This hay when weighed January 7, 1904, was found to contain 3 tons 1,665 lbs., a loss of 415 lbs., or 5·1 per cent in 144 days.

CORN.

Five varieties of corn were sown:—

Early Mastodon.—Planted in hills, 5 acres, sown May 16, cut for ensilage September 23. Yielded 13 tons 265 lbs. per acre. Growth strong; rather uneven, on account of the very weather just after sowing. Very well cobbed, cut in dough stage. Promising sort.

Selected Leaming.—Planted in hills, 35 inches apart, 7 acres. Sown May 23, cut ensilage September 26 to 28; yielded 15 tons 1,735 lbs. per acre. Growth strong and even, well cobbed, but very late owing to bad season. Cobs mostly in early milk. Part of this plot suffered from drought in spring, lessening weight per acre.

Longfellow.—Sown in drills, 35 inches apart, 4½ acres. Sown May 23, cut for ensilage September 26; yielded 13 tons 52 pounds per acre. Growth strong and even, well cobbed, mostly in milk, some in dough stage.

Selected Leaming.—Sown in drills, 35 inches apart, 7 acres. Sown May 23, cut for ensilage September 30; yielded 13 tons 1,947 lbs, per acre. This plot also suffered from drought, lessening weight per acre.

Selected Leaming.—Planted in hills, 35 inches apart, 7 acres. Sown May 23, cut for ensilage September 25; yielded 8 tons 879 lbs. per acre. This plot suffered very heavily from drought, so the yield per acre was lessened.

Thoroughbred White Flint.—3 acres. Sown June 3, cut for ensilage September 28; yielded 16 tons 156 lbs. per acre. Growth very strong and even; good showing for cobs mostly in early stage sown too late for making best ensilage. This variety and the next 3 acre plot of Mammoth Cuban were sown to replace root crop ruined by drought.

Mammoth Cuban.—3 acres sown June 3, cut for ensilage September 29; yielded 16 tons 1,830 lbs. per acre. Growth very strong, even, good showing for cobs, mostly in very early stage.

Cost of Growing 34 Acres of Corn—

Rent of land at $3 per acre	$102 00
Cultivating, ribbing and shallow ploughing, 6 days at $2.50 per day	15 00
One-fifth manure, at 15 tons per acre, $1 per ton	102 00
Ploughing in autumn, 8 acres at $2 per acre	16 00
Cultivating in spring, 3 days at $2.50	7 50
Ploughing 14 acres at $2, gang ploughing 8 acres at $1 in spring	36 00
Harrowing in spring, 2 days, $2.50	5 00
Seed, 25 lbs. per acre, 850 pounds at $1 per bushel	15 19
Sowing, team, 3 days at $2.50 per day	7 50
Marking, 2 days, 1 horse at $1.75 per day	3 50
Planting 7 acres, 2 days at $1.33⅓ per day	2 67
Harrowing after sowing, 4 days at $2.50	10 00
Hoeing, 55 days, $133⅓	73 33
Cultivating team, 33 days at $2.50	82 50
Cultivating single horse, 14 days, $1.75	24 50

Cutting with corn harvester, 7 days at $2.50	$17 50
Loading, unloading, tramping and putting into silo, 69 days, $1.33⅓ per day	92 00
Drawing with team, 24 days at $2.50	60 00
Use of machinery, 20 cents per acre	7 05
Twine 5 lbs. per acre, 170 lbs. at 12 cents	20 40
Use of engine, fuel, ensilage cutter, and engineering, 6 days at $6.50 per day	39 00
Total cost	$738 64

Average yield per acre, 13¼ tons.
Thirty-four acres yielded 450 tons 1,107 lbs.
To produce 1 ton ensilage in silo cost $1.64.
Cost to produce 1 acre corn in silo, $21.73.

ROOTS.

Owing to adverse weather conditions in May and June, it was found necessary to break up on June 2 all the land that had been sown to roots about the middle of May.

It was decided to reseed one acre to sugar beets, mangels and turnips. Below are reports upon the different small plots. All were sown on June 15 and harvested October 30.

SUGAR BEETS.

Wanzleben—⅛ acre. Yielded 2,870 lbs. or 47 bushels 50 lbs.; yield at the rate of 11 tons 960 lbs. per acre.

Giant Sugar Feeding Mangel—⅛ acre. Yielded 2,910 lbs. or 48 bushels 30 lbs.; yield at the rate of 11 tons 1,280 lbs. per acre.

MANGELS.

Gate Post Red—¼ acre. Yielded 8,220 lbs. or 133 bushels 40 lbs.; yield at the rate of 16 tons 80 lbs. per acre.

TURNIPS.

Prize Purple Top—½ acre. Yielded 10,280 lbs. or 171 bushels 20 lbs.; yield at the rate of 10 tons 560 lbs. per acre.

EXPERIMENTAL SILO.

Three years ago a silo was constructed to be used for experimental purposes.

Different green crops have been tested as to their fitness for ensilage production, and reported upon in former reports.

This silo was again filled during September, 1903, but as the contents have not been fed out yet, it is impossible for me to report upon the same.

The contents at present are as follows, beginning at the bottom:—

		Lbs.
1.	Pure corn late milk stage	9,370
2.	Corn late milk stage	5,280
	Rape cut when about 15 inches high, mixed while going through blower or cut box	5,280
3.	Pure corn, late milk stage	960
4.	Pure rape, cut when about 15 inches high	5,620
5.	Corn, late milk stage	12,370
	Sunflower heads mixed going through machine	2,120
6.	Horse beans	1,002

LITTER OR BEDDING FOR CATTLE.

An experiment to gain some information as to the influences affecting the consumption of straw for litter was conducted during the month of March.

Experiment lasted 23 days.

Lot 1.—9 three year old steers in box stall required during 23 days 2,375 lbs. long wheat straw.

Lot 2.—9 three year old steers tied required during 23 days 1,150 lbs, long wheat straw.

Lot 3.—9 three year old steers tied required during 23 days 2,300 lbs. cut wheat straw.

EFFECTS OF ROTTING OR HEATING OF MANURE UPON VITALITY OF WEED SEEDS.

In March some straw containing a considerable amount of scutch, twitch or quack grass (Agropyrum repens) was used for bedding the steers in the box stalls, and it was decided to heat or rot half the manure to note the effect upon the vitality of the objectionable seeds likely to be found among the straw.

The manure produced weighed 42,876 lbs. Half of this was hauled out upon the field and put in small piles and the other half was piled in a low flat topped pile to induce rotting or heating.

The manure weighed when piled 21,438 lbs., and when drawn to the field weighed 18,650 lbs.

The rotted manure was put on a plot of land adjoining the plot upon which the green manure had been placed.

A careful watch was kept to note the comparative weediness of the two plots.

Both plots showed a considerable growth of scutch grass, but the rotted manure plot seemed quite as badly infested as the green manure plot.

REPORT OF THE HORTICULTURIST

(W. T. MACOUN.)

December 1, 1903.

DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the seventeenth annual report of this division. In the following pages will be found the results of some of the most important experiments conducted during the past year.

Character of season.—Winter set in at Ottawa on November 25, 1902, with the ground frozen, and on the 26th and 27th, five inches of snow fell, which gradually increased during the month of December, the result being that practically all the frost came out of the ground and, as in the winter of 1901-02, the soil remained unfrozen all winter. December was an unusually cold month, the temperature falling to 25° F. below zero on the 9th. January was also cold, the temperature going down to 29·8° F. below zero on the 19th, this being the coldest day of the winter and the lowest temperature since 1896, when the lowest was 30·7° F. below zero. There were a few very cold days in February, the coldest being 22° F. below zero on the 18th, but the month on the whole, was only moderately cold. There was an abundant snowfall in January and February, with few days above freezing, so that although the weather was cold there was good protection for the roots of trees and for herbaceous plants. The weather became mild during the first week of March and continued so all month with very little snow or rain. Sleighing was gone before the middle of the month. The first ploughing was done in the plum orchard on March 23, the earliest date in the history of the farm. The ground was in excellent condition with no frost in it. April was mild to cool, except during the last three days, when it was warmer, the temperature rising on the 30th to 82° F. On May 1 and 2, 1903, there were seven and nine degrees of frost respectively, which did much damage. Market gardeners who had set out early vegetables, lost heavily. Asparagus, wherever it showed, was frozen back to the ground, and rhubarb was considerably injured also. Apples were unaffected. The flowers of the native plums were injured by this frost, and the crop much lessened. Nearly all the flowers of the cherries were destroyed, although a large part had probably been already killed by winter. Strawberries were badly affected by frosts on May 24 and 29, and also by the drought, as a result of which the crop of many varieties was practically a failure. Grapes, raspberries, currants and gooseberries were little affected.

The severest drought since the Central Experimental Farm was established, seventeen years ago, and one of the severest in the history of this country, was experienced this year. There was little precipitation of any kind during the months of March, April and May, and it was not until June 11, that the drought was broken. Notwithstanding the moisture from the snow which fell in the winter, the ground appeared drier during the month of May than it had ever been in midsummer before. Vegetable seeds, which had been sown on May 8, did not germinate until June 22. Potato sets, where they were near the surface, in some cases dried up in the ground. Apple trees did not suffer, as the soil was kept cultivated. Trees in the plum orchard, however, were affected, as the soil is naturally drier there, and it was necessary to water and mulch the young trees to keep them from dying. The dry weather was very hard on herbaceous plants and trees, which had been set out in the spring, and although the perennials in the botanic garden were watered three times, a considerable number died from the drought. By June the grass was dried up as in the driest time in midsummer. There was abundant rain after June 11, and it was not long before there was little indication left of the drought.

June, July and August were cool for summer months. The warmest day was on July 8, when the temperature rose to 90° F. In August the highest temperature was only 80° F., which occurred on the 6th. There were a great many rainy days in these months. September and October were fine and warm, and fruits and vegetables matured well. Although there was a little white frost locally during the last week of September, there was no frost recorded by the thermometer until October 19, when it was 30° F., and until that date even tomatoes and melon vines were uninjured. On October 26, the temperature dropped to 27° F., when most foliage was destroyed.

November was mild until the 5th, when it became cooler. Winter set in on November 16, and there was sufficient snow for sleighing by November 24. The last week of November was cold, the temperature falling to zero on the 26th.

Fruit and vegetable crops.—The apple crop in the provinces of Ontario and Quebec was good this year, and the fruit was of much better quality than last year, the dry weather in the early part of the season being unfavourable to the development of the apple spot fungus, as a result of which the fruit was much freer from spot than usual, this being especially true of the fruit in eastern Ontario and Quebec. There was a heavy crop of peaches, which made the fruit very cheap this year. There was also a good crop of pears. The plum crop was unusually heavy, and on the whole did not prove profitable. Thousands of baskets were left to rot in the orchards, as the markets were glutted with this fruit. There was an average crop of grapes in the Niagara district, but in the Lake Erie district the crop was nearly ruined by black rot. The crop of small fruits was an average one, except in northern and eastern Ontario and in some parts of the province of Quebec, where spring frosts and drought reduced the crop. Strawberries suffered most.

At the Central Experimental Farm the apple crop, though considerably less than last year, was fine in quality. There were few worms of the codling moth and no spot, and the fruit matured well. The plum crop, though better than last year, was not an average one. Cherries were a failure again this year, owing to winter killing of the flower buds. The fine weather of September and October was very favourable to grapes, and 101 varieties ripened. The crop of raspberries and currants was about an average one, but the dry weather reduced the gooseberry crop somewhat. The blackberry crop was better than usual this year. The yield of strawberries was light, as frosts when the plants were in bloom and the drought were very hard on this fruit. Owing to the dry weather in spring which delayed the germination of the seeds, to the spring frosts, and to the cool summer, it was a poor year for vegetables in eastern Ontario and part of the province of Quebec. The potato crop was much reduced by the dry weather, and by blight and rot in the autumn where the vines were unsprayed. Tomatoes did not ripen well and the crop was not nearly as large as usual. The melon crop was a failure. Celery was good, owing to the cool moist weather of late summer.

MEETINGS ATTENDED, ADDRESSES GIVEN AND PLACES VISITED.

A part of the work of the Horticulturist is to attend meetings of farmers, fruit growers and horticultural societies throughout the country, and to give addresses on horticultural topics. During the past year quite a number of such meetings were attended.

Following were the meetings attended with subjects of addresses:—

Annual meeting, Ontario Fruit Growers' Association, Walkerton, Ont., December 1, 2 and 3.—'Special Methods of Fruit Culture for Special Conditions.'

Annual meeting, Quebec Pomological Society, Waterloo, Que., December.—'Strawberries.'

Annual meeting, New Brunswick Farmers' Association, Sussex, N.B., January 26-28.—'Preparation of Soil, Cultivation and Fertilizing of Orchards and Potato Culture.'

Woodstock, N.B., January 29-30.—'Strawberries.'

Annual meeting, Nova Scotia Farmers' Association, Windsor, N.S., February 4.—'Potato Culture.'

Annual meeting, Prince-Edward Island Fruit Growers' Association, Charlotte- 'The Individuality of Fruits.'

Annual meeting, Prince Edward Island Fruit Growers' Association, Charlottetown, P.E.I., February 10.—'Site and Protection of an Orchard.'

Meeting at Miscouche, P.E.I., February 12.—'Fruit Growing.'

Meeting at Hazelbrook, February 11.—'Fruit Growing.'

Meeting at Smith's Falls, Horticultural Society, Smith's Falls, Ont., March 31.—'The Improvement of the Home Grounds.'

Meeting, Belleville, Fruit Growers' Association, Belleville, Ont., April 8.—'Recent Changes in Orchard Methods.'

Orchard meeting, at Vernon, Fallowfield and Metcalfe, Ont., July 7, 8 and 9.—'Demonstrations in Orchard Work.'

Summer meeting, Quebec Pomological Society, Abbotsford, Que., August 26, 27.—'Individuality of Fruits,' 'Hardy Climbers.'

Biennial meeting American Pomological Society, Boston, Mass., September 10-12.—'The Best Amateur Red Raspberry,' 'Progress in Horticulture in Ontario during the past Twenty-five years.'

Annual meeting, Ontario Fruit Growers' Association, Leamington, Ont., November 24-26.—'Hardy Fruits for Northern Districts.'

In addition to attending the above meetings, I visited the Toronto exhibition on September 7, and the Arnold Arboretum, and the Massachusetts Agricultural Experimental Station while at Boston, obtaining much information which will prove valuable to me in my work. I also visited the orchard of the Trappist fathers, La Trappe, Que., those of R. W. Shepherd, Como, Que., R. Brodie, Westmount, Que., and also Mr. W. W. Dunlop, Outremont, Que., and also drove sixty-five miles along the south shore of the St. Lawrence between St. Denis and Montmagny, having the opportunity at that time of visiting the orchards of J. C. Chapais, St. Denis, and Auguste Dupuis, Village des Aulnaies. At all these places there were new and interesting things to be seen and I got many suggestions for future work.

ACKNOWLEDGMENTS.

As in past years, I have been greatly aided in my work by the fruit growers of Canada, who have been always ready to assist me. During the past year, when preparing a bulletin on plum culture, it was necessary to write to a large number of persons for information regarding varieties and methods of culture, and I always received courteous assistance. I take this opportunity of thanking those fellow workers for their ready and willing aid.

At the experimental farm, Mr. J. F. Watson and Mr. H. Holz have again proved themselves able assistants in the work, the former by the manner in which he has handled the correspondence and much of the office work, and the latter in his capacity as foreman, by his untiring and faithful supervision of the work outside.

Donations.—The horticultural division is favoured every year with donations of plants, scions, seeds, &c., from institutions, and persons who either desire to have them tested at the experimental farm or who send them merely as gifts to the institution. The horticulturist is always pleased to receive such donations and to give them a fair trial. In the case of seedling fruits, however, it is desirable to see the fruit and pass judgment upon it before accepting trees or scions, as by adopting this plan only the really promising kinds are tested.

The following donations were received during the year, and we beg to gratefully acknowledge the same:—

DONATIONS.

Sender.	Donation.
Arnold Arboretum, Jamaica Plain, Mass	Seeds, collection of.
Bug Death Chemical Co., St. Stephen, N.B	Bug Death, 1 case of.
Baker, E. P., Kentville, N.S	Scions, Beauty of Horton apple.
Brodie, R., Montreal, Que	" Grand Duke Contantine apple. Burbank, Lachine and Brodie plums.
Ballantyne, James, Ottawa East, Ont	Scions, No. 2 seedling apple.
Beall, Thomas, Lindsay, Ont	" seedling apple.
Carter, J. H., Massawippi, Que	" Shiawassee Beauty apple.
Cass, C. A., L'Orignal, Ont	" of seedling apples.
Carstesen, Hans Peter, Billings Bridge, Ont	" Carstesen plum.
Cockburn, J. P., Gravenhurst, Ont	" Algonquin apple.
Dunlop, W. W., Outremont, Que	" and trees of Montreal seedling plums.
Dempsey, W. H., Trenton, Ont	" Hubbardston Nonsuch apple.
Fisk, J. M., Abbotsford, Que	" apple, Canada Baldwin, Stettin Red.
Greenfield, Samuel, Ottawa East, Ont	" seedling, apple and plums.
Gardener, James, Cornwall, Ont	" of unknown apple.
Graham, J. I., Vandeleur, Ont	" hardy peach.
Hamilton, Robert, Grenville, Que	Seeds of Japanese trees and vegetables.
Harkness, A. D., Irena, Ont	Scions, Red Fameuse apple.
Iowa Experimental Station, Ames, Ia	" Tatge and Ames plums, and Brilliant and Avista apples.
James, George, Lochlin, Ont	Tubers, James' Nugget potato.
Johnston, Asa., East Farnham, Que	Scions, apple.
Jack, N. E., Chateauguay Basin, Que	" May Queen plum.
Livingston, L. L., Frankville, Ont	Buds, seedling apple.
Little, E. E., Ames, Ia., U.S	Scions, apple and plums.
Lizotte, Rev. J., St. Jean des Chaillons, Que	" seedling apple.
Lagace, Jules, Fraserville, Que	" "
Messenger, R. J., Bridgetown, N.S	" "
Macoun, J. M., Ottawa, Ont	Seeds of Western plants.
Morgan, H. H., Manchester, N.H	Tubers, Morgan White and Morgan Seedling potatoes
Morrow, J. F., Calumet, Que	Scions, Seedling apple and Knudson cherry.
Newman, C. P., Lachine Locks, Que	" peach.
Reynaud, G., La Trappe, Que	" Perdrigon plum, Flemish Beauty pear.
Rowley, Joseph, Cummings Bridge, Ont	Trees, Rowley and No. 2 seedling plums.
Royal Botanic Gardens, Kew, England	Seeds, collection.
Shaw, R. M., Waterville, N.S	Plants, Big Bobs strawberry.
Scott, W. A., Montreal, Que	Buds, Blue Pearmain apple.
Saunders, W. E., London, Ont	3 trees Betula lenta
Shepherd, R. W., Como, Que	Scions, Windsor Chief apple.
Stephens, C. L., Orillia, Ont	Seedling gooseberry; Scions, hardy peach.
Tuttle, A., Clark, Baraboo, Wis., U.S	Scions, apple.
Whyte, R. B., Ottawa, Ont	Walnuts, 1 bushel.
Waugh, Prof. F. A., Amherst, Mass., U.S	Scions, Palmer Greening and Scarlet Cranberry apples.

APPLES.

The apple trees wintered well this year and there were fewer deaths than usual in the orchard. Vacancies were filled by new varieties and by additional trees of some kinds found desirable to grow in this district. The crop was below an average one, but the fruit was of good quality, there being no scab and little codling moth. There were 199 named varieties fruited this year, and of these there was a much larger proportion of winter apples than in previous years.

SEEDLING AND CROSS-BRED APPLES.

This year 208 trees were added to the seedlings already planted, making a total of 1,596 now in the orchards. The first fruit among the seedlings planted in 1890 was borne this year when one Wealthy seedling bore three apples. In the Russian seedling orchard 31 trees bore which had never fruited before, making a total of 225 which have fruited altogether. Of these, twenty-seven have been thought worthy of propagation for trial in northern Ontario, and Manitoba and the North-west Territories, but practically none of them are sufficiently promising for districts where varieties already recommended succeed.

Some further work was done in cross-breeding apples, the varieties used for this purpose being McIntosh Red, Lawyer, Northern Spy, North-western Greening, and Milwaukee.

TOP GRAFTING.

The work of top grafting the tenderer varieties on hardy stocks is continued and extended each year, as it is believed that this is a valuable line of work. Already 90 varieties have been top grafted. A tree of Northern Spy top grafted in 1893 bore over one barrel of apples this year. This variety has not proven satisfactory when grown as a standard tree.

SHIPMENT OF APPLES TO GLASGOW IN COLD STORAGE.

As the trees in the apple orchard at the Central Experimental Farm get larger the crop naturally increases, and as there are in some cases a number of trees of each kind, a fair quantity of some varieties can now be obtained. Although most of the apples are sold on the Ottawa Fruit Exchange, it was thought that it might be profitable, and at the same time of interest to fruit growers, to send some to Great Britain. A small shipment of 100 bushel boxes of autumn apples, therefore, was made to Glasgow last year, with good profit. The results of this shipment, which were published in the Annual Report of 1902, interested a great many, and various letters of inquiry were received. These came especially from small growers, who were pleased to get in the report all the details regarding the shipping of the fruit, cost of boxes and other material, and the details regarding the rates charged on the steamer and on the other side of the Atlantic, as fruit growers who have but a small quantity to sell are reluctant to adopt a new plan without knowing all the particulars.

This year another small shipment, mostly of Duchess of Oldenburg, was made in cold storage, and although the profits were not quite as large as last year they were still above what could have been obtained here.

The fruit was sent by the steamer *Kastalia,* which sailed from Montreal on August 20, and arrived at Glasgow on August 31.

The apples were picked on August 13, 14, and 15, and brought under cover and packed in boxes, the inside measurement of which was: depth, 10½ inches, width, 11½ inches, length, 22 inches. The sides and top and bottom were made of three-eighth inch boards, and the ends of half-inch, dovetailed and glued. Only apples free from defects were selected. These were wrapped in tissue paper, and packed tightly in layers, a sheet of cardboard being put between each layer and a thin layer of Excelsior between the apples and the boards at top and bottom. There were four layers of fruit to a box. No Excelsior was used as packing among the apples, as different sized apples were used for this purpose. The apples when picked were practically full grown, well coloured, but still quite hard. The fruit was kept in a cool place until August 18, when it was taken to the station at Ottawa, and put on a freight car, which left for Montreal that night. The fruit arrived in Montreal early on the morning of August 19, but just reached the steamer before the cold storage compartments were closed in the evening. More time will be allowed another year, as the fruit might not have got into cold storage. The rate for cold storage and freight on the steamer was 30 shillings for 40 cubic feet.

Following is the account sales:—

43 and 44 BAZAAR AND COVENT GARDEN MARKET, 25 STIRLING ST., CITY.
GLASGOW, Septemebr 4, 1903.

Account sales of 90 boxes apples ex. *Kastalia*. Sold by Thomas Russell, by order and for account of Mr. W. T. Macoun, Central Experimental Farm, Ottawa:—

W. T. Macoun.

	£	s.	d.	£	s.	d.
XXX......10 boxes North Star, 7 | —	3	10	0			
80 " Duchess, 5 | 6	22	0	0			
				25	10	0
Charges.						
Freight on goods	7	5	2			
Freight on empties, river and harbour dues, master porterage, landing, selecting, coopering, catalogues, advertising, &c., cartage to warehouse, housing and delivery	2	5	0			
Commissioner and guarantee	1	5	6			
				10	15	8
Net proceeds				14	14	4=$71.29

The expenses of the shipment on this side of the Atlantic, exclusive of growing the fruit, picking, packing and sending to the car at Ottawa, which would be necessary in any shipment, were:—

Cost of 90 boxes at Toronto, 14 cents	$12 60
Freight on 90 boxes, Toronto to Ottawa	2 05
Cost of 63 lbs. Excelsior at 3 cents	1 89
Cost of 450 strips of cardboard	2 70
Cost of 4 reams of tissue paper at $1.25	5 00
Wrapping, 66 hours at 7½ cents an hour	4 95
	$29 19

Leaving a net balance of $42.10, or approximately, 46·77 cents per box. There were about 180 apples in each box of Duchess, or about one-third of a barrel, thus making a net balance of, approximately, $1.40 per barrel. This is not a large profit, but it is a fair one, and better than would have been obtained at Ottawa by selling the fruit in baskets, barrels or boxes. In shipping large quantities of fruit the cost of material would be much less and the profits greater.

Following is the report of the government agent who saw this fruit sold at Glasgow:—

8 GLENBANK TERRACE,
LENZIE, N.B., September 7, 1903.

'These arrived at Glasgow on August 31 in very good condition, and were kept at a temperature of 35 to 40 degrees in refrigerator chamber during the voyage over. The 80 cases Duchess made 5s. 6d. a case. These showed up well for the variety, but several buyers complained to me about the lightness of the cases, which only weighed 36 pounds gross. This meant about 30 pounds of fruit in each case. The 10 cases North Star realized 7s. They were in excellent condition and looked well. I like the way you had these 10 cases packed, and think the sheet of cardboard between each layer with a little Excelsior top and bottom could not be improved upon.'

(Signed) JOHN BROWN,
Inspector at Glasgow.

Both this year and last, the complaint was made that the weight of fruit per box was too small. The Duchess is, however, a light apple and very little additional weight of fruit could have been obtained by another method of packing this variety.

NEW OR LITTLE KNOWN VARIETIES OF APPLES.

A large number of varieties of apples have been already described in the reports of the 'Horticulturist.' The following five kinds have not been described in the reports before. All of these descriptions are original, having been made from specimens in the writer's possession, and all from fruit grown on the Central Experimental Farm:—

Dempsey No. 80.—Originated at Trenton, Ont., by the late P. C. Dempsey. A cross between Northern Spy and Golden Russet. Fruit roundish, regular; size above medium; cavity deep, narrow, slightly russeted; stem short, slender to moderately stout; basin medium depth and width, smooth; calyx partly open; colour pale yellowish green splashed and washed with deep reddish pink; dots few, large, indistinct; skin, thick, tough; flesh yellow, firm, juicy; core small; briskly subacid, not highly flavoured; quality above medium; season late winter; tree vigorous and bears young. A promising winter apple at Ottawa.

Dudley (North Star).—Originated in Maine. Fruit roundish; size large; cavity open, deep, slightly russeted; stem medium length, slender; basin deep, medium width, slightly wrinkled; calyx partly open; colour pale yellow; streaked and splashed with deep lively red; dots few, small, pale yellow, indistinct; skin moderately thick, tender; flesh yellow, rather coarse, tender, moderately juicy; core small; subacid, pleasant flavour, quality above medium, almost good; season late September to early winter. Tree vigorous and productive. This is about the same season as Wealthy, but does not keep as long. A handsome apple.

North-western Greening:—Originated in Wisconsin. Fruit large, roundish to roundish oblong, slightly conical, regular; cavity deep, medium width, sometimes more or less russeted; stem short, stout; basin medium depth and width; almost smooth; calyx open; colour green at first then greenish yellow when fully mature; dots indistinct; skin thick, tough; flesh yellowish, firm, moderately juicy; core medium, closed; mildly sub-acid, pleasant flavour; quality good. Season mid-winter to late winter. Tree hardy at Ottawa and a vigorous grower, but inclined to be top heavy, causing splitting of the trunk. Not an early bearer, but is eventually quite productive. The fruit is very symmetrical and has an attractive smooth skin. One of the most promising winter apples for the north.

Rideau (Wealthy female X Duchess male).—A cross-bred apple, originated at the Central Experimental Farm, by Dr. C. E. Saunders in 1894, and fruiting this year for the first time. Fruit roundish, angular; size medium to large; cavity deep, open; stem short, stout; basin deep, open; calyx open or partly open; colour pale yellow, well washed and splashed with bright crimson, especially on sunny side; dots numerous, small, indistinct; bloom none; skin moderately thick, tender; flesh yellowish, remarkably firm, coarse, juicy; core rather small; subacid, sprightly; aromatic, though not high flavoured; quality good; season late September. Resembles Duchess somewhat in outward appearance, but is longer. There is a suggestion of Wealthy in flavour and sprightliness. Shows indications of water-core. A handsome apple and may prove useful, as its season is between Duchess and Wealthy.

Windsor Chief.—Originated in Wisconsin. Fruit oblate to roundish, slightly angular; size medium to large; cavity shallow, open, more or less russeted; stem medium length, stout; basin medium depth and width, almost smooth; calyx open; colour yellow, well washed with dark red; dots few to medium, yellow, prominent; skin thick, tough; flesh yellowish, firm juicy; core small; mildly subacid, pleasant flavour; quality good, season late winter. Tree hardy, vigorous, productive. Fruit hangs well. A promising apple. A little too dark in colour.

SEEDLING FRUITS.

Quite a number of seedling fruits were again sent in for examination this year, most of which were apples, although pears, plums and peaches were also represented. In most cases full descriptions were made of the fruit, which will be useful for future reference. If the variety was considered promising, scions were asked for and those received will be grafted. As a result of this grafting of seedling varieties, every year there is now a large number of these growing at the experimental farm. As these fruit they are recommended for general planting or otherwise as their merits deserve.

We trust that fruit growers will continue to send in specimens of promising seedling fruits for examination.

Full descriptions follow of the best of those received.

Record.	Province.	Address of Sender.	Description of Fruit.
			APPLES.
250	N. B.	Morley Small, Lawson	See full description.
251	Que	A. C. Kennesen, Dixville	Medium size, pale yellow, quality above medium, season autumn, not specially promising.
252	"	Theodore Hanon, Mt. St. Hilaire	See full description.
253	"	" "	Medium size, splashed with purplish red, fall, not promising.
254	"	" "	Medium size, deep purplish red, early fall, not promising.
255	"	R. Hamilton, Grenville	No. 1, above medium size, dark purplish red, medium quality, season October.
256	"	" "	No. 2, above medium to large, yellow with purplish red on sunny side, quality above medium, season late September.
257	"	" "	No. 3, medium size, yellow and reddish pink, good quality, season October, not attractive enough.
258	"	" "	Medium size, bright purplish red, medium quality, season late fall.
259	"	" "	Medium size, pale yellowish green with deep red on sunny side, quality good, season late autumn. Evidently Fameuse seedling. Not as good as Fameuse.
260	"	" "	See full description.
261	"	" "	Large, orange red, quality almost good, season October, not nearly as good as Wealthy.
262	"	" "	Large, deep purplish red, quality above medium to good, season autumn, not of much promise.
263	"	Rev. J. Lizotte, St. Jean des Chaillons	Medium size, deep crimson, quality above medium, season winter.
264	"	Trappist Fathers, La Trappe	See full description.
265	Ont	Russell Hale, Orillia	Above medium size, yellow, splashed and washed with purplish red, quality good, season late winter, not of special merit.
266	"	John Bertram, Dundas	Above medium size, pale yellow, splashed with bright purplish red, quality good, season early autumn, not sufficiently promising.
267	"	M. G. Bruner, Olinda	Medium size, pale yellow, well washed and splashed with bright red, quality medium, season October, handsome but not promising.
268	"	T. A. Harsant, Glen Orchard	Very large, washed and splashed with purplish red, quality below medium, season late autumn to early winter.
269	"	W. J. Kerr, Renfrew	Large, green with splashes of purplish red, medium quality, season late autumn.
270	"	" "	Medium size, sweet, medium quality, not promising.
271	"	" "	Medium size, yellow with traces of purplish red, quality good but fruit not attractive, season early winter.
272	"	F. Ballantyne, Smiths Falls	Medium size, pale yellow, quality medium, season probably mid winter.
273	"	" "	Medium to below in size, bright red, quality good, season early winter, not large enough.

(Photo. by Frank T. Shutt.)
COVER CROP. HAIRY VETCH, CENTRAL EXPERIMENTAL FARM, SEPTEMBER 21, 1903. SOWN IN DRILLS, JUNE 18, 1903.

(Photo. by Frank T. Shutt.)
COVER CROP. HORSE BEANS, CENTRAL EXPERIMENTAL FARM, SEPTEMBER 13, 1903. SOWN IN DRILLS JUNE 18, 1903.

Record.	Province.	Address of Sender.	Description of Fruit.
274	"	C. A. Cass, L'Orignal..................	See full description.
275	"	Thos. Connolly, Lindsay	"
276	"	C. H. Snow, Cummings Bridge .. .	'Sport' "
277	" .. .	Daniel Lack, Lindsay...........	"
278	"	L. L. Livingston, Frankville.........	"
279	"	M. G. Bruner, Olinda....	"
280	"	J. Ballantyne, Ottawa East.........	"
281	"	David Francis, Perth..................	Large, greenish yellow with a dull red blush, quality medium, season late winter.
282	"	C. Wallenshlager, New Edinburgh .	Medium size, yellow with a pink blush, quality medium, season early winter, not desirable.
283	"	" " ..	Above medium size, pale green with pinkish blush, quality good, season mid to late winter, may be promising.
			PEARS, PLUMS AND PEACHES.
284	"	R. B. Martin, Elmira.................	Seedling pear, see full description.
285	"	W. J. Kerr, Renfrew..................	" "
286	P.E.I....	H. E. Wright, Summerside...........	Seedling plum "
287	Ont.. ..	Samuel Greenfield, Ottawa East	No. 1, seedling plum "
288	"	" "	No. 2 " large, dark purplish red, medium quality, season early September.
289	"	W. J. Diamond, Belleville	Seedling plum, medium size, dark, purplish red, quality good, season early September.
290	"	W. K. Ireland, Owen Sound..........	Seedling peach, see full description.

No. 250—Seedling apple from Morley Small, Lawson, N.B.:—Size above medium to large; form roundish, conical, slightly angular; cavity shallow, medium width; stem short, stout; basin narrow, shallow, wrinkled; calyx partly open; colour greenish yellow well washed and splashed with red; dots fairly numerous, small, yellow, distinct; skin thick, tough; flesh yellowish, moderately juicy, mildly sub-acid; core medium; quality above medium; season mid to late winter.

Said to have originated from seed brought from England by Mr. Small's grandfather about eighty years ago. May be a promising late winter variety. Scarcely in condition for test yet, November 30, 1903.

No. 252—Apple: seedling, from Theodore Hanon, Mount St. Hilaire, Que.:—Size medium; form roundish conical; cavity medium depth and width, russeted, stem short, moderately stout; basin medium depth and width, slightly wrinkled; calyx partly open; colour pale yellow well washed with bright crimson; dots obscure; skin moderately thick, tender; flesh white tinged with red, juicy, tender, melting; core medium; mildly sub-acid, good flavour; quality very good; season evidently mid September.

A handsome apple and may be very useful as coming just before Wealthy.

No. 260—Apple seedling from R. Hamilton, Grenville, Que.:—Size above medium; form roundish; cavity medium depth, open, russetted; stem short to medium, stout; basin rather deep, medium depth and width, almost smooth; calyx open; colour pale greenish yellow well splashed and washed with rich purplish red; dots few, pale, indistinct; skin rather thick, tender; flesh yellowish, moderately juicy; core medium; sweet, sugary, pleasant flavour; quality good for a sweet apple; season evidently late September and October.

A handsome apple resembling Wealthy very much in outward appearance. October 16, still in good condition.

No. 264—Marlboro, seedling apple, from G. Reynaud, La Trappe, Que.:—Size large; form oblate; cavity deep, open, russeted at base; stem short, stout; basin, medium depth and width; calyx closed or open; colour pale yellow well washed with deep crimson and with purplish red splashes; dots fairly numerous, pale yellow, distinct; skin moderately thick, rather tough; flesh white, tinged with red, tender, juicy; core medium; sub-acid, pleasant flavour, but slightly astringent; quality good. Season early to mid-winter.

Tree is quite hardy and is bearing well. A very handsome apple of about the same season as Fameuse and McIntosh Red. It is somewhat like Canada Baldwin in flavour, and may be a seedling of that variety, as it resembles it somewhat in other respects.

No. 274.—Apple from C. A. Cass, L'Orignal, Ont.:—Size, above medium; form, roundish, conical ,angular; cavity narrow, medium depth; stem short, moderately stout; basin narrow, shallow to medium; calyx open; colour pale yellow, well washed and splashed with crimson; dots obscure; skin moderately thick, rather tough; flesh white, tender melting, juicy; core medium size, open; mildly subacid, good flavour; quality good to very good; season probably January and February.

Tree bore in 1902 for the first time. Nearly a barrel taken off.

Probably a seedling of Fameuse. Lacks sprightliness. Same season as McIntosh Red and Fameuse.

No. 275.—Seedling apple from Thos. Connolly, Lindsay, Ont.—Size large ; form oblate; cavity medium depth and width; stem short, stout; basin medium depth and width, smooth; calyx open; colour pale greenish yellow, with traces of pink on sunny side; dots moderately numerous, indistinct, grey and green; skin thick, tough; flesh yellow, crisp, juicy; core medium; subacid, sprightly, pleasant flavour; quality good; season probably early to mid-winter. A promising seedling.

No. 276.—Apple 'Sport,' from C. H. Snow, Cummings Bridge, Ont.:—Size above medium to large; form oblate; conic; cavity deep, open; stem short, stout; basin medium depth and width, wrinkled; calyx closed; colour greenish yellow, almost covered with dark red; dots moderately numerous, yellow, distinct; skin thick, rather tough; flesh white tinged with red, crisp, juicy, tender; core small; flavour subacid, pleasant; quality good to very good. Season early to mid-September.

Thought to be a sport of St. Lawrence, which it resembles in shape, flesh, and somewhat in flavour. The flavour, however, does not seem to be as high as St. Lawrence. Promising. Tree fruiting among a number of St. Lawrence trees procured from same nursery.

No. 277.—Apple seedling from Daniel Lack, Lindsay, Ont.:—Size large; form roundish; cavity shallow, open; stem short, stout; basin medium depth and width, almost smooth; calyx closed; colour pale greenish yellow, almost greenish white, with a bright pink blush on sunny side; dots fairly numerous; flesh white, crisp, tender, juicy; core small; mildly subacid, pleasant flavour; quality good. Season evidently mid to late September. November 4, 1903, still in condition. A promising variety, resembling Princess Louise in appearance and quality, but earlier. Evidently a seedling of Fameuse.

No. 278.—Apple from L. L. Livingston, Frankville, Ont.:—Size medium; form oblate; cavity open, russeted; stem short, stout; basin deep, open, slightly wrinkled; calyx open; colour greenish yellow, splashed and washed with dull purplish red; dots few, grey, distinct; skin thick, rather tough; flesh yellow, crisp, moderately juicy; core small; subacid, pleasant flavour; quality good. Season late winter. Would be more promising if a little larger.

No. 279.—Apple from M. G. Bruner, Olinda, Ont.:—Size medium; form oblate to roundish, slightly angular; cavity deep, narrow, heavily russeted; stem medium length, slender; basin medium depth and width, smooth; calyx open; colour yellow, well splashed, washed, and streaked with purple red; dots obscure; skin moderately thick, tough; flesh white, tender, fairly juicy; core small; subacid, good flavour; quality good; season early to mid-winter. Scarcely large enough or juicy enough to be very promising, although it has considerable merit.

No. 280.—Apple from Jas. Ballantyne, Ottawa East, Ont.:—Size medium; form oblate, conic; cavity deep, medium width; stem short, fairly stout; basin narrow, very shallow; calyx partly open; colour pale yellow, splashed and streaked with purplish red; dots obscure; skin moderately thick, tough; flesh white, firm, crisp, moderately juicy, subacid; core medium; quality above medium. Season, late winter.

No. 284.—Seedling pear from R. B. Martin, Elmira, Ont.:—Fruit large, obovate, ovate, obtuse pyriform; colour yellow, with an orange blush; skin thin, tender; flesh yellowish, tender, melting, buttery; moderately sweet, not high flavoured; core small; quality good. Season, late September. Not high enough flavoured to be among the best varieties.

No. 285.—Seedling pear from W. J. Kerr, Renfrew, Ont.:—Fruit medium size, obovate, obtuse; colour yellow with a faint pink blush; stem medium length, stout; flesh yellowish, juicy, buttery, sweet but, not high flavoured; quality good; season evidently early September. Promising if hardier than Flemish Beauty. Seedling of Bartlett. Originated in the county of Leeds. Tree, 20 feet high.

No. 286.—Abegweit. Plum seedling from Henry E. Wright, Summerside, P.E.I.:—Form round oval; size large; cavity medium depth and width; suture distinct, slightly depressed; apex slightly depressed; colour yellow, well covered wrth deep red dots obscure; bloom none on specimens received; skin moedrately thin, rather tough; flesh yellow, juicy; stone medium to below medium, oval, flattened, cling; sweet, rich flavour; quality very good. A handsome plum and one worth propagating. Raised from stone of a plum from California. Bore first time this year. Tree a fast grower, very healthy and hardy so far. Ripens a few days later than Moore's Arctic and earlier than Lombard. Tree 6 or 7 years old from seed. Domestica group.

No. 287.—Plum seedling No. 1, from Samuel Greenfield, Ottawa East. Ont.:—Form roundish oval (broad); size large; cavity shallow; suture indistinct, no depression; apex rounded; colour dark purplish red; dots numerous, small, yellow; skin thin, tough; flesh greenish yellow, juicy, sweet; stone large, oval, cling; sweet, good flavour; quality good to very good. A plum of the Bradshaw type. Tree fruiting well this year. Promising. Domestica group.

No. 290.—Seedling peach from W. K. Ireland. Owen Sound, Ont.—Fruit large, roundish, colour yellow, well washed with deep red; suture distinct, depressed, deepest towards the apex; skin moderately thick; flesh yellow, juicy, sweet, rich, good flavour. Quality very good. Season mid September.

PEARS.

Although a few trees of named varieties of pears are still growing in the orchard, they are not at all satisfactory. Seedlings of Flemish Beauty and others are being grown, and it is hoped that some more blight resistant varieties may be obtained.

PLUMS.

As usual, nearly all the flower buds of European plums were destroyed by winter. The spring frosts did some injury to the flowers of native plums, but the Americanas were not affected, and the crop of the latter was an average one as regards quantity, but the quality was not as good as usual, owing to the drought which weakened the trees and caused some of the foliage to fall; to the aphis which were very difficult to control, and to the brown rot which caused much injury, notwithstanding frequent spraying which was offset by the wet weather during the latter part of the summer, making the conditions very favourable for the development of the disease.A bulletin on plum culture was published this year, giving the results of experiments with plums up to date.

One new experimental farm seedling was named this year, of which the following is a description:—

Welcome (seedling of DeSoto).—Fruit above medium size, oval, flattened considerably; cavity narrow, shallow; colour rich yellow more or less washed with red; dots very small, yellow, indistinct; bloom thin; skin moderately thick, fairly tough; flesh yellow, juicy, sweet, a pleasant but not rich flavour; quality good; season mid September. A very handsome plum. Tree vigorous and productive.

GRAPES.

Although the summer was cool and wet, the autumn was very favourable for the ripening of grapes, and 101 varieties matured this year. Among the newer varieties the Campbell's Early, which matures about the same time as Moore's Early, and is better in quality, is the best. For districts where the climate is like that at Ottawa, the following varieties are those which will give greatest satisfaction:—

Campbell's Early, Moore's Early, Moyer, Peabody, Wilder, Roger's 17, Delaware, Brighton, and Lindley. It is necessary to plant the last two among others, as they are not self fertile.

Several of Munson's hybrid grapes fruited this year. Of these the most promising is Manito, which is as early as Champion. The following description was made of it:—

Manito:—Vine medium growth, productive; fruit clusters below medium size, cylindrical, sometimes slightly shouldered and moderately loose; fruit below medium size, globular, black with a blue bloom; skin thin, fairly tender, somewhat acid; pulp very tender, melting, sweet, good flavour; quality good. As early as Champion. Promising for the north.

CHERRIES.

The cherry crop was a failure this year owing to the winter killing of the flower buds and to spring frost. There were only a few scattered cherries on a few trees. The Orel 25, is the hardiest in flower bud of all the varieties yet tested, as this has given fair crops when others have had little or none. Cherries, like European plums, will succeed well when grown near large bodies of water, when in the interior where the temperature does not fall any lower the flower buds are destroyed by winter.

STRAWBERRIES.

The strawberries wintered well and would probably have produced a fine crop but for the drought and spring frosts. As it was, the dry weather in April and May and until near the middle of June was very hard on the plants and they made little growth. The frosts of May 1 and 2, and particularly May 24 and 29, destroyed a large proportion of the flowers, the pistil being the part most injured. Many kinds set little or no fruit. The following table, in which are given the yields of the twenty-five most productive varieties, is instructive in that it shows which kinds were most resistant to the frost, but, as showing how much less was the yield of the most productive variety this year than last, the Mele, which was first, yielded 35 lbs. 6 ozs. in 1902, and the Lovett, which was 25th on the list, 20 lbs. 5½ ozs., while in 1903 the most productive variety, Jucunda Improved, yielded only 11 lbs. 15 oz., and the Young's seedling, which was 25th on the list, only 3 lbs. 11¼ oz. Of the 25 varieties which yielded best in 1903, 9 averaged best previous to 1903, and 10 were among the most productive 25 varieties in 1902.

For general market, the following are among the best:—Buster, P., Warfield, P., Beder Wood, B., Lovett, B., Sample, P., and for shipping long distances, the Williams, B. Other productive varieties for near market are: Bubach, P., Glen Mary, B., Greenville, P., and Haverland, P. The Clyde, B., is also a very productive berry, but as it has not very much foliage, is liable to scald, unless given high cultivation.

Name.	Bisexual Pistillate.	Date of full bloom.	Date of first ripe fruit.	Date of first picking.	Date of last picking.	Number of pickings.	Total Yield 1903. — Length of Rows, 30 ft. Lbs.	oz.
Jucunda Improved	B	May 29..	June 22..	June 24..	July 13..	8	11	15
Irene	P	" 27..	" 25..	" 27..	" 13..	7	10	4¾
Swindle	P	" 26..	" 27..	" 29..	" 13..	6	9	11½
Buster	P	" 26..	" 22..	" 24..	" 13..	7	9	8
Thompson's Late	P	" 29..	" 27..	" 29..	" 13..	6	9	5
Splendid	B	" 29..	" 22..	" 24..	" 10..	6	9	0
Daniel Boone	P	" 26..	" 22..	" 24..	" 13..	8	7	1
Gandy	P	" 29..	" 27..	" 29..	" 13..	6	6	12½
John Little	P	" 26..	" 22..	" 24..	" 13..	8	6	10
Dora	P	" 29..	" 22..	" 24..	" 13..	8	6	5¾
Lovett	B	" 26..	" 15..	" 21..	" 10..	9	6	4¾
World's Champion	B	" 29..	" 22..	" 27..	" 13..	7	6	1½
Vories	B	" 26..	" 15..	" 21..	" 10..	8	6	1
Wonderful	P	" 26..	" 22..	" 24..	" 13..	8	5	12
Brandywine	B	" 29..	" 27..	" 29..	" 13..	6	5	10½
Crescent	P	" 26..	" 19..	" 21..	" 13..	9	5	10
Williams	B	" 28..	" 15..	" 21..	" 13..	9	4	11½
Daisy	P	" 29..	" 24..	" 27..	" 10..	6	4	7¾
Carrie	P	" 26..	" 15..	" 21..	" 13..	9	4	7¼
Plover	P	" 28..	" 26..	" 27..	" 13..	5	4	5
Boynton	P	" 26..	" 22..	" 24..	" 13..	8	4	4¾
Howard's 41	P	" 26..	" 15..	" 21..	" 13..	8	4	4¼
Scarlet Ball	P	" 29..	" 27..	" 29..	" 13..	6	3	12¾
Beder Wood	B	" 26..	" 13..	" 21..	" 13..	9	3	11½
Young's Seedling	B	" 29..	" 15..	" 24..	" 13..	8	3	11¼

RASPBERRIES.

Raspberries have never been very productive in the horticultural department at the experimental farm, as the soil is a little too light for that fruit and the canes are not as strong as they would be if grown in heavier soil. The lightness of the soil, however, is perhaps an advantage in testing varieties, as one is better able to learn which kinds are best than if the soil were very rich and heavy, when the variations would not be so great.

The canes came through last winter in very good condition, but the drought and spring frosts lessened the crop somewhat.

In the following table will be found the average yields of the twelve most productive red varieties under test for the past four years. The Brighton, which heads the list, is one of Dr. Saunders' seedlings, and is a very hardy variety. The Cuthbert only averaged 4 lbs. ½ oz. This variety does not succeed as well as many others at the Experimental Farm.

Name of Variety. — Red Varieties.	Date of first ripe fruit, 1903.	Average date of first ripe fruit, 1900–03	Date of first picking, 1903.	Average date of first picking, 1900–03.	Date of last picking, 1903.	Average date of last picking, 1900–03.	Number of pickings, 1903.	Average number of pickings, 1900–03.	Total yield, 1903.		Average total yield, 1900–03.		Length of row, feet.
									Lbs.	oz.	Lbs.	oz.	
Brighton............	July 1.	July 6.	July 2.	July 9.	July 27.	Aug. 4.	12	11	28	6½	19	10½	36
Kenyon............	" 1.	" 10.	" 2.	" 12.	Aug. 10.	" 10.	16	12	16	14¼	16	7	36
Count............	" 1.	" 6.	" 2.	" 9.	July 27.	" 3.	12	11	16	3	16	6¼	36
Henry............	" 1.	" 5.	" 2.	" 9.	" 29.	" 2.	13	10	20	8½	16	0	36
Clarke............	" 5.	" 9.	" 7.	" 12.	Aug. 10.	" 12.	13	13	12	12½	15	14½	36
Marlboro............	" 5.	" 8.	" 7.	" 11.	July 31.	" 3.	11	11	9	9½	14	10	36
Phoenix............	" 7.	" 11.	" 9.	" 15.	Aug. 20.	" 16.	15	13	11	10¼	14	6½	36
Herbert............	" 7.	" 11.	" 9.	" 14.	" 13.	" 11.	14	11	14	12¼	12	4¾	36
Muriel............	" 1.	" 7.	" 2.	" 9.	July 27.	" 4.	12	11	12	15½	12	1	36
Reliance............	" 1.	" 6.	" 2.	" 9.	Aug. 10	" 9.	16	13	14	8½	11	14	36
Dora............	" 9.	" 10.	" 11.	" 13.	" 10.	" 13.	12	12	9	2¾	10	3½	36
Brandywine.........	" 7.	" 13.	" 9.	" 15.	" 13.	" 19.	14	14	12	5¼	9	15¼	36

INDIVIDUALITY OF FRUITS.

The stock breeder has for a great many years paid especial attention to the individual animal in breeding for size, shape and markings, and for flesh and milk. In the writer's judgment, just as satisfactory results should be obtained in improving the strain of a variety of fruit, and although comparatively little has yet been done by horticulturists in this respect with fruits, much has been accomplished with flowers and vegetables. It is now recognized by the best authorities that each bud of a tree has individual characteristics which separate it from all other buds, and although the differences in buds are in most cases so slight that it is impossible to detect them, yet in some instances they may be quite marked.

Fruit growers have often noticed that one tree or bush is more productive than another, or bears larger, more highly coloured or better flavoured fruit. Take as an example the Fameuse apple. When this excellent old variety first bore fruit several hundred years ago one tree produced all the Fameuse apples that there were at that time. Some apples on that original tree were probably not as highly coloured as others, although exposed to the same amount of light. Some branches, probably, were more heavily laden than others, although there was no apparent reason why they should be. On some branches the fruit was larger though as well loaded as others. In time, scions were cut from that tree and grafted, and a new generation of Fameuse trees was the result. Were the trees thus produced identical in vigour and productiveness, and was the fruit borne on each of them exactly similar in every respect? We believe that they were not. Every bud on every tree of every generation of Fameuse apple trees had individual characteristics, and although the differences were rarely enough marked to see, there were doubtless always fine shades of variation. It does not need a great stretch of imagination to see that if such changes can be made, as have been made in live stock, flowers, vegetables, and other economic plants, by careful selection, that if, when that first generation of Fameuse apple trees began to bear, scions had been taken from the most productive tree bearing the finest coloured apples of the best size, that in the next generation of trees there would be at least a slight improvement, and if this selection had been carried on down to the present time we should have a better Fameuse than we have to-day. This selection, however, has not been carried out, and about all that has been done, in a few cases, is to graft from trees bearing highly coloured fruit, but as yet we have practically no reliable information in Canada as to whether the results have been satisfactory. In small orchards, where the fruit is intended for home consumption, the individuality of different trees is more noticed than in large orchards, where the record of each tree is not brought so prominently before the grower. The effect of the stock on the productiveness of the tree and characteristics of the fruit is not yet well understood. Whatever may be the influence of the stock there is no doubt that each variety maintains most of its individual qualities.

At the Central Experimental Farm the yields are kept from each individual tree in the orchard, making it possible to tell at the end of a certain period just what each tree has borne. It has been found that trees planted at the same time, and growing under practically the same conditions as other trees of the same variety, vary widely in productiveness. Some trees also bear a medium crop every year, while others bear a heavy crop every other year.

In the following table will be found the yields of trees of four varieties of apples for the past six years, with the total yield per tree for that time. It will be seen that some trees have yielded two to four times as much as others. The yield is given in gallons rather than in barrels, to avoid large fractions.

It is worth mentioning that of the 17 Wealthy trees in the table only 7 bore fruit this year, and of those that fruited, the tree which had borne regularly during the past four years, again bore a good crop in 1903.

APPLES—WEALTHY.

(Planted 1896.)

Yield in Gallons.

Tree.	1899.	1900.	1901.	1902.	1903.	Total.
1	1·0	2·25	2·75	15·0	....	21·00
2	2·0	·5	2·5	12·0	....	17·0
3	1·75	12·0	2·25	8·0	....	24·0
4	9·0	2·25	15·5	20·5	27·0	74·25
5	7·5	6·5	7·75	23·0	7·5	52·25
6	3·25	6·5	3·5	24·0	....	37·25
7	7·5	1·0	10·0	19·0	16·0	53·5
8	....	8·5	·5	21·5	....	30·5
9	....	11·25	·25	27·5	....	39·0
10	1·0	12·25	....	30·0	....	43·25
11	1·25	11·25	....	21·5	....	34·0
12	....	7·5	....	18·5	2·0	28·0
13	4·25	6·25	4·5	20·0	·5	35·5
14	2·5	5·5	·5	34·0	....	42·5
15	....	2·25	3·5	21·5	8·5	35·75
16	3·0	2·25	4·0	22·5	4·5	36·25
17	....	2·0	1·0	22·5	....	25·5

APPLES—MCMAHON WHITE.

(Planted 1888.)

Yield in Gallons.

Tree.	1898.	1899.	1900.	1901.	1902.	1903.	Total.
1	62·0	....	83·0	2·0	147·0	1·5	295·5
2	42·0	1·0	6·0	12·5	98·0	23·0	182·5
3	32·0	29·0	49·0	18·0	55·0	63·5	246·5
4	35·0	....	34·5	4·0	63·0	34·0	170·5
5	....	37·5	55·0	49·0	....	61·0	210·5
6	29·0	4·5	46·0	·5	69·5	43·0	192·5
7	·5	9·5	19·5	4·0	19·0	39·5	92·0
8	7·0	9·0	27·0	9·0	53·0	15·5	120·5

APPLES—MCINTOSH RED.

(Planted 1890.)

Yield in Gallons.

Tree.	1898.	1899.	1900.	1901.	1902.	1903.	Total.
1	17·5	26·0	37·0	6·5	71·5	94·0	252 5
2	1·0	9·5	10·5	1·0	37·5	31·0	90·5

APPLES—PATTEN'S GREENING.

(Planted 1892.)

Yield in Gallons.

Tree.	1898.	1899.	1900.	1901.	1902.	1903.	Total.
1	27·0	2·0	35·0	1·5	71·0	15·0	151·5
2	2·0	6·0	14·0	19·0	24·0	55·5	120·5
3	2·0	31·0	1·5	40·5	22·0	67·0	164·0
4	13·0	·0	6·5	·0	12·0	15·0	46·5
5	1·0	·0	19·0	·5	17·5	21·0	59.0

Experiments are now being conducted at the Experimental Farm by top grafting with scions from productive and unproductive trees, to determine how far the productiveness and unproductiveness of the trees is constant. Root grafted trees are also being grown for this purpose.

In order that fruit growers might learn, by personal experience, of the great variation in individual trees of the same variety, a co-operative experiment was begun this year. On application to the horticulturist, six pieces of zinc, bearing six consecutive numbers, were sent to each person. These pieces of zinc when received were to be attached to six bearing trees of a single variety of apple, pear, plum, or peach, the trees to be the same age, and growing under the same conditions of soil and culture. A record of the yield of each tree was to be kept for at least five years. A number of fruit growers in different parts of Canada have already joined this co-operative test, and it is hoped that more persons will desire to take part in this experiment.

If scions from productive trees will produce productive trees when grafted, and if scions from unproductive trees will produce trees which are poor croppers, it is very important that scions should be taken from the best yielding trees. As grafting will, in all probability, become much more general among fruit growers in the near future, the importance of knowing that trees vary widely in productiveness is easily seen.

SPRAYING.

The spraying of fruit trees is not becoming as general as its importance deserves. The good results and profits from spraying have been proven over and over again, and yet only a small percentage of farmers with orchards spray their trees. The following is a statement made by Mr. Jos. Tweddle, of Fruitland, Ont., this year:—

'I have some 25 or 30 acres of apple orchard in bearing, mostly Greening, Spy and Baldwin. I figure on spraying three times a year, and estimate each spraying as adding a thousand dollars to the value of my crop. This is no mere guess work either.

The accuracy of the figures has been demonstrated, when owing to unfavourable weather conditions I have been unable to complete the work at the proper time. By spraying three times, I have got from 80 to 90 per cent of No. 1 apples from my total crop. I have sold 15 cars of apples of my own production in Germany, which have netted me $3 for No. 1, and $1.25 to $2 for No. 2.'

Spraying is now such an essential factor in successful orcharding, that the most economical means of applying the mixtures and solutions are being sought for. While the ordinary barrel pump is sufficient for smaller orchards, the power sprayer is evidently going to take its place in large orchards. Up to the present time compressed air sprayers appear to have given the best satisfaction, although gasoline engines have given very satisfactory results. In a demonstration of power spraying given by the Fruit Division of the Commissioner's branch with a gasoline engine, it was shown that it could do good work in spraying orchards. Mr. Jos. Tweddle, of Fruitland, Ont., used compressed air, which he said was also very satisfactory.

As a rule, the greater the number of sprayings, up to five or six, the better the results will be, but if a farmer or fruit grower finds it impossible to spray more than three times, the early sprayings are decidedly the most important. Although this is especially true in spraying to prevent the apple spot fungus, it is also true with other diseases.

The following formula is that recommended at the Central Experimental Farm for fungi on fruit trees:—

Poisoned Bordeaux Mixture for Fungi and Leaf-eating Insects on Fruit Trees.

Copper sulphate (bluestone)........	4 lbs.
Unslaked lime..........	4 lbs.
Paris green (for leaf-eating insects)........	4 oz.
Water (1 barrel)........	40 gals.

Dissolve the copper sulphate in hot water, or by suspending it in a coarse bag in a wooden or earthen vessel containing 4 or 5 or more gallons of water. Slake the lime in another vessel. If the lime, when slaked, is lumpy or granular, it should be strained through coarse sacking or a fine sieve. Pour the copper sulphate solution into a barrel, or it may be dissolved in this in the first place; half fill the barrel with water; dilute the slaked lime with 8 or 10 gallons of water, and pour it into the copper sulphate solution, then fill the barrel with water and stir thoroughly. It is then ready for use. Do not pour the undiluted slaked lime into the undiluted copper sulphate solution, or vice versa, as when mixed in this way a poor, flakey Bordeaux mixture which settles rapidly is the result. A stock solution of copper sulphate and lime wash may be prepared and kept in separate covered barrels throughout the spraying season. The quantities of copper sulphate, lime and water should be carefully noted. Further particulars regarding other spraying mixtures and solutions may be found on the spraying calendar, which will be sent on application.

DUST SPRAYING.

In the western states, particularly in the state of Missouri, where orchards are often on steep hillsides, and where water is sometimes scarce, fruit growers have been looking about for some easier way of applying fungicides and insecticides than by means of water, which is difficult to get, and more difficult to draw over the rough ground. Trees have been dusted with sulphur and other materials in the past, but copper sulphate had not been generally used in this way until tried in the west. Machines for spraying dust mixtures have been invented or old ones improved upon, and during the past few years dust spraying has been carried on in a number of commercial orchards in the western states, and quite satisfactory results have been obtained. Air slaked lime has been used in the place of water for carrying the fungicides and insecticides, although it, in itself, to a certain extent is both.

The formulæ recommended up to the present year were not entirely satisfactory, as they did not contain the copper in the same chemical condition as in Bordeaux mixture. Experiments were conducted by the chemist of the Missouri Experiment Station, and a dust is now recommended which is said to have the copper in the right chemical condition. The formula, with methods of preparation, is given in Bulletin No. 60, Missouri Experiment Station, Columbia, Mo., U.S.A.

A dust machine was obtained from the Ozark Sprayer Company, Springfield, Mo., and tested at the Experimental Farm this year. It was found to distribute the dust satisfactorily, but in order to get the dust to adhere to the leaves it must be applied when the dew is on the foliage. This is a serious drawback to dust spraying in this time of scarcity of labour. Moreover, the liquid spray gives such satisfactory results when properly made and applied, that the dust spray is not likely to take its place, except, perhaps, where the ground is rough, or where the orchards are on steep hillsides.

It would appear at first that there was great danger from the use of arsenical poisons when applied in a dust spray, but while there is undoubtedly danger if the dust is inhaled, the nozzle is so far away from the operator that there is really little or no danger if the work is carefully done.

DISEASES OF FRUITS.

There are a few diseases of fruits which cause much more loss than others, and although these have already been discussed and remedies recommended many times, one cannot too often refer to them, as the endeavour to prevent and control them is by no means general yet.

Apple spot fungus.—The apple spot fungus, or apple scab, is still one of the commonest diseases in Canadian orchards, but it is one of the easiest to control, as the Bordeaux mixture, if thoroughly applied at the proper times, is very effectual. The most important sprayings are: 1st, just before or as buds start to develop; 2nd, just before blossoms open; 3rd, as soon as possible after blossoms fall. Also 4th, 5th, and even 6th, sprayings at intervals of ten days to two weeks after the 3rd spraying, if the first sprayings are not sufficiently effective.

In 1903 the spot was not as bad as usual, probably owing to the dry weather in spring and early summer, which was unfavourable to the development of spores. In eastern Ontario and most of the province of Quebec there was practically no spot, and the fruit was cleaner than it has been for years. Spraying should be thoroughly done in 1904, so as to endeavour to keep this fungus under better control, now that it has received a check. The experience of this year shows the importance of early spraying. Although the summer was a very wet one after the middle of June, no spot developed in the east.

Ripe rot, brown rot.—This disease does great injury every year to the peach and plum crop. It is not as easily controlled as the apple spot, but thorough spraying has been found very effectual. The ripe rot spreads by means of spores, which germinate early in the spring and penetrate the twigs from the leaves and flower buds on which they alight. In order to destroy as many of the spores as possible, all diseased fruit should be gathered and burned, whether it is on the ground or on the tree. This fruit harbours myriads of spores, which endure the winter, and are capable of infecting the trees the following spring. The trees should be thoroughly sprayed in time to destroy the spores before the disease penetrates the wood in the spring. The first spraying should be made with poisoned Bordeaux mixture, or a sulphate of copper solution, 1 pound sulphate of copper to 25 gallons of water, shortly before the buds start to develop, and with poisoned Bordeaux mixture just before the blossoms open. These sprayings are very important, and should never be neglected. After the trees have bloomed they should be thoroughly sprayed again with ordinary poisoned Bordeaux mixture, and also ten days to two weeks before the fruit begins to colour. The trees should also be sprayed with ammoniacal copper carbonate solution when the fruit is beginning to ripen. This will destroy the spores which appear in great numbers on the mature plums, and will not discolour the fruit. Plums and peaches which touch one another on the tree give very favourable conditions for the spread of the disease from one fruit to another. Being close together, moisture is retained on the skin, and the spores which may be on one fruit germinate readily and soon infect the next, and thus the disease spreads rapidly. Thinning the fruit makes the conditions much less favourable for the development of the disease. Also discoloured and dead wood should be cut out and burned in the meantime. If spraying is thoroughly done the injury from this disease will be much lessened.

Peach-leaf curl.—The leaf curl has been very troublesome in peach orchards during recent years, but it has been so well proven that it can be kept under control by spraying that peach growers need not now suffer much from this disease. The presence of the leaf curl is known early in the spring by the abnormal curling and swelling of the peach leaves. There is also frequently a whitish bloom accompanying these symptoms. Two early applications of Bordeaux mixture, if thoroughly applied, are all that are necessary; the first after the flower buds begin to swell and before they open, and the second, just after the blossoms fall.

Black rot of the grape.—Fruit growers in the south-western part of Ontario along Lake Erie are becoming discouraged in their efforts to grow profitable crops of grapes, owing to the prevalence of black rot fungus, which has done great damage there in recent years, and was again very bad in 1903, causing almost or quite a total loss of crop in some vineyards. This disease is very difficult to control, especially when it has gained such a foothold as it has in the south-western peninsula, but it can be controlled by spraying regularly year after year, as has been proven by experiments which have been made and by the results obtained by some commercial growers. The price obtained for grapes in Ontario is now so low that Canadian growers hesitate to spray as frequently as is recommended, and hence the disease is not checked. It has been found necessary to spray six or seven times in order to check the rot immediately. The first spraying should be made with a sulphate of copper solution (1 lb. of sulphate of copper to 25 gallons of water) before the bursting of the buds. The second spraying should be with poisoned Bordeaux mixture before the flowers open. This is a very important spraying, and if neglected may mean great loss from the rot. The third spraying should be made with poisoned Bordeaux mixture just after the blossoms fall, and the fourth spraying with the same mixture about two weeks later. There should then be from two to three sprayings with the ammonical copper carbonate solution at intervals of about two weeks.

COVER CROPS.

Cover crops are now recognized to be so essential to the most successful culture of large fruits that it might seem like repetition to deal with them again, were it not for the fact that new information is being constantly obtained at the Central Experimental Farm as to the methods of growing these crops, to the kind of plants used for this purpose, to their relative value as plant food, and to their effect on the moisture content of the soil. Information regarding plant food and moisture-content will be found in the report of the Chemist, who has taken many samples for analysis from the orhcard.

The main uses of the cover crop in the orchard are: to hold the snow in winter and to protect the roots of the trees; to furnish vegetable matter to plough under in the spring for the purpose of obtaining humus and nitrogen, and to act as a catch crop in autumn to prevent leaching of plant food made available during the summer. Much has been written in former reports regarding the value of clover as a cover crop. The experiments this year were made to test other plants grown in a different way.

It is sometimes difficult to get a good stand of clover in the autumn, owing to dry weather after seeding time, and as in the north especially it is very desirable to have the cover crop as tall as possible so that it will hold the snow, some methods of ensuring a good growth were thought of, and it was decided to try growing a cover crop in drills. By adopting a plan of this kind it was thought that the seed could be sown comparatively early, and when it germinated the soil between the rows could be cultivated until the usual time, and thus conserve almost as much moisture as if the ground were bare, and yet a good cover crop would be sure to be established.

The kinds of plants used were horse beans, soja beans and hairy vetch, the two former being planted with the object of having something that would grow tall and hold the snow well. It was also observed in former years that the horse bean stood several degrees of frost, which is an advantage.

The seed was sown at two different dates, the object being to learn when was the best time for the purpose intended. All received two cultivations.

Horse beans: 1st sowing June 18. Sown at the rate of one bushel per acre, in rows 28 inches apart. These germinated well and grew rapidly, the cool weather of the past summer appearing to suit them well. By July 28, the plants were from 15 to 18 inches high, and were beginning to bloom. On September 21, a plot four feet square was cut, and the yield when still green was found to be at the rate of 7 tons 733 lbs. per acre. At this time the plants were 3 feet 6 inches to 4 feet in height, and in some places 4 feet 6 inches high, and although the ground between the rows was not covered with foliage, it was nearly so. The plants at this time were still growing and blooming profusely, and pods were well formed to a height of 2 feet 6 inches from the ground. By October 6 some of the plants were 5 feet in height. It was not until October 26 that the plants were much injured by frost, but they remained alive near the ground until the winter set in, November 16. At this time, November 30, the plants are standing up well, and it is expected they will hold the snow admirably. In the spring they will be harrowed or ploughed in, when, being leguminous plants, they will add much nitrogen to the soil.

Horse beans: 2nd sowing.—Sown June 26, at the rate of one bushel per acre in rows 28 inches apart. Up July 5. On September 21, the plants were 3 feet 6 inches in height. They were not so well podded as the first sown, but were healthy, in full bloom, and podded to a height of 2 feet 2 inches, and growing vigorously. Although not as tall as the first sown plants, they were tall enough to hold the snow well.

Horse beans: 3rd sowing. Sown July 7 at the rate of one bushel per acre in rows 28 inches apart. The plants reached a height of 3 feet and more, and should hold the snow well. They bloomed freely and pods were well formed before winter.

Soja beans: 1st sowing.—Sown June 18, at the rate of 37½ lbs. per acre in rows 28 inches apart. Owing to the cool summer, the soja beans did not make as rapid growth as they would otherwise have done, as they require plenty of heat, but the fall being warm they had good time to develop. On September 21, a plot four feet square was cut and the green crop found to weigh at the rate of 7 tons 350 lbs. per acre. At this time the plants were 2 feet to 2 feet 3 inches in height, and meeting between the rows in most places. The plants were well podded and still growing thriftily. At the first light frost, however, they were killed, as the Soja bean is very tender. The Soja bean should hold the snow well this winter, and will be valuable for turning under in spring.

Soja beans: 2nd sowing. Sown June 26 at the rate of 37½ lbs. per acre in rows 28 inches apart. Up July 2. On September 21, the plants were from 2 feet to 2 feet 3 inches in height and meeting between the rows in most places. The pods were not so well matured as the first sown, but otherwise there was very little difference between them.

Soja beans: 3rd sowing.—Sown July 7 in same manner as the others. By September 21, the plants were 2 feet to 2 feet 3 inches in height, having grown rapidly.

Vines were about as large as those of the first and second sowings, but the pods were not as well developed. This sowing was on warmer soil, which accounts for the rapid growth.

Hairy vetch: 1st sowing. Sown June 18 at the rate of 20 lbs. per acre and in rows 28 inches apart. The seed germinated well, and by the end of the first week of August the plants were meeting between the rows. On September 21, the length of the vines was 3 feet to 3 feet 6 inches in length. The vines formed a perfect carpet, and it was impossible to distinguish the rows. At this date a plot four feet square was cut, and the green crop was found to weigh at the rate of 11 tons 1,895 lbs. per acre. The Hairy Vetch continued to grow up to the time winter set in on November 16, only a few leaves here and there being injured by the earlier frosts. It had not begun to bloom when the growth was checked by winter. The Hairy Vetch will not hold the snow as well as the horse beans, but as it forms such a thick mat on the ground, the frost will probably not be so deep as where horse beans and Soja beans were grown; it makes a perfect mulch and will prevent thawing and freezing to a large extent. Furthermore, it is rich in plant food and is very valuable for turning under. The Hairy Vetch as a cover crop is a keen rival of red clover in this district, and under some conditions, such as where there is rough ground, will give better satisfaction.

Hairy Vetch: 2nd sowing.—Sown June 26, at the rate of 20 lbs. per acre, in rows 28 inches apart. Up July 2. By September 21 this had formed a thick mat, and the rows could not be distinguished, although the mat was not as thick as where the vetch was sown earlier. The vines at this date were 2 feet 6 inches to 3 feet in length. The cover was very satisfactory at this date, and by winter it was much better.

Hairy Vetch: 3rd sowing.—Sown August 7 in the same manner as at previous times. By winter the vines had formed a good mat, though this was not thick enough to be perfectly satisfactory, and as the autumn was favourable for growth this is a little too late to plant the hairy vetch as a cover crop here.

Cost per acre of seed of cover crops, sown in drills, 1903.

Horse beans: 60 lbs. at 3⅓ cents per lb.	$2 00
Soja beans: 37½ lbs. at 9 cents per lb.	3 37½
Hairy vetch: 20 lbs. at 9½ cents per lb.	1 90

Common red clover sown broadcast, 12 lbs. per acre at 14 cents per lb. costs $1.68.

LIST OF BEST VEGETABLES FOR FARMERS.

The list of best vegetables for farmers was omitted last year, as there were few changes to make. There are some changes to make this year, and as such lists are liable to get lost it is thought best to publish it again. Furthermore, owing to the limited number of pages available for reporting on the tests made, it is not possible to go into details with many kinds of vegetables. The following list gives in a concise form the names of the varieties considered best after many years' tests:—

Asparagus.—Conover's Colossal is the best all-round variety, but this variety is more subject to rust than Palmetto or Argenteuil.

Beans.—Keeney's Rustless Golden Wax, or Wardwell's Kidney Wax, for early crop; Early Refugee, for medium; and Refugee or 1,000 to 1, for late crop, are the most satisfactory dwarf varieties. Asparagus, Lazy Wife and Old Homestead are three of the best pole varieties.

Beets.—Egyptian Turnip, Eclipse and Bastian's Blood Turnip are three of the best varieties.

Borecole or Kale.—Dwarf Green Curled Scotch is the best.

Broccoli.—White Cape.

Brussels Sprouts.—Improved Dwarf is the most satisfactory.

Cabbage.—Early Jersey Wakefield (early), Succession (medium); Late Flat Dutch, Drumhead Savoy (late), Red Dutch (red), is a select list of the best varieties of cabbage. For extra early use Paris Market is desirable, being a week earlier than Early Jersey Wakefield.

Cauliflowers.—Extra Early Dwarf Erfurt and Early Snowball.

Carrots.—Chantenay is one of the best, but if a good extra early sort is required, the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Golden Self-Blanching (Paris Golden Yellow), Improved White Plume, White Walnut (early); Perfection Heartwell, White Triumph, London Red (late), are among the best.

Corn.—Early Fordhook, Early Cory (early); Crosby's Early, Henderson's Metropolitan (second early); Perry's Hybrid, Stabler's Early, Early Evergreen, and Black Mexican (medium); Stowell's Evergreen, Country Gentleman (late). In planting, the Country Gentleman should not be omitted, as it lengthens the season very considerably, and is of fine quality.

Cucumbers.—Peerless White Spine or White Spine, Cool and Crisp, and Giant Pera are three of the most satisfactory slicing varieties. Boston Pickling is a good pickling sort.

Egg Plants.—New York Improved and Long Purple succeed best.

Lettuce.—Black Seeded Simpson, The Morse, and New York (curled), Improved Salamander, Unrivalled, Tennis Ball and Golden Queen (cabbage); Trianon and Paris Cos lettuce.

Melons, Musk.—Long Island Beauty, Hackensack and Montreal Market, of the Nutmeg type, and Surprise, Christiana and Emerald Gem, of the yellow fleshed types, are all good.

Melons, Water.—Cole's Early, Imperial, Ice Cream, and Phinney's Early are early water melons of excellent quality.

Onions.—Yellow Globe Danvers and Large Red Wethersfield are two of the best onions in cultivation.

Parsnips.—Hollow Crown and Dobbie's Selected are both good sorts.

Parsley.—Double Curled is as good as any.

Peppers.—Cayenne, Cardinal, Chili and Golden Dawn are four of the best.

Pease.—Gregory's Surprise, Gradus, American Wonder and Premium Gem (early); McLean's Advancer, Nott's New Perfection, and Heroine (medium). None of these are tall growing varieties. Stratagem, Juno (dwarf), Telephone (late). Excelsior is a promising second early sort.

Potatoes.—Extra Early: Early Ohio and Early Andes (pink), Bovee and Burpee's Extra Early (pink and white). Early: Everett and Rochester Rose (pink), Early Puritan (white). Main crop: Carman No. 1 (white), Empire State (white), Late Puritan (white), American Wonder (white), Dreer's Standard (white), Rural Blush (pink).

Radishes.—Early: Scarlet White-tipped Turnip, Rosy Gem, French Breakfast, Red Rocket (red) and Icicle (white). Late: White Strasburg, Long White Vienna. Winter: Long Black Spanish, Chinese Rose-coloured.

Rhubarb.—Linnæus and Victoria are the most satisfactory.

Salsify.—Long White and Sandwich Island.

Spinach.—Victoria and Thick-leaved are the best.

Squash.—Early: White Bush Scalloped and Summer Crook Neck. Late: Hubbard.

Tomatoes.—Early: Sparks' Earliana. Main crop: Brinton's Best, Trophy, Matchless (scarlet) and Burpee's Climax and Autocrat (purplish pink).

There are many varieties of tomatoes which are almost equal in excellence and productiveness.

Turnips.—Early: Extra Early Milan and Red Top Strap Leaf. Swedes: Champion Purple Top, Skirving's Improved.

POTATOES.

Although the crop of potatoes was not as good as last year owing to the extremely dry weather in the early part of the summer, the largest yield, which was given by the Dreer's Standard, was at the rate of 534 bushels 36 lbs. per acre, and the lowest yield, that of the Red Rock, was only 19 bushels 48 lbs. per acre, a difference between highest and lowest in the 97 varieties under test of 514 bushels 48 lbs. per acre, which shows the great importance of planting only the most productive kinds.

The potatoes were planted in good sandy loam soil, which had been well manured for tobacco the previous year. The soil was ploughed in the fall and again in the spring and thoroughly harrowed with disc and smoothing harrow shortly before planting. Drills 2½ feet apart and about 4 inches deep were opened with the double mould board plough, and 66 sets of each variety were planted 1 foot apart in a single row. The sets were of good size, having at least three eyes and a liberal amount of flesh. The sets were injured somewhat by the dry weather and did not grow as evenly as usual. In some of the experiments, particularly in a spraying experiment, the sets came up too unevenly to get accurate results, hence these are omitted this year. The soil was harrowed once before the potatoes were above ground, to kill weeds, and then kept loose with the cultivator until the vines met. The potatoes were kept thoroughly sprayed to prevent injury from potato beetles and blight. The potatoes were planted on May 22, and dug on October 5 and 6.

POTATOES—Test of Varieties.

No.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Un-marketable.		Colour.
1	Dreer's Standard..........	Good.	534	36	508	12	26	24	White.
2	Carman No. 1....	"	514	48	490	36	24	12	"
3	Late Puritan.............	"	473	0	433	24	39	36	"
4	Bergeron..................	Medium	464	12	440	0	24	12	White, pink eye
5	Canadian Beauty...........	Good.... ...	451	0	402	36	48	24	Pink and white.
6	Dakota Red................	Medium....	442	12	398	12	44	0	Red.
7	Rural Blush..........	Good......	440	0	411	24	28	36	Pink.
8	Dr. Maercher	Medium....	429	0	391	36	37	24	White.
9	Clay Rose......	"	418	0	387	12	30	48	Pink.
10	Burnaby Seedling	Good.......	418	0	376	12	41	48	Pink and white.
11	Burnaby Mammoth.........	"	415	48	385	0	30	48	" "
12	American Giant......... ...	Medium....	411	24	341	0	70	24	White.
13	Flemish Beauty............	Good.....	402	36	360	48	41	48	Bright pink.
14	Rose No. 9................	Medium....	398	12	385	0	13	12	Pink.
15	Money Maker.............	Good.	396	0	367	24	28	36	White.
16	Uncle Sam................	"	393	48	367	24	26	24	"
17	Everett.........	"	393	48	356	24	37	24	Pink.
18	State of Maine.............	"	387	12	363	0	24	12	White.
19	Peachblow	Medium....	385	0	341	0	44	0	"
20	Troy Seedling.............	"	374	0	330	0	44	0	"
21	Seattle.................. ...	"	371	48	334	24	37	24	"
22	Cambridge Russet...... ...	Good....	369	36	336	36	33	0	"
23	I. X. L...................	"	367	24	334	24	33	0	Pink and white.
24	Enormous..................	"	363	0	330	0	33	0	White.
25	Vanier..........	Poor to med.	358	36	323	24	35	12	Red.
26	Seedling No. 7.............	Medium....	356	24	332	12	24	12	Bright pink.
27	Rural No. 2....	Good.....	352	0	321	12	30	48	White.
28	Penn. Manor..............	....	347	36	323	24	24	12	Pink and white.
29	Country Gentleman.........	....	347	36	303	36	44	0	White.
30	Dooley................. ...	....	341	0	330	0	11	0	
31	Irish Cobbler..............	Good......	338	48	299	12	39	36	White.
32	Pearce	"	334	24	301	24	33	0	Pink and white.
33	Sabean's Elephant.........	"	330	0	299	12	30	48	White.
34	Mammoth Pearl............	....	319	0	310	12	8	48	"
35	Burpee's Extra Early.	Good.......	319	0	283	48	35	12	Pink and white.
36	Doherty's Seedling	"	316	48	297	0	19	48	White.
37	Lee's Favorite.	"	312	24	297	0	15	24	Pink.
38	Early Norther..............	"	310	12	264	0	46	12	"
39	Brown's Rot Proof..........	Medium....	305	48	272	48	33	0	"
40	Swiss Snowflake...........	Good......	305	48	268	24	37	24	White.
41	Rochester Rose............	"	305	48	246	24	59	24	Pink.
42	Delaware..................	"	301	24	233	12	68	12	White.
43	Vick's Extra Early.........	"	299	12	270	36	28	36	Pink and white.
44	New Queen.........	"	292	36	264	0	28	36	" " "
45	Early Elkinah.............	"	292	36	259	36	33	0	Pink.
46	Northern Beauty...... ...	....	292	36	257	24	35	12	
47	Crimes Lightning..........	....	290	24	279	24	11	0	
48	Irish Daisy...............	Good.......	288	12	270	36	17	36	White.
49	Jubilee......	"	286	0	257	24	28	36	Pink and white.
50	Early Envoy..............	....	283	48	257	24	26	24	
51	White Elephant...........	....	281	36	266	12	15	24	Pink and white.
52	Montana Bluff..	... .	279	24	255	12	24	12	White, bright pink eye.
53	Quaker City..............	....	272	48	242	0	30	48	White.
54	Reeve's Rose.............	Good..	272	48	233	12	39	36	Pink.
55	Early Ohio...............	"	268	24	233	12	35	12	"
56	Sir Walter Raleigh........	....	268	24	233	12	35	12	White.
57	Early Michigan	....	268	24	204	36	63	48	"
58	Maule's Thoroughbred......	....	266	12	222	12	44	0	Pink.
59	Holborn Abundance........	Medium....	261	48	253	0	8	48	White.
60	Green Mountain...........	Good......	259	36	222	12	37	24	"
61	Carman No. 3............	"	253	0	228	48	24	12	"
62	McIntyre	Medium....	253	0	228	48	24	12	White and purple.
63	Napoleon............	Good.......	246	24	222	12	24	12	Pink.
64	Maggie Murphy..... ...	Medium....	242	0	209	0	33	0	Bright pink.
65	Snowball..................	....	242	0	195	48	46	12	White.

POTATOES—Test of Varieties—*Continued.*

No.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Un-marketable.		Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
66	Livingston	....	242	0	200	12	41	48	White, pink eye.
67	Burbank's Seedling	Good	239	48	189	12	50	36	White.
68	Wonderful	....	231	0	204	36	26	24	
69	Brosseau	....	224	24	198	0	26	24	Red and white.
70	Polaris	Good	215	36	187	0	28	36	White.
71	Dublin Prize	....	213	24	178	12	35	12	
72	Early Rose	Good	209	0	169	24	39	36	Pink.
73	Rawdon Rose	....	202	24	184	48	17	36	Pink and white.
74	Wall's Orange	....	200	12	178	12	22	0	Yellow, purple eye
75	Sharpe's Seedling	Good	193	36	162	48	30	48	Pink and white.
76	Juana	....	191	24	149	36	41	48	
77	Early Puritan	Good	189	12	149	36	39	36	White.
78	Van Orman's Earliest	....	184	48	173	48	11	0	
79	Empire State	Good	180	24	165	0	15	24	White.
80	General Gordon	"	180	24	154	0	26	24	Pink.
81	Up-to-Date	"	180	24	154	0	26	24	White.
82	Pink Eye	....	180	24	136	24	44	0	White, bright pink eye.
83	American Wonder	Good	169	24	143	0	26	24	White.
84	Early Sunrise	"	169	24	129	48	39	36	Pink.
85	Prolific Rose	....	162	48	134	12	28	36	Pink.
86	Eureka Extra Early	....	162	48	129	48	33	0	
87	Seedling No. 2. (D. Murray)	....	162	48	101	12	61	36	
88	Bliss Triumph	....	140	48	103	24	37	24	Red.
89	Early St. George	Good	121	0	107	48	13	12	Pink and white.
90	Silver Dollar	....	114	24	83	36	30	48	White.
91	Bovee	Good	103	24	88	0	15	24	Pink and white.
92	Early Summer	....	85	48	77	0	8	48	" "
93	Early White Prize	Good	57	12	57	12	....		White.
94	Pingree	....	37	24	28	36	8	48	
95	Early Andes	Good	33	0	19	48	13	12	Pink.
96	Pat's Choice	....	30	48	26	24	4	24	
97	Red Rock	....	19	48	19	48	....		Red.

ADDITIONAL VARIETIES OF POTATOES TESTED IN 1903.

The following varieties, some of which were sent for test, were grown in smaller plots:—

Name of Variety.	Number of Sets Planted.	Total Yield per Acre.		Yield Per Acre of Marketable.		Yield per Acre of Unmarketable.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Morgan seedling	20	522	43	450	7	72	36
Vermont Gold Coin	21	477	6	456	21	20	45
Morgan White	20	392	2	363	..	29	2
John Bull	6	387	22	333	48	48	24
Quick Crop	22	369	12	316	48	59	24
Hammond's Wonderful	10	333	57	319	26	14	31
Clark's Pride	9	322	40	274	16	48	24
Nott's Peachblow	22	303	36	264	..	39	36
Peck's Early	22	303	36	264	..	39	36
Rough Coat Cup	60	229	54	159	43	70	11
Early Carter	60	227	29	196	1	31	28
Vick's No. 9	8	217	48	181	30	36	18
Daybreak	4	217	48	181	30	36	18
James' Nugget	42	186	41	79	31	107	10
Todd's Seedling	20	65	21	43	34	21	47

TWELVE BEST YIELDING VARIETIES OF POTATOES—AVERAGE OF FOUR TO NINE YEARS.

Name of Variety.	Average Yield per Acre.		Name of Variety.	Average Yield per Acre.	
	Bush.	Lbs.		Bush.	Lbs.
1. Late Puritan, 9 yrs.	436	32	7. Carman No. 1, 9 yrs.	398	4
2. Holborn Abundance, 9 yrs.	408	10	8. Burnaby Seedling, 8 yrs.	394	44
3. American Wonder, 9 yrs.	401	28	9. Country Gentleman, 5 years	392	2
4. Uncle Sam, 4 yrs.	401	8	10. Rose No. 9, 7 years	390	39
5. Dreer's Standard, 9 yrs.	398	50	11. Money Maker, 9 yrs.	386	36
6. Penn Manor, 5 yrs.	398	38	12. State of Maine, 9 yrs.	379	48

An average crop for the twelve varieties of 399 bush. 13 lbs. per acre.

The above table was taken from bulletin No. 44, prepared by Dr. Wm. Saunders and Dr. C. E. Saunders.

EXPERIMENTS WITH CORN.

In the following table will be found the average results from testing varieties of sweet corn for the past five years. Although many varieties have been tested, those in the table have proven the most productive. The soil in which the corn was planted this year was a light sandy loam on which vegetables were grown in 1902. The soil received a good dressing of rotted barnyard manure in the spring of 1903, and was then ploughed and thoroughly harrowed. The corn was planted on May 23 in hills three feet apart each way. About six kernels were planted in a hill. After germination had taken place and danger from cut-worms was over, the number of plants in a hill was reduced to four, twenty-four hills of each variety were planted, but twelve average hills of each were used for comparison. The corn was kept thoroughly cultivated during the summer.

Name of Variety	Fit for use, 1903.	Average date fit for use, 1899-1903.	Height, 1903.		Length of ears, 1903.	Average length of ears, 1899-1903.	Marketable ears from 12 hills, 1903.	Average number of marketable ears from 12 hills, 1899-'03.
Early.			feet.	in.	Inches.	Inches.		
Early Fordhook	Aug. 19	Aug. 17	5		5	$6\frac{1}{5}$	57	60
Extra Early Cory	" 22	" 18	5	7	6	$6\frac{2}{5}$	48	57
Burbank's Early Maine	" 22	" 19	5	4	7	7	41	57
Lackey's Early Sweet	" 27	" 19	5		6	$6\frac{3}{5}$	48	56
Ford's Early	" 28	" 19	5	10	$6\frac{1}{2}$	7	62	56
Early Marblehead	" 19	" 17	5	6	$6\frac{1}{2}$	$6\frac{4}{5}$	34	47
Second Early.								
Crosby's Extra Early	Sept. 5	Aug. 29	7	2	7	$6\frac{3}{5}$	38	58
Metropolitan	" 8	....	6	8	7	$7\frac{1}{5}$	56	51
Early Giant Sweet	" 5	Aug. 30	6	7	7	$7\frac{3}{10}$	47	50
Kendall's Early Giant	Aug. 31	" 28	5	2	6	$6\frac{9}{10}$	37	49
Child's Honey Dew	Sept. 5	" 31	7	1	7	$7\frac{2}{5}$	45	48
Shaker's Early	" 10	Sept. 2	7	4	7	$7\frac{9}{10}$	35	45
Medium.								
Black Mexican	Sept. 15	Sept. 6	6	10	7	$7\frac{1}{5}$	75	68
Stabler's Early	" 12	" 6	7		7	$7\frac{1}{2}$	53	52
Perry's Hybrid	" 10	....	7	2	$7\frac{1}{2}$	$7\frac{4}{5}$	44	47
Moore's Early Concord	" 12	Sept. 5	6	7	$7\frac{1}{2}$	$7\frac{3}{5}$	44	47
Early Evergreen	" 12	....	7	2	$7\frac{1}{2}$	$7\frac{1}{5}$	52	43
Late.								
Zig-Zag Evergreen (1899-1902)	....	Sept. 10	......	......	......	$7\frac{1}{4}$	....	49
Country Gentleman	Sept. 20	" 14	7		6	$6\frac{7}{10}$	36	47
Columbus Market	" 20	" 13	8	6	8	9	46	42
Shoe Peg (Ne Plus Ultra)	" 20	" 14	7	3	6	$6\frac{4}{5}$	39	40
Mammoth Sweet	" 17	" 14	7	6	$7\frac{1}{2}$	8	52	40
Stowell's Evergreen	" 20	....	7	5	$7\frac{1}{2}$	$7\frac{3}{5}$	25	34

TOMATOES.

This was an unfavourable season for tomatoes, and the yields in consequence were not large. The spring frosts destroyed many plants in this neighbourhood, and the wet, cool weather of most of the summer prevented much fruit from ripening on those plants which did escape the frost. At the Experimental Farm the plants were not set until after the frosts were over. If it had not been for the warm weather in September and October the yields would have been very much less than they were. A season like the past one brings out the value of the varieties of tomatoes which ripen their fruit early. The reader's attention is directed to the table in which is given the six varieties which ripened the most fruit previous to August 15. These are taken from a collection of 90 varieties tested this year. In this table it will be found that the Sparks Earliana yielded at the rate of 1,701 lbs. 9 oz. per acre before August 15. Between the

Early Ruby and the Sparks Earliana there is a difference in favour of the latter variety of 510 lbs. 8 oz. per acre. Tomatoes were selling in Ottawa on August 15, 1903, at 80 to 90 cents a pail, and before this date at higher prices. Taking the price at 80 cents a pail, and 20 lbs. of tomatoes to the pail, we have a difference in favour of Sparks Earliana of $20.42 per acre, and this in comparison with Early Ruby, which is also a very early variety, but not as smooth as Sparks Earliana. The Comrade did even better than the Sparks Earliana, but this is unusual, while the Sparks Earliana has always been very early and is recommended as the best early variety yet tested.

The seed of the tomatoes grown this year was sown in hot beds on March 24; the young plants were pricked out into strawberry boxes on April 17, and planted in the open ground on June 3, four by four feet apart each way, five plants of each variety being set. The soil was a light sandy loam which had been well manured for corn the previous year. The soil was kept cultivated until the growth of the vines prevented it.

TOMATOES—TWELVE BEST YIELDING VARIETIES, 1903.

Name of Variety.	Date of First Ripe Fruit, 1903.	Yield of Ripe Fruit to Aug. 15, 1903—five plants.		Total Yield of Ripe Fruit per acre to Aug. 15, 1903.		Total Yield of Ripe Fruit, five plants, all pickings 1903.		Total Yield of Ripe Fruit per plant, 1903.		Remarks.
		Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	
Atlantic Prize	Aug. 1.	1	4	680	10	114	4	22	14	Medium size, wrinkled to almost smooth, scarlet.
Canada Victor	July 21.	1	8	816	12	91	..	18	3	Medium size, wrinkled, scarlet.
Dominion Day	Aug. 29.	..	..	..	..	90	8	18	2	" " "
Early Bermuda	" 29.	..	..	..	..	81	4	16	4	" " "
Extra Early Advance	July 16.	1	7	782	11	78	3	15	10	Below medium size, smooth, scarlet.
Nolt's Earliest	" 16.	1	7	782	11	74	6	14	14	Medium size, wrinkled, scarlet.
Early Bird	" 17.	2	3	1,191	1	73	11	14	12	Below medium size, smooth, purplish pink.
Thorburn's Earliest	" 21.	1	8	816	12	71	..	14	3	Medium size, wrinkled, scarlet.
Bright and Early	Sep. 1.	..	..	..	..	68	..	13	10	Below medium size, smooth, scarlet.
Maule's Earliest	Aug. 1.	1	..	544	8	67	12	13	9	Medium size, wrinkled, scarlet.
Quicksure	July 20.	2	6	1,293	3	66	14	13	6	Medium size, wrinkled to almost smooth, scarlet.
Extra Early Red	" 16.	2	3	1,191	1	64	11	12	15	Below medium size, smooth, scarlet.

TOMATOES—SIX EARLIEST VARIETIES, 1903.

Comrade	July 16.	3	12	2,041	14	32	8	6	8	Medium to below medium size, smooth, scarlet.
Sparks' Earliana (C.E.F.)	" 16.	3	2	1,701	9	52	3	10	7	Medium size, half wrinkled to smooth, scarlet.
Burpee's Climax	" 18.	3	..	1,633	8	46	4	9	4	Medium size, smooth, purplish pink.
Sparks' Earliana	" 20.	2	12	1,497	6	49	12	9	15	Medium size, half wrinkled to smooth, scarlet.
Frogmore Selected	" 16.	2	6	1,293	3	38	2	7	10	Below medium size, almost smooth, scarlet.
Quicksure	" 20.	2	6	1,293	3	66	14	13	6	Medium size, wrinkled to almost smooth, scarlet.
Early Ruby	" 17.	2	3	1,191	1	46	4	9	4	Medium size, half wrinkled to smooth, scarlet.

SIX BEST YIELDING WRINKLED VARIETIES—AVERAGE FOR FIVE YEARS OR MORE.

Variety.	Number of Years.	Average Date of First Ripe Fruit.	Average Yield per plant. Lbs.	oz.	Remarks.
Dominion Day	5	Aug. 7.	17	12	Medium size, wrinkled, scarlet.
Early Bermuda	8	" 9.	16	14	" " "
Canada Victor	8	" 4.	16	6	" " "
Maule's Earliest	5	" 4.	16	1	" " "
Money Maker	8	" 3.	14	14	" " "
Conqueror	8	" 1.	14	3	" " to smooth, scarlet.

TWELVE BEST YIELDING SMOOTH VARIETIES—AVERAGE FOR FIVE YEARS OR MORE.

Bright and Early	7	Aug. 12.	16	9	Below medium size, smooth, scarlet.
Bond's Early Minnesota	8	July 31.	15	6	" " purplish pink.
Early Bird	5	Aug. 2.	15	5	" " "
Atlantic Prize	8	" 4.	15	3	Medium size, smooth to almost smooth, scarlet.
Extra Early Advance	8	" 3.	15	2	Below medium size, smooth, scarlet.
Early Ruby	8	July 29.	14	7	Medium size, half wrinkled to smooth, scarlet.
Freedom	6	Aug. 3.	14	1	Medium to below medium size, smooth, scarlet.
Extra Early Red	5	" 1.	13	12	Below medium size, smooth, scarlet.
Burpee's Climax	5	" 8.	13	1	Medium size, smooth, purplish pink.
Comrade	8	" 4.	13	..	Medium to below medium size, smooth, scarlet.
Brinton's Best	8	" 12.	12	14	Medium to large, smooth, scarlet.
Autocrat	8	" 16.	12	14	Medium to above medium size, smooth, purplish pink.

PEASE—EXPERIMENTS FOR COMPARISON OF YIELDS AND QUALITY.

During the past six years more than 160 so-called varieties of pease have been tested in the horticultural division. Some of these have been found to be synonyms, and a large number of them have proven inferior to a few of the best varieties. Notes are taken on the time of maturing, productiveness, quality, and length of vine of the different varieties, and four years ago some of the best kinds were selected for test in large plots. This test was continued this year. Twelve hundred selected peas of 23 varieties were sown in drills 100 feet long and 2½ feet apart on May 6. Notwithstanding the extreme drought, the pease germinated well and there was a good stand. As each variety became ready for use, the date was recorded and the yields of green pods from the several pickings entered. Owing to the wet weather during July, the length of vines this year is greater than usual. In the following table the average results for the four years 1900-1903 are given.

PEASE—TEST OF VARIETIES.

Name of Variety.	Ready for use, 1903.	Average Date, ready for use, 1900-1903.	Number of pickings, 1903.	Green Pods, 100 feet, 1903.	Average Yield of Green Pods, 100 feet, 1900-1903.	Average length of vine, 1903.	Quality.
				Quarts.	Quarts.	in.	
Early—							
Exonian	July 3	July 5	3	24	$34\frac{3}{4}$	24	Good.
American Wonder	" 5	" 6	3	28	$32\frac{3}{4}$	31	Very good.
Child's Morning Star	" 2	" 3	3	24	32	41	"
Gregory's Surprise	" 2	" 2	4	30	$31\frac{1}{4}$	40	"
Nott's Excelsior	" 5	" 6	3	26	$28\frac{1}{2}$	24	"
Thos. Laxton	" 5	....	3	32	....	40	Good
Second Early—							
Excelsior (2 years)	" 8	July 8	3	44	48	23	Very good.
Nott's New Perfection	" 13	" 11	3	52	$45\frac{1}{2}$	54	"
Chelsea	" 6	" 7	2	40	$41\frac{3}{4}$	30	"
English Wonder	" 8	" 10	4	36	$40\frac{1}{4}$	30	Good.
Gradus	" 5	" 7	3	28	$39\frac{1}{2}$	39	Very good.
Premium Gem	" 8	" 8	3	40	$37\frac{1}{2}$	41	"
Medium—							
Burpee's Quantity	" 13	" 14	2	40	$48\frac{3}{4}$	43	Good.
McLean's Little Gem	" 13	" 14	3	40	48	24	Very good.
McLean's Advancer	" 13	" 14	3	40	$46\frac{1}{2}$	46	"
Medium Late—							
Boston Wrinkled	" 18	" 19	3	66	$61\frac{3}{4}$	66	Good.
Telephone (2 years)	" 18	" 18	2	32	59	81	Very good.
Heroine (3 years)	" 20	" 20	2	44	$43\frac{1}{3}$	48	"
Market Master	" 18	....	3	48	....	40	Good.
Late—							
McLean's Prolific	" 18	July 21	2	$42\frac{2}{3}$	61	42	Good.
Champion of England	" 20	" 21	3	46	$59\frac{3}{4}$	74	Very good.
Juno	" 20	" 22	3	48	40	40	Good.
Stratagem	" 20	" 21	2	$45\frac{1}{3}$	$38\frac{1}{3}$	40	Very good.

EXPERIMENTS IN GROWING VEGETABLES IN A CHEESECLOTH INCLOSURE.

During the last three or four years a number of experiments have been tried in the United States in shading different kinds of crops. One of the most practical experiments, and one which gave the most satisfactory results from a monetary standpoint for a time was that conducted at the Connecticut Experiment Station, in shading Sumatra tobacco with cheesecloth, the extra cost in growing being much more than offset by the improved quality of the tobacco and the prices obtained for it. So much was this experiment appreciated that in 1902 there were a large number of acres of tobacco grown under shade in Connecticut.

No experiments had been conducted in Canada as far as the writer is aware in shading crops with cheesecloth until 1902, when an interesting test was made with vegetables by Dr. Graham Bell, at his Canadian home at Baddeck, Cape Breton, N.S. In these experiments it was found that the temperature was higher inside the inclosure, that lettuce and beans were tenderer, and that tomatoes ripened earlier, although the crop was not as large as outside.

At the Central Eperimental Farm two small inclosures were made this year. In one which was 24 x 17 feet in area, different kinds of vegetables were grown, and in the other, which was 62 x 14 feet, the Sumatra, Pennsylvania Seed Leaf, and Connecticut Seed Leaf varieties of tobacco were tested. These inclosures were completely covered on top and sides, and ends, with cheesecloth. Owing to the very cool, wet summer, which was unfavourable to a test of this kind, especially with tobacco, the results in most respects were by no means conclusive. The experiment with tobacco may be dismissed with the mere statement that the plants grew better inside the inclosure and the leaves were nearly all perfect, while outside they were broken by the wind and injured by the soil. The texture of the leaf was lighter inside than outside.

In the other inclosure a number of kinds of vegetables were tested, the same varieties being grown just outside for comparison. As was already stated, the season was too wet and cool to get conclusive results, but the following notes are interesting and may be suggestive:—

All the vegetables inside grew better at first than those outside, and some continued to grow better until the end of the season.

Beets, sown June 10:—The tops were about as good inside as outside, but when they were pulled it was found that the crops of roots outside weighed 22½ lbs., while that inside was only 9 lbs.

Lettuce, sown June 10:—The plants grew almost equally as well inside as outside the inclosure. Outside they were from two to four days earlier than inside.

Radish, sown June 10:—Radish was ready for use inside fully three days before those outside. The radishes inside were perfectly free from maggots, while those outside were practically worthless. Those inside grew to be a large size before losing their crispness.

Beans, sown June 10:—The beans were ready for use three days earlier inside than outside, and the plants were about as vigorous. There were 11 quarts of green beans inside, as against 14 quarts outside.

Egg Plants, Water Melons, and Musk Melons, planted June 10:—These were all failures as regards crop, both inside and outside, owing to the wet and cool summer, but all plants grew well in both places. Hand pollination would be necessary to insure a crop even in a favourable season, as few or no insects could get into the inclosure.

Cauliflower, planted June 10:—The root maggot attacked those outside badly, while those inside, though injured some in the cold frame before transplanting, were not affected inside the inclosure.

Cucumbers, planted June 10:—Although the plants grew well, no cucumbers set inside until autumn, at which time a few rents in the cloth permitted insects to enter. There was only a small crop outside owing to the unfavourable season.

Tomatoes, planted June 10.—The plants grew well inside, but were never as robust as those outside. The first tomotoes ripened inside on July 15, and outside on July 21, six days later. The crop of ripe fruit was 55 lbs. 2 ounces outside, and only 15 lbs. 8 ounces inside, but there was twice as much ripe fruit before the middle of August inside as out.

Corn, planted June 10.—This grew more rapidly inside than out at first, but later on was not as robust.

The rain came through the inclosure as a mist, and hence the soil was not compacted the way it was outside. Light frosts which injured vegetables outside did not injure those inside.

While the vegetables were growing, daily records, with the exception of Sundays, were kept of the temperature inside and outside the inclosure. From June 12 until July 1, the readings were made at 7 a.m. and 1 p.m., and after that date until October 26, the temperature was taken at 4 p.m. as well. The temperatures taken at 7 a.m. in June and July are not considered in the average, as the position of the thermometer in the inclosure was found afterwards to favour it somewhat at that reading. The thermometer was changed on August 1. The average temperatures during the summer months up to September 1 were:—

		Number of Readings.
Outside, 7 a.m.	58·4	26
Inside, 7 a.m.	58·3	26
Outside, 1 p.m.	72·8	68

		Number of Readings.
Inside, 1 p.m.	76·23	68
Outside, 4 p.m.	74·7	52
Inside, 4 p.m.	76·9	52

The average temperature for September and October was:—

Outside, 7 a.m.	47·85	45
Inside, 7 a.m.	47·3	45
Outside, 1 p.m.	64·25	45
Inside, 1 p.m.	66·65	45
Outside, 4 p.m.	63·	44
Inside, 4 p.m.	64·7	44

As will be seen from the above the temperatures averaged a little higher inside than out. The greatest difference was 9 degrees.

Following is the description and cost of the inclosure for tobacco. The inclosure for vegetables was partly made of rough material, trees grown on the farm being used for posts, hence a fair estimate cannot be given of the cost, but the tobacco inclosure was all made of bought material.

The inclosure was 62 feet long by 16 feet wide, by 6 feet 6 inches high. These measurements being used to suit the width of the cheesecloth, the strips of which were 40 inches wide. Scantlings 2 by 4 inches were sunk 18 inches in the ground and about 8 feet apart, and when set were 6 feet 6 inches above the ground. Scantlings 2 by 4 inches were then nailed along the tops of these and across at every upright scantling for an upper framework, while along the base 6-inch boards were nailed for the same purpose. Braces of 2 by 4-inch scantling were used at the corner posts inside to strengthen the framework. A doorway was left in one corner. The cheesecloth was fastened to the frame by laths through which nails were driven. A wire was stretched across the top of the inclosure to prevent the cheesecloth from flapping and tearing.

Although there were several very severe wind storms and heavy rain storms during the summer, during which many trees were blown down, this inclosure stood well.

Cost of making cheesecloth inclosure 62 feet long by 16 feet wide, by 6 feet 6 inches high.

To 333⅓ feet 2 by 4 scantling at $15 thousand	$5 00
75 feet lumber at $20 thousand	1 50
150 laths at $2.50 thousand	37½
169 yards cheesecloth at 5 cents per yard	8 45
Stitching 169 yards cheesecloth at 1½ cents	2 53½
5 lbs. nails at 3 cents	15
10 lbs. wire at 5 cents	50
Labour in making inclosure, 41 hours at 13⅓ cents	5 47
Total	$23 98
Estimated value of materials on hand	15 99
Total expenses for 1903	7 99

It will be seen that the inclosure was quite expensive, but as the framework will probably last for five years or more, the yearly expense is lessened considerably. The cheesecloth used in the vegetable inclosure cost 4½ cents a yard, but was somewhat torn by the end of the season, and it is doubtful if it will be of much value next year. The other was stronger and was in good condition in the autumn, and will probably last through another season.

The cheesecloth inclosure may be of value in cities and towns where it is difficult to have a garden owing to the injury done by cats, dogs, and even by young children. Vegetables will probably be tenderer as a rule grown inside an inclosure, though this was not the case this season owing to the wet weather. It may be useful to market gardeners for growing vegetables which are affected by root maggots.

FOREST BELTS

The trees in the forest belts are doing well on the whole and are becoming a prominent feature here. Annual measurements are taken of the season's growth, in height and diameter, of average trees of the most important species, and useful information is thus being obtained. Tables showing the growth have been published in the report from time to time, the last one being published in 1901. The trees in the plantation of European White Birch nearly all died this year and were removed. This birch evidently is not going to be long lived here, especially in the forest belts, where it is crowded. Some additional close planting was done in the belts this autumn where other trees had died, and vacancies were filled in the younger plantations of close planted trees and shrubs. These close planted trees and shrubs, which are set 2½ by 2½ feet apart, are not cultivated after the second year, as the trees and shrubs which are used for undergrowth shade the ground and prevent the growth of weeds to a large extent. One of the best schrubs tested for undergrowth is the Nine-bark (*Neillia opulifolia*) which grows well even in sod, and as it has heavy foliage, it shades the ground well.

ARBORETUM AND BOTANIC GARDEN.

The fine collection of trees, shrubs, and herbaceous perennials which has been brought together in the Arboretum and Botanic garden is increasing in attractiveness year by year and is being more used for reference by teachers and students in their work. Practically all the specimens are now neatly labelled with zinc labels and the trees and shrubs are labelled in duplicate, in order that they may be readily identified if one label should be destroyed. This year 654 trees and shrubs comprising 534 species and varieties were added to the collection, making the total number of specimens alive 4,942 up to the autumn of 1903, comprising about 3,000 species and varieties. There were also added 155 species and varieties to the Herbaceous Perennials, making the total number of species and varieties 1,700 living in the autumn of 1903.

Notes were taken during the year on the hardiness, growth and time of blooming of the trees and shrubs, and the time of blooming, length of blooming season, descriptions of the flowers, growth and height of plants of the herbaceous perennials.

During the past six years useful lists of plants have been published in the annual reports. In 1897 descriptive lists were published of *One Hundred of the Most Ornamental Hardy Trees and Shrubs,* and also of *One Hundred of the Best Herbaceous Perennials.* In 1898 an *Additional List of Good Perennials* was given. In 1899 a list was published of *Some Good Low Growing Flowering Shrubs,* and also *an Additional list of Good Perennials.* In 1900 there was given a *List of the Best Hardy Woody and Annual Climbers.* In 1901, *A List of the Best Lilacs,* and in 1902, *A List of Best Spring Flowering Perennials.* In 1899 there was also published a *Catalogue of the Trees and shrubs* which had been tested up to that date, with notes regarding their hardiness.

These lists have been of great service to Canadians, helping them to choose the best plants.

No list has yet been published of hardy trees and shrubs which have especially attractive foliage, bark and fruit, and as it is important to know which are best in this respect a list is herewith given of some of the most attractive of those tested in the Arboretum.

DECIDUOUS TREES, SHRUBS AND CLIMBERS WITH ATTRACTIVE FOLIAGE, BARK OR FRUIT.

Acer (Maple).—It is scarcely necessary to tell Canadians of the beauty of the autumn colouring of our maples, but although we see this beauty as we wander through the woods or along the streets one often fails to plant these fine trees near the home. During the latter part of summer odd trees of the Red Maple *(Acer rubrum)* stand out among their duller surroundings clothed in scarlet and crimson, and a little later on this tree fairly makes the woods on fire with its bright coloured foliage. Still a little later, the leaves of the Hard Maple *(Acer saccharinum)* take on their varied and attractive shades of red, green and yellow, and although the colours are not as bright as on the Red Maple they are often richer. The Silver Maple *(Acer dasycarpum)* is also very attractive, the green, yellow and bronze shades predominating. The most attractive maple not native to Canada is the Ginnalian Maple *(Acer tataricum Ginnala)*. This little tree is ablaze with colour every year, no matter what the season is like, and rivals the Red Maple for brightness; scarlet, yellow, and cirmson, being the predominating colours. In the spring the Schwedler's Maple *(Acer platanoides Schwedleri)* is a very attractive tree, the young leaves being of a dark purplish crimson and contrasting well with the surrounding foliage of other trees. This tree soon loses its spring colouring, however, and the leaves become dull green. Reitenbach's Maple *(Acer platanoides, Reitenbachi)* another purple-leaved variety, while not as attractive in spring as Schwedler's Maple, retains its colour better throughout the summer.

Berberis (Barberry).—The barberries are very useful for autumn effect, as their foliage and fruit are both attractive. Among the best of these are: Thunberg's Barberry *(Berberis, Thunbergii)*, which grows about four feet high. It is a compact shrub with bright green foliage in summer which changes to deep red in autumn. The scarlet fruit is very abundant and makes this barberry quite ornamental throughout the winter. Another species *(Berberis sinensis)* is also very attractive both in foliage and fruit, and the Common Barberry *(Berberis vulgaris)* is also good. The purple-leaved variety of the latter species is one of the best purple-leaved shrubs and is very attractive. The Oregon Grape or Holly-leaved Barberry is a very desirable low-growing shrub with thick glossy, holly-like foliage, which becomes bronzy purple in the autumn.

Betula (Birch).—The yellow foliage of most of the Birches contrasts strongly with other trees in autumn, but the most attractive of all is the Cut-leaved Birch *(Betula alba laciniata pendula)*, the finely cut leaves and graceful form of which make it one of the most attractive trees. There is a purple-leaved variety of the White Birch, but the purple is rather dull and the tree not especially desirable.

Caragana arborescens (Siberian Pea Tree). This shrub has many points of merit and its bright, green compound leaves and fruiting pods give it a place in such a list as this.

Catalpa.—The Catalpas have such large foliage, suggestive of a sub-tropic climate, that it renders them especially attractive in the colder parts of the country, where they give a warmer tone to the landscape. The Japanese Catalpa *(Catalpa Kaempferi)* is the hardiest species, but the Hardy Catalpa *(Catalpa cordifolia*, Jaune) though not as hardy, is more attractive and more desirable for the warmer parts of Ontario.

Celastrus (Shrubby Bitter-sweet).—There are two species of Shrubby Bitter-sweet, which are especially desirable for their attractive fruit. The first is the native Climbing Bitter-sweet *(Celastrus scandens)*. This is a very satisfactory hardy climber. The leaves are bright green and free from insects, and in the autumn and throughout the winter the scarlet and orange berries, which are produced in great abundance, make the vine very attractive. The outside of the berries is orange, but when they are cracked open by frost the scarlet inside is shown. The Japanese species *(Celastrus articulatus)* is just as attractive as the native one, and perhaps more so. The berries are smaller, but more abundant, and there is a greater contrast between the outside and inside, the outside being yellow and the inside orange. These vines may be kept quite shrub-like by cutting them back.

Cornus (Dogwood).—The hardy Dogwoods are most attractive in winter when the colour of the bark is much intensified. The best variety is *Cornus alba sibirica,* the bark of which is bright red in winter and in striking contrast with the snow, and other surrounding objects. There is a yellow barked variety of *Cornus stolonifera,* which could be used with good effect in contrast with the red-barked varieties. In foliage the most attractive hardy kind is *Cornus alba sibirica elegantissima* of the nursery catalogues, the leaves of which are delicately variegated with white, silver and green making this one of the best of variegated shrubs.

Cotoneaster.—There are several hardy ornamental species of Cotoneasters. The species with the most attractive foliage is *C. acutifolia,* the dark, glossy green leaves of which make this shrub quite attractive. Among red fruited species, *C. nummularia, C. tomentosa, and C. integerrima (vulgaris)* are the most desirable.

Crataegus (Hawthorn).—Some of the Hawthorns are attractive in flower, leaf and fruit; among these, two of the best are: *Crataegus coccinea* and *C. Crusgalli.* Both of these species have glossy foliage and bright red fruit, but the latter is, perhaps, preferable, as it does not sucker like the former, which may become troublesome.

Elæagnus (Olive).—The Russian Olive (*(Elæagnus angustifolia)* is one of the best trees with silvery foliage, and is a very handsome species. The Wolf Willow *(E. argentea)* has a finer silvery foliage than the last, but as this species suckers badly it should be planted with caution.

Euonymus (Spindle Tree).—The different species of Euonymus do not, as a rule, make graceful or attractive shrubs at any time except autumn. At that season of the year, however, they are quite noticeable on account of their scarlet and red fruit, which is in some species very bright. The most attractive in fruit are *Euonymus europaeus,* and *E. americanus,* but for brilliant coloured foliage *E. atropurpureus* and *E. alatus* are excellent, and the fruit of these is also attractive.

Fagus (Beech).—The purple-leaved Beech *(Fagus sylvatica purpurea)* is one of the handsomest of trees where it is hardy, but unfortunately it kills back to the snow line at Ottawa. The foliage is rich, bronzy purple and very attractive.

Hippophae rhamnoides (Sea Buckthorn).—This is a hardy shrub with fairly attractive narrow leaves, which bears an abundant crop of small bright orange fruit. It suckers badly and should be planted with discretion.

Ilex (Holly).—None of the hollies are satisfactory at Ottawa, with the exception of the Black Alder *(Ilex verticillata).* This shrub is not attractive during the summer, but in the autumn the scarlet holly-like fruit is very showy. There is a yellow fruited variety of this which is also good.

Lonicera (Honeysuckle).—Many of the Honeysuckles are attractive, both in flower and fruit, but the best showy species when in fruit is *Lonicera tatarica,* and the many varieties of it. The fruit of this species varies in colour from yellow to bright red and shows up well in contrast with the foliage. Of the hardy climbing species the most attractive in foliage and fruit are those with glacous foliage, such as *L. glauca, L. Sullivantii,* and *L. flava.*

Lycium (Matrimony Vine).—The Matrimony Vine is very useful for training over rocks, stumps and other places. The foliage is not especially attractive, but the numerous bright scarlet berries in autumn are very showy.

Neillia (Ninebark).—The ordinary Ninebark *(Neillia opulifolia)* is not a very attractive shrub, although the seed pods are rather showy, but the golden leaved variety, *Neillia opulifolia aurea,* is a very striking object, and where a strong-growing, golden-leaved shrub is desired it is one of the best.

Pachysandra terminalis.—This is a dwarf, hardy shrub with attractive evergreen foliage, and succeeds well in shady places.

Populus (Poplar).—The poplars have nearly all more or less attractive foliage, but probably the most attractive is the silver or white poplar, *Populus alba,* the leaves of which are silvery above and white below. The poplar multiplies rapidly by means of suckers, and as the falling seeds are disagreeable only trees with male flowers should be planted. A pyramidal variety, *Populus alba pyramidalis,* is a striking tree. The golden-leaved poplar, *Populus deltoidea aurea* (Van Geerti), is a good golden-leaved variety, but is much subject to galls. A weeping variety, *Populus grandidentata pendula,* is a very graceful tree with good foliage, and is especially handsome in flower.

Prunus (Plum).—The native plums of Canada and the United States are very attractive in flower, and fruit and if varieties are chosen which have particularly attractive fruit, they may be used very advantageously.

Petelea trifoliata aurea (Golden Leafed Wafer Ash).—This is one of the finest hardy golden-leaved shrubs. There is a richness of colour in this variety which is not excelled.

Pyrus (Mountain Ash).—The mountain ashes are attractive both in flower and fruit, but are especially noticeable in autumn and winter when the bright coloured fruit hangs thickly on the trees. The European Mountain Ash or Rowan Tree, *Pyrus Aucuparia,* is perhaps the best, although the American Mountain Ash, *Pyrus americana,* is good.

Pyrus (Crab Apple, Apple).—The crab apples and apples make very showy trees, both in flower and fruit. One of the most useful crab apples is the wild Siberian crab, *Pyrus baccata.* As this does not grow large it can be planted where other trees would be too large.

Quercus (Oak).—The oaks keep up the show of colour in the autumn after most of the other trees have lost their leaves. The two most desirable hardy species are the Red Oak, *Quercus rubra,* and the black oak, *Quercus velutina,* both of these species colour up well in autumn and the leaves remain bright until severe frosts. The Scarlet Oak, *Quercus coccinea,* though not quite as hardy, colours well also.

Rhus (Sumach).—Sumachs are among the most showy autumn tinted shrubs and trees, and are very effective when grown wild in large masses. The common native species, the Staghorn Sumach, *Rhus typhina,* is one of the best and its compound leaves tinted with red are very striking. The Smooth Sumach, *Rhus glabra,* and the graceful cut-leaved variety of it are also fine. The foliage of the low growing fragrant sumach, *Rhus aromatica,* always colours well and there is a richness of tints in it not found in the others. The Smoke Tree, *Rhus Cotinus,* is a very striking shrub. The pedicels in the loose flowering panicles become covered with soft hairs which give a smoke-like effect to the whole plant. The leaves also colour well and are attractive both in summer and autumn.

Ribes alpinum (Mountain Currant).—This is quite a showy species with bright red fruit and deep green glossy leaves.

Rosa (rose).—The wild roses are nearly all effective when in bloom, and some have attractive foliage and fruit. One of the best wild roses in foliage and fruit is *Rosa lucida.* This species has glossy leaves which contrast well with the red fruit. The Japanese Rose, *Rosa rugosa,* has very ornamental foliage and fruit, the leaves being rich green and glossy and the fruit of large size and very striking. Another good species is *Rosa pomifera,* which has exceptionally large fruit and silvery or glaucous leaves. The Purple-leaved Rose, *Rosa ferruginea (rubrifolia),* is one of the best purple-leaved shrubs. The leaves are deep reddish purple, and when the shrub is in bloom the contrast between the leaves and delicate pink flowers is very good.

Salix (Willow).—There are quite a number of willows which have ornamental leaves and bark and in the winter those with attractive bark are especially noticeable, and brighten up the landscape very much. The Laurel-leaved Willow, *Salix pentandra* (laurifolia), is a very ornamental tree, the leaves being deep green and very glossy. The rosemary-leaved willow, *Salix rosmarinifolia,* has narrow, rosemary-like leaves, and where a shrubby willow is desired it is one of the best. The best willows with attractive bark are: *Salix alba britzensis,* with red bark, and *S. alba vitellina flava* or *S. Voronesh* with yellow bark. These varieties are in striking contrast and stand out well in a winter landscape.

Sambucus (Elder).—Some of the elders are quite desirable. One of the best golden-leaved shrubs is *Sambucus nigra foliis aureis,* and although this kills back at Ottawa, it makes such rapid growth that it soon makes a show again. The Scarlet-berried Elder, *Sambucus racemosa,* and its variety *pubescens* may be used with good effect.

Spiræa.—There are a few hardy spiræas with good foliage, among these being *Spiræa Van Houttei,* also one of the best when in bloom ; *Spiræa arguta,* also one of the best when in bloom ; *Spiræa Thunbergii,* not quite hardy at Ottawa, and *Spiræa sorbifolia.*

Symphoricarpus (Snowberry).—The Snowberry, *Symphoricarpus racemosus,* is well known, the pure white berries in autumn being a familiar sight in most parts of Canada. The Coral Berry, *Symphoricarpus orbiculatus* (vulgaris), which has red fruit, is also effective, especially when in contrast with the other.

Tamarix amurensis.—This tamarisk is the hardiest of all those tested in the arboretum, and although it kills back some it makes strong growth during the summer. It is an elegant shrub with small foliage and tender branchlets.

Viburnum (Arrow-wood).—The viburnums are nearly all attractive shrubs in flower and foliage, and some species have very ornamental fruit. The Guelder Rose or High-bush Cranberry, *Viburnum Opulus,* is probably the most satisfactory. It is beautiful when in bloom, the foliage is effective, and the scarlet fruit which hangs on nearly or quite all winter makes it very desirable. Next will come the Wayfaring Tree, *Viburnum Lantana.* This also has ornamental flowers, foliage and fruit. Unlike the Guelder Rose, however, the fruit does not hang long. When ripening, the fruit is at first scarlet and becomes black when fully ripe. Two other species with very attractive foliage are: *Viburnum prunifolium* and *Viburnum dentatum,* both native species.

Vitis (Virginia Creeper).—The Virginia Creeper, *Vitis quinquefolia (Ampelopsis quinquefolia),* is well known, but must appear in a list of this kind. The leaves, while quite attractive in summer, become highly coloured at the first approach of autumn and for some time this vine is very effective. The self-fastening variety colours as well and has the advantage of clinging unaided to the wall on which it is trained.

REPORT OF THE CHEMIST

(Frank T. Shutt, M.A., F.I.C., F.S.C., F.R.S.C.)

Ottawa, December 1, 1903.

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the seventeenth annual report of the Chemical Division of the Experimental Farms.

It will be found to include, I believe, much of interest and value to Canadian farmers—to those engaged in general or mixed farming, as well as to those devoting their attention to some special branch of agriculture, such as fruit growing, dairying, &c. The work of this Division is, necessarily, of a varied character and covers a wide field, but we may safely say that all investigations undertaken are directly prosecuted with a view of obtaining information that may be of immediate and practical benefit to one or other of the numerous divisions or departments of Canadian agriculture.

Before the brief enumeration which it is customary to make of the matter treated of in the report, it may be well to state that very much of the work that has engaged the attention of the staff of this Division during the past year will not here find a place. Thus, during three months of the past season, an investigation was carried on to ascertain the effect of certain factors or conditions of manufacture upon the composition of butter, and more especially upon its water content. In all, some 150 butters, made by an expert under known conditions of temperature, &c., have been carefully analysed. The results of this investigation are now tabulated and we trust they will furnish information of a useful character regarding the extent to which the composition of butter may be effected by the churning temperature, size of granules, temperature of wash water, &c. It is proposed to publish this work very shortly in bulletin form.

Further inquiry has been made in the matter of the effect of food on the quality of pork. In this, the fat of about 50 pigs on various rations has been analysed, but as the investigation is as yet unfinished, the results are, for the present, held over.

The following summary gives in outline the nature of the various investigations presented in this report:—

Chemistry of Horticulture.—The problem of *soil moisture conservation in orchards,* first investigated by this Division in 1901, has again received attention, and data have been obtained that emphasize the practical value of cultivation and the preservation of an earth mulch to retard surface evaporation. The great draft upon the soil's moisture by sod is also very clearly brought out by this season's experiments.

Continuing the inquiry as to the value of certain legumes as orchard 'cover' crops, the relative merits of the *Hairy Vetch,* the *Soja Bean* and the *Horse Bean* have been determined. Our data denote the extent to which the soil may be enriched and improved by these crops, and, further, afford evidence of a most satisfactory character regarding the Hairy Vetch—the latest among the legumes to be introduced for this purpose.

The composition of certain insecticides recently put upon the market has been ascertained. These include Kno-bug, Bug Finish, and 'Owens' Compound for the Protection of Trees.'

Fodders and Feeding Stuffs.—A considerable number of feeding stuffs, including various milling and other by-products, has been analysed and their relative nutritive value determined.

Interesting data as to the nutritive properties of the hull, kernel, and whole grain, respectively, of the oat are presented.

Molassine Meal and Improved Molasses Cattle Food are two feeding stuffs upon the Canadian market now reported upon. The latter is a product of the Dresden Sugar Co., Limited, Dresden, Ont., and is prepared from the exhausted pulp and molasses.

The principal field roots have again been examined and a table prepared showing the results that have been obtained in this research since 1900. The high feeding value of the 'Sugar' mangels has ag in been demonstrated.

Sugar Beets.—The sugar content of several of the principal varieties of factory beets, as determined from roots grown on the experimental farms at Ottawa, Nappan, Brandon, Indian Head, and Agassiz, has been ascertained. Results are also given of beets from the Knight Sugar Company at Raymond, South Alberta; of beets from the vicinity of Strathcona, Northern Alberta, and also of beets grown on the Provincial Farm, near Charlottetown, P.E.I.

Wheats.—A careful and thorough enquiry from the chemical standpoint has been made respecting the relative merits of the following wheats: Red Fife, Percy, Preston, Stanley, and Early Riga. The information obtained will prove especially interesting to those engaged in wheat growing in Manitoba and the North-west Territories. The results of this investigation will be found as a special report in the article on Wheat, in the current report of the Director of the Experimental Farms.

Swamp Muck.—A short article has been written on swamp muck, its nature and treatment. The use of muck as an absorbent in and about the farm buildings and the preparation of muck composts of various kinds have been concisely described, in order to furnish in printed form the information on these subjects so constantly requested.

Chemistry of Bee-keeping.—The experiments towards ascertaining the best conditions under which honey should be stored have been continued. The desirability of a warm, dry atmosphere for the storage of both comb and extracted honey is clearly brought out by this research.

We have, after a lapse of 13 years, again found adulterated beeswax. The presence of 25 per cent to 35 per cent of paraffin of a high melting point was noted in certain samples submitted to analysis this past summer. This adulterated wax had been purchased in the United States by a large 'bee supply' firm in Canada, and was immediately returned on the receipt of our report to the effect that the wax was not genuine.

Well waters.—The analyses of 55 samples of well waters from farm homesteads in various parts of the Dominion are given, and a brief report added as to the quality and wholesomeness of the waters.

Experiments in Chicken fattening.—Further results in the fattening of chickens have been obtained and are presented in the report of the poultry manager. The experiments included a further trial, in duplicate, of feeding in pens with yards attached as against feeding in crates, and also a trial in duplicate of feeding an 'all grain' ration as against a 'grain and meat' ration.

Correspondence.—The letters received by this division from November 30, 1902, to December 1, 1903, in addition to those referred to us by the other departments of the farm, numbered 1,234; those sent out, 1,163.

Samples received for analysis.—In the appended tabular scheme the samples received for examination during the past year have been enumerated and classified. The number exceeds that of the year previous by 101. Reference to the report of this Division will show the yearly increase in the number of samples forwarded to farmers, which may be taken as an excellent sign of the growing appreciation of the information to be obtained through chemistry on matters relating to practical farming. In order, however, to cope with these requests and at the same time carry on the special

(Photo. by F. T. Shutt.)

CHEMICAL LABORATORY, CENTRAL EXPERIMENTAL FARM, OTTAWA.

investigations which constitute the chief work of the Division, it is evident that very shortly further laboratory assistance will be necessary.

SAMPLES Received for Examination and Report, November 30, 1902, to December 1, 1903.

Samples.	British Columbia.	Northwest Territories.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	3	3	2	10	7	2	9	....	36	13
Mucks, muds and marls	....	3	....	4	4	3	8	8	30	7
Manures and fertilizers	....	....	...	4	1	3	10	5	23	1
Forage plants and fodders	2	....	5	13	9	4	3	....	36	16
Well waters	1	16	11	43	3	6	3	2	85	
Sugar beets	8	13	6	13	....	....	8	7	55	
Miscellaneous, including dairy products, fungicides and insecticides	4	9	4	365	37	6	6	3	434	15
Total	18	44	28	452	61	24	47	25	699	52

Acknowledgments.—Once again I would with much pleasure express my thanks to Mr. A. T. Charron, M.A., assistant chemist, and Mr. H. W. Charlton, B.A.Sc., second assistant chemist, for their valuable help and co-operation. The larger part of the analytical work of the various researches has necessarily been performed by them, and this work has, as I can bear testimony, been done skilfully and carefully.

I would gratefully acknowledge my indebtedness to Mr. J. F. Watson, who has continued to discharge faithfully and well his duties in connection with the clerical work of the division.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

THE CONSERVATION OF MOISTURE IN ORCHARD SOILS.*

In further investigating the factors that affect the soil's moisture-content, we have this year obtained comparative data during the early months of the season, from plots in the Central Experimental Farm orchard (1) under cultivation during past and present season, (2) in sod during past and present season, and (3) in sod 1902, but ploughed early in the present season, according to the following plan:—

Plot A.—This plot was cultivated during the summer of 1902, as well as throughout the present season. The cultivations during the period of examination this year were made on May 12 and June 1.

(*N.B.*—This is Plot I of the second series, 1902, the moisture-content of which is recorded in the report of the Chemical Division for that year, page 138-9.)

* The results of our previous work upon this question, with reference particularly to the relation of tillage, sod and cover crops to soil moisture-content, are to be found in the Report of the Chemical Division, Experimental Farms, 1901 and 1902.

Plot B.—This plot adjoins A and was under sod, 3 years old, throughout the season.

(*N.B.*—This is Plot 2 of the second series, 1902.)

Plot C adjoins B. In sod 1902. Sod ploughed under April 13, 1903; disc harrowed May 29, and cultivated June 3.

The very severe and exceptional drought that prevailed in the Ottawa district during the spring and early summer months of this year, afforded an excellent opportunity for prosecuting our research in this matter of the conservation of soil moisture. That the rainfall for the spring months of 1903 was very much below the average will be seen from the following summary :

TOTAL PRECIPITATION IN INCHES.

—	1898.	1899.	1900.	1901.	1902.	1903.
March	3·20	4·96	6·15	4·04	3·62	1·96
April	4·90	1·65	5·55	2·36	2·92	1·15
May	2·90	2·62	3·04	4·97	1·62	0·24
June 1st to 5th	....	0·24	1·81	0·96	0.99	none.
Total	11·00	9·47	16·55	12·33	9·15	3·35

The soil samples upon which the moisture determinations were made were taken, as in previous years, to a depth of 14 inches and consequently the percentages and amounts of water given in the following table are those present in the soils to that depth.

CONSERVATION OF SOIL MOISTURE.

Date of Collection.	Plot A. Cultivated 1902 and 1903.			Plot B. In Sod 1902 and 1903.			Plot C. In Sod 1902; Cultivated 1903.		
	Per cent.	Pounds per acre.		Per cent.	Pounds per acre.		Per cent.	Pounds per acre.	
1903.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.
May 14th	12·03	261	1,218	5·32	107	982	11·85	257	337
" 23rd	12·65	277	89	4·78	96	66	6·51	133	431
June 5th	7·76	160	1,880	3·03	59	1,552	8·91	187	247

Discussion of Results.—We cannot fail at first sight to be struck with the marked character of these data, which, as might have been expected from the abnormal dryness of the season, emphasize the value of cultivation and the earth mulch for the retention of the soil's moisture. They certainly present a lesson of the greatest significance and importance to orchardists.

It should be borne in mind that the plots adjoin one another; that the soil throughout the series is of a uniform character (a light sandy loam); and that the moisture-content after the autumn rain of the previous season, as determined in November, 1902, when the winter set in, was practically identical for them all.

May 14.—Analysis shows that at this date the amount of moisture in the soil of Plot A (12·03 per cent) was less than it was in the previous November by about 3 per cent. Much of this loss undoubtedly might have been prevented by earlier cultivation, the first harrowing and formation of the earth mulch being only two days before the collection of the sample for analysis, viz., May 12. Nevertheless, the soil was quite damp, both to the touch and in appearance. So far as one could judge it appeared to be amply supplied with moisture for the requirements of the orchard trees.

Plot B, which by that date was covered with a heavy growth of grass, green and luxuriant, contained less than one-half of the moisture in A, viz., 5·32 per cent. This means that somewhat more than 150 tons per acre, to a depth of 14 inches, had been lost from B by remaining in sod, lost by the growth of the grass and the capillary action that had been set up by allowing the soil to remain unstirred. The earth of this plot was already assuming a powdery condition.

Plot C.—The sod had been turned under one month previous to the date of collection, viz., April 13. Its moisture content was somewhat less than that of Plot A, but the difference is comparatively insignificant. The results of this plot give satisfactory evidence of the importance of turning under the previous cover crop at an early date in districts likely to be visited by a spring or early summer drought. By this means it is seen the moisture may in a very large measure be conserved.

May 23.—Between May 14 and 23 the rainfall was scarcely more than one-tenth of an inch (·12). This probably was not sufficient at any time to thoroughly dampen the surface of the soil, for the precipitation occurred on four days of the interval and on no one of them exceeded more than a few hundredths of an inch. Practically speaking, it evaporated as soon as it fell, without benefiting the soil.

Plot A.—Now, in spite of this adverse condition, this soil, by reason of its mulch, was able to hold its own ; indeed, its moisture at this date was some half a per cent higher than it was nine days earlier. No doubt there had been loss by evaporation from the soil, but the loss had been more than compensated for by water brought up from the subsoil by capillary action.

Plot B.—On the other hand, this plot continued to lose, and now showed 11½ tons less moisture per acre than at the date of the preceding collection.

Plot C.—The soil of this plot had dried out very considerably, losing almost half its water. This was undoubtedly due to the fact that the turned over sod was not immediately disc-harrowed and an earth mulch formed. The drying atmosphere and winds freely permeated the heavy sod, abstracting its moisture. This points to the necessity of immediately discing and cultivating after the ploughing under a heavy sod, in order that capillary action may bring up water from below, and that a mulch may be formed that will prevent or retard its loss through evaporation. This plot was not disc-harrowed until May 29.

June 5.—Between May 23 and June 5 a period of thirteen days, but three-one-hundredths of an inch (·03) of rain fell. During the latter six days of this period there was absolutely no precipitation. Under this condition we find the moisture-content of plots A and B considerably reduced.

Plot A.—This soil now held but 7·76 per cent water. Probably if it had been cultivated again in this period (the previous cultivation had been on May 12) it would have had a higher water content. As it was, the drying out process had affected the soil for more than a foot. It still contained, however, over 160 tons to a depth of 14 inches.

Plot B.—The examination of this soil at this date showed it to be in the condition of powder. It had no adhesiveness and had the appearance of a soil thoroughly dried by exposure to air. Its percentage of moisture had been reduced to 3·03, having lost 48 tons per acre since the date of the first collection three weeks previous. The grass was still alive, but showing very little vitality and no growth. The leaves of the orchard trees growing in the sod had begun to shrivel and fall. It was evident that unless rain came very shortly these trees would succumb. It is important to note that under these extreme climatic conditions the soil of Plot A possessed 100 tons more water per acre in the surface 14 inches than that of Plot B, a very considerable amount.

Plot C at this date contained 8·9 per cent water, an increase of practically 2·5 per cent over that it possessed on May 23. This, in my opinion, was owing to the disc harrowing it received on May 29, followed by cultivation. By these means not only was surface evaporation largely arrested, but capillary action was set up which enabled the surface soil to draw upon the water content of its underlying soil.

The drought this year has taught a very important lesson in orchard soil management. It has emphasized what we gave experimental data for in 1902, viz., the very exhaustive character of sod as regards soil moisture. It has furnished proof of the immense value of cultivation in arresting the drying out of soils, and lastly the necessity not only of early ploughing under the cover crop in districts where drought is likely to prevail, but also the desirability of further working the soil by disc harrow and cultivator in order to again set up capillary action with the underlying soil, as well as to create an earth mulch to prevent surface evaporation.

ORCHARD COVER CROPS.

HAIRY VETCH, SOJA BEAN, AND HORSE BEAN.

Without entering into any lengthy discussion as to the various functions of a cover crop and the many chemical and physical benefits it may confer upon an orchard soil, it may suffice for the present purpose to remind our readers briefly of one or two of the more important advantages of such crops in increasing the fertility of the soil.

Apart, then, from the benefit to be derived from the conservation of moisture in the summer, and the winter protection of the roots of the trees, it is sought by this system of orchard treatment to enrich the soil, by the addition of vegetable matter and nitrogen, by the conversion of mineral plant food of the soil into more available forms and by the retention and storing up of the more soluble nitrates produced in the soil during the summer months. Many crops are used or have been suggested for these purposes, but it is only the legumes which possess the ability (through the agency of certain bacteria residing in nodules on their roots) to add nitrogen to the soil—nitrogen taken from that inexhaustible store, the atmosphere. Hence, it is that the legumes are *par excellence* the most valuable of all cover crops.

The value of the clovers—red and mammoth—and of alfalfa, in this connection, has already been demonstrated in several of our reports and bulletins—the first account of which, in the reports of the Chemical Division, is to be found in that for 1896. Our experiments in that year showed that in three months, from the middle of July to the middle of October, large crops could be obtained from alfalfa and the clovers, even when grown on a poor, sandy soil. Further, that these legumes contained in their foliage and roots in the neighbourhood of 100 lbs. of nitrogen per acre, nitrogen which we believe for the most part was obtained from the atmosphere. For the purposes of comparison with the results of the present season from Hairy Vetch, Soja Bean, and Horse Bean, we may insert in tabular form the data respecting these clovers and alfalfa:—

ANALYSIS of Clovers and Alfalfa, 1896.

Sown, July 13th. Collected, October 20th.	Composition.			Nitrogen.	Weight of Crop Per Acre.		Amount of certain Constituents Per Acre.		
	Water	Organic Matter.	Ash.		Tons.	Lbs.	Organic Matter.	Ash.	Nitrogen.
Mammoth Red, stems and leaves..	79·13	17·05	3·82	0·620	6	1,310	2,269	508	82
" roots........ ...	77·57	19·41	3·02	0·662	3	1,260	1,409	219	48
Total..................	......	....	.. .	....	10	570	3,678	727	130
Common Red, stems and leaves....	76·24	18·84	4·92	0·718	4	1,779	1,842	481	70
" roots...............	71·22	25·61	3·17	0·784	2	1,445	1,394	172	47
Total..................	......	....	......	....	7	1,224	3,236	653	117
Crimson Clover, stems and leaves..	83·32	13·91	2·77	0·382	11	234	2,093	602	85
" roots.............	83·87	12·92	3·21	0·304	3	201	801	199	19
Total..................	......	....	......	....	14	435	2,894	801	104
Alfalfa, stems and leaves	71·63	23·81	4·56	0·671	5	1,192	2,664	510	75
" roots.....................	64·74	29·47	5·79	0·557	5	558	3,120	613	61
Total..................	......	....	......	....	10	1,750	5,784	1,123	136

EXPERIMENTS WITH COVER CROPS, 1903.

In the experiments conducted during the past season by the Horticulturist with cover crops, the following modification was tested. Instead of sowing broadcast, (as has been the custom) the crops under trial—Hairy Vetch, Soja Beans and Horse Beans—were planted in rows 27 inches apart and the spaces between the rows kept cultivated. This was done, as explained at length by the Horticulturist in his report, to serve a dual purpose—the conservation of soil moisture by means of a dry earth mulch, and the production of a crop that might serve as a winter protection to the roots (by holding the snow) and for the enrichment of the soil.

The seed was sown on light, sandy soil in the farm orchard, June 18, and the samples collected for estimation of crop per acre and analysis, on September 21. At this latter date the Hairy Vetch formed a perfect mat or carpet 6 to 8 inches in thickness, entirely covering the ground, but it had not flowered. The Soja Beans were practically 2 feet high, and well branched and possessing many pods. The Horse Beans stood 3½ feet high, having made a vigorous growth, and were well podded.

After the date of collection the weather contined open and mild for several weeks, and no doubt if a further examination had been made in the middle of October larger amounts per acre than those recorded would have been obtained.

The roots in each instance were taken to a depth of 9 inches.

ANALYSIS of Hairy Vetch, Soja Bean and Horse Bean used as Cover Crops, 1903.

Sown June 18. Collected September 21.	Height or length on date of collection.		Composition.			Nitrogen.	Weight of Crop Per Acre.		Amount of certain Constituents per Acre.		
			Water	Organic Matter.	Ash.				Organic Matter.	Ash.	Nitrogen.
	ft.	in.				%	Tons.	Lbs.	Lbs.	Lbs.	Lbs.
Hairy Vetch (Vicia villosa) stems and leaves	3	3	82·78	15·44	1·78	·54	11	1895	3689	425	129
" " " roots	....		86·35	12·35	1·30	·41	2	345	536	56	18
Total	....		......	......	......	....	14	240	4225	481	147
Soja Bean (Soja Hispida) stems and leaves	1	10	74·69	23·13	2·18	·57	7	350	3319	313	82
" " " roots	....		80·12	18·92	·96	·48	1	900	549	28	13
Total	....		......	......	......	....	8	1250	3868	341	95
Horse Bean (Faba vulgaris, var. equina) stems and leaves	3	6	84·04	14·89	1·07	·43	7	733	2193	156	63
" " " roots	....		86·72	12·47	·81	·30	2	852	605	39	15
Total	....		......	......	......	....	9	1585	2798	195	78

Hairy Vetch.—This plant gave the heaviest crop of the three under trial. It also furnished the largest amount of nitrogen. Considering the entire plant, we have, from three months' growth, in round numbers 2⅛ tons (4,225 lbs.) of humus-forming material per acre, containing almost 150 lbs. of nitrogen. In these data we have a strong endorsation of the very high opinion expressed by certain horticultural writers regarding the fertilizing value of this plant.

Soja Bean.—Though not yielding as heavily as the foregoing, it is undoubtedly a useful orchard cover crop, since when sown in drills it allows of surface cultivation for the conservation of moisture. Moreover, it should prove a good snow-holder, by reason of its upright form of growth and stiff stems. Somewhat more than 1¾ tons (3,868 lbs.) of humus-forming material per acre were obtained, containing almost 100 lbs. of nitrogen.

Horse Bean.—Although at the time of collection this crop made the finest appearance of the three, the analytical data place it last in fertilizing value. In total weight of crop the figures show 9¾ tons, approximately, per acre, but owing chiefly to its high percentage of water it contained less organic matter and nitrogen than the Soja Beans. The difference in favour of the latter was approximately 1,000 lbs. of organic matter and 20 lbs. of nitrogen, per acre. There is this, however, to be said in favour of the Horse Bean, that its root system is more extensive than that of the Soja Bean and the plant, being more succulent, would probably decay more quickly the ensuing season. In humus-forming material the figures denote nearly 1½ tons (2,798 lbs.) per acre.

FODDERS AND FEEDING STUFFS.

BANNER OATS.

An important consideration in determining the relative feeding values of different varieties of oats lies in the proportion (by weight) of hull to kernel, for the nutritive properties of the former are very small compared with those of the latter.

This subject has already been discussed by Dr. Wm. Saunders, the Director of the Experimental Farms. It, therefore, only remains to say that it is proposed, as time allows, to obtain chemical data both as to kernels and hulls, respecting all the more commonly grown oats in Canada, and that a beginning has been made in this inquiry by an examination of that widely known and highly esteemed variety—the Banner. This has included not only a determination of the relative weight of hull and kernel, but also their complete analysis, together with that of the whole grain. These oats were of the crop of 1902, grown on the Central Experimental Farm.

Proportion of Kernels to Hulls.

Kernels	71·92
Hulls	28·08
	100·00

ANALYSIS of Banner Oats: Whole grain, Kernels and Hulls.

—	Moisture.	Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash.
Oats, (whole grain)	12·74	11·22	4·82	58·84	9·47	2·91
Kernels	12·03	14·51	6 24	63·15	1·93	2·14
Hulls	10·19	2·60	0·78	49·63	31·63	5·17

The tremendous difference in feeding value between the kernel and the hull is very well brought out by the foregoing data. In albuminoids, or flesh-formers, and in fat or oil—the two most valuable constituents of a feed—*the hull is seen to contain but very small percentages compared with the kernel.* Further, the hull is practically one-third indigestible fibre, which in the kernel does not amount to two per cent. In fact, oat hulls would appear to have a considerably lower feeding value than oat straw.

It has been shown by Dr. Wm. Saunders that considering any one variety of oats, samples differing in weight do so by reason of the relative plumpness and heaviness of the kernel, and not to any extent from variations in the weight of hull. It is, therefore, of moment not only to know the proportion of hull to kernel in the varieties upon the market, but also to purchase the heaviest oats of the variety selected—for this will mean the heavier kernel.

BRANS AND SHORTS.

These two by-products in the manufacture of flour are by far the most important of all concentrated feeds used in the Dominion to-day. They are produced from Canadian wheats in Canadian mills in large quantities. From their extensive use, from their high nutritive value, as well as from the fact that they are materials rich in nitrogen and ash constituents derived from Canadian soils—and which under careful management are capable of being returned, in a large measure, to the soil—they are materials well worthy of the consideration of our farmers and dairymen.

Bran.—As a milk-producer, bran possesses merits peculiarly its own; it has long been recognized as standing in the very front rank for this purpose ; indeed, in the opinion of many experienced dairymen it has no equal among meals and milling products for keeping up the milk flow.

This, undoubtedly, is due, in part, to its composition, furnishing, as it does, in large amounts and in excellent proportions those constituents required in the elaboration of milk ; in part, to its high digestibility by the cow, which is furthered by its loose, light, bulky nature, permitting the digestive fluids to readily and easily act upon it and the other foods with which it may be used. It, moreover, has a certain mild mechanical action upon the digestive tract, and particularly in the intestines, that serves to keep the animal from becoming constipated.

Bran consists of the three outer coats of the wheat kernel, together with the aleurone layer immediately underlying them. These outer coats are very fibrous and contain large percentages of phosphates and other mineral constituents; the aleurone layer consists of cells exceedingly rich in protein. Fat also is present in fair amounts, so that all the necessary materials for the production of milk are present. In the internal economy of the animal, a large proportion of these nutrients is digested and, as has been demonstrated by many carefully conducted experiments, subsequently through the blood is transformed into muscle and bone and milk. Its 'nutritive ratio,' that is, the proportion of digestible protein to the digestible fat and carbo-hydrates, is 1 : 3·68, which clearly demonstrates the value of this by-product for furnishing the protein necessary to supplement that in the home-grown coarse fodders (usually characterized by a low protein-content) in order to obtain a balanced ration.

The composition of the bran will vary somewhat according to the character of the wheat (spring or winter) and of the milling, and of the relative freedom of the bran from weed-seeds and other foreign matter. Spring wheat seems to yield a bran containing slightly more protein than winter wheat.

Shorts and Middlings.—According to Snyder,* 'wheat shorts consist of those outer portions of the wheat kernel which contain less fibre, protein and ash than the parts which make up the bran. This product is practically the fine bran subjected to more complete pulverisation and mixed with some low grade flour. It is more variable in composition than bran, but for some purposes, as pig feeding, is more valuable. When the wheat germ is added to the shorts the product is called middlings or shorts middlings.' Henry, in his work 'Feeds and Feeding,' says: 'Shorts consist of re-ground bran. Middlings contain the finer bran particles and more flour; often with this grade there are incorporated the germs of the wheat grain,' and further, he states, 'Middlings and shorts are terms used interchangeably to some extent. It has become rather common of late to find shorts consisting simply of ground-over bran, almost free from floury particles.' It is evident from these statements that the distinction between bran and shorts, which has been so marked in past times, is now becoming obliterated, and this is borne out to some extent by the appearance and analytical data of the Canadian samples we have examined this year, and which will shortly be discussed.

The introduction of the 'roller' process of milling and the wonderful improvement in bolting and sifting machinery now permits the miller to include practically all beneath the aleurone layer as flour—a most desirable result from his point of view. The germ is usually mixed with the lower grade flours. This means, naturally, that shorts or middlings as we have known them from the old stone mill will soon become a feed of the past. From the farmer's standpoint, and particularly that of the pig feeder, this is perhaps to be regretted, for as food for pigs shorts have always been most highly esteemed, especially in conjunction with skim milk. As an offset to this loss of mealy shorts, we have to recognize that the shorts of the future will be richer in protein and mineral matter, and consequently of greater value for muscle making and the development of the frame. It does not seem likely, however, that it will prove as desirable a feed for pigs and young stock generally.

Before presenting the results obtained recently on Canadian brans and shorts it will be of interest, for the sake of comparison, to insert the average composition of

* The Chemistry of Plant and Animal Life (Snyder), p. 306.

these feeds as obtained by American chemists. The following averages are taken from tables in Henry's 'Feeds and Feeding':—

Feed.	No. of Samples.	Water.	Ash.	Protein.	Fibre.	Carbo-hydrates.	Fat.
Bran, spring wheat	10	11·5	5·4	16·1	8·0	54·5	4·5
" winter wheat	7	12·3	5·9	16·0	8·1	53·7	4·0
Middlings	32	12·1	3·3	15·6	4·6	60·4	4·0
Shorts	12	11·8	4·6	14·9	7·4	56·8	4·5

We may also insert certain data from Bulletin No. 160 of the New Jersey Experiment Station (1902), which gives the results from the analyses of 91 samples of wheat bran, 49 of which were reported as of winter wheat, 34 of spring wheat, and 8 either mixed or not designated. The composition of 20 samples of middlings are also included:—

—	Protein.	Fat.	Fibre.
Bran, Winter	15·96	4·63	7·51
" Spring	16·97	5·27	8·81
Middlings	15·21	3·85	2·34

The figures from this latter table bear out the contention that spring wheat bran contains more protein than that of winter wheat, though the results from Henry lend little support to that view. Middlings, it will be seen, are slightly lower in protein, fat, fibre and ash constituents than bran, by both sets of results.

Canadian Brans.

To obtain information regarding the composition and relative feeding value of Canadian brans and shorts, we have submitted to analysis a series of samples of these feeds, kindly supplied by certain of the leading milling companies of the Dominion. The results obtained from this investigation may now be considered.

Eight brans have been analysed, the samples in every case being received direct from the mills. In appearance they were clean and bright, the flakes thin and large, and with one or two exceptions particularly free from all mealiness. Several contained a few hulls and occasionally whole grains of wheat or oats, and in three cases a few weed seeds were noticed. They were all free from sweepings and dirt and would undoubtedly be considered of first class quality. The exact character of the wheat from which these brans were prepared could not in the majority of cases be learnt, but we may presume that spring wheat only was used in the Manitoban and Keewatin mills, and also that a large proportion of the wheat of the Ontario mills was of that nature.

Moisture.—This constituent is seen to vary from 9·73 per cent to 12·37 per cent—the average from all the samples being 11·07 per cent, a figure somewhat lower than the American average, and pointing, other things being equal, to the higher feeding value of our brans.

It will be observed that in the majority of instances the drier brans are from mills in Manitoba. Only two of the series contain more than 12 per cent water, and these are from Ontario mills. The drier atmosphere of the North-west and the larger proportion of spring wheat used in milling there are, we suppose, the factors that have led to this low water-content.

Protein.—This nutrient, the most important of all, varies from 13·25 per cent to 15·31 per cent, the average being 14·52 per cent. Making a comparison with the average for protein in American brans, our figure is seen to be somewhat the lower. Whether this is due in part to differences in structure of the wheat, *e.g.*, greater thickness of the outer fibrous coats, or a thinner aleurone layer in Canadian spring wheat, or whether it is due to some recent improvement or alteration in the milling machinery affecting the proportion of the various products, we are at present unable to say, but this we hope at some future time to investigate.

Fat.—Certain differences apparently exist between the various samples as regards fat content, these differences for the most part, however, are not of any great magnitude. The general average for the fat is practically the mean of the figures quoted by Henry for American brans, though somewhat lower than the results from New Jersey.

Carbo-hydrates.—The nitrogen-free extract (chiefly starch) is seen to be very fairly uniform throughout the series and to give an average practically identical with that quoted from American sources.

Fibre.—Here we find a slight increase over the percentage given by American chemists. If on further work brans from Canadian spring wheats in general show this higher fibre content it will be of interest to ascertain the cause. If one or other of the theories already advanced when discussing the protein content be found correct, we shall at the same time receive an explanation for this increased percentage of fibre.

Ash.—The average percentage of ash obtained agrees very closely with that given for pure brans. An inspection of the data shows that all the samples were free from mill sweepings, dirt, sand, &c.

Analysis of Brans—1903.

Name of Milling Firm.	Address.	Moisture.	Protein.	Fat.	Carbo-hydrates	Fibre.	Ash.
		%	%	%	%	%	%
Ogilvie Flour Mills	Winnipeg, Man	9·73	14·00	4·55	55·18	10·74	5·80
Alexander & Law Co	Brandon, Man.	10·57	15·19	5·19	53·83	9·80	5·42
Lake of the Woods	Portage la Prairie, Man	9·89	14·81	4·68	53·75	10·63	6·24
"	Keewatin, Ont	10·83	14·56	3·60	54·56	10·93	5·52
Goldie Milling Co	Galt, Ont	12·70	13·25	3·78	54·61	9·66	6·00
Tilsonburg Milling Co.	Tilsonburg, Ont	11·81	14·19	4·17	54·45	9·70	5·68
Kingston Milling Co.	Kingston, Ont.	10·65	15·31	4·87	52·96	10·35	5·86
Winchester Roller Mills	Winchester, Ont.	12·37	14·84	4·12	54·20	9·28	5·19
	Average	11·07	14·52	4·37	54·19	10·14	5·71

Canadian Shorts.

The analytical results of nine samples of shorts are presented. In eight of the nine cases they were received from the mills forwarding the brans. They were all labelled 'shorts,' the term middlings not being used either in their description or designation.

Though the samples differed somewhat as regards fineness and, to some extent, as to mealiness, we may safely state that they all resembled fine bran rather than the floury, mealy shorts of the old stone mills.

Protein.—The percentage of protein is seen to be considerably higher than in the case of the brans. This we presume may be due to more of the aleurone layer and less of the outer fibrous coat entering into the composition than in the case of the brans. This increase in protein-content amounts to practically 1·5 per cent. With the exception of one sample, they are all over 15 per cent protein, ranging from 15·15 per cent to 17 per cent, the average being 15·93 per cent.

Fat.—In this constituent also the shorts give higher figures than the brans, the average for the former being 5·24 per cent and for the latter 4·37 per cent. In the comparatively high fat-content we have confirmatory evidence that these shorts are more closely related to bran than to the old stone mill shorts.

Carbo-hydrates.—Considering the average, there is about 5 per cent more carbo-hydrates (starch) in the shorts than in the bran. This points to a difference in their structural composition, and clearly indicates that we cannot conclude that the shorts are merely finely ground bran. This extra starch makes the shorts more mealy than the bran, and consequently better suited for certain classes of farm stock, as already pointed out in our general remarks on shorts and middlings.

Fibre and Ash.—In both of these constituents the shorts show much lower percentages than the brans. The fibre of the shorts is about one-half and the ash is approximately two-thirds, of that in the bran. Since it is the outer coats of the wheat kernel that have a high fibre-content and are particularly rich in ash, it is obvious that these shorts are not to be considered as entirely made up of finely ground bran.

ANALYSIS of Shorts, 1903.

Name of Milling Firm.	Address.	Moisture.	Protein.	Fat.	Carbo-hydrates	Fibre.	Ash.
		%	%	%	%	%	%
Ogilvie Flour Mills	Winnipeg, Man	8·88	15·62	4·83	59·07	7·51	4·09
Alexander & Law Co	Brandon, Man	9·83	17·00	6·23	59·12	4·43	3·39
Lake of the Woods	Portage la Prairie, Man	9·54	16·03	5·97	59·15	5·41	3·90
"	Keewatin, Ont	10·38	16·25	5·50	57·40	6·51	3·96
Goldie Milling Co	Galt, Ont	12·34	14·62	4·54	58·76	5·74	4·00
Tilsonburg Milling Co.	Tilsonburg, Ont	11·60	16·75	5·61	57·55	4·77	3·72
Kingston Milling Co.	Kingston, Ont	10·81	16·41	5·38	60·07	3·82	3·51
Winchester Roller Mills	Winchester, Ont	12·13	15·15	3·98	60·50	4·80	3·44
Woodstock Roller Mills	Woodstock, N. B.	7·58	15·56	5·09	64·56	4·11	3·10
	Average	10·34	15·93	5·24	59·58	5·23	3·68

Concluding this comparison of Canadian brans and shorts, we may state that the analytical data of this investigation clearly indicate the higher feeding value of the shorts. Their larger percentages of protein, of fat, and of carbo-hydrates and their lower fibre content, all point in the same direction, and furnish most conclusive and satisfactory proof of their superiority.

MOLASSINE MEAL.

This feeding stuff, imported from England, is prepared from crude molasses and peat or moss—the latter constituent acting simply as an absorbent and not adding in any way to the nutritive value of the compound, though counteracting, it is claimed, the tendency to 'looseness' frequently induced when molasses alone is fed.

As received at the farm, this 'meal' was in the form of a loosely held together mass, brownish black, with all the appearance of an agglutinated peat. It was somewhat moist and slightly sticky, but readily broken into granules on handling.

Its analysis furnished the following data:—

Moisture	·11·74
Water soluble extract	59·88
Ash	8·92

In the water soluble extract:—

Cane sugar	45·37
Glucose	5·40
Nitrogenous organic matter	5·13
Ash (chiefly potash salts)	6·30

On comparing these results with those from an analysis made in England, we find a considerable difference in moisture-content, the present sample containing some 8 per cent less water, which necessarily means a higher value for the meal. This drying out may merely be accidental and due to the exposure of the sample to the drier air of this country. We presume it would not occur to such an extent when the feed is imported in bulk.

The constituent of importance in such compounds is sugar, which in the animal economy has a very high value as a source of energy and heat, and in the formation of fat. Its ready solubility, and the ease with which it is digested and assimilated, place sugar before all other carbo-hydrates, starch, gum, &c., for these purposes.

Molasses, and more particularly molasses feeds, of various kinds, have been used for some time in Europe in the feeding of horses, cattle and swine, and when judiciously employed and in conjunction with a sufficiency of nitrogenous matter, have given excellent results.* Apart from their direct food value, they are stated to act beneficially in increasing the appetite, stimulating the digestion, and keeping the animal in a thrifty condition.

Though containing a certain amount of nitrogenous material, molassine meal does not in itself possess a sufficiency of protein for the animal's requirements. Hence, it can only serve as a part of the ration, and is most economically employed as a substitute for say one-third to one-half of the usual grain feed.

The sample of molassine meal here reported upon was received from Messrs. Grassett & Reid, Toronto.

IMPROVED MOLASSES CATTLE FOOD.

This newly introduced feeding stuff is made by the Dresden Sugar Company, Limited, Dresden, Ont., and constitutes what may be termed a by-product in the manufacture of sugar from beets. It is prepared from two residues in the process—the exhausted beet pulp and waste molasses. These, by the aid of suitable machinery to accomplish the necessary pressing, drying and mixing are greatly concentrated and converted into a palatable fodder. As placed upon the market, it has the appearance of dry pulp, chips or flakes, quite loose and without any stickiness so noticeable in other feeding stuffs into which molasses has entered as a component. We have analysed several samples of this feed, together with a sample of the untreated dried beet pulp, and append our results. The particulars are as follows:—

No. 1.—Dried beet pulp (collected at the factory by Dr. Saunders).

No. 2.—Improved Molasses Cattle Food (collected at the factory by Dr. Saunders).

No. 3.—Improved Molasses Cattle Food, taken from a 75-lb. bag sent to the Experimental farm.

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* A short article on this subject, including an analysis of molasses, is given in the Report of the Chemical Division, Experimental Farms, 1898.

No. 4.—Improved Molasses Cattle Food, taken from one bag of 100 lbs. in a consignment of 4 tons sent to the Experimental farm for a feeding trial.

No. 5.—Taken after mixing 20 bags of above mentioned consignment.

ANALYSIS of Dried Pulp and Molasses Cattle Food from Dresden Sugar Company, Limited, Dresden, Ont.

—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
	%	%	%	%	%
Moisture	7·61	4·59	4·31	3·99	4·36
Crude protein	7·62	8·75	8·37	8·03	8·28
Fat	·40	·16	·09	·10	·74
Carbo-hydrates	59·49	65·44	66·07	64·38	64·61
Fibre	20·85	14·42	15·52	18·73	16·36
Ash	4·03	6·64	5·64	4·77	5·65
	100·00	100·00	100 00	100·00	100·00
Aqueous extract, dried at 105° C	9·58	35 11	24·90	12·58	22·17
Ash in aqueous extract	1·02	3·80	2·55	1·31	1·97
Cane sugar	6·92	25·85	17·06	9·19	13·51
Glucose (reducing sugar)	0·88	1·11	3·78	0·63	2·05
Non-albuminoid nitrogenous substances	....	2·56	2·99	0·31	·84
Albuminoids	7·62	6·19	5·38	7·72	7·44

Dried Pulp.—This is the first product in the manufacture of the 'Improved Molasses Cattle Food.' It is stated that 100 lbs. of the freshly exhausted beet pulp yield approximately 5 lbs. of the 'Dried Pulp.' This agrees very well with our analysis of the fresh pulp made some years ago, which was as follows:—

Analysis of Fresh Pulp.

Water	95·72
Crude protein	·51
Carbohydrates	2·36
Fat	0·01
Fibre	1·26
Ash	·14
	100·00

Roughly speaking, therefore, we may say that the dried pulp has, weight for weight, 20 times the feeding value of that of the fresh pulp. Notwithstanding this great concentration, dried pulp, by reason of its low protein and fat and its high fibre is not in the same class as the various meals and concentrated feed stuffs. It is rather to be considered with those generally known as coarse fodders—from many of which it, however, differs in being much more digestible and palatable. We may safely assert from a consideration of its composition, its digestibility and palatability, that 'dried pulp' has a distinct feeding value and would constitute a wholesome addition to the ration when roots or ensilage are scarce.

Improved Molasses Cattle Food.—From the practical feeding standpoint this differs from 'Dried Pulp,' simply in containing more sugar, derived from the added molasses. This undoubtedly greatly enhances the feeding value, since sugar is readily assimilable and performs most important functions in the body in the production of heat and the formation of fat.

From the four samples so far anlysed it would not seem that uniformity in composition has yet been obtained. This is most probably due to the fact that the process of manufacture is new and not as yet thoroughly worked out in all its details for the best results, that is, as far as obtaining uniformity of product is concerned. The differences referred to lie chiefly in the sugar-content ; in other words, in the proportion of molasses that had been dried with the pulp. This will clearly be seen by a reference to the table of data. The solid matter dissolved out of the feed by cold water (aqueous extract dried at 105° C) is seen to vary from 35·11 per cent to 12·58 per cent; containing from 25·85 per cent to 9·19 per cent cane sugar. The extracted matter in the dried pulp is fairly constant at about 9·5 per cent, containing nearly 7 per cent cane sugar. The differences here noted in the Improved Molasses Cattle Food must therefore be due to the varying amounts of molasses with which the pulp has been dried. This is further supported by the data for the ash in the extract and those for the non-albuminoid nitrogenous substances—the latter being practically absent in the dried pulp. We have dwelt upon these differences because, as stated in the preceding chapter, the sugar content is the real measure of the feeding, and we might add the fattening, value of these preparations. It has already been remarked that in addition to its function as a heat-producer, sugar is an excellent fattener. It would seem that provided the animal has a sufficiency of nitrogenous material for its requirements, the addition of sugar to the ration greatly enhances the latter's fattening properties.

The crude protein is slightly higher in the Improved Molasses Cattle Food than in the Dried Pulp, but by the further differentiation of this into the albuminoids or true flesh-formers and the non-albuminoid nitrogenous substances (nutrients of much lower feeding value) it will be seen that the percentage of the former is really greater in the Dried Pulp. The nitrogenous substances in molasses are practically all of the non-albuminoid nature, and consequently the addition of molasses to the pulp lessens the proportion of the true albuminoids present in the finished product.

The percentage of moisture in this food is exceedingly low—in fact, considerably lower than that of other feeding stuffs ordinarily upon the market. This, of course, means a larger percentage of dry matter. This dryness enhances its nutritive qualities and keeping properties besides facilitating convenience in using.

Its proportion of fibre—the nutrient of least value in a fodder—is somewhat lower than that of the Dried Pulp. This is occasioned by the addition of molasses, which contains no fibre. The larger the proportion of molasses contained in this food, the more sugar—which is the element of value—and the less fibre will it possess.

As the manurial value of a fodder is a matter of some moment, it should be pointed out that the mineral matter of molasses consists chiefly of potash—an important element of plant food. This will appear largely in the urine, and consequently sufficient litter should be used to absorb all the liquid manure if this potash is to be saved for crop use.

COTTON SEED MEAL.

We had occasion last year to call the attention of our readers to the fact that an inferior brand of this valuable feeding stuff had appeared on the Canadian market (see page 148, report of the Experimental Farms, 1902). From samples received during the past year, it is evident that this low grade meal is still being sold in the Maritime provinces and at prices very little below those of the genuine article. It may be distinguished by those accustomed to handling cotton seed meal, as darker in colour and coarser than good quality meal. Such a sample was received from Mr. H. H. Bartlett, St. Andrews, N.B., and stated to have been purchased in St. Andrews from an agent of the Florida Cotton Oil Company, Jacksonville, Fla. This, it will be remembered, is the firm from which the inferior brand analysed and reported upon last year was obtained:—

Analysis.

Moisture	10·11
Protein (albuminoids)	23·81
Fat	5·98

That this meal is very much inferior to genuine cotton seed meal will be obvious when it is stated that the latter contains in the neighbourhood of 42 per cent protein and 13 per cent fat.

Two samples were received from Mr. Thos. B. Smith, Truro, N.S., and also submitted to analysis. They were taken from the one consignment (2,000 lbs.), but differed from one another considerably in depth of colour. The meal was labelled: 'Canary' Brand Cotton Seed Meal, manufactured for R. W. Biggs & Co., Memphis, Tenn.

Analysis.

	No. 1 Light coloured.	No. 2 Dark coloured.
Moisture	6·71	6·74
Protein	43·06	39·43
Fat	11·47	8·10

No. 1 meal, though somewhat below the standard in fat, is evidently genuine, but such is not the case with No. 2. Though not as seriously adulterated as the Florida Cotton Oil Company's meal, this is seen to be decidedly inferior, both as to protein and fat, and consequently should not be sold at the same price as No. 1 meal.

The consumption of concentrated feed stuffs steadily increases year by year, and will continue to do so. Their price, in the majority of instances, is high compared with other fodders, and for this reason alone it is of paramount importance that there should be no falling off in their feeding value. Many of these feeds are by-products, and consequently variable in their composition or at least capable of being mixed with inferior materials. As instances, we may cite oat feeds, from oat meal manufacture; gluten feeds, from the starch factory; and cotton seed meal. Analyses of these in the Farm laboratories have frequently shown that the selling price does not agree with their nutritive value. Further, it is often difficult, or indeed impossible, for a farmer to judge of the value of such feeds by mere inspection; an analysis is absolutely necessary to learn their percentages of protein and fat, the two constituents of greatest importance from the feeding standpoint.

For these reasons, the writer is of the opinion that such by-products should be sold under a guarantee and that there should be an official examination and analysis of them, similar to that in vogue for fertilizers. If it is necessary to protect the farmer in connection with the purchase of plant food, it seems equally essential that there should be a like protection in the purchase of animal food. During the past few years many of the states of the American Union have passed laws compelling the manufacturer or vendor of such feeds to attach to every consignment a tag on which is printed the guaranteed analysis, showing the percentages of protein and fat the feed contains. It appears that the time is about at hand when we shall require that the same information and protection should be given to Canadian farmers.

THE RELATIVE VALUE OF ROOTS.

For several years past we have examined the principal field roots, with the object of ascertaining how far their nutritive value may vary from season to season, as well as to obtain data which would enable us to judge of their relative feeding properties.

The chief varieties of mangels analysed were: Gate Post, Giant Yellow Globe, Giant Sugar Feeding, Half Long Sugar Rosy, and Half Long Sugar White. Of carrots, the varieties were: Short White and Half Long White. Of sugar beets: Danish Improved. Of turnips: Skirvings. Of Swedes: Selected Purple Top.

ANALYSIS of Roots, C. E.F., Ottawa, 1903.

Variety.		Water.	Dry Matter.	Sugar in Juice.	Average weight of one root.	
		%	%	%	lbs.	ozs.
Mangel—Half-long Sugar Rosy	Sugar mangels.	87·55	12·45	9·61	2	8
Half-long Sugar White	Sugar mangels.	86·54	13·46	9·82	1	13
Giant Sugar Feeding	Sugar mangels.	85·26	14·74	10·40	2	8
Giant Yellow Globe		89·11	10·89	6·17	3	13
Gate Post		87·07	12·93	7·38	3	3
Carrots—Improved Short White		89·60	10·40	4·77	1	10
Half-long White		90·17	9·83	2·52	1	15
Turnips—Skirvings		89·03	10·97	2·78	2	9
Selected Purple Top		88·99	11·01	2·77	5	6

The results are, on the whole, very satisfactory, showing that notwithstanding the abnormal character of the season most of the varieties are very little behind their average in dry matter and sugar.

The so-called sugar mangels again maintain their superiority, the richest of them, as in 1902, being the 'Giant Sugar Feeding' mangel, but the varieties, 'Half Long Sugar Rosy' and 'Half Long Sugar White,' follow very closely. They are all evidently roots of a high feeding value.

The following results, as regards dry matter and sugar of the mangels 'Gate Post' and 'Giant Yellow Globe,' during the past four years, will prove interesting. They show that despite changes due to season, &c., the relative position of these two well known roots has been maintained throughout.

DRY Matter and Sugar in Mangels.

—	1900.		1901.		1902.		1903.	
	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.
	%	%	%	%	%	%	%	%
Gate Post	11·14	6·15	9·41	4·15	13·90	9·39	12·93	7·38
Giant Yellow Globe	8·19	2·64	9·10	4·08	10·24	5·24	10·89	6·17

We have not the same continuous series of results for the carrots and turnips examined, and shall not, therefore. at the present time undertake any discussion of the feeding values of the different varieties.

SUGAR BEETS.

The principal varieties of sugar beets grown on the several Experimental Farms have, as in past years, been examined. The results will be found in the subjoined table; the particulars of growth are also presented in tabular form.

SUGAR BEETS grown on the Dominion Experimental Farms, 1903.

Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Coefficient of Purity.	Average weight of one Root. Lbs.	Oz.
Vilmorin's Improved	Nappan, N. S.	16·29	19·55	83·3	0	14
" "	Ottawa, Ont.	15·61	16·90	92·3	1	8
" "	Brandon, Man.	11·36	15·41	73·7	1	4
" "	Indian Head, N.W.T	15·52	18·27	84·9	1	3
" "	Agassiz, B. C.	17·47	21·08	82·8	1	15
Klein Wanzleben	Nappan, N. S.	14·23	18·80	75·7	1	1
" "	Ottawa, Ont.	15·12	17·38	86·9	1	9
" "	Indian Head, N.W.T	16·19	20·80	77·8	1	1
" "	Agassiz, B. C.	17·34	21·06	82·3	2	3
French "Very Rich"	Nappan, N. S.	15·46	19·00	81·3	0	15
" " "	Indian Head, N.W.T	16·90	20·60	82·0	0	15
" " "	Agassiz, B. C.	17·53	22·00	79·6	2	4
Danish Improved	Nappan, N. S.	11·65	15·58	74·7	1	1
" "	Ottawa, Ont.	13·49	15·74	85·7	1	6
" "	Indian Head, N.W.T	11·24	14·56	77·1	1	8
" "	Agassiz, B. C.	11·42	15·94	71·6	2	3
Red Top Sugar	Nappan, N. S.	12·37	16·80	73·6	1	2
" " "	Ottawa, Ont.	11·02	13·32	82·7	1	8
" " "	Indian Head, N.W.T	11·43	14·40	79·3	1	7
" " "	Agassiz, B. C.	8·14	13·67	59·5	3	12
Improved Imperial	Nappan, N. S.	10·47	17·69	59·1	1	1
" "	Ottawa, Ont.	12·19	14·33	85·0	1	12
" "	Indian Head, N.W.T	13·60	16·97	80·1	1	9
" "	Agassiz, B. C.	10·33	14·87	69·6	4	7
Danish Red Top	Nappan, N. S.	11·48	15·77	72·7	1	4
" " "	Ottawa, Ont.	11·63	14·12	82·3	1	9
" " "	Indian Head, N.W.T	11·49	15·35	74·8	1	9
" " "	Agassiz, B. C.	10·48	15·31	68·4	3	4
Royal Giant	Nappan, N. S.	9·43	14·40	65·4	1	12
" "	Ottawa, Ont.	11·03	12·95	85·1	1	8
" "	Agassiz, B. C.	11·04	15·91	69·3	3	3
Name unknown, seed from Mr. C. N. Bell	Indian Head, N.W.T	17·45	21·40	81·5	1	3

NOTE—It should be observed that of all the varieties here reported upon the Vilmorin's Improved Klein Wanzleben and the French "Very Rich" are those only commonly employed for sugar extraction.

SUGAR BEETS grown on the Experimental Farms, 1903—Particulars of Growth.

Locality.	Date. Sowing.	Date. Pulling.	Distance between Rows. Ft.	Rows. In.	Plants in Row. In.	Remarks
Experimental Farm—						
Nappan, N.S.	May 15.	Oct. 22.	2	0	12	Light clay loam; manured fall 1902.
Ottawa, Ont.	......	......	......		......	Moderately heavy loam in excellent condition.
Brandon, Man.	June 1.	Sep. 21.	3	0	9	Black vegetable loam; manured two years ago.
Indian Head, N.W.T.	May 26.	Oct. 9.	2	6	10	Clay loam; 15 loads of rotted manure to the acre.
Agassiz, B.C.	" 7.	" 22.	2	6	9	Sandy loam; clover stubble ploughed in fall of 1902.

Nova Scotia, Nappan.—The first four mentioned beets in the table—Vilmorin's Improved, Klein Wanzleben, French 'Very Rich' (Très Riche) and Danish Improved—

practically comprise the varieties now grown for factory purposes. Their sugar-content and purity this year do not differ widely on the whole from those reported for this locality in 1902, though certain individual variations are to be observed. Thus, the average percentage of sugar, as calculated from the four varieties, is 14·44 for 1902 and 14·41 for 1903.

Ontario, Ottawa.—The exceptional, and in many respects unfavourable, season experienced here this year—a protracted drought in the spring and early months followed by a somewhat excessive rainfall at the time when the beets were maturing and storing up sugar—has materially influenced both the sugar-content and the purity of the beets. In nearly every instance, this season's results are lower than those of last year. Averaging the results from Vilmorin's Improved, Klein Wanzleben and Danish Improved, we obtain the following results:—

1902—	Percentage of sugar in juice	16·00
	Co-efficient of purity	91·0
1903—	Percentage of sugar in juice	14·74
	Co-efficient of purity	88·3

Manitoba, Brandon.—Only one variety was examined from this district—Vilmorin's Improved. The results are exceedingly low for this excellent beet, indicating that conditions were unfavourable for a root suitable for factory purposes.

North-west Territories, Indian Head.—The results from this farm show a decided improvement over those obtained last year. Thus, we find the average sugar content in the four varieties first on the list was 13·97 per cent in 1902, whereas, this season it is 14·96 per cent. It is of interest to note that a variety, the seed of which was sent by Mr. C. N. Bell, but the name of which is unknown, was found to contain 17·45 per cent of sugar.

British Columbia, Agassiz.—In spite of the fact that most of the roots were much larger than is recommended for factory purposes, the varieties, Vilmorin's Improved, Klein Wanzleben, French Very Rich, and Danish Improved, had a most satisfactory sugar content. The average of the three first mentioned is 17·45 per cent, and the average of the first four (including Danish Improved, the roots of which were altogether too heavy) is 15·94 per cent.

Southern Alberta, Raymond.—A sample of Klein Wanzleben, forwarded by the Knight Sugar Company, who have established a factory at this place (in operation for the first time this autumn) gave the following results:—

Percentage of sugar in juice	20·40
Co-efficient of purity	80·79
Average weight of one root	1 lb. 3 oz.

As the sample is stated to be representative of a field of 30 acres, we must conclude that the crop will prove highly satisfactory for sugar extraction.

The following particulars have been forwarded by the Knight Sugar Company: 'Variety of beet, Klein Wanzleben, sown May 28, pulled October 31. Distance between rows, 20 inches; distance between plants in row, 10 inches. Clay loam. No manure, no irrigation. Sod broken up in the autumn of 1901; disced and reploughed in autumn of 1902, preparatory for spring planting. This field of 30 acres yields 12 tons per acre.'

Northern Alberta, Strathcona and vicinity.—In the following table are given the data from the examination of 5 samples received from the Secretary of the Board of Trade, Strathcona:—

ANALYSIS OF SUGAR BEETS—Northern Alberta.

Number.	Locality.	Variety.	Marks.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Coefficient of Purity.	Average weight one Root.
							Lbs. Oz.
1	Strathcona	Danish Improved	J. F.	9·37	12·97	72·24	1 6
2	"	" "	W. F.	10·84	13·55	80·00	1 5
3	Robert Hill	" "	M. R.	6·75	10·72	62·96	2 10
4	"	" "	W. M.	9·73	13·56	71·75	1 6
5	Ellerslie	K. Wanzleben	J. G.	11·74	14·92	78·68	.. 13
6	Clover Bar	"	G. A. C.	14·37	19·91	72·17	.. 15
7	Rabbit Hill	Wanzleben and Danish Imp.	J. J. S.	14·37	19·97	72·00	1 3
8	Clearwater	K. Wanzleben	W. L.	14·38	19·65	72·23	1 1

Nos. 1-5.—These results are not indicative of good factory beets; indeed, they are much too low to allow of profitable sugar extraction. In one instance (No. 3) the roots were too large, but even allowing for this, it is evident that the unfavourable season, heavy rains and low temperatures prevailing in the late summer months when the beet matures, had a disastrous effect upon the sugar content. Last year (1902) 4 samples of Klein Wanzleben from the same locality were tested and gave data of a much more satisfactory character.

Nos. 6, 7 and 8.—These three samples are practically identical, the differences being insignificant. Though not exceeding in sugar content a moderate average, they are decidedly superior to samples Nos. 1 to 5, which had been received and tested some three weeks earlier.

SUGAR BEETS—Northern Alberta, Strathcona and Vicinity.

Number.	Name.	Locality.	Variety.	Dates.		Distance Between.		Remarks.
				Sowing.	Pulling.	Rows.	Plants.	
1	Jas. Fisher	Strathcona	Danish Imp.	June 6	Oct. 15	18	7	Soil rather poor.
2	Wm. Fitzpatrick	"	"	" 2	" 3	16	9	Black clay loam, fairly good.
3	M. Reynolds	Robert Hill	"	" 2	" 13	18	8	Heavy black loam, new land.
4	Wm. Magee	"	"	" 5	" 10	22	7	Heavy clay loam, lying low.
5	J. Govenlock	Ellerslie	K. Wanzleben	May 28	" 10	16	9	Heavy black loam.
6	G. A. Coff	Clover Bar	"	June 4	" 14	......	......	Black loam.
7	J. J. Scribner	Rabbit Hill	Danish Imp.	" 6	" 20	......	......	
8	W. Loughridge	Clear Water	K. Wanzleben	May 29	" 19	......	......	Rich black loam.

Wallaceburg Sugar Company, Limited, Wallaceburg, Ont.—A sample of beets (Klein Wanzleben) forwarded from the factory of the Wallaceburg Sugar Co., Limited, afforded the following data:—

Percentage of sugar in juice	15·61
Percentage of solids in juice	19·26
Co-efficient of purity	81·05
Average weight of one root	2 lbs. 5 oz.

As to richness in sugar and purity, these beets are of excellent quality, and this in spite of their weight being somewhat above that usually recognized as best for factory purposes.

Prince Edward Island, Charlottetown.—Two samples of sugar beets grown on the provincial farm near Charlottetown, were forwarded by Mr. E. J. McMillan, Secretary of Agriculture, Charlottetown, P. E. I., who writes, 'The yield was so small, owing to damage to the young plants by cut worms, as to be scarcely worth reporting. These roots were taken from a portion of the plot which escaped being cut down.'

Variety.	Sugar in Juice.	Solids in Juice.	Coefficient of Purity.	Average Weight of one Root.
1. Vilmorin's Improved	19·93	24·35	81·64	1 lb. 0 ozs.
2. Klein Wanzleben	12·07	17·33	69·64	1 " 2 "

As the roots of sample No. 1 were somewhat shrivelled, the sugar content, as here reported, is no doubt slightly higher than in the beet as pulled. The evidence, however, is sufficiently clear and conclusive of the high quality of these beets.

No. 2 is below the average and not sufficiently rich for factory use. If grown under similar conditions to No. 1, it seems doubtful if the seed were really of the Klein Wanzleben variety, which usually gives much higher results.

In forwarding the beets, Mr. E. J. McMillan, writes as follows : 'Both samples were grown side by side on a rich loam soil; the previous crop was grain. The land was ploughed in the fall and again in the spring, when a dressing at the rate of thirty cart-loads per acre of barn-yard muck and well rotten manure was turned under. The surface was well cultivated and the seed sown in rows, 26 inches apart, on May 25. The plans were thinned to about 8 inches apart in the rows. Cutworms completely destroyed a portion of the plots so that the rate of yield could not be determined. The roots were pulled in the last week of October, and were found to be very rough. We hope to overcome this in another year by more careful cultivation.'

NATURALLY-OCCURRING FERTILIZERS AND WASTE PRODUCTS.

SWAMP MUCK: ITS NATURE AND TREATMENT.

Attention has been repeatedly directed in the past reports of this Division to the agricultural value of swamp muck, black muck, peat, bog mud and allied materials, rich in organic matter, and from a large correspondence we have reason to believe that many farmers, more particularly in the older provinces, are now employing these deposits and finding in them a useful source of humus and nitrogen. Requests for information as to the nature and uses of these natuaally-occurring fertilizers, however, continue to be received, and a concise account of the several ways in which they may be advantageously treated, seems to be in constant demand. We accordingly offer the following statements and suggestions in the hope that they may prove of benefit to our readers.

Origin and Nature of Swamp Deposits.

The accumulation of the semi-decayed vegetable matter known as peat, swamp muck, &c., is due to stagnant water. Swamps and bogs are the sites of former lakes or ponds, or possibly mere depressions covered by water, which have been filled up by the gradual encroachment of aquatic or semi-aquatic vegetation from their shores. Successive generations of mosses, and other water-loving plants, starting in the shallows and drawing their food supply year after year from the remains of the previous season's growth, have gradually pushed out towards the middle of these bodies of water, until in many instances the lake or pond has entirely disappeared. Under such conditions, though there is a certain amount of decomposition, a large proportion of the humus conserved is especially rich in nitrogen. In this way, vast deposits have accumumlated, which may be utilized to furnish vegetable matter (humus) and nitrogen to both clays and sands deficient in these valuable constituents.

Uses and Treatment of Peat and Muck.

Speaking generally, the application of these materials in the crude and raw condition is not to be aavised, for their plant food does not exist in immediately available forms. Fermentation is necessary to set it free. Further, the mode of occurrence develops acid, and as acidity or sourness is more or less injurious to ordinary farm crops, it is desirable to correct this quality before the muck is applied to the soil. For these reasons, we counsel one or other of the following means of preparation:—

In the first place, after digging the muck—which may be done at any time when other work on the farm permits and the bog is sufficiently dry to be accessible to teams—it is well to pile it and allow it to so remain throughout the winter. The weathering—the action of the air and frost—serves to sweeten and disintegrate the muck, oxidizes any poisonous iron compounds that may be present, and thus prepares it for more ready decomposition in the compost heap. There are mucks so sweet and so well decomposed that they may with benefit be at once applied to the soil, but these are not of common occurrence.

Use as an Absorbent in and about the Farm Buildings.

The air-dried and roughly powdered muck—and especially that from the upper layers of the bog composed chiefly of sphagnum and other mosses—is an excellent absorbent. Its use as such in and about the farm buildings, or wherever there is liquid manure likely to go to waste, cannot be too strongly recommended, for thereby not only is valuable plant food conserved (the liquid portion of the manure being by far the richer in fertilizing constituents), but the subsequent fermentation of the muck now intimately mixed with the manurial elements, rapidly brings about the conversion of its plant food into an assimilable condition. All mucks are not equally suitable for this purpose, but those of a peaty, mossy or powdery nature will be generally found of good absorbent capacity, and can be so employed. No special directions are necessary in this matter, but we may state that the practice of spreading a shovelful of the air-dried muck (which may be kept in a heap convenient to the building) in the gutter behind each cow after cleansing the stable, has been found to work excellently. It soaks up the liquid manure and makes the cleaning of the stable an easy task. The resulting manure, now largely increased in bulk and value, may be taken at once to the fields, or, still better, perhaps, submitted to a slight fermentation in the heap previous to use.

Muck Composts.

The object of composting muck with various substances, such as manure, wood ashes, &c., is to start its further fermentation, and to liberate its plant food. It is obvious that those who have deposits of this naturally-occurring fertilizer convenient may at little cost largely increase their supply of manure, and restore to their land the humus and nitrogen which has been dissipated and used by continuous cropping.

Composts with Manure.—Spread on a level piece of ground a layer of the weathered and air-dried peat or muck, 6, 8, or 10 feet wide, and of any desired length, and 1 foot to 1½ feet in thickness. Cover with a layer of manure, say, 1 foot thick, and continue with alternate layers of muck and manure until the heap is 4 to 5 feet high, finally covering with a layer of muck. The proportions here given are to be considered as suggestions only, the principle involved being to use sufficient manure to set up active fermentation in the muck. Too large a proportion of the latter prevents the decomposition of the muck, which it is sought to bring about. Keep the heap moist, but at no time should it be saturated. An occasional watering in a dry season may be beneficial, and for this purpose liquid manure and house slops will be found valuable in assisting fermentation and enriching the compost. At the end of a few weeks—the period will largely depend on the season—the mass should be forked over and again covered with muck. This operation may be repeated at similar intervals two or three times. At the end of two, or possibly three, months the compost should be in excellent condition for application to the soil.

It will be obvious that any and all refuse on the farm of an organic nature, whether vegetable or animal, can be used advantageously for composting with these materials.

Composts with Wood Ashes, Lime, &c.—The growth of micro-organisms, which bring about the further fermentation of the muck, is retarded or altogether checked by the acid naturally present in the muck. On the other hand, a slightly alkaline condition favours fermentation, and it is, therefore, evident that wood ashes, lime or marl (alkaline substances) may be employed as composting materials.

Wood Ashes.—For every 100 bushels of muck add 10 to 15 bushels of wood ashes. Intimately mix by shovelling, and shape up into a compact heap, 3 to 5 feet high. If the muck is quite damp, no water need be added, but if it is dry, pour on a sufficiency to thoroughly moisten the mass. Finally cover with a few inches of muck, and leave the heap for, say, two months. It may then be reshovelled and again covered, moistening if necessary. Usually, from 4 to 6 months in summer time are required to bring the muck into a suitable condition for application to the soil.

Such a compost not only contains the plant food of the muck—now in more or less available condition—but also the potash, phosphoric acid, and lime of the wood ashes, and these greatly enhance its value as a fertilizer.

Lime.—Slake 10 bushels of quick-lime to a fine powder with brine made by dissolving 1 to 1½ bushels of salt in a sufficiency of water. This is then spread upon the muck in alternate layers, and the heap built up and treated as before described. For muck fresh from the swamp, use about 2 bushels of the lime to 100 bushels of the muck, for air-dried muck (to be subsequently moistened, if necessary), 10 bushels of lime to 100 bushels of the muck or peat.

Marl, gas-lime, and leached ashes may all be used for composting, using 20 to 25 bushels to the 100 bushels of muck.

TOBACCO REFUSE.

Tobacco stalks, and the stems (from which the leaves have been stripped) dried and powdered, constitute a fertilizer of considerable value by reason of the nitrogen and potash they contain.

Tobacco dust or refuse from the cigar manufactory is largely made up of powdered stems or leaf ribs, and, if not too largely mixed with inert matter, such as sand, sweepings, &c., is well worth the attention of market gardeners, fruit growers, &c., in the neighbourhood of tobacco factories.

This material, we are informed, may frequently be obtained for the hauling, or at a nominal price. If, however, any considerable figure is asked it would be desirable to obtain some knowledge of its fertilizing value, as this may vary in different samples within very wide limits. A sample of the tobacco dust forwarded by Mr. L. S. Campbell, K.C., Montreal, and recently analysed by us, furnished the subjoined data:—

Analysis of Tobacco Refuse.

Moisture	7·45
Organic matter	63·09
Ash or mineral matter soluble in acid	8·69
" " insoluble in acid	20·77
	100·00

	Per cent.	Pounds per ton.
Nitrogen	1·27	25·4
Potash	1·36	27·2
Phosphoric acid	·34	6·8

As usually quoted by writers on agricultual chemistry, this material should contain from 1½ to 3 per cent nitrogen, and from 3 to 7 per cent potash. We suppose that in the sample here reported upon the lower values are due to the large amount of sand, &c., present. Nevertheless, it has distinct value, for at market prices of nitrogen and potash in equally available forms, it would be worth about $4 per ton for its plant food.

Though not, strictly speaking, a matter coming within the province of the Chemical Division to report upon, mention might be made here of the insecticidal properties of powdered tobacco leaves, stems, &c., used dry or in the form of a decoction or for fumigation. This material is largely used in the preparation of many insecticides now found upon the market and is especially advocated for the destruction of plant lice and other sucking insects.

REFUSE FROM A POTATO STARCH FACTORY.

The results of our analysis of a sample of this by-product, forwarded from Charlottetown, P.E.I., and stated to be thoroughly representative of this material, are as follows:—

ANALYSIS of Refuse from Potato Starch Factory.

——	As Received.	Calculated to Water-free basis.
Water	72·47	....
Organic matter	23·41	85·04
Ash or material matter	4·12	14·96
Total	100·00	100·00
Nitrogen	0·183	0·782
Phosphoric acid	0·046	0·17

These data show that the fertilizing value of this material is insignificant, though it might prove of value to soils lacking in organic matter. The percentage of nitrogen does not exceed that in many soils of average productiveness, and in phosphoric acid this refuse is also decidedly low. It is evident, therefore, that this by-product could only be used locally with any hope of profit.

Undoubtedly, the best returns would be on light, sandy or gravelly soils, and used in conjunction with lime and marl.

CHEMISTRY OF INSECTICIDES AND FUNGICIDES.

KNO-BUG.*

So many inquiries regarding the nature and value of this newly introduced preparation have been received during the past season that its analysis was deemed desirable.

The packages sent in for examination were all of the same size and weight, holding 1 lb. of the powder. The printed matter upon the package states that it is a 'combined bug-killer and potato grower.' It further states 'Kno-bug is a preparation to destroy potato bugs and all other bugs that eat leaves, plants or vines. It not only destroy the bugs, but, unlike Paris green, acts as a vegetable tonic and stimulates the growth of the plant, prevents blight, scab and rots. Carpenter-Morton Co., Boston, Mass.'

It is a fine, earthy powder of a pinkish-red colour, but revealing under the microscope many particles of Paris green.

The analysis included a search for and determination of compounds that might act as insecticides, and also of those which would furnish plant food.

Analysis.

	Per cent.
Paris green	2·16
Nitrogen (present as nitrates)†	·729
Potash (soluble in water)†	2·44
Phosphoric acid	traces only
Ground gypsum (land plaster)	88·15
Oxide of iron (ochre)	3·67
Insoluble rock matter	1·32

This insecticidal compound, it will be seen, contains an amount of Paris green approximately equivalent to that in the 'dry mixture' recommended by entomologists for leaf-eating insects, and particularly for the potato bug. The formula on the spraying calendar of the Experimental Farm reads: '1 lb. of Paris green to be mixed with 50 lbs. of flour, land plaster, slaked lime or any other perfectly dry powder.' The vehicle, or filler, in Kno-bug being land plaster, shows that the manufacturers have in this case followed closely the teachings of those best qualified to advise in such matters.

There was no free arsenious acid present, or only mere traces, consequently this preparation could not injure foliage.

As regards plant food, analysis shows notable quantities of two important elements—nitrogen and potash—and these constituents are present as a compound which is soluble. They may, therefore, be considered as immediately available to growing plants.

The economy of using such compounds must depend largely upon their price, and in order to consider their value from this standpoint it would be necessary to know the prices at which the various ingredients could be bought. The latter are not necessarily the same for all purchasers. They depend upon the distance from large markets

* In this name is evidently incorporated the formula of saltpetre or nitrate of potash KNO_3, one of the constituents of this preparation.

† Equivalent to 5½ lbs. (approximately) of potassium nitrate (saltpetre) per hundred weight of Kno-bug.

and the quantities in which the materials are purchased. On making a comparison, however, between the cost of the ingredients and of the prepared article, the probability is that there will be found a very handsome margin to cover the cost of mixing, putting up, &c., of the latter. Thus, for the purpose of illustration, we may assume the following prices: Paris green, 20 cents per lb.; nitrate of potash, 10 cents per lb.; and ground land plaster, 40 cents per 100 lbs. At these prices, the ingredients in 100 lbs. of Kno-bug would cost, approximately, $1.35. In other words, this preparation would be worth, for its several constituents that make it of value, either as an insecticide or fertilizer, about 1½ cents per lb. The retail price of Kno-bug is stated to be 10 cents per lb.

In the case of condimental foods for stock, the price almost invariably exceeds very largely the cost of the various constituents, and the same is no doubt true of preparations for the treatment and feeding of plants.

BUG FINISH.

This is another preparation for the destruction of the potato bug. In its main features it is similar to the foregoing compound: that is, the base is gypsum, with a small quantity of Paris green as the insecticide. The essential elements of fertility, however, are absent. It is stated to be manufactured by 'Church's Alabastin Company, Paris, Ont.,' and to be retailed at 3 cents per lb.

In appearance, it is a grayish-white powder, showing under the microscope scattered particles of Paris green. On analysis we obtained the following data :—

Analysis.

	Per cent.
Ground gypsum	64·55
Carbonate of lime	7·14
Oxide of iron and alumina	2·30
Insoluble rock matter	17·51
Paris green	1·27

For those who prefer to use the 'dry powder' form of insecticide on potatoes, this compound no doubt will answer, though the percentage of Paris green is somewhat less than that recommended.

As regards the economy in using it compared with the home prepared powder, the remarks made in discussing Kno-bug are here equally applicable.

OWENS' COMPOUND FOR THE PROTECTION OF TREES AGAINST INSECT AND FUNGUS RAVAGES.

This material, which has been exploited to a considerable extent in Western Ontario, was brought to our notice last March by several prominent orchardists, who requested an analysis and a report upon the claims of the promoter. These claims are that not only will it protect the tree against all insect and fungus ravages, but that the general health and vigour of the tree will be improved. The directions for use are simply to bore a hole in the trunk of the tree and insert the powder. Presumably, the 'powder' is to enter into the sap circulation and that this will be effective in rendering the tree immune against all insects and fungi.

We were able to obtain several samples of this compound, some of which had been taken out of trees previously treated. The first sample, obtained in the neighbourhood of London, Ont., furnished on analysis the following data:—

	Per cent.
Sulphur	94·3
Charcoal (containing a little ash, &c.)	5·7
	100·00

A second sample of this 'Owen mixture used in the tree plugging process,' received some six weeks later, and obtained from another correspondent, was found to contain the same constituents in almost the same proportions:—

	Per cent.
Sulphur	90·18
Charcoal	9·82
	100·00

The third sample, also from Western Ontario, afforded on analysis the following data:—

	Per cent.
Sulphur	93·65
Charcoal	6·35
	100·00

It is evident, therefore, that though little care is taken by the vendor in obtaining always the same proportions, we may be sure that the chief constituent is sulphur, to which has been added 5 per cent to 10 per cent of charcoal.

It seems scarcely necessary to point out that such a mixture could not be of the slightest value in protecting the tree against the ravages of insects and fungi, or in stimulating growth. It would be absolutely inert and inactive, remaining in the tree where it is put (as we had an opportunity of proving) and incapable of entering into the sap circulation.

It is extremely problematical if any chemical could thus to any extent be introduced into the sap circulation—and certainly such is out of the question with insoluble substances, such as sulphur and charcoal. Further, if such were possible, there is no doubt but that a quantity sufficient to deter insects and fungi from attacking the fruit and leaves would materially affect the health of the tree, and in all probability cause its death.

From time to time, such methods or processes as the one under consideration are exploited—indeed, it is quite an ancient fraud—and we presume a number of people, especially those who wish to save themselves the trouble of spraying, are induced to purchase and make a trial. Such methods are always of the same general character, and equally without merit. Quite recently an effort was made to sell county rights in Ontario for the Royal Insect Destroyer, promoted by a Mr. Lester, of Roanoke, Va., U.S., the plan of operation being identical with that of the so-called Owen Process. On inquiry from a reliable source, it was learnt that this compound was a mixture of gunpowder, sulphur, copperas, and saltpetre.

FORMALIN,* FORMALDEHYDE.

This well known antiseptic, disinfectant and preservative is now extensively and most satisfactorily used in Manitoba and the North-west Territories for the treatment of seed grain for smut. It has been for this reason that we have undertaken the analysis of the more important brands of this material upon the market and now present the results. The following descriptions are copied from the labels on the bottles collected for analysis :—

No. 1.—Formalin, Chemische Fabrik auf Actien (Schering), Berlin.

* Formalin is the name copyrighted by Schering (Berlin) for a 40 per cent solution of formaldehyde. Merck, of Darmstadt, in the same way, for the same strength of solution uses the name Formol.

No. 2.—Solution Formaldehyde 40 per cent solution, Parke, Davis & Co., Walkerville, Ont.

No. 3.—Formaldehyde, 40 per cent solution, Lyman, Sons & Co., Montreal, Que.

No. 4.—Formaldehyde, Merck (Formol), Darmstadt.

These have been carefully analysed by the following four well known methods: The ammonia method, the cyanide method, the iodine method and the hydrogen peroxide method. All these, according to our experience are open to some objection, but the one in our judgment yielding the most reliable results is the last mentioned, and accordingly we shall only present the data from it:—

Percentage of Formaldehyde (by weight).

No. 1	36·1
No. 2	37·3
No. 3	37·2
No. 4	37·0

Nos. 2, 3 and 4 are practically identical. Our results go to show that great uniformity in strength prevails among the chief brands of this material for sale in Canada.

It is of interest to note that the data do not in any case show the presence of 40 per cent of formaldehyde, as advertised by the manufacturers. Upon consulting analyses by American chemists a similar result is to be generally seen, and we may, therefore, conclude that the strength of 40 per cent by weight is an approximation rather than a statement of an exact nature.

The specific gravity of the several solutions was taken with the following results:—

Specific Gravity at 15·5° C.

No. 1	1·0815
No. 2	1·0900
No. 3	1·0895
No. 4	1·0885

These are in accord with the determinations of formaldehyde above given, though somewhat at variance with those quoted in several standard works.

THE CHEMISTRY OF BEE-KEEPING.

THE STORAGE OF HONEY.

Our experiments towards ascertaining the best conditions under which honey should be stored, were begun in the season of 1902. These were with extracted honey, and the results showed that it seriously deteriorated if stored in any room with a moist atmosphere.

The experiment was conducted in December, a season when at Ottawa the air may be termed dry. The temperature of the laboratory in which the work was done, was from 65° F. to 70° F. In the subjoined table the term 'dry atmosphere' has reference to the atmosphere of the laboratory; the 'moist' or 'saturated' atmosphere was obtained by exposing water in a flat dish at room temperature, under a large bell jar. In this bell jar the honey, contained in a suitable vessel, was placed upon a scaffolding or frame-work.

Experiments on the Storage of Extracted Honey, 1902.

	Water, per cent.
Ripe honey, from capped comb, at beginning of experiment..	15·88
" exposed to dry atmostphere 1 month*........	14·24
" exposed to moist atmosphere 1 month*......	31·46
" exposed to dry atmosphere 20 days†........	13·84
" exposed to moist atmosphere 20 days†........	48·23

*Exposed in glass cylinder. †Exposure in evaporating dish.

We notice that the honey kept in dry air lost somewhat in moisture-content. At the close of the exposure period this honey was in excellent condition.

On the contrary, that which had been kept in the moist atmosphere (under the bell jar) had absorbed large amounts of water. It had become thin and watery, and before the expiration of the exposure period had begun to ferment. In the tall cylinder, the percentage of water in the honey had doubled; in the open flat dish, with its large surface of honey (the same weight of honey was used in each), the absorption was much greater, the original amount of water being increased from 15·88 per cent to 48·23 per cent. This demonstrates very well the exceedingly hygroscopic character of honey and the desirability of keeping it in a dry atmosphere.

We have repeated this experiment during the past season with extracted honey, with a similar result, and also have had under trial honey in the comb. The latter is also shown to deteriorate rapidly in a moist atmosphere. The plan of the experiment was as follows:—

Extracted Honey.—This was weighed into flat-bottom, open dishes and exposed for three weeks (1) to the air of the laboratory, (2) in an atmosphere saturated with moisture (under a bell jar) in the laboratory, (3) to the air in a pantry of a house on the experimental farm, and (4) to the air in the cellar of the same house—this cellar being fairly dry and ventilated. The temperatures in (1), (2), and (3) varied from 60° F. to 70° F., and in (4) from 50° F. to 60° F., during the period of storage, October 12 to November 3.

Comb Honey.—A similar series of honey in the comb, i.e., section, were exposed, the temperatures being those already stated and the period of storage the same.

The results have been tabulated and set forth in the following charts:—

EXPERIMENTS IN STORAGE OF HONEY, 1903.

Extracted Honey.

From October 12 to November 3.

Place of Exposure, &c.	Temperature.	Loss, (Water.)	Gain, (Water.)
	°F.	%	%
In laboratory (ordinary atmosphere) in open dishes..............	60-70	2·79	....
" (saturated ") "	60–70	....	26·80
In house (pantry) in open dishes..............	60–70	1·81	....
" (cellar) "	50–60	....	3·38

Honey in Comb (sections).

From October 12 to November 3.

Place of Exposure, &c.	Temperature.	Loss, (Water.)	Gain, (Water.)
	°F.	%	%
In laboratory (ordinary temperature)	60-70	1·5 / 1·26	....
" (saturated atmosphere)	60-70	....	2·73 / 4·84
In house (pantry)	60-70	1·33 / 0·90	....
" (cellar)	50-60	....	1·13 / 0·76

Very little need be said in explanation of these results: their meaning is self-evident. The extracted honey exposed in the saturated atmosphere in the course of a few days showed marked signs of deterioration in quality, becoming thin and watery and beginning to ferment. At the end of the three weeks' period of experiment it was quite unsaleable, and indeed unfit for use as an article of diet. That which had been kept in the ordinary atmosphere (both in the laboratory and in the pantry) had not perceptibly altered in appearance or taste, and was in excellent condition. The cellar stored sample, at the end of three weeks, had begun to ferment.

While not suffering to the same degree as the extracted honey, that in the comb deteriorated considerably when placed in the cellar and still more so in the saturated atmosphere artificially provided in the laboratory. The latter before the close of the three weeks' period showed drops of water collected on the comb and had begun to mould. The comb stored in the pantry and in the laboratory at the end of the period of exposure was in first-class condition.

This investigation, therefore, covering two years' work, emphatically points to the desirability of storing honey—both comb and extracted—in a warm, dry atmosphere, such as may be obtained in an upstairs' pantry or room. Deterioration is sure to follow exposure in a damp atmosphere, and for this reason the cellar, no matter how dry it may appear, is not a good place in which to keep honey.

This work has been brought before the Ontario Bee-keepers' Association, and will be found in greater detail in the proceedings of that association for 1902 and 1903.

BEESWAX.

In the report of this Division for 1890, there was published an account of the examination of certain samples of 'foundation comb' found to be seriously adulterated with paraffin. These, it was stated, although sold in Canada, had been imported from the United States. Since that date, until the present no complaint, so far as we know, has been made by Canadian beekeepers regarding the quality of the 'foundation' sold in this country.

In March, however, of this year, a request was made by the Goold, Shapley & Muir Co., Brantford, Ont., for an analysis of certain beeswax they had purchased from the United States for the manufacture of foundation, on the ground of suspected adulteration. In the interests of the Canadian honey industry, it was deemed desirable to accede to this request, and the examination was made. The results pointed to the presence of paraffin in all three samples, varying approximately from 25 per cent to 29 per cent.

Unlike the adulterated 'foundation' of 1890, these samples possessed a melting point practically identical with that of genuine beeswax, showing that the adulterant must be of the nature of ozokerite or cerasin—the former a naturally-occurring paraffin, and the latter its refined product.

We are informed that the firm in the United States on the receipt of our report made no demur to the return of the consignment, a decision at once acted upon by the Canadian manufacturers on learning from us that the wax was not genuine.

WELL WATERS FROM FARM HOMESTEADS.

Of the 85 samples received during the past year, 55 have been submitted to analysis, the remainder, either from being forwarded in dirty bottles or being insufficient in quantity, were not submitted to examination. Though the larger number of these waters were, as usual, from Ontario, samples have been received from all parts of the Dominion. For the most part they are from farmer's wells, but the series also includes a certain small number of natural spring and river waters used by farmers.

In the table of analytical data a very brief statement is made as to the general character of the water from the standpoint of wholesomeness (see last column). A more extended account or consideration of the data would not here be possible, but in reporting to the senders a fuller opinion has been given, accompanied by advice as to the purification of the water or the abandonment of the supply, as the facts dictated.

Broadly classifying the results, we find that 20 of the waters were returned as seriously polluted and dangerous to use for drinking purposes, 18 were reported as suspicious or probably contaminated to such a degree as to render them unwholesome and unsafe, 5 were designated as saline and for this reason considered non-potable, and 12 were adjudged free from all pollution, safe and wholesome.

We have for a number of years past taken the opportunity annually afforded by the presentation of the results of these water analyses to utter a protest, or rather a warning, against the use of polluted waters. By far the greater number of wells examined are undoubtedly receiving excrementitious matter, either by soakage through the soil or by surface drainage. This polluting material comes from the barnyard, privy or some similar source. This means that such waters contain readily putrescible matter and most probably—most assuredly in the summer time—are teeming with bacterial life. Some of these bacteria or germs may be harmless and have little or no effect upon the health of those who drink the water. But if the germs of disease by any chance find an entrance—and this is by no means an uncommon occurrence—they find therein all that is necessary for their rapid development and the water at once becomes most dangerous. The only safeguard the farmer has in such cases is to boil all the water required for drinking purposes. No system of household filtration is so effective as boiling the water. The boiled water, on cooling in a vessel, exposed to the air, will lose its insipidity, and become pleasant and palatable. If there is any suspicion as to the quality of the well water, either from appearance or smell, there should be no neglect in taking this simple but most effective precaution.

But apart from the possible presence of disease germs, there is a danger in such contaminated waters that must not be overlooked, namely, from poisonous organic compounds derived from the partial decomposition of the infiltrating sewage material. It seems very probable that these are in many cases responsible for various disorders of the intestinal tract, diarrhœa, indigestion, as well as sick headache and general derangement of the system. If, therefore, it be established that the well is receiving polluting matter, in fact acting more or less as a cesspit, it should be abandoned, and at the earliest possible date.

The shallow well in the barnyard or close to possible sources of pollution is always a menace. At the very earliest possible opportunity a more distant and deeper source of supply should be sought and the old well abandoned. We do hope the day of the shallow well is passing away. The driven or bored well situated out of range of pollution from the farm buildings will, as a rule, furnish good water and an ample supply of it. With such a supply and a windmill pump the farmhouse and buildings can enjoy a water service at once wholesome, convenient and constant.

Farmers in doubt as to the purity of their well water may obtain an analysis and report of the same from the Chemical Division of the Central Experimental Farm, Ottawa. Directions for the collection of the sample (a matter of considerable importance) will be forwarded on application.

ANALYSIS OF WELL WATERS, 1903.

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
			1902.									
1	Ottawa East, Ont.	J.B., No. 3	Dec. 9.	·04	·19	7·70	32·5	508·0	302·4	205·6	None	Polluted, condemned as unsafe.
2	"	J.B., " 4	" 9.	·195	·38	9·45	75·0	509·2	286·8	222.4	"	" " "
			1903.									
3	Hazeldean, Ont	H. H. A	Jan. 22.	·045	·11	11·67	32·0	314·4	191·2	123·2	Traces	Seriously contaminated.
4	McAdam, N.B	D. T	Feb. 27.	·134	·39	·38	12·50	156·0	85·6	70·4	"	Suspicious.
5	Almonte, Ont	J. F	" 28.	·05	·19	8·24	34·5	450·0	274·0	176·0	"	Polluted.
6	Ottawa East, Ont	F. X. L	Mar. 2.	·03	·205	6·82	147·5	911·2	482·4	428·8	"	Undoubtedly contaminated.
7	Summerside, P. E. I	R. H	" 9.	·44	·46	8.72	40·0	277·0	175·0	102·0	H. ppte	Seriously contaminated.
8	Ottawa, Ont	T. G. B	" 9.	·04	·127	10·37	10·3	549·6	346·8	202·8	V. H. ppte	Undoubtedly seriously polluted.
9	Beulah, Man	J. C., No. 1	" 23.	·016	·395	·003	28·0	3733·6	2756·0	977·6	H. traces	Free from organic pollution, saline
10	"	" " 2	" 23.	·85	·765	·239	70·0	5134·8	4233·2	901·6	Traces	Suspicious, saline.
11	Port Sydney, Ont	A. L. F. B	" 31.	·01	·11	1·35	2·0	38·0	12·0	26·0	None.	Wholesome, unpolluted.
12	Kilaloe Station, Ont	J. W. P	Apr. 7.	·89	·96	6·14	175·0	688·0	440·0	248·0	Traces.	Most seriously contaminated.
13	Nepean, Ont	W. D	" 14.	·045	·16	14·26	24·0	426·4	234·4	192·0	H. ppte	Very bad water, unsafe for use.
14	Almonte, Ont	L. C	" 20.	·03	·11	3·36	3·0	267·2	196·0	71·2	"	Very suspicious.
15	Yorkton, Assa	S. G., No. 1	" 20.	1·576	·28	None	122·5	2600·0	2115·0	485·0	Traces.	Suspicious, not suitable for drinking purposes.
16	"	" " 2	" 20.	·072	·41	"	15·0	712·0	458·0	254·0	H. traces	Probably safe and wholesome.
17	Chilliwack, B.C	G. M. S	" 28.	·02	·285	3·45	6·50	116·8	60·8	56·0	V. S. Traces	Very suspicious.
18	Almonte, Ont	L. C	May 2.	·028	·103	3·53	3·9	236·0	146·8	89·2	H. Traces.	Polluted.
19	Ottawa East, Ont	J. B., S. Well	" 11.	·044	·186	5·01	7·5	132·0	60·0	72·0	"	Suspicious.
20	Hamiota, Man	A. E. K	" 12.	2·79	·145	None	31·0	2071·6	1627·6	444·0	Cons. traces.	Polluted, not suitable for drinking purposes.
21	Desbarats, Ont	S. G. F	" 21.	·05	·21	1·42	16·0	310·4	208·8	101·6	Traces	Very suspicious.
22	Stirling, Alta	C. B. R	June 1.	1·59	·395	·076	49·5	2130·0	2082·0	48·0	S. traces	Saline water.
23	Summerside, P. E. I.	F. B	" 3.	Free	·038	1·29	10·0	137·6	116·0	21·6	V. S. traces.	Free from pollution, wholesome.
24	Almonte, Ont	L. C	" 3.	·01	·095	2·174	4·5	296·0	229·6	66·4	" "	Suspicious.
25	Mansewood, Ont	T. C., No. 1	" 12.	·01	·075	5·54	13·0	465·6	315·2	150·4	S. traces	Polluted.
26	"	" " 2	" 12.	·11	·044	18·19	32·5	534·0	239·6	314·4	"	"
27	Cutbank, Alta	F. G	" 23.	·889	·72	3·797	180·0	2528·0	1922·0	606·0	H. traces	Suspicious, not a good water.
28	Sheffield, N.B	F. B. J	July 4.	·02	·08	10·5	40·0	216·4	124·0	92·4	None	Polluted.
29	Meaford, Ont	J. L	" 18.	·595	·115	....	58·5	3068·4	2358·8	709·6	Traces	Seriously contaminated.
30	Hall's Glen, Ont	E. E. P	" 22.	Free	·18	·453	160·0	840·8	586·4	254·4	S. traces	" polluted.

31	Martintown, Ont...	A. W. U., No. 1.	" 24.	·04	·135	14·12	54·0	614·0	331·6	282·4	Traces..	Seriously polluted, dangerous for drinking.
32	"	" " 2.	" 24.	·02	·08	3·21	4·5	316·4	194·4	122·0	"	Wholesome, unpolluted.
33	St. Agathe, Man.........	T. H...........	" 27.	2·65	·305	....	4300·0	11508·0	8516·0	2992·0	Free.........	Saline water.
34	Sussex, N. B............	H. W. F.......	Aug. 4.	3·99	·285	8·85	34·0	302·0	208·0	94·0	S. traces....	Seriously polluted.
35	Picton, Ont	W. O. P.........	" 5.	·117	·397	None...	9·0	393·0	258·0	135·0	Traces..	Probably contains drainage.
36	Hargrave, Man..........	W. B. P.........	" 7.	·068	·405	·006	39·0	525·0	348·0	177·0	H. traces....	Not a first-class water.
37	Masonville, Ont..........	A. H. C., No. 1.	" 12.	·08	·265	12·87	31·0	645·2	330·8	314·4	" ...	Unwholesome, polluted.
38	"	" " 2.	" 12.	Free....	·06	7·86	50·0	576·8	296·8	280·0	S. traces....	Suspicious.
39	Urquhart, Alta..........	P. McD.........	" 13.	Free....	·265	·032	1·0	668·0	418·0	250·0	Traces..	Free from pollution, wholesome.
40	Vankleek Hill, Ont.......	K. McC.........	Sep. 5.	·26	·19	·008	4·0	780·0	503·2	276·8	"	Suspicious.
41	Calgary, Alta............	Mrs. J. A. T....	" 10.	·25	·29	·369	7·0	328·0	234·8	93·2	"	"
42	McAdam, N.B.	J. W. H.......	" 11.	·06	·12	2·85	7·3	120·0	74·4	45·6	H. traces...	Possibly safe, but not a first-class water.
43	Guelph, Ont.............	W. H., No. 1..	" 14.	·06	·247	·756	5·8	262·8	146·4	116·4	S. traces....	From River Speed.
44	"	" " 2..	" 14.	·08	·214	·763	6·7	261·6	148·8	112·8	V. S. traces.	" "
45	Woodstock, Ont..........	W. G. F..	" 24.	·058	·21	16·14	80·0	839·2	572·0	267·2	H. traces....	Suspicious.
46	Martintown, Ont........	A. W. U.... ..	Oct. 1.	None...	·175	2·88	3·8	298·0	187·6	110·4	V. S. traces.	Probably a good and safe water.
47	Brackenrig, Ont.........	T. W. K........	" 5.	·024	·124	·94	None...	42·4	23·2	19·2	V. H. traces.	Wholesome.
48	Balsam Hill, Ont........	C. L. McC......	" 12.	·66	·215	·058	20·0	360·0	238·4	121·6	Traces..	Unwholesome, suspicious.
49	Moosomin, Assa..........	J. H...........	" 17.	·024	1·164	·158	175·0	11837·2	8538·8	3298·4	None..	Saline water.
50	Ottawa East, Ont........	J. B., (S. Well).	" 29.	Free....	·15	2·71	5·5	172·8	94·4	78·4	S. traces....	Shows a marked improvement on samples of May 11th.
51	Thamesford, Ont.........	W. J...........	" 31.	·562	·252	4·12	24·5	444·0	256·0	188·0	"	Very suspicious.
52	Newbury, Ont...........	G. A...........	Nov. 4.	·16	·195	8·57	55·0	642·4	396·8	245·6	Traces......	Seriously polluted.
53	Grenfell, Assa...........	J. R...........	" 6.	1·287	·315	·076	12·0	1572·0	1166·0	406·0	S. traces....	Suspicious.
54	Sault au Recollet, Que....	R. P. J.........	" 16.	None...	·10	5·259	4·75	250·0	134·5	115·5	H. traces...	Wholesome.
55	Proctor, B. C..	J. W. F........	" 26.	Free....	·102	Free....	Free....	188·0	126·0	62·0	Free........	Exceptionally pure water.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST

(JAMES FLETCHER, LL.D., F.L.S., F.R.S.C.)

1903.

OTTAWA, December 1, 1903.

Dr. WM. SAUNDERS,
Director of Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to hand you herewith a report on some of the more important subjects which have been brought officially under my notice during the past season.

The appreciation of the value of the investigations prosecuted by the officers of the Division is indicated by the large correspondence with farmers, fruit-growers and others in all parts of Canada. It is impossible in an annual report to deal with all the subjects which come up for consideration during the year. Many of these have already been treated of in previous reports, and the investigation of some is as yet in an incomplete state. Correspondents are constantly adding much to previously recorded facts concerning the habits of injurious insects, the utility of remedies, and the best way to apply them, the value of fodder crops, and many other subjects. The correspondence and replies relating to these are all carefully preserved and classified for future use. A complete index has been made of all letters which have been sent out from the division since the institution of the Experimental Farms up to the present time, which is of much use when working up afresh a subject which has been previously studied.

Fodder Plants.—The testing of grasses and other fodder plants, native and exotic, both in the experimental grass plots at the Central Experimental Farm and by correspondents, has been continued, and, as in the past, has been a source of much interest to all who have witnessed these experiments. The Awnless Brome Grass, the cultivation of which, from its introduction up to the present time, I have persistently endeavoured to encourage, has proved a great boon to farmers and stockmen in Manitoba and the North-west Territories. This grass is now recognized as one of the important staple crops of the West, where it is grown both for hay and pasture, as well as for the seed, which always meets with a ready sale. Attention has also been drawn to the value of various mixed crops for summer feed, and, following the experience of our Superintendents at the western farms, some farmers have grown with great satisfaction mixtures of pease, oats and wheat, one bushel of each to the acre; tares and oats, or pease and oats, one and a half bushels of each to the acre.

Lucerne or alfalfa has been tried to a certain extent in most of the provinces of the Dominion, and where care has been taken to prepare the land properly by ploughing deeply and then consolidating and smoothing the surface by harrowing, it has done well in many localities where it had been thought previously that this most valuable clover would not grow. It is also most important that the land should be in the condition known by farmers as 'good heart,' that is, fit to grow a good crop of an ordinary farm crop. I feel confident that this fodder plant, which is of such immense importance in the semi-arid districts of the western States, both on ordinary farm land and under irrigation, is worthy of a much more extensive trial in the North-west and Manitoba than up to the present it has received. This, to a large measure, is also the case with the other well known clovers so extensively cultivated in the East, but which are considered out of the question as farm crops on prairie farms. All of these clovers may be found in many places along railway banks throughout the West, and, where they have been tried on farms, although the general result has been considered a failure, still there are many plants persisting and in some places increasing slowly year by year. It is now well known that the satisfactory cultivation of clovers is much affected by the presence of bacteria-containing nodules upon the roots, and that, if these be present in the soil, the vigour of the plant is much increased. This increase takes place more and more every year when clovers are grown upon new soil, the original bacteria, adjusting themselves to the clovers from nodules on roots of native leguminous plants, or, possibly, being carried with the seed. White Clover is thoroughly established in the streets of Winnipeg and some other Manitoban towns, where it is sown to crowd out coarse weeds along the boulevards and in the streets. This plant grows well also at Regina, Calgary, and many other places. Mr. Bedford, the superintendent of the Manitoba Experimental Farm, writes:—'On this farm, when sown without a nurse crop, Alfalfa, Common Red, Mammoth Red, Alsike and White Dutch Clovers form robust plants by fall, and do not fail to pass the winter successfully. I sow in spring without a grain crop, because, when sown with grain, alfalfa and other clovers, but particularly alfalfa, have been winter-killed, the roots produced during the first year being small and short. I have grown alfalfa since 1887.'

When travelling through the North-west Territories, I have frequently come across farmers who have small patches of alfalfa, some of these of three or four years' standing. and Mr. T. N. Willing, of Regina, who, as Provincial Weed Inspector, has exceptional opportunities of seeing what crops are grown on farms in all parts of the North-west Territories, and who, as a practical farmer, is well able to judge the value of crops, writes:—'I am sorry to say I am not aware of any one who is conspicuously successful with alfalfa on a large scale, although many have tried small patches, which have apparently given most promising results. Mr. W. Stevens, of Cloverbar, near Edmonton, has a patch in its second season, which wintered perfectly; when mowed at the end of July it was between three and four feet high and gave a crop estimated at from three to three and a half tons. Near Battleford, the late Mr. Laurie sowed alfalfa about 1884; the season was dry, but the plants struggled on in spite of drought and gophers; the farm was subsequently abandoned, but in 1900, the alfalfa area was still clearly defined and proved attractive to the cattle. Mr. Laurie was satisfied that this would have done well, had he been able to care for it better. A man near Boscurvis has grown alfalfa for three years, and it has constantly improved. Near Prince Albert it was grown for five years by Mr. Acorn, but was then killed out by a late spring frost.'

In view of what I myself have seen in the North-west, and of statements made by farmers who have tried it upon small areas, I have thought it wise to recommend farmers in the West to test alfalfa more thoroughly, doing so on small areas and sowing in spring at the rate of from fifteen to twenty pounds to the acre, without any nurse crop and upon land which had been summer-fallowed the year before. The first year all that would be necessary, would be to mow the weeds. If, in districts where there is a little more moisture than is found on the open prairies, it was thought desirable to mix with the alfalfa or clover any grass, decidedly the best kinds for this purpose would be the Awnless Brome or the Western Rye-grass, which might be mixed in the proportion of ten pounds of alfalfa to six pounds of the grass seed. Awnless Brome does not as a rule make a very heavy growth the first season, and therefore it would not crowd out the somewhat delicate alfalfa seedlings, nor deprive them of too much soil moisture. The alfalfa, being a very deep-rooted plant, would be well suited for cultivation with either of these grasses, the root systems of which are much nearer the surface. I am glad to learn that the North-west government has secured from the Russian government a quantity of seed of the Turkestan variety of alfalfa, which will probably be distributed for testing in various localities next spring. This variety is merely a form of the common alfalfa which has been grown in Western Asia for a long time and has thus become accustomed to more severe conditions. I was fortunate enough to secure from the United States Bureau of Plant Industry some seed of the original distribution which was brought to America, and have a vigorous plot now growing from that seed. The two plants are almost indistinguishable, although the Turkestan variety is rather more vigorous in growth; but the leaves and flowers of both forms are similar.

Collections.—The collections of insects and plants in the Division have been very much augmented during the past year, many interesting additions having been made from material collected in the field, as well as through the kindness of correspondents who have sent in collections to be named by the officers of the Division. The success of the recent Nature Study movement in education has had a marked effect in increasing the interest in the subjects dealt with in the Division of Entomology and Botany, as has been evidenced by the large number of natural history objects which have been sent in with inquiries for information concerning them. These were for the most part insects and plants and came from teachers, students and farm children living in every province of the Dominion. I was much pleased to have the opportunity of distributing useful knowledge concerning these important subjects in this direct way to those for whom it was of so much practical value; and, moreover, from this source many valuable additions have been made to all of our collections. For several years material of all kinds has been accumulating from my own collections in the West, from the extensive breeding investigations into the life-histories of insects which have been carried on here, and from specimens sent in by correspondents for examination. During the past season many insects have been mounted and arranged in the cases, as well as plants in the herbarium, so that we have in the Division fairly good working collections which are now available for reference when required.

Insects.—The chief effort has been made to study and represent in the cabinets the various stages of those species which are injurious to crops, and those which are known to be beneficial. Much has also been done to build up the general scientific collections of the different natural orders of insects.

Plants.—Large additions have been made to the collection of native wild plants, and some hundreds of sheets have been mounted and arranged in the herbarium. These consisted chiefly of plants of various orders from the North-west Territories, from the Rocky Mountains, and from British Columbia. A good representation has also been secured of fodder plants, particularly of grasses. Agricultural weeds and poisonous plants, which are a subject of burning interest in the wheat lands of the West, and on the stock ranges, are well represented in our collections, and a recent improvement has been made by arranging the collection of seeds of weeds and other plants; this collection now contains seeds of about 450 species and includes nearly all of the weeds of importance in different parts of the Dominion. These samples have been of much service in identifying seeds found among seed grain and clover and grass seeds, sent in by farmers and seed merchants for examination as to purity and for testing as to vitality.

Insects of the year.—I am pleased to report that there have been no serious outbreaks of injurious insects during the season of 1903, nor have any new pests of importance made their appearance. One species of interest, but of no great economic importance is the Rhubarb Weevil (*Lixus concavus*, Say), which was found injuring rhubarb at Harrietsville, Ont. There was, however, been considerable loss in various parts of the Dominion from regularly occurring insect enemies; and, where farmers have applied promptly the remedies recommended, great saving has been effected. The season, on the whole, has not been quite as propitious as usual for good crops. Until the middle of June, the exceptional drought which prevailed through eastern Canada, prevented the germination of seed of all kinds, which retarded the development of many crops and exposed them to attacks from insect enemies. Later in the year, cool damp weather prevailed, which again delayed maturity and was the cause of some loss. Some of the leading features of insect presence during the year were the following:—

Among cereal crops there were no widespread or very serious losses. Hessian Fly was reported as the cause of some loss in Prince Edward Island, at one place in western Ontario and in restricted localities in Manitoba and the North-west Territories. The Wheat-stem Sawfly was abundant and destructive, although little observed, in south-western Manitoba. The Grain Aphis appeared suddenly during July and August in enormous numbers throughout Ontario, in Manitoba and in the North-west Territories and was the cause of considerable alarm; happily, however, the parasites which usually control this species, appeared soon afterwards and eventually, owing to the excellent weather for the grain to fill which prevailed last autumn, the injury was unimportant. In Manitoba locusts did some harm, but this was far less than in previous years. Farmers throughout the district, assisted by the provincial government, applied the standard remedy, the Criddle mixture, and in every instance with most satisfactory results. Experiments undertaken with a view to destroying these insects in a wholesale manner with the fungous disease which has been used in other parts of the world, were without avail, and this, I find, has been the general outcome of most experiments of this nature. Occasional successes which have been reported, seem to have been largely due to exceptionally advantageous atmospheric conditions at the time of the experiments. An outbreak which caused widespread alarm in Manitoba, was by the caterpillars of two broods of a common prairie moth, which this year appeared in vast numbers and, having consumed all of their natural food plant, the common weed known as Lamb's Quarters, ate many other plants, amongst which were some kinds of garden plants. This insect was the pyralid known as the Sugar-beet Web-worm (*Loxostege sticticalis*, Linn.).

Root crops and vegetables were diminished to a certain extent by the ordinary pests of the field and garden. Cutworms of various kinds were reported during the dry spring weather from all parts of the Dominion, and where not controlled did much damage. Root maggots, as usual, were irregular in their appearance, but in most places were the cause of great loss amongst onions, radishes, cabbages and turnips. The Colorado Potato Beetle was noticeably less abundant in most places. The Asparagus Beetle, a recent importation into Canada, although not a cause of much loss, has gradually extended its field of destructiveness, and last summer was reported as far east as Toronto.

Fruit crops generally have been good and remunerative, growers in all districts are seeing more and more the advantage of practising such common sense factors of success as spraying for the prevention of insect enemies and fungous diseases. The San Jose Scale has been held in check to a satisfactory extent wherever instructions of specialists have been followed, and although this insect has not spread beyond the limits of the previous year's infestation, the injury done and the future danger from its work are very great. The work of the Oyster-shell Bark-louse has been much complained of in New Brunswick, Nova Scotia and Ontario. The Pear-tree Flea-louse has been locally in Ontario the cause of considerable loss and has for the first time this year been recorded from Nova Scotia. The Pear-leaf Blister-mite is abundant in British Columbia and occurs now in every province of the Dominion. When trees have been sprayed just before the buds burst, with the lime, sulphur and salt wash, good results have followed. Plant-lice of various kinds were rather more abundant than usual on apple, plum and cherry trees, but were in most cases destroyed by parasites before much damage was done. The Tent Caterpillars, Cankerworms and the Codling Moth were noticeably less troublesome last season than for some years.

Shade-tree and forest insects were seldom referred to in correspondence, and few serious attacks were observed. In Montreal, Kingston and Toronto the White-spotted Tussock Moth has increased so much that remedial measures are now urgently needed or the beauty of shade trees in these cities will be much marred at no distant date. A remarkable outbreak of the Maple Soft Scale, *Pulvinaria innumerabilis,* Rathvon, took place on the street shade-trees last summer in London, Ont., causing much inconvenience to foot passengers, and the same insect also occurred on the shade-trees in Woodstock, Hamilton, and some other towns in western Ontario. The Negundo Plant-louse disfigured shade-trees to some extent in Winnipeg, Regina and Calgary, but not to a very serious extent. An insect which has gradually increased in abundance and now is destructive over a wide area in Canada, is the Spruce Gall-louse represented in the East by *Chermes abietis,* L., and in the West by *Chermes sibirica,* Cholodk. On small ornamental trees, spraying with a tobacco and soap wash has been effective, but in forests nothing can be done to check the ravages. There are, however, indications in some places that good work is being done by parasites. The unsightly nests of the Fall Webworm have become conspicuously more abundant lately than they have been for several years, and already demand attention from municipal authorities in towns, as well as from fruit-growers in many parts of Ontario and Quebec, as also in British Columbia. The insect occurs right across the Dominion.

Live Stock.—The Cattle Horn Fly, which a few years ago caused such extensive losses to dairymen and stockmen in eastern Canada, has now reached the Pacific coast. Although still occurring in some numbers in the eastern provinces, its most severe attacks in 1903 were in British Columbia, where I found it last summer extremely abundant in some localities on Vancouver Island. Cattle-owners were not prepared to use the remedies which have proved to a large measure effective in the East ; but, when these were applied, relief was soon apparent. The most convenient remedy in our experience, is to smear the animals on the parts most attacked with a light dressing of pine tar, one pound mixed with five pounds of lard or half a gallon of fish oil.* Specimens of the fly were sent from Regina by Mr. Willing, which he had taken on horses; but I saw no annoyance either to cattle or horses during a long journey through several of the cattle districts of the North-west in June and July last. I am hopeful that it is hardly likely this insect will ever be a very serious pest of stock in the dry regions of the West, where the cattle droppings, in which only the fly propagates while these are in a semi-fluid condition, dry up so quickly that they are soon unsuitable for the larvæ to live in.

Meetings.—Whenever official duties would permit of my absence, no opportunity has been lost of meeting farmers and of attending meetings of farmers' institutes and agricultural associations of various kinds. The subjects treated of at these meetings were as stated below:—

December 26 to 29, 1902: Washington, D.C.—Association of Economic Entomologists: 'Can the Pea Weevil be Exterminated ?'; 'Injurious Insects of the Year in Canada.'

Through the kindness of the President of the Association, a special discussion was held on the former of these papers, and co-operation was promised by several of the entomologists at the United States experiment stations, in disseminating information and in applying remedies for the Pea Weevil in those States where pease are grown for seed.

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* This mixture contains twice as much pine tar as in former recommendations. We have found that it keeps off the flies much longer than the old mixture of 1 lb. in 10 lbs. of lard.

December 29, 1902: Washington, D.C.—Society for the Promotion of Agricultural Science: 'Co-operation in Fighting Insects.'

January 5, 1903.—A series of addresses on the Value of Nature Study in Schools was given at the school houses in the following places: January 5, Harmony, Cedardale and Oshawa. January 6, U. S. S. No. 4, Whitby; U. S. S. No. 5, Whitby and Kinsale. January 7, U. S. S. No. 1, Pickering; U. S. S. No. 4, East Pickering and Pickering Village. January 8, Pickering, Frenchman's Bay and Dunbarton. January 9, Audley, Brock Road and Cherrywood. January 10, a large meeting in the town hall at Whitby. At all of the above meetings I was accompanied by Mr. W. A. Dent, who delivered most interesting addresses upon the habits of birds. These meetings were organized to help the children of this district in competing for the prizes offered by the Live Stock Commissioner at the Whitby Model Fair.

February 18 : Toronto.—Canadian Association of Fairs and Exhibitions : 'The Value of School Children's Exhibits at Fairs.'

March 6 : Pembroke High School.—'The Value and Pleasure of Natural History Studies.'

March 16 : Toronto.—Canadian Institute : 'Rocky Mountain Plants and Insects.'

March 18 : Cowansville, Que.—(1) 'The Brome Corners Weed Exhibit and its Lessons'; (2) 'Fodder Plants Suitable to the Eastern Townships'; (3) 'Spraying to prevent Insect Injuries.'

March 21 : Toronto Teachers' Association.—'Nature Study, What is it ?'

April 3 : Renfrew.—'Why should boys and girls study Nature ?' A mass meeting held in the city hall. Renfrew Horticultural Society : 'What Everyone can do to Improve the town he lives in.'

May 11 : Hamilton Horticultural Society.—'Seasonable Hints on Insect Enemies.'

May 14 : St. Catharines district.—Examining orchards which had been treated with the McBain Carbolic Insecticide for the destruction of the San José Scale, in company with some members of the Ontario Fruit Growers' Association.

June 15 to August 21.—In the West, investigating an outbreak of locusts in Manitoba, and holding a series of farmers' meetings in the North-west Territories and in British Columbia.

September 3 and 4 : Ottawa.—Entomological Society of Ontario : 'Insects Injurious to Ontario Crops, 1903' ; (2) 'Entomological Record for 1903.' At this meeting a paper was also read by my assistant, Mr. Gibson, entitled 'Basswood, or Linden, Insects.'

September 16 : Whitby.—Attending the Central Ontario Model Fair and judging the natural history exhibits sent in by school children. Delivered an address in the evening at a public meeting upon 'The Children's Exhibits at the Fair.'

September 29 : Richmond.—Opening the Model Fair for Eastern Ontario. Address: 'Model Fairs and their Management.'

November 25 and 26: Leamington, Ont.—Ontario Fruit Growers' Association: (1) 'Insects Injurious to Fruit Trees and how to Fight them'; (2) 'Insects affecting House Plants.'

Correspondence.—The correspondence of the Division has been of the usual varied nature and as heretofore has taken up much of the time of the officers. Many of the letters written are practically articles upon special subjects which are suitable for publication in the press, and have frequently been made use of for this purpose, in that way reaching a larger number of interested readers than could be done by direct correspondence. From December 1, 1902, to December 1, 1903, the number of letters, exclusive of circulars, registered as received is 3,150, and the number despatched, 2,664.

Acknowledgments.—As in previous years, I take pleasure in gratefully acknowledging my obligation to many correspondents, to practical farmers who have much aided the work of the Division by promptly reporting outbreaks of injurious insects and noxious weeds, and for making, at request, special observations upon these. I must particularly mention in this connection, Prof. John Macoun, of Ottawa, who has on many occasions helped me with the identification of specimens, and also Dr. L. O. Howard, the U.S. Entomologist, Dr. Harrison G. Dyar, of the U.S. National Museum, and Mr. B. T. Galloway, of Washington. My thanks are also specially due to Dr. J. B. Smith, of New Brunswick, N.J., who has examined and named for me large numbers of Noctuidæ taken in Canada.

In conclusion, I take pleasure in again testifying to the excellent work done by my assistants, Mr. J. A. Guignard, B.A., and Mr. Arthur Gibson, to whose loyal and careful work much of the success of the work of the Division is due.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist to the Dominion Experimental Farms.

DIVISION OF ENTOMOLOGY.

CEREALS.

Weather conditions during 1903 in all parts of the Dominion have been somewhat unusual, and crops of all kinds, particularly cereals, have suffered somewhat from this cause. Crop reports from the eastern provinces record a prolonged spring drought with frosts in some places, which in Prince Edward Island and Nova Scotia somewhat thinned fruit crops and retarded growth of hay and pastures. A noticeable absence of injurious insects, with the one exception of cutworms, is mentioned by numerous correspondents in the maritime provinces. In Manitoba, conditions at sowing time were exceptionally favourable and all crops were got in and started well. The weather up to the middle of May was somewhat cool, and there was not much growth of grass and no trees were in leaf. After that time copious rains fell, which germinated all seed and gave promise of an enormous crop. The dry June which followed, with only light showers in July, checked the growth somewhat and, in districts where there was too little rain, grain was prematurely ripened. The result was that crops were rather lighter than usual, and in some districts both in Manitoba and the North-west Territories, where rain fell late in the season, crops did not ripen early enough to escape injury. The handsome gross yield, however, of fifty-seven million bushels of wheat, with an average of over 18 bushels to the acre, in conjunction with the higher price of wheat, gave the farmers of Manitoba and the North-west good returns for their work. In British Columbia Mr. J. R. Anderson reports that all grain crops were good and free of injury by insects. In Ontario the growing of wheat has decreased considerably during the last two or three years. This is doubtless due to losses from the Hessian Fly. In 1900, 1,068,000 acres were put in to fall wheat and 377,000 to spring wheat, while in 1903 only 665,000 acres of fall wheat were sown, with 248,500 of spring wheat. Prof. James, in his November crop report, for Ontario, says: 'The yield of fall wheat per acre is large and the quality of the grain is, as a rule, first class. Taking both yield and quality into consideration, the crop of 1903 may be considered as one of the best in the history of the province. There has been a greatly increased area of wheat sown this fall, more particularly in the Lake Erie district and other localities where the Hessian Fly did so much injury during the previous three or four years. The crop of spring wheat may be counted as above the average, although not so good relatively as fall wheat.' Oats, in all parts of the Dominion, were a heavy crop, but in some places were late in maturing and rather light in weight. No injury by insects, either to this cereal or to barley, was mentioned, and only very few references were made to rust, notwithstanding the heavy rains in some districts. The season of 1903 was not very favourable for corn. Seed planted early did best; that which was put in at the ordinary time, germinated very poorly from lack of rain and was consequently late. The long open autumn, before severe frost came, gave an opportunity for the crop to mature well, and most of it was saved in good condition, both for the bin and the silo.

Pease, which for several years have suffered so severely from the Pea Weevil, were grown to a much smaller extent in Ontario than for many years. In 1903 there were 125,500 acres less land sown to this crop in Ontario than in 1902; but the crop reaped was 1,259,971 bushels above that of 1902, with an average of 22 bushels per acre, against 14½ the previous year. This improvement, it must be acknowledged, is to some extent due to the campaign against the Pea Weevil, organized by the officials of the Ontario Department of Agriculture and this Division. Many farmers and others who grew pease, demanded from their seedsmen seed pease which had been treated to destroy any living weevils which might be contained in them, and the present satisfactory state of affairs emphasizes the importance of treating all seed before sowing it, and of insisting that all who sell pease should attend to this matter. If a little more effort is now put forth, I see no reason why the Pea Weevil should not be entirely wiped out in Ontario. The remedies which will, in my opinion, effect this, were given at length in my last report, and consist of sowing early, so as to hurry on maturity as soon as possible, reaping directly the crop is in a fit condition, threshing and fumigating with bisulphide of carbon at once and then bagging up the seed and keeping it in bags until required for use. If it is not considered convenient to fumigate the seed before sowing, all the weevils can be destroyed by sprinkling a little coal oil or turpentine over the seed and turning it well for two or three days before sowing, or the seed may be held over till the second year, when it will be quite free from weevils, because these always emerge at latest by the spring of the year following the season when they develop.

The GRAIN APHIS *(Nectarophora granaria,* Kirby=*Siphonophora avenæ,* Fab.).—The only insect which was complained of as having occurred in undue numbers on cereal crops during the past year was the well known Grain Aphis, or 'green fly.' There is no doubt that where this occurred early in the season some injury was done to growing wheat and oats, but for the most part, although the aphides were exceptionally abundant, the usual parasites accompanied them, and in a short time they entirely disappeared.

'Aweme, Man.—The Grain Aphis was extremely abundant on wheat and oats this year. They attracted our attention during the first week in July and later they were so plentiful that they wetted all the front part of the binder canvases, on which they could be gathered up in handfuls. Mr. Sutcliffe, of Treesbank, tells me that they were so abundant on his oats that they actually stopped the binder. On looking beneath the canvases, he found the rollers simply packed with smashed up plant-lice. These insects undoubtedly did considerable harm this year by sapping the vitality of the plants, thus preventing the heads from filling as well as they should have done. As usual, numerous parasites were present with these and the many other kinds of aphis which appeared on various plants this year. By the end of the season, the parasites had almost exterminated these.'—NORMAN CRIDDLE.

Samples and reports of the presence of the Grain Aphis were sent in from many places in Manitoba and eastern points in the North-west Territories, as well as from a few places much further west. It was reported as being unduly abundant in Manitoba, at Bagot, by Mr. Eli Roberts; at Portage la Prairie, by Mr. James Thompson, and at Miami, by Mr. Thos. Renwick, who spoke of it as general throughout that district. The farthest point west where injury was done was at Beaver Dale, N.W.T. (34.26.7 west of 2nd meridian), from which place specimens were sent by Mr. Geo. Fernie. At Ottawa large numbers of the Grain Aphis were found on wheat and oats at the end of July, and it was noticed in the experimental plots here that certain varieties of wheat were more attractive to the insect than others. As a general thing, the bearded varieties were found in this observation to be much less infested than bald wheats. In every instance, large numbers of parasites were found present with specimens sent in for examination. In our Ottawa fields these were represented by the following species of Hymenoptera: *Asaphes vulgaris,* Walk., *Lygocerus niger,* How., *Xystus* (Allotria) *tritici,* Fitch, *Aphidius avenæ,* Fitch, *Pachyneuron,* sp. There were also numerous specimens of the common coccinellids *Adalia bipunctata,* L., *Hippodamia convergens,* Guér., and the Thirteen-spotted Lady-bird Beetle (*Hippodamia 13-punctata,* L.), and of the Hovering Fly *Syrphus ribesii,* L.

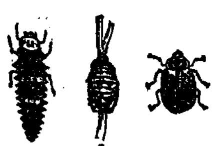

Fig. 1.—Lady-bird Beetle: *a,* larva; *b,* pupa; *c,* perfect insect.

Fig. 2.—The 13-spotted Lady-bird Beetle—enlarged.

WHEAT-STEM SAWFLY *(Cephus pygmæus,* L.).—An insect which appears in a rather intermittent manner in Manitoba and the North-west Teritorries is the Wheat-stem Sawfly. Although present in considerable numbers in a locality one year, it seldom appears again in the same place the following year. It has from time to time been reported from Central Manitoba right across the plains to the Rocky Mountains. There are, I believe, other species of *Cephus* which attack various grasses in the West. In 1902, Mr. Norman Criddle sent me from Aweme, Man., a large number of stems of two grasses, *Ammophila longifolia* and *Agropyrum caninum,* which were attacked by Cyphid larvæ. Judging from the colour—one was bright yellow and the other white like the Wheat-stem Sawfly—there were at any rate two species; but, unfortunately, I failed to rear any of the flies from the large amount of material sent me by Mr. Criddle. During the past season I received several infested wheat straws from Mr. John Davis, of Waskada, Man., who wrote :—

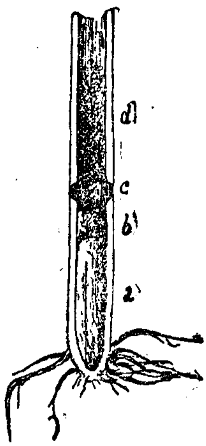

Fig. 3.—Wheat-stem Sawfly: *a*, cocoon, *b*, borings.

August 19.—I am sending you a few stems of wheat which I and many others here would like you to report upon. You will notice that some of the straws are broken or bent down three or four inches from the ground. The cavity of the straw is full of fine dust, and there is a small white grub about half an inch in length. This I have generally found low down quite near the root. It is very general through this district, but is not very destructive. The straws fall as they get dry, and where the attack is slight it might easily pass unnoticed. I have one field of 45 acres summer-fallowed last year. We were estimmating this to yield 30 bushels to the acre. There is about 5 per cent of this field down. I have not seen any other field so badly attacked as this is, but I have not seen any field about here that is quite clear of injury. It is a new pest here, and no one seems to know anything about it.'

This insect has provisionally been named *Cephus pygmæus,* L., and it certainly bears a close resemblance to that European species; but there are some points in its habits and life-history which do not agree, and it is just possible that the insect which occurs in our North-west may be a native grass-feeding species which occasionally attacks wheat when it finds that plant in a suitable condition at the time the females are laying their eggs. This can only be proved by carefully rearing a large series of the insects. The perfect insect is a shining black four-winged sawfly, banded and spotted with yellow, and having the abdomen slightly compressed. The head is large, with prominent eyes, the antennæ slightly club-shaped and composed of about 20 segments. The female is rather larger than the male and less ornamented with yellow. The average length of this fly is about one-third of an inch. The eggs are laid probably about the 1st of July, just before the wheat comes into head. They are inserted into the hollow of the stem by means of the female's saw-like ovipositor. The egg hatches in a few days, and the larva grows rapidly; before the straw ripens and hardens it will have eaten its way from the topmost joint of the stem to the lowest, feeding on the substance of the knots and on the inside tissues of the straw. About the time the grain ripens, it goes down to the lowest joint and gnaws away the inside of the straw so as to cut a ring almost, but not quite, through to the outside. This is just above or at the surface of the ground. The larva then burrows further down into the base of the stem and spins a very fragile skin-like cocoon, in which it remains unchanged until the following spring. The date of appearance of the perfect insect varies with the season and locality. I have taken specimens by sweeping, both in grain fields and on the prairie, from the last week of June to the middle of July. As all the larvæ pass the winter in the base of the straw, remedial measures must aim at treating the stubble so as to destroy them or the pupæ before the flies emerge. I have suggested that this may be done either by ploughing deeply or by burning over the stubbles. As a few of the cocoons occur high enough up in the straw to be cut with the grain, all straw which cannot be used during the winter should be burnt.

The HESSIAN FLY (*Cecidomyia destructor*, Say).—This destructive insect, which a few years ago was the cause of such extensive loss in the fall wheat-growing districts of Ontario, was hardly noticed during the past season. Prof. Lochhead, of the Ontario Agricultural College, writes : 'This pest of wheat, barley and rye is no longer a serious enemy in the province. It has only been observed in one or two localities during the past season. In the vicinity of Georgetown it did much damage in wheat grown on stubble. A correspondent writes : "In good crops very little harm was done. On one occasion, in passing along the road, I noticed in a badly injured field that there was one very luxuriant patch of grain. I examined this patch, where evidently a pile of manure had lain, and found that the straw and grain were in good condition. I could not find a single stalk infested by the Hessian Fly." Most farmers are practising late sowing, that is about September 15. This probably had a good deal to do with the disappearance of the Fly.'

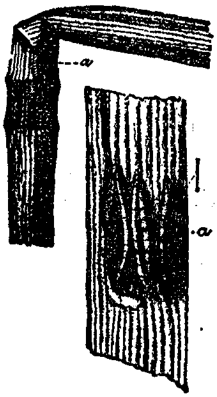

Fig. 4.—Hessian Fly: injured wheat-stem; 3 puparia—enlarged.

Reports from Prince Edward Island show that the Hessian Fly was noticeably present in several localities, and Mr. E. J. McMillan informs me that there was a considerable amount of loss in some places. In the West, Hessian Fly was mentioned quite frequently in correspondence from Manitoba and the Territories, but I believe that there was a confusion, in some instances at any rate, with the work of the Wheat-stem Sawfly. The only account of a serious outbreak was from Beulah, Man., where Mr. A. J. Dennis reports that 'the Hessian Fly has been much thicker this summer than I ever saw it.'

On the whole, however, there was probably not quite so much injury in Manitoba this year from Hessian Fly attack as in 1902. As has been frequently stated, there is normally only one annual brood of the Hessian Fly in Manitoba; consequently, the remedy is comparatively simple as compared with Ontario and the eastern provinces, where the insect is carried over in fall wheat. When Hessian Fly is known to be present in a district the grain should be cut high and the stubble burned over or ploughed down in autumn, and straw should be fed or burnt before the time the flies emerge the following spring. Screenings and rubbish from threshing machines should be put where poultry can get at them or where they will be trampled into the ground during the winter by stock.

LOCUSTS.

Locusts, or grasshoppers, which have been the cause of much anxiety in Manitoba during the past three years, again appeared last spring in the same localities as previously. They were so abundant that the provincial Minister of Agriculture again thought it wise to help farmers with advice and to supply Paris green for poisoning them with. Mr. Hugh McKellar, the energetic Chief Clerk of the Department of Agriculture, by instruction of his Minister, visited the infested districts and made arrangements for the distribution of poison. This was taken advantage of by many farmers, who used the Criddle Mixture with great satis-

Fig. 5.—The Rocky Mountain Locust.

faction. Some farmers who had read in the newspapers of experiments in treating grasshopper outbreaks with parasitic fungi, asked that some experiments of this nature might also be tried in Manitoba. The idea of treating outbreaks of injurious insects by means of introducing parasitic insects or fungi is an exceedingly attractive one, and, to those who have never studied these matters, is apparently a very easy solution of a difficult problem. Knowing that many of our leading American entomologists and botanists had made extensive experiments in this direction, but that nothing was being done by these students at the present time, I had not any very sanguine hopes of securing great success in Manitoba; but, as there certainly was a chance of doing good work for the province, I endeavoured to procure some cultures of the so-called South African Grasshopper Fungus for this purpose. After correspondence with many who had experimented, I at last succeeded, through the kindness of Dr. Howard, the United States Entomologist, in obtaining six tubes. These I took with me to Manitoba in June last and placed them in the hands of Mr. Norman Criddle, a careful experimenter and asked him to follow closely the instructions which accompanied them. This work was begun while I was with him and carried out by Mr. Criddle during the summer. Notwithstanding every care, this experiment must be recorded as a failure. I append herewith Mr. Criddle's report upon his work with locusts during the season of 1903.

LOCUST NOTES FROM AWEME, MAN., 1903.

BY NORMAN CRIDDLE.

There has been throughout this part of the country a marked decrease in the number of locusts during 1903, especially where they were poisoned last season. All the early damage done, which amounted to very little, was owing to many of the stubble fields being last spring devoid of all vegetation, and consequently locusts were obliged to attack the grain much earlier than they otherwise would have done. The first hoppers noticed hatched out on the 3rd May; they were becoming quite numerous by the 5th, and on the 12th the majority were out. They then began to do harm. By the 15th they had swept into some fields in millions, I think, thicker than I had ever seen them before. They had in three days marched 200 yards. Up to this time a small amount of damage was done; but this was principally owing to carelessness, and the insects were soon got under control with poison. By the 5th June most of the locusts had passed the third stage and, owing to the hot weather, it required a good deal of exertion to keep them from the growing grain. Wherever poison had been spread, countless numbers were found lying dead about the edges of the fields. At this period quite a number hatched in the wheat fields, the eggs having evidently been laid on summer-fallow last year. On June 13 most of the locusts were in the fifth stage, and the first one was noted with wings. By July 2 two-thirds could fly and some of them began migrating. By July 6 they could nearly all fly, and many of them flew into the crops. It is at this time that the second stage of the fight begins; the locusts, flying to all parts of the crop, eat the heads of grain. Fortunately, they soon collect into the sunny places, such as where the seeder has missed or any other open spot, so that, by walking up and down the fields, these places can be found and poison spread there. In fact, I am inclined to believe that in localities where locusts are troublesome it would be a good plan to miss a foot or so when drilling for the insects to collect upon. The migrating season was over by July 15, the weather at that time being cold and unfavourable for flying, so that very few left the neighbourhood. On August 1 the first female was noted laying eggs, although egg-laying did not become general until the 11th of that month, from which date eggs were deposited continuously until all these insects had disappeared. This they began to do about September 1, gradually getting less, until by October 3 they had nearly all disappeared. A few remained until the winter set in. The locusts responsible for damage this year were the same as last, and in the same proportion.

These were the Lesser Migratory Locust *(Melanoplus atlanis,* Riley), Packard's Locust *(M. Packardii,* Scudd.), the Two-lined Locust *(M. bivittatus,* Say), and the Rocky Mountain Locust (*M. spretus,* Uhler).

There is no doubt that the cause of the decrease in locusts was largely due to the co-operative work of farmers with Paris green, added to the increase of two species of Blister beetles, *Epicauta sericans,* Lec., and *Epicauta pennsylvanica,* DeG. This year the first of these insects were seen on June 1, and by the 4th of that month they had become abundant. *E. sericans* occurred on the dry prairies and *pennsylvanica* in somewhat damper spots, wherever the Wild Pea *(Lathyrus venosus,* Muhl.) is plentiful. *E. pennsylvanica* did considerable damage to potatoes and broad beans, but *E. sericans* is in no way injurious; it is, on the contrary, beneficial, as it seems to confine itself almost entirely to lamb's-quarters, though I have seen them actually eating wheat when other food was not to be found. The native food plant appears to be the Crocus Anemone, *Anemone Nuttalliana,* Gr., which I have often seen them eating. These beetles had all disappeared by August 28. That these two species of insects will be the cause of a still greater decrease of locusts next season is, I think, little to be doubted; for, although there are still numerous fertile eggs in some places, and notwithstanding that many locusts remained alive late into the season and there were an enormous number of eggs deposited, still, from observations I have made, I find that at least two-thirds of the eggs have been destroyed by Blister beetles. Of 141 pods examined, the eggs of 97 were destroyed. Of other locust parasites, there was an increase of tachina flies, and the Locust Mite seems to be rather more plentiful than usual. Another friend was Franklin's Gull, *Larus Franklinii.* During the migratory season, between July 26 and 31, thousands of these birds were to be seen flying up and down the fields, particularly on the summer-fallows, busily engaged in picking up locusts. Unfortunately, they were too late to prevent many of the females from laying eggs, although, of course, they did an immense amount of good.

Some damage was caused from locusts eating binder twine; very few had bluestoned the twine, and we have now been able to demonstrate without a doubt that some brands of binder twine are much more subject to attack than others. Whether it is that certain brands are made of different material or that they are looser than others, I cannot say; but the twine which was most attacked is very loosely twisted.

With regard to what you have called the Criddle Mixture, numerous tests were made with Paris green during the season to ascertain as accurately as possible the strength required to kill locusts, and it was found that one pound of Paris green could be mixed with five patent pails of horse droppings with absolute success. Weaker mixtures were not quite so successful. In the past, I believe a large amount of Paris green, as well as labour, has been wasted through putting out the mixture in cold or wet weather, whereas I find that practically no feeding takes place in the spring with a temperature below 50°F. It is on the hottest days that locusts eat most, and consequently are most easily poisoned. In the early stages locusts much prefer the mixture moist, and I have found that spreading a little every other day, in the morning, gives much better results than scattering a lot at a time, and less frequently. Another advantage of spreading lightly is that the danger of cattle eating it is greatly lessened, whereas when put in lumps the danger is claimed to be considerable.

I regret to say that some cases of cattle poisoning were brought to my notice during the season. Though in every case the loss was the result of either ignorance or gross carelessness, in some cases, through spreading the mixture in too large lumps, or even putting it in pasture fields, or through leaving the barrel or whatever it was mixed in, where cattle could get at it. As I have said more than once, if the mixture is only scattered properly, there will be practically no danger. A good preventive measure is to keep cattle well salted. As Mr. McKellar remarked, 'Some farmers are overgenerous with salting their grasshopers, but neglect their cattle. This is a fact.

Locust fungus.—I am sorry to say that the tubes of the fungous locust disease left in my care, proved a complete failure. One failed to show any signs of growth, but the others were perfectly fertile. The first culture was mixed in sugar and water and was left in a warm place, as directed, until it showed signs of growth, when it was put out as follows: (1) Scattered among the grass infested by locusts; (2) locusts were caught and dipped in it; (3) it was put on pieces of horse droppings, bran and other attractive food, the weather at the time being very dry. Locusts after being dipped in the culture were kept in a large box for some days, but showed no signs of being any the worse for their treatment. The second culture was put out on the evening of July 22, during damp and rainy weather, though rather cold. It was spread among the locusts in the same way as the first. Two locusts were found dead, possibly as a result of this, three days after it had been put out.

The third lot of fungus was put out on July 15, in the evening when considerable dew had fallen. No results were observed. Another lot was put out on the 16th. This was mixed in bread crumbs, some of which was eaten by locusts; but no dead insects were found. During the time several locusts were found which had been killed by the native fungous disease in spots widely removed from one another and at long distances from where the experiments were being conducted, showing that the weather conditions were at least fairly favourable for this work, and also that this disease is probably always present and makes its appearance as soon as the conditions are favourable. The last lot of fungus was put out on August 2 in the same way as the first. No results were noticed.—NORMAN CRIDDLE.

Referring to the above statement that cattle have been poisoned by the Criddle mixture, it need hardly be pointed out that, with this remedy as with every other in which an active poison is used, at any rate ordinary and reasonable precautions must be taken to prevent stock of all kinds from eating the material. It is well known that horned stock will, if allowed to do so, eat the bedding from a horse stable, but this can hardly be recommended as a good food for the production of milk, and the practice should be prevented. If the Criddle mixture is distributed in the manner recommended, that is, for the material to be scattered loosely through the plants at the edge of a field of standing grain, it can hardly be said that there is any danger. One instance came to my knowledge of a man in Manitoba who had mixed half a barrel of the Criddle mixture, part of which he did not use. The half barrel containing this was put in his barn and left there till threshing time, when, to make room, it was turned out into his yard where he had some cows. Some of these ate the poisoned material and died from its effects, but this instance of carelessness can hardly be cited as a reason for not using this most useful remedy against grasshoppers. If it is, it means that the use of active poisons such as Paris green and many other compounds now thought to be necessary to the fruit-grower and farmer, and the whole operation of spraying, would have to be condemned. On occasions when farmers have been using the Criddle mixture, which is in every way the cheapest effective remedy for grasshoppers which I have ever tried, if there is any of the material left over, it should be scattered loosely over a piece of land where its fertilizing effects may be secured and where there will be no danger of poisoning animals.

The only other place in Canada where grasshoppers were noticed in numbers was in the Okanagan valley of British Columbia. Mr. E. P. Venables, of Vernon, writes: 'Grasshoppers were numerous at some places, and, although no appreciable damage was done, some people are anxious lest there may be a repetition of the plague of three years ago. Some of their enemies, however, were in evidence to an equal extent with the grasshoppers. Among these, the Spotted Gray Blister-beetle (*Epicduta maculata*, Say) was very abundant, feeding upon wild plants. Therefore, it is to be hoped that their larvæ will help, if they keep up their good name for destroying the eggs of grasshoppers.'

The Criddle mixture, as modified in accordance with the latest experiments, consists of one part of Paris green, mixed thoroughly in 100 of fresh horse droppings, to which two pounds of salt per half barrel of mixture have been added, after being dissolved in water. This is placed in a half barrel and drawn on a cart to the edge of an infested field or one likely to be infested. The mixture is then scattered broadcast along the edge of the crop by means of a trowel or wooden paddle. The locusts are attracted to it from long distances and are killed in large numbers by eating the poison.

FIELD CROPS.

The CLOVER SEED-MIDGE *(Cecidomyia leguminicola,* Lintner) has been the cause of very serious loss to seed growers in all parts of Ontario where clover seed is produced. Probably one-half of the crop was destroyed by this insect. In some districts the whole crop was completely ruined. The remedy of feeding off or mowing the first crop of clover before June 20 has been found satisfactory by all who have tried it. The reason of this is that the maggots of the first brood come to maturity towards the end of June, and then leave the clover heads to enter the ground, where they complete their changes; and if the clover is cut or fed off before that date, the immature larvæ are destroyed. If the clover is left standing later than June 20, the maggots will have time to complete their growth and leave the clover heads. From these larvæ the second brood which attacks the seed of the second crop is produced. Just about the time the seed is ripe, the larvæ of the second brood fall to the ground and burrow beneath the surface, where they pass the winter, the flies emerging in June of the following year and laying their eggs in the flower heads soon after these form.

The HOP APHIS *(Phorodon humuli,* Schrank).—It is many years since serious complaint has been received at the Division of excessive injury by the Hop Aphis. In the extensive hop fields of British Columbia there is an occasional outbreak, but the excellent crops of the last few years and the high price which has been secured for British Columbian hops, shows that this crop has been produced to great perfection and without serious injury from insects. In some of the plantations in the valley of the Fraser it has required constant attention on the part of growers to keep the 'Red Spider' under control; but this has been done to a reasonable extent. The sovereign remedy for all mites, of which the so-called Red Spider is one, is sulphur in some form, either as flowers of sulphur mixed in the ordinary quassia and tobacco wash, which is pretty generally used as a remedy or a preventive of Hop Aphis, or distributed as powder through the plants. A new pest which has appeared in sufficient numbers this year to be noticed in British Columbia is *Psylliodes punctulata,* Mels., a small flea-beetle which was sent in by Mr. H. Hulbert, of Sardis, B.C., under the name of the Hop Flea-beetle. This has been referred to briefly as a hop pest in Bulletin No. 4, old series, of the United States Division of Entomology.

Some years ago hops were grown to a large extent in Prince Edward County, Ontario; but of late years the industry has been to some measure given up for the cultivation of other crops. Some growers, however, have continued to grow hops, and quite recently others were resuming the practice. During the summer of 1903, which, as has been stated already, was particularly characterized by the abundance of many kinds of plant-lice, the hop yards of Ontario have suffered from a serious visitation of the old-time enemy, the Hop Aphis. Through the kindness of Mr. John D. Evans, of Trenton, I have received a great deal of information concerning this outbreak, and he has been good enough to visit and interview several of the growers who were most interested in this subject. I have also received from Mr. W. B. Cooper, of Bloomfield, Ont., who has been for many years an extensive grower of hops, a detailed account of this outbreak. Mr. Evans writes:

'Trenton, Nov. 23.—Mr. H. S. Miller, of Picton, who is a large dealer in hops, and who visited many of the hop yards at different times during the past season, states that the total hop crop in the district this year yielded only 46 tons; last year, with the same acreage, it was 128 or 130 tons, and that at least two-thirds of the hop acreage this year was afflicted with the pest. Although the loss was severe in some places, it was not general throughout the district; for instance, Mr. Branscombe, of Chisholm, only got two bales from three acres, his crop being almost a total failure. He stated that the insects appeared first of all as plant-lice when the hops were coming into burr. After that it seemed as if a blight had struck them; the vines which were affected produced no hops, and the leaves turned black. On a knoll in his yard the vines were heavy and produced the two bales referred to. Then, on the other hand, Mr. Philip Vanmeer, of Bethel, Ont., had 22 acres of hops. The centre of his yard was on high ground, but the land sloped off in all directions to low ground. His yard was not affected, and he did nothing in the way of spraying or otherwise, in the way of special treatment, except that the yard was kept thoroughly cultivated. He had a very heavy crop. It would appear, then, that the abundance of this insect is not affected by the land being high or low. A great many ladybird beetles were present among the aphides. There was a similar visitation by the Hop Aphis in 1886, when the hop crop was almost ruined; but since that time the insect has occurred only in very limited numbers and has not been noticed. None, or very few, of the growers here have done any spraying, as they have not the special apparatus which is necessary. I am told that the spraying pumps which answer for fruit trees will not for hops.'

Mr. Henry Corby, of Belleville, Ont., as far as I can learn, was the only grower who sprayed his yards in a thorough way to protect them from injury by the Hop Aphis last year. His experience, however, has been so widely commented upon by hop growers in the vicinity and in Prince Edward county that I have no doubt the wise measures adopted by Mr. Corby will have the good effect of inducing others to spray their yards next year, should there be any appearance of the Hop Aphis. Mr. Corby writes:

'Belleville, Nov. 19.—Your favour in *re* Hop Plant-louse received. In reply we first noticed the Hop Plant-louse on the vines about the 1st July. From the 1st to the 10th they came on very thickly indeed. As I had eighty acres under cultivation, we continued the spraying for close on to a month. The mixture I used, was 7 pounds of whale-oil soap and 8 pounds of quassia chips, boiled for an hour. This made 100 gallons of wash. I used an English sprayer which takes two horses to draw it, but it does thorough work. I consider that I lost one-quarter of my crop at least; but, had I not used the sprayer, I doubt if I should have had any hops at all. The quality of my hops is first-class.'

The life history of the Hop Aphis is a remarkable one and is given in a condensed form in my annual report for 1889, which I repeat herewith, as the life history has an important application in this species, to the remedies which are suggested. The life history of the Hop Aphis has been carefully worked out by Prof. Riley and recorded in his report for 1888 as follows: 'Of this species the winter eggs are laid by the perfect females upon plum trees in autumn. From these hatch, the following spring, wingless females which are called "stem-mothers." These produce young plant-lice by a process analagous to budding in plants and known as parthenogenesis (from the Greek *parthenos,* a virgin, and *genesis,* production), which means the production of young from imperfect and unimpregnated females, without the intervention of a male. There are three broods of these parthenogenetic females produced on various kinds of plum trees, the third becoming winged. This last is known as a migrant and it instinctively flies to the hop plant, which up to this time has been free from attack. A number of generations of wingless females are produced upon the hop until, in autumn, winged females known as the return migrants again apear. These return to the plum and produce some three or more young which have no wings but are true sexual females. Somewhat later than this, upon the hop vines true winged males, the only males of the whole series, are developed. These fly to the plum trees and towards the end of the season may be found pairing with the wingless females, which afterwards stock the tree with eggs which pass the winter there.'

The above life history will show how complex and difficult to understand are the habits of some of our injurious insects. The importance of this knowledge, however, cannot be over-estimated; for it is plain that, if the Hop Plant-louse passes the winter in the egg form upon plum trees, by having no plum trees near the hop yard, the opportunities for the insect to increase in a certain district are much reduced, and, further, that, if plum trees near hop yards are treated during the winter to destroy the eggs, a very large proportion of the infestation can be wiped out. It has frequently been noticed by farmers and others with what enormous rapidity the different kinds of plant-lice sometimes increase. Dr. Wm. Saunders, in the annual report of the Entomological Society of Ontario for 1878, refers to this matter as follows:—

'Some idea may be formed of the numbers to which in a short time plant-lice increase, from a calculation of Curtis, the celebrated English entomologist, who computed that from one egg only there would be produced in seven generations, taking thirty as the average of each brood, the enormous number of 729,000,000, so that, were they all permitted to live, everything on the face of the earth would in a short time be covered with them. Indeed, sometimes the possible rate of increase is even greater than this. Dr. Fitch, the state entomologist of New York, ascertained by actual experiment, that the wingless females of the Grain Aphis became mothers at three days old, and thereafter produced four young ones every day, so that even in the short space of twenty days the progeny of one specimen, if all were preserved from destruction, would number upwards of two millions.'

Some of the useful facts derived from a knowledge of the life history of the Hop Aphis, are that, as the eggs are laid upon plum trees and pass the winter there, it is important not to allow wild or useless cultivated plums to grow round hop yards; but, if these trees are growing in the vicinity and it is impracticable to destroy them, the value of treating these before the eggs hatch, or just at the time the young plant-lice are hatching in May, with kerosene emulsion, or a whale-oil soap solution, is manifest. As the males are only produced at one season of the year and this on the hop plants after the females have migrated to plum trees, the utility is plainly shown of burning up at once after the crop is picked all the vines and leaves of the hop plants. In this way, it is believed that so many of the males will be destroyed that there will not be enough left to fertilize all the females which have flown away to the plum trees. Although plant-lice can produce young for a long time without the intervention of males, when the time comes for the perfectly sexed females to be produced, the males are necessary for the fertilization of the over-wintering eggs.

As there are three broods produced upon plum trees subsequent to the hatching of the eggs, it is not until comparatively late in the season that the plant lice appear upon the hop vines. It is an important observation then to know exactly at what date this migration from the plum trees to the hops takes place, because these insects are exceptionally prolific and multiply with enormous rapidity as soon as they reach the hops. Consequently the sooner the plants are sprayed to destroy the aphides the easier that work will be accomplished and naturally at a much smaller loss of vitality to the plants. In New York State the migration from the plum trees to the hops takes place in the month of May, so it is probable that this may also be expected about the end of that month, or early in June, in southern Ontario.

As to the best insecticide for controlling the Hop Aphis, there are several which may be used. Kerosene emulsion diluted to as weak a wash as one part to twenty-five of soft water, will kill the insects upon the foliage at the time they migrate to the hop plants. This strength will not injure the leaves, which it is stated is the case with stronger mixtures. To destroy the winter eggs on plum trees a much stronger mixture of the emulsion, viz., one to six, is necessary. Instead of the above, whale-oil soap, one pound to six gallons of water, may be used on the hop vines. The remedy, however, which is by far most generally used by hop growers in England, California and British Columbia, is the one which has been styled the 'English wash,' and is the standard remedy for the Hop Aphis in the hop gardens of the south of England. It is very similar to the one used by Mr. Corby, mentioned above :

100 gallons of soft water (if the water is hard add soda).

4 to 5 lbs. of soft soap.

6 to 8 lbs. of quassia chips, first steeped in cold water and afterwards boiled for one hour before mixing with the main supply of water.

The value of this wash has been clearly shown in England, where some hop-growers, as is the case with ourselves, do good careful work and get large and paying crops of hops of the first quality, while others who do not attend to these important matters get nothing at all or very little. The points most to be borne in mind by hop growers in this conection are,—that early work is less troublesome, less expensive, and pays enormously all trouble taken, therefore constant attention must be given to the yards at the time the insects migrate to them, and lastly, that one application of any remedy is not sufficient. The washes effective against plant lice, unlike the arsenical poisons which are placed on foliage and remain active for a long time until eaten by insects, are contact remedies only which, to be of any use, must actually be thrown on to each individual insect ; moreover, as the plant-lice do not all migrate to the hops at the same time, two or three applications at short intervals may be necessary. Throughout the summer the various broods of the hop aphis are wingless, therefore, if the first broods which appear on the hops are thoroughly dealt with, the yards can be kept clear for the rest of the season.

ROOTS AND VEGETABLES

Roots crops in all the eastern provinces of the Dominion have suffered from the unusual weather which prevailed generally last spring from the lakes to the Atlantic coast. The dry late spring prevented prompt germination of seed when sown early. Mangels were not up to average, from poor germination and the attacks of cutworms, Sugar beets, which are now being grown in many parts of Canada both for sugar and for stock, gave a fair crop. Turnips, where not injured by cutworms and the Turnip Aphis, gave good returns, particularly from late sowings put in after the June rains. Potatoes did not start well, owing to the drought of May and early June. The crop, however, was fairly good in size and quality, where not injured by the 'Potato Rot.' This disease, which can to such a large extent be prevented by spraying with Bordeaux mixture, as has frequently been pointed out in these reports, was, it is to be regretted, very destructive from the Maritime Provinces to the Prairies. The following extracts from Mr. B. W. Chipman's Nova Scotia government crop report for November last, are well worthy of consideration by the thousands of farmers and others who grow potatoes either in large or small quantities :—

'Chester.—The potato crop will be heavy and of large size, but the rot has begun in some places very badly. Early spraying with Bordeaux mixture has proved beyond doubt a preventive for blight rot, and should be thoroughly tested by all potato growers. The trial costs little and the result in this district has proved its value. Spray as soon as the plant is in blossom, and twice at intervals of two weeks later on, if the season is wet.'

'New Germany.—No potato bugs. Potatoes took blight about September 1, and in some cases 50 per cent are rotten. One man here, and only one, as far as I know, sprayed his potatoes, with the result that less than 1 per cent were rotten.'

The results of demonstration experiments which have been carried on at the Central Experimental Farm, Ottawa, year after year, for many years, have uniformly shown the enormous benefit of spraying potato vines about August 1, and twice afterwards at intervals of 15 days, with the Bordeaux mixture, which for this purpose contains bluestone, 6 lbs.; unslaked lime, 4 lbs.; Paris green (to destroy leaf eating insects) 4 ozs., and soft water 40 gallons.

In the Ontario crop report for November last, Prof. James refers to the prevalence of the potato rot and estimates the loss at from 10 to 60 per cent in various localities. Mangels were in some places replaced by turnips, where the seeds had not germinated well, and turnips, although yielding a good crop, were in many quarters considerably injured by the Turnip Aphis.

The Colorado Potato Beetle was reported from all sections as being less abundant than for many years. The following reports are representative of many others received:—

'Charlottetown, P.E.I.—Root crops were badly injured by cutworms, and many fields were resown for the third time; some land was ploughed up and sown to other crops. The yield of roots was fair on the decreased acreage; the cutworms seem to have been general over the whole province.'—E. J. McMillan.

'Halifax, N.S.—Roots and vegetables good; potatoes above the average. No complaint of injurious insects on potatoes except the potato bug, and that was not as bad as usual. In some places, mangels, beans and vegetables were injured by cutworms. Turnips were somewhat attacked by aphis.'—B. W. Chipman.

There were not many large fields of roots this year in the province of Quebec. Many thought that it was too late after the rain came to bother with roots, so on the whole there will not be a very large crop. Some few have fair pieces.'—Peter MacFarlane.

Root Maggots.—Among vegetables, considerable injury has been done in nearly all parts of the Dominion by root maggots. The Cabbage or Radish Maggot, and the Onion Maggot, which for all practical purposes may be treated of as the same species, caused great loss in crops of cauliflowers, early cabbages, turnips, radishes and onions. The occurrence, however, was irregular, much harm being done in spots, while in another not very far distant there was no appearance of the attack. There is nothing new so far in the shape of a remedy for these insects when large areas have to be treated; but some experiments which have been carried on by the Horticulturist at the Central Experimental Farm during the past summer with the object of producing early tobacco and vegetables of high quality, have an important entomological bearing which is well worthy of mention. An enclosure was made of a light framework of wood, six feet in height, and covered entirely on the top and along the sides with cheese cloth. In this tent tobacco and various kinds of vegetables were sown, or planted, and a similar duplicate plot was also planted just outside with the same conditions of soil and soil moisture. The rows of this plot were practically in continuation of those inside the enclosure. This experiment was satisfactory, both as to forcing the plants forward to earlier maturity, and on account of the important discovery made by Mr. Macoun that this cheap protection prevented entirely the attacks of many kinds of injurious insects. Radishes, onions, cabbages and cauliflowers developed well and were absolutely free from root maggots. Nothing was attacked by the troublesome Tarnished Plant Bug (*Lygus pratensis*, L.) or the Four-lined Leaf Bug (*Pœcilocapsus lineatus*, Fab.). Cucurbits of all kinds were entirely free from injury by the Striped Cucumber Beetle. In fact, this experiment has furnished us with a sure means of growing many vegetables of which, from the difficulty of getting them into perfect condition, gardeners had in some places given up the cultivation. This is particularly the case with cauliflowers, early cabbage, radishes, onions

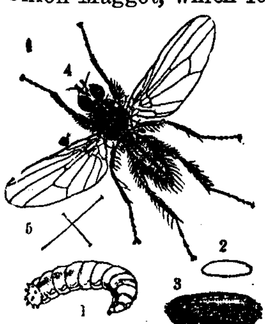

Fig. 6.—Cabbage Maggot: 1-3, maggot and pupa case; 4, fly—1, 3 and 4 enlarged.

and other plants of only moderate height. These could be entirely protected by a framework which any ordinary workman could make, only three feet high and three feet wide for single rows in a garden. With such a covering, it would be impossible to cultivate between the rows; but, if made in sections, these could be removed for that purpose when necessary. The cost of building an inclosure in which a man could work with ease and where several hundreds of plants could be grown, would be little compared with the increased price which would be obtainable for the earlier and much superior crop. Careful handling in taking down and storing away the cheese cloth and framework would insure the lasting of these for at least two or three years. These inclosures are manifestly better suited for the cultivation of some plants than for others; such plants as egg plants and cucurbits, which depend on the intervention of insects for the fertilization of their flowers, would require to be fertilized by hand if grown in these inclosures. A noteworthy result of these experiments was that the vegetables grown within the inclosure were entirely free from attacks of root maggots, while those grown in the corresponding plot outside were badly affected.

Remedies for root maggots are frequently asked for, and those which have been recommended in the past are as follows : For early cabbage and cauliflowers, the best remedy is undoubtedly an early application of the disks of tarred paper recommended by Prof. Slingerland. We use these regularly at the Central Experimental Farm, and always with great satisfaction. Where these have not been put on early, a remedy which may be used is to pour about half a teacupful of a strong decoction of pyrethrum insect powder, four ounces to the gallon of water, around the roots of each plant, after drawing away the earth right down to the rootlets. The earth must then be pushed back again. For onions and radishes, dusting white hellebore along the rows as soon as the young plants appear, has given good results in seasons when the flies are not abnormally abundant. Kerosene emulsion and a solution of whale-oil soap have also been used by some. Another excellent remedy is the carbolic wash recommended by Prof. A. J. Cook many years ago. This consists of boiling up one quart of soft soap or one pound of hard soap in a gallon of water. When boiling, add half a pint of crude carbolic acid. Boil for a few minutes and stir thoroughly. The mixture is then ready to be stored away for future use. When required, take one part of this mixture by measure to fifty of water, and sprinkle or spray directly upon the growing plants once a week from the time they appear above the ground.

The Cabbage and Turnip Aphis (*Aphis brassicæ*, L.).—Although not so injurious as it has been in some previous years, this insect was the cause of considerable loss in British Columbia, Ontario, Nova Scotia and Prince Edward Island. The worst attacks were probably in Prince Edward Island and Nova Scotia, whence frequent requests for information came. The injuries were to both cabbages and turnips. When cabbages in gardens are attacked, the insect should be looked for when the plants are being cultivated, and, as soon as the first colonies appear, which will probably be late in July or in August, they should be attended to at once, before they increase in numbers. Whale-oil soap, one pound in six gallons of water, or the ordinary 1 to 9 dilution of kerosene emulsion, if sprayed thoroughly, will destroy the aphis. In turnip fields, where by far the greatest amount of injury is done, those engaged in thinning and hoeing should be constantly on the watch for infested plants, which may at that time be hoed out and destroyed. This will, in many instances, be sufficient to prevent the occurrence later of a serious outbreak. The eggs of this insect are laid on the turnip tops late in autumn. This suggests the

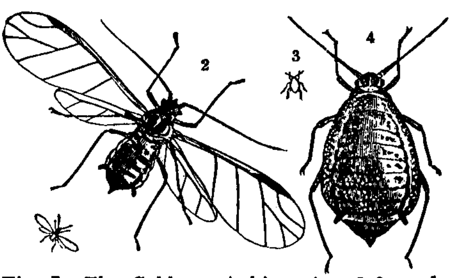

Fig. 7.—The Cabbage Aphis : 1 and 2, male; 3 and 4, wingless female—2 and 4 enlarged.

advisability of ploughing down deeply all tops which are cut from the roots at the time of harvesting in autumn, so as to destroy the eggs. In fields of cabbages, where also eggs are laid, the same practice should prevail when the cabbages cannot be fed or are too poor to store for feed purposes. The leaving of poor or imperfectly developed crops in the field until the following spring is always a dangerous practice from the point of view of those who study insect attacks. Not only may the crop have been reduced to its worthless condition by the attacks of insects which will pass the winter safely among the plants; but, even on well developed plants, there are always certain natural enemies the presence of which is detrimental to the farmer and gardener. Whenever possible, all haulms, vines, stems and foliage should be fed to stock; but, in the few cases where these are useless, they should be ploughed down into the soil to decay or be burnt, and, when this can be done in autumn, it is far better than waiting till the following spring. Many insects and fungous diseases are thus destroyed or placed where they can do no harm, and much time is saved in spring in having the land in a condition to start work at once.

CUTWORMS.—These troublesome caterpillars have, as is usually the case, been more or less destructive to field and garden crops everywhere; but in Nova Scotia and Prince Edward Island almost every report mentions their depredations, and the official crop reports from these provinces show that considerable harm was done in almost every county. Such specimens as were received at the Division were the Red-backed Cutworm *(Paragrotis ochrogaster,* Gn.). The same species was the one responsible for most of the harm done in Quebec, Ontario and Manitoba. In Ontario it was accompanied by the Dark-sided Cutworm *(Paragrotis messoria,* Harr.), which was enormously abundant in some places at Ottawa. Here also in restricted localities the so-called Climbing Cutworm *(Paragrotis scandens,* Riley) was troublesome in sandy fields. At Regina and Calgary, N.W.T., the species which did harm in gardens was *Chorizagrotis auxiliaris,* Grt., the large caterpillars of which resemble the Red-backed Cutworm in a general way, and are equally omnivorous, destroying all kinds of succulent plants. The moths of *C. auxiliaris,* Grt., as well as of the allied *C. introferens,* Grt., and *C. agrestis,* Grt., both of which, possibly, are only varieties of *C. auxiliaris,* Grt., have been taken in large numbers at Millarville, 20 miles south of Calgary, by Mr. F. H. Wolley-Dod, and by Mr. T. N. Willing, at various places north and south of Regina. In Vancouver Island the species which was most troublesome proved to be *Paragrotis perexcellens,* Grt., which was very much commoner than it had been for some years. In 1885 it was a perfect plague in market gardens around Victoria, and in 1888 specimens were also sent to me, which were at that time incorrectly identified and mentioned in my report for 1888 as an allied species, under the name of *Agrotis obeliscoides,* Gn.

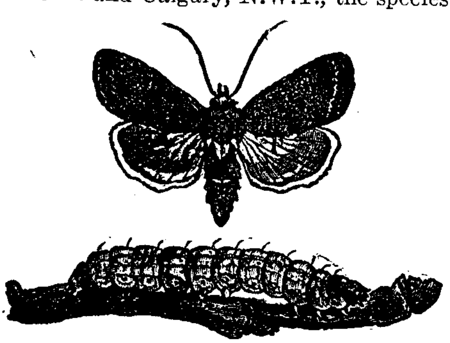

Fig. 8.—The Climbing Cutworm: moth and caterpillar.

All of the species mentioned above have the same feeding habits and would be controlled by the same measures, which are: The removal from gardens or fields, as early as possible in the autumn after crops are reaped of all refuse, and the cultivation of the land so as to prevent the deposition of eggs. This takes place during August and September, and some of the eggs, if not all of them, remain unhatched until the following spring; therefore, late fall ploughing, or early spring ploughing, by which the eggs were buried deeply would be beneficial. When in large numbers, these caterpillars, like most other cutworms, wander long distances at night in search of food. Therefore, it is necessary to make some direct application to destroy them. For this purpose, the best remedy in my experience is the poisoned bran mash, which is remarkably efficacious. In making this material, which is equally useful in field practice as in gardens, it is best to dampen some of the bran slightly with water containing a little sugar. After mixing thoroughly, add the Paris green little by little, stirring all the time. If Paris green is added to the bran when it is perfectly dry, it will, owing to its weight, sink at once to the bottom when stirred. Half a pound of Paris green is sufficient to poison 50 lbs. of bran, although double this amount may be used. Bran should be added to the mixture until it will crumble easily and run through the fingers without adhering. It may then be distributed through or along the edge of an infested crop or may be applied to land either around or between plants, or a row may be run close to drills by means of a Planet Jr. seeder, or a similar implement. For such crops as tomatoes, cabbages, tobacco, &c., a collar of paper put around the stem at the time of planting, will prevent the destruction of many plants. Seedlings must be planted so that none of the leaves hang down and touch the ground. The same protection is provided in a more permanent manner, but at greater cost, with strips of tin. Convenient rings may be made from old tomato and fruit cans by throwing these into a bonfire and melting off the tops and bottoms and then splitting the sheet of tin which is left down the centre. This not only makes a good protection against cutworms, but disposes of a class of rubbish which often accumulates to an inconvenient degree.

The SUGAR-BEET WEBWORM *(Loxostege sticticalis, L.)*.—When in Manitoba last July, my attention was drawn by Mr. Hugh McKellar to reports which appeared in the newspapers of swarms of a small blackish caterpillar which had appeared at Brandon and other points east and west of that city, and which after devouring its natural food plants, had wandered in armies to new fields in search of food. The first notice of this insect in 1903, came to me from Mr. J. R. McMullen, of Melita, Man., who stated that two years before this he had noticed enormous numbers of small moths among his wheat in the month of June. He writes on June 15, in a letter addressed to the Department of Agriculture for Manitoba, which was referred to me, an interesting account of an excessive occurrence of the caterpillars during 1902, as follows: 'I thought no more of these moths until last summer. I had ploughed a field of stubble in June and sowed it in Brome grass, of which I got a good catch. There was a lot of pigweed in it, and, when the weeds were about four or five inches high, I was surprised to see thousands, yes millions of worms, eating up the pigweed, making a complete job and killing it entirely. On thirty acres they ate every pigweed, but very little of the grass or any other plants. They started to work on the north side of the field and travelled south. Nothing would turn them. When they came to the tub where the horses are watered, they crawled up the sides and fell into the water by thousands; even when they came to the house, they crawled up the walls and clean over the house. These caterpillars were from three-quarters of an inch to an inch long, greenish in colour and with yellow stripes down the back and sides for the full length of their bodies. On the back the stripes were widened out or dotted in ten or a dozen places. When they reached the garden, they ate nothing except beets, although they tasted some other vegetables but did not eat much of them. They came to a big field of wheat just headed out, but did it no harm. In four or five days they were all

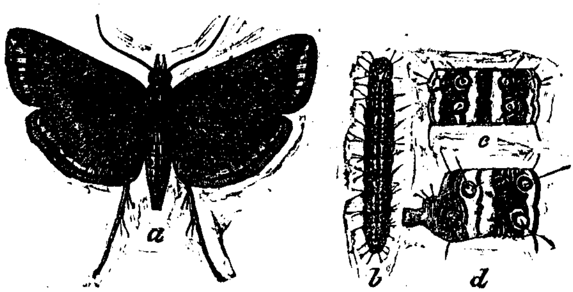

Fig. 9.—The Sugar-beet Webworm : *a*, moth ; *b*, caterpillar ; *c*, *d*, segment of *b*—all enlarged. (Chittenden, U. S. Dept. of Agriculture.)

gone. I did not notice any of the moths last year, but now (June 15), the moths are thick, and I send you a few to examine. I should like to know what these are, although they did me no harm last year; in fact, they saved me a day or two's work cutting weeds, but I might not have a field of pigweed ready for them when they come again.'

The Sugar-beet Webworm can hardly be described as a green caterpillar, because it is dark black, with greenish yellow stripes, but, strange to say, almost every correspondent who mentioned it referred to it as a green caterpillar. As, however, in most instances specimens of the caterpillars accompanied the inquiries, there was no doubt as to the identity of the species, which has been kindly supplied to me by Dr. Dyar, of the Division of Entomology, at Washington. It would appear from the dates when caterpillars are mentioned by observers in Manitoba, that there were two broods of this insect last summer. The life history of the species has been carefully worked out by the Division of Entomology at Washington, and illustrated articles have appeared upon it in 'Insect Life,' V. and VI., and in the recent Bulletin 43, by Mr. F. H. Chittenden, on the 'Principal Insect Enemies of the Sugar-beet.' The excellent illustrations given herewith have been kindly lent to me by Dr. Howard and were used in the last named bulletin.

The following letter gives some idea of the range of plants liable to be attacked by these caterpillars. There is no doubt that the normal food plant is the Lamb's-quarters or Wild Spinach *(Chenopodium album,* L.), often called pigweed.

'Deleau, Man., July 21.—We have had a visitation from a pest that I have never seen before in my 21 years' residence here. About two weeks ago we noticed the pigweed on land left for summer-fallowing covered with a greenish worm, samples of which I send you. In a day or two these swarmed into the garden in millions. They scarcely touched potatoes, beans or corn, but devoured turnips, beets, cabbages, onions, carrots, currant bushes, and even crap-apple leaves. We made a vigorous fight to save something, making narrow trenches for them to fall into, and tried various poisons, but without avail; so, we stuck systematically to knocking them into tin pans and emptying these into pails of water with coal oil in them. In this way we caught several pailfuls in a day. They have now almost disappeared but have left the garden in a very dilapidated condition. As soon as we noticed them coming off summer-fallow, we ploughed the land next to our garden, but they swarmed over on top of the ploughing. They seem to be good travellers. I should like to know what they are.' —J. E. MARPLES.

Specimens of the caterpillars were sent, without any letter being received, from Mr. H. L. Patmore, of Brandon.

Mr. Norman Criddle, of Aweme, sends the following notes :

'Sept. 5.—Do you remember mentioning when here a small prairie moth, which one of your correspondents was afraid of as a possible enemy of wheat. I am sending you now what I am pretty sure are the larvæ of the moths you showed me. These caterpillars are here now simply in enormous numbers, more so than anything of the sort I have ever seen. They clear off all the food before them and then march on in a regular swarm, all going the same way. The food plant seems to be usually lamb's-quarters, but this has been all eaten clean, and they are now turning their attention to wild buckwheat, the native asters, the tumble-weed *(Amarantus),* sand cherry, red cherry, rose, red-root pigweed, and even wheat and oats, as well as numerous other plants. Fortunately, they are too late in the season to do much harm, and in any case they seem to prefer weeds to grain. The moths were very abundant during June and July.'

'Sept. 27.—The larvæ have now all disappeared beneath the ground, but whether to hibernate or pupate, I am not quite sure. Several that I dug out had not yet undergone any change, but had merely made a straight burrow about two inches deep, which they had lined somewhat loosely with web. In reply to your letter, the food preferred to all others is lamb's-quarters, and wheat was only attacked when all other plants had been eaten. So far, instead of this insect being an enemy, the caterpillars have proved undoubted friends.'

'Oct. 18.—I went out this morning to try and find out for you whether the larvæ of *Loxostege sticticalis*, L., had turned to pupæ or not. I found they were all hibernating as larvæ, as you suspected. They are from one to two inches beneath the ground in a closely woven chamber of web, and they are now very sluggish.'

The Sugar-beet Webworm is stated by Mr. Chittenden in his bulletin, to be an introduced insect from western and central Europe and northern Asia, which is evidently slowly but steadily pushing its way eastward. From the letters given above, it is quite apparent that the outbreak of last summer was exceptional, and also that the favourite food plant is the well known and troublesome weed of western wheat fields, the lamb's-quarters, and allied plants. As, however, the sugar-beet is one of these and great efforts are being made in the West to foster the cultivation of this crop, it seems important to make the appearance and habits of this insect well known. The most important points with regard to these are as follows: The pale yellow eggs are laid singly or in rows of two to five, overlapping like fish scales. The young larvæ are at first whitish, with polished black heads and bristle-bearing spots. They soon become blackish caterpillars with thin skins, through which the green contents of the body show. These are very voracious and very soon strip plants of their leaves. The caterpillars appear in July and early September. Pupation takes place in the ground, not deeper than two inches beneath the surface, consequently they can be reached and disturbed by the teeth of an ordinary cultivator at the time they are in the delicate chrysalis condition. Actual experiments are reported by Dr. Howard (Insect Life, VI., p. 37) to have been successful with the winter brood. It would doubtless be so with the summer brood. Prompt attention in spraying an infested crop with arsenical poisons will certainly control this insect should it ever become troublesome in crops of sugar beets. Such plants as spinach in gardens could not, of course, be treated with poison. In those cases, mechanical means of prevention as ditching, might be tried.

FRUIT CROPS.

A satisfactory feature of the year 1903, like that of the previous year, has been a marked decrease in the injuries caused by some of the well known pests of the fruit-grower. The Tent Caterpillars, Cankerworms, Squash Bugs, and even the Codling Moth, in most places may be said to have done hardly any harm. Fruit crops have been exceptionally remunerative. The apple crop in Nova Scotia was a remarkably good one, large in quantity and excellent in quality, being very free from insect attacks as well as from Black Spot and other fungous diseases. (B. W. Chipman.) In Prince Edward Island the crop was 'rather poor, having been injured by the late frosts and dry weather in spring.' (E. J. McMillan.) Through Quebec and Ontario the crop on the trees was not so large as in some previous years, but the quality was so exceptionally good that there was a larger quantity of A 1 fruit for export than has been the case for several years. Only in the west of Ontario was any trouble experienced with Black Spot fungus, or insect enemies. In British Columbia apple crops were somewhat reduced by the attacks of the Apple Aphis, but the output was large and of excellent quality. The poor crop of apples in England last season gave Canadian growers a good opportunity of showing to what exceptional excellence this valuable fruit can be grown in this country, and the large quantity shipped up to the end of November, over 1,000,000 barrels, with a probable total export of 2,000,000 by the end of the season, as well as the high quality of the fruit, will no doubt make a lasting impression on the British market.*

'There was a fair yield of apples; but in various parts of the province of Ontario complaints were made of the scarcity of barrels, and, on this account, buyers were more particular than ever in the selection of this fruit; thousands of bushels of apples that in former years would have passed for shipment to Great Britain, were this season rejected by them.'—(C. C. James).

Not only was the quality of the fruit exported this year better for the above reason, but the rigorous application of the 'Fruit Marks Act' has prevented much second-rate fruit from going forward, which otherwise would have found its way to the British markets. This will be a decided and lasting benefit to the country. Grapes were a good crop in the Niagara peninsula, but in Essex and Kent the crop was practically destroyed by the Black Rot of the Grape *(Læstadia Bidwelli,* V. & R.) Plums were an enormous crop in almost all parts of the Dominion, injuries by the Plum Curculio being considered this year rather a benefit than otherwise for the work they did in thinning fruit on the overloaded trees. The only discounted reports as to plums were from some parts of the maritime provinces. In British Columbia considerable loss occurred from the attacks of the fungous disease known as Brown Rot or Ripe Rot (*Monilia fructigena*), which attacks the fruit just when it is ready for the market. This loss was chiefly on Vancouver Island and near the coast on the mainland. Orchards which had been sprayed early in spring and where the diseased plums had been carefully gathered and destroyed, were noticeably freer from attack than where no remedial measures had been adopted. The Shot-hole Fungus (*Cylindrosporium padi*) also did considerable injury by defoliating the trees before the fruit was ripe. This, like the last named disease, can be controlled by regular spraying. Peaches were an enormous crop of excellent quality. Cherries were fair on Prince Edward Island, good in New Brunswick and Nova Scotia, excellent and abundant in Quebec, Ontario and British Columbia. The pear crop is reported as good; but the ravages of the Pear-tree Slug were serious in some places, and the Pear-tree Flea-louse is reported by Prof. Lochhead as having been very injurious in the Grimsby district of Ontario. On the fruit farm of Mr. W. R. Dewar, trees were much stunted and were covered with the dirty black fungus, *Fumago salicina,* which develops upon the honey-dew emitted by this insect and various other kinds of plant-lice. Berries and small fruits generally were seriously affected by the drought of early summer through the region where this prevailed. The rains, which came about the middle of June, were too late to save the strawberry crop but helped considerably raspberries and currants. Cranberries in Nova Scotia did not produce such a paying crop as usual, but this was not due to any trouble with insect enemies. In Prince Edward Island this crop was reported as 'fair.'

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* The following extract from the 'Glasgow Herald' of January 5, 1904, in an article upon the Fruit Imports into the United Kingdom in 1903 is significent: 'Green Fruit Import. The apple trade was unique, 1903 being a bumper year. The total weight was 4,550,000 cwt. valued at £2,850,000. In ten years the imports have been nearly doubled; 1903 even surpassed 1896, which was the most prolific season of recent years. The imports in favour of 1903 against 1896 are 3,000,000 bushels. We get the largest parcels from the United States and Canada. These countries send us more than 2,500,000 cwt. annually. Of course, the Canadian apples are much superior to those of the United States.

OYSTER-SHELL BARK-LOUSE (*Mytilaspis ulmi*, L=*M. pomorum*, Bouché) has been complained of from almost every part of the Dominion where fruit trees are grown; and the chief reason that it remains unchecked and continues to increase, seems to be that it is so often overlooked by fruit growers and others who ought to know such a common and destructive enemy by sight and also be well acquainted with the best means of fighting against it. In south-western Ontario excellent work has been done in preventing the spread of this scale by the minute chalcid parasite, *Aphelinus mytilaspidis*, LeBaron. The presence of the parasite in a district can be detected by the minute round holes left by the tiny parasites where they have eaten their way out through the tops of the old scales. This minute friend is so small that it can hardly be seen with the unaided eye. It is bright yellow in colour, with golden eyes, and measures only about one thirty-sixth of an inch in length. Under a magnifying glass, it is found to be a four-winged fly shaped as shown in the enlarged figure herewith. This parasite is sometimes so abundant that it destroys more than half of the scales which are formed. It has occurred in all parts of Canada but never seems to remain long in any district, a fact which is rather remarkable, as the Oyster-shell Bark-louse upon which it feeds is abundant everywhere. For the last year or two it has been noticed in large numbers upon scale-infested fruit trees in the Niagara district. There is only one brood of the Oyster-shell Bark-louse in the year. The young bark-lice emerge from beneath the old scale in Ontario and British Columbia about the end of May, and in the maritime provinces towards the end of June. At that time they are small six-legged insects resembling mites. After emerging, they wander about the trees for a few hours, looking for a suitable place to attach themselves to the bark, which they do by means of their slender beaks. Once having attached themselves, they never move from that place; gradually their legs disappear, with the increase in size of their bodies, and a waxy scale is secreted over them. By the middle of August the female bark-louse has practically changed into a bag of eggs protected by a scale. Little by little the body of the mother insect dries up; and, when all of her eggs are laid, the scale is well filled with these minute white objects, and the mother's body is merely an empty skin at the small end of the scale. The scales of the male bark-lice are seldom noticed. They are of different shape and, as a rule, occur on the leaves. They are much smaller than those of the female and are long, narrow and white. (Fig. 12*c*.) The perfect male is a tiny winged insect which is able to fly well.

Fig. 10.—Twig infested with Oyster-shell Bark-louse.

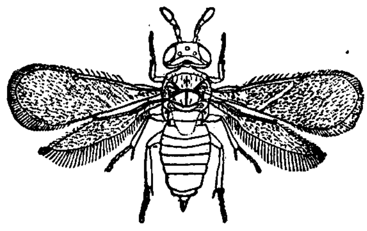


Fig. 11.—*Aphelinus mytilaspidis.*

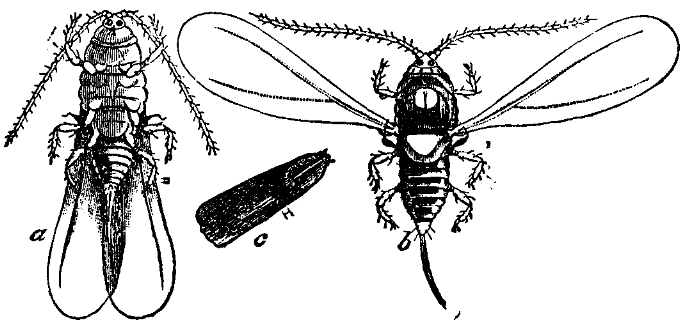


Fig. 12.—The Oyster-shell Bark-louse: *a*, *b*, male adult; *c*, male scale—much enlarged.

Trees upon which this insect occurs, are weakened by being robbed of their sap by these small insects, which frequently occur in such enormous numbers as almost to coat the trees and entirely hide the bark. Although so destructive in all parts of Canada, the Oyster-shell Bark-louse is not a particularly hard insect to control, where trees are attended to regularly. The first step to take when an orchard is found to be attacked is to invigorate the trees by ploughing round them and feeding them with some quick-acting fertilizer, such as well rotted manure, or a dressing of wood ashes. When trees have been standing in sod, it is well to break this up. Trees which are planted too closely, should be pruned and cleaned out, so that they may be easy of access for spraying and other operations. As soon as winter has set in, the trees should be sprayed thoroughly with a thin lime wash, one pound of lime in each gallon of water. Two coats must be applied, the second immediately after the first is dry. Where the lime-sulphur-and-salt wash is used to protect trees against fungus and insect enemies, there will never be any trouble with the Oyster-shell Bark-louse. The young bark-lice emerge from their mothers' scales during June ; the exact date should be watched for, and, immediately the dust-like yellow mites are noticed, the trees should be sprayed without delay with weak kerosene emulsion, or a whale-oil soap solution, using one pound to six gallons of water.

The SCURFY BARK-LOUSE (*Chionaspis furfura,* Fitch.)—In western Ontario this bark-louse has become so abundant recently, that many fruit growers are noticing it. In several cases, it has been mistaken for the San José scale and has been sent in for that insect. It is only occasionally that this scale develops in sufficient numbers to injure trees seriously. When it does so, it can be treated in the same way as the Oyster-shell Bark-louse. Mr. W. W. Hilborn found it was entirely destroyed by the lime-sulphur-and-salt wash. The eggs of the Scurfy Bark-louse are bright red in colour and are to be found beneath the scales by the middle of August or early in September. The male scale, as in the case of the Oyster-shell Bark-louse, is of quite a different shape from that of the female. In both sexes the scales are white and so closely appressed to the bark that they are easily overlooked or are not recognized as scale insects. The male scales are frequently found all clustered together in groups around the base of a twig or at some inequality of the bark.

The EYE-SPOTTED BUD-MOTH (*Tmetocera ocellana,* Schiff).—The insect concerning which most inquiry was received from Nova Scotia last spring, was the Eye-spotted Bud-moth. Attention had already been called to it by its frequency in Nova Scotian orchards during the previous year, and specimens also came in from some parts of Ontario and Quebec and from one point in British Columbia. Prof. F. C. Sears, Director of the Nova Scotia School of Horticulture, of Wolfville, N.S., writes at the end of the season: 'Even the Bud-moth, which for the past few seasons has been extremely abundant, proved much less troublesome than was anticipated. This was undoubtedly due in large measure to the fact that our orchardists now understand it better and apply the early spraying, by which it is best controlled. We find that this early spraying should be applied from May 1st to 10th, according to the season. I am glad to report that spraying was much more general during the past season than ever before, particularly in Annapolis County. One dealer there sold one hundred spraying outfits ; but, as the season was particularly unfavourable for fungous pests and most insects, I fear that some that sprayed for the first time may be discouraged.' It was suggested by Mr. E. E. Archibald, of Wolfville, N.S., that the irregularity in the fruit crop in the celebrated Annapolis valley of Nova Scotia might be due to the depredations of this small but very destructive and frequently unrecognized enemy. I believe that his suggestion was in a large measure correct and, where correspondents had reported a blighting of the leaves and fruit buds, I am sure these results had been in many cases directly due to the attacks of the caterpillars of the Eye-spotted Bud-moth. On account of its abundance last year, it will be wise for fruit growers to examine their trees during the present winter and early next spring, to see if there are any of the small brown caterpillars upon them, and, should they find any, to be prepared to spray their orchards thoroughly, just at the time the buds are bursting, with a poisoned Bordeaux mixture, this being the remedy,—of many which have been tried,—which has given the best results. This mixture, made according to the formula which we use at the Experimental Farm, is as follows:—

Copper sulphate (bluestone)........................	4 lbs.
Unslaked lime..................................	4 lbs.
Paris green (for Bud-moth and other leaf-eating insects)..	8 oz.
Water (one barrel)...........................	40 gals.

Dissolve the copper sulphate by suspending it inside a cotton bag in a wooden or earthen vessel containing five or more gallons of water. Slake the lime in another vessel, and then strain the lime wash through coarse sacking or a fine sieve. Pour the copper sulphate solution into a barrel, or it may be dissolved in this in the first place, and fill the barrel with water. Stir thoroughly before using. A stock solution of copper sulphate, and lime wash may be prepared and kept in separate covered barrels through the spraying season; but the quantities of copper sulphate and lime in the solutions should be carefully noted, so that the proper strength may be used when a wash is required for spraying.

The caterpillars of the Eye-spotted Bud-moth pass the winter on the twigs of trees, upon the foliage of which the eggs had been laid the previous summer. Each caterpillar is snugly curled up inside a small silken tent or covering called a pseudo-cocoon. These are extremely difficult to find until their appearance is known. They are located, as a rule, right in the crotch between two twigs, or in any small depression on a fruit spur. In many instances, I have found that a small piece of leaf or of lichen, is attached to the outside. On opening these with the tip of a knife, the small brown black-headed caterpillar, one-eighth of an inch in length, will be found inside. These caterpillars when they go into winter quarters are less than half-grown, having passed through three or four of their six moults. Early in spring, just before the time that the leaf buds burst, they emerge from their shelters and attack the opening leaf and flower buds. They do a great deal of harm at this time because they not only devour the young leaves but a single caterpillar will destroy a whole cluster of flowers. Their injuries are severe, both upon young trees and also upon full-grown bearing trees, which in some instances have been stripped of almost every bunch of flowers. These caterpillars become full-grown during June and then spin cocoons among the dead leaves which they have injured. The small gray and white moths appear during the month of July. These moths are similar in shape and size to the Codling Moth but are of a general dark gray colour, blotched with white, which makes them very inconspicuous when they are at rest on the trunks of trees. They measure about three-fifths of an inch across the opened wings and may be recognized by an eye-like spot upon each of the fore wings. The moths appear from June to the middle of July ; they rest on the trees during the day time but are very active at night, flying about fruit trees and laying their eggs upon the leaves. The eggs are remarkable little objects which lie very flat upon the leaf on which they are deposited. Under a magnifying glass, they have more the appearance of minute drops of water, or of tiny fishes' scales than of the eggs of an insect. Ten days after the eggs are laid, the young caterpillars hatch, and their habits during the summer are quite different from those of the spring. As soon as the caterpillars hatch, they crawl to the middle of the lower side of the leaf and form a silken tube close to the midrib of one of the larger veins. Here they feed upon the tissues of the lower side of the leaf, leaving the network of veins and the upper surface of the leaf. As they extend their operations, they cover themselves with a light tent of silk. They grow slowly, remaining for eight or ten weeks on the same leaf where they were born ; they then stop feeding and crawl from the leaves to a convenient place on the twigs, where they spin their winter coverings. This generally takes place, Professor Slingerland found, in the first half of September, and is done irrespective of the weather, even if it be fine and hot, and there is abundance of food. Like all other insects, they seem to know instinctively that it is the proper time for them to prepare for winter. The spring appearance of the caterpillars, on the other hand, is much less regular as to date and will vary as much as three or four weeks, according as the spring and the time of the opening of the buds is early or late. However, it may be generally stated that the caterpillars leave their winter quarters and begin their depredations at the time the leaf buds open. There is only one brood of this insect in the year, the caterpillars which attack the leaves in the late summer, being the same ones which destroy the leaf buds the following spring. The moths appear at only one period in the year, viz., during the three or four weeks from the middle of June till the middle of July. Since the life-history of this insect has been discovered, better remedial measures have been devised than were previously known. The fact that the caterpillar passes the winter half-grown, accounts for the large amount of injury which is done so soon after growth begins in spring. The Eye-spotted Bud-moth attacks, besides the apple, the plum, the peach, the pear, the quince and the blackberry.

The remedy which, as stated above, has given the best results, is to spray the trees thoroughly with a Bordeaux and Paris green mixture at the time the buds are opening, covering the whole tree so that every bud may receive its share of poison. The Bordeaux mixture will also, when applied at that time, materially hold in check the troublesome Black Spot disease of the apple. There are, of course, many other kinds of poisons which may be used; but those which have given the best results, are Paris green, Arsenate of Lead or Disparene, and Green and Pink Arsenoid. Where great care is exercised in mixing and making the application according to instructions and also in destroying carefully all surplus left on hand after spraying, white arsenic in any of its combinations may be used and will destroy all leaf-eating insects, upon trees which have been sprayed with a mixture containing it; but its use is attended with considerable danger to foliage and also with great risk to animal life, including human beings, from having about a house or outbuilding a substance which so closely resembles so many materials used in a household. In Prof. Bailey's most useful little Horticulturists' Rule Book, under the head of arsenic, we find the following:—'Arsenic.—Known to chemists as arsenious acid or white oxide of arsenic. It is considered an unsafe insecticide, as its colour allows it to be mistaken for other substances; but in its various compounds it forms one of our best insectides. From one to two grains, or less, usually prove fatal to an adult; 30 grains will usually kill a horse, ten grains a cow, and one grain, or less, is usually fatal to a dog. In cases of poisoning, while awaiting a physician, give emetics; and, after free vomiting, milk and eggs. Sugar and magnesia in milk is useful. In the very complete experiments which have been recently carried out under the instructions of Dr. L. O. Howard, the United States Entomologist, by Mr. C. B. Simpson, on the Codling Moth, the following important statement is made as to the insecticide which he found most useful in his extensive investigations:—

'Arsenite of Lime with Soda.

White arsenic.	pound	1
Sal soda (crystal)	pounds	4
Water.	gallon	1

'The ingredients are boiled in the required amount of water until dissolved, which will take place in a comparatively few minutes, after which the water lost by evaporation is replaced. To every 40 or 50 gallons of water a pint of this stock solution and from 2 to 4 pounds of fresh slaked lime are added. The chemical compound derived from the combination of the sal soda and the white arsenic is arsenite of soda. In the presence of lime this breaks down and arsenite of lime is formed. It requires 4·4 pounds of crystal sal soda, or 1·6 pounds of dry sal soda to combine with one pound of arsenic, and 2 pounds of freshly slaked lime to combine with one pound of arsenic to form arsenite of lime. It is always desirable to have an excess of lime present, in order to prevent all danger of burning; furthermore this excess is a convenience to fruit growers, because they can see by the distribution and amount of lime on the foliage how well the spraying has been done. The formula, which is the Kedzie formula with a few minor changes, has been used in many different sections of the country with unvarying success. In all of the practical tests under the advice of the writer, this solution is used and is found to be, not only as efficient as other solutions, but far cheaper.'

'When it is desired to use Bordeaux mixture with this solution, it is added to the Bordeaux mixture in the same proportion as to a similar quantity of water.'

The above quotation is given here because I am aware that many fruit growers in different parts of Canada are using white arsenic in some form for spraying fruit trees in preference to Paris green, and moreover because considerable injury has followed this practice, which has to a certain measure served to discredit the most important practice of spraying fruit trees for the prevention of injury by leaf-eating insects. In my own experience, I prefer to use Paris green, knowing it to be perfectly effective and believing that, notwithstanding the fact that it is a little more expensive than some other arsenical insecticides, it yet repays enormously any expenditure by the improved condition of sprayed trees; but, if other substances are used, probably the Kedzie mixture is the best. Disparene, or arsenate of lead, is also another very valuable insecticide, one great feature in its favour being the length of time it remains effective on the foliage. Mr. Joseph Tweddle, of Fruitland, Ont., who not only himself grows very satisfactory crops in orchards which he has sprayed, but has also done much work in spraying orchards for other fruit growers, who have been well satisfied with the treatment used by Mr. Tweddle, tells me that the spray which he uses is made as follows:—'I boil half a pound of white arsenic in one gallon of water with one pound of lime for 45 minutes, and make up to the original quantity of water when it is finished boiling. I use this in 50 gallons of Bordeaux mixture for apple and pear trees, except for the third or fourth treatment when it will sometimes burn the foliage if used at this strength. I have never used it on plums and cherries at the above strength without doing some injury, and would always advise care in spraying so as not to drench the trees. I find this mixture very effective against all leaf-eating insects. When spraying peach trees for Curculio I use this mixture of half the strength without the Bordeaux mixture, and when with the latter not more than one quarter strength.'

Prof. C. P. Gillette, of Colorado, recommends a somewhat simpler method of preparing arsenate of lime, which is to boil for three-quarters of an hour one pound of white arsenic and two pounds of fresh lime in one gallon of water, and of this he uses one quart to an ordinary barrel of 40 gallons. Prof. Gillette also draws particular attention to the necessity of using fresh lump lime and of exercising the greatest care in labelling everything containing this mixture plainly 'Poison.'

The proportions in which I have found the best known arsenical poisons satisfactory, are as follows:

Paris green—1 pound to 160 gallons of water, with 1 pound fresh lime.

Arsenate of lead—1½ pounds to 50 gallons of water.

Green arsenoid—1 pound to 160 gallons water, with 1 pound fresh lime.

The Apple-leaf Sewer [*Ancylis (Phoxopteris) nubeculana*, Clem.].—Apple orchards at Fruitland, Grimsby, St. Catharines and Niagara-on-the Lake, were to a moderate extent infested last autumn by the small caterpillars of this insect. The sewed leaves were conspicuous on the trees in autumn. Inside these leaves, which fall to the ground, the caterpillars remain until the following spring, when they change to chrysalids; and the pretty moths, which are shown at fig. 13, appear in May and June. The chrysalis works its way through the leaf, and, when the moth escapes, the empty skin remains attached to the leaf. This insect has never been a serious pest to the apple grower, and is only sometimes sufficiently abundant to attract notice. The only remedy which has been recommended, is to rake up the leaves in the autumn and burn them.

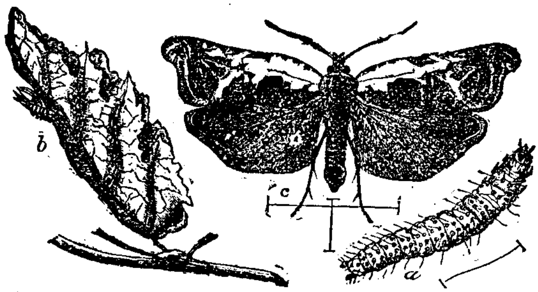


Fig. 13.—The Apple Leaf-sewer: *a*, caterpillar; *b*, pupa case on leaf; *c*, moth—*a* and *c* enlarged.

The Apple-leaf Miner (*Tischeria malifoliella*, Clem.)—Rather more abundant than the above and more destructive was this small leaf-miner. It occurred in several orchards near Grimsby, and Mr. Joseph Tweddle reports it as being sufficiently abundant to require attention. It has been noticed more or less in this same district for several years, specimens having been sent once or twice by Mr. Geo. E. Fisher, of Freeman, Ont., who had noticed it in orchards and nurseries in the above named district, when inspecting for San José scale. I do not think that it is ever likely to develop into a serious enemy, but it is advisable for students of insects to find out a little more than is at present known concerning its exact life history, so that, in case it ever requires special treatment, we may be prepared with a practical remedy, which as yet is wanting. The only remedy now suggested is to burn the fallen leaves in infested orchards, either in autumn or before the moths leave them in the spring.

The Apple Aphis (*Aphis mali*, Fab.).—Plant-lice of all kinds have been noticeably abundant on many crops throughout Canada and the northern United States during 1903. Although this has been the case, it cannot be said that their injuries have been excessive, for in nearly every instance, they were attended by large numbers of their natural parasites, which soon reduced the numbers so much that they were unable to do appreciable harm. The only injuries which could be considered serious, were where the insects attacked young stock in nurseries and fruits while young. Some of our large nurserymen in western Ontario inform me that Apple Aphis did them considerable harm last season, particularly upon budding stock, late in July and in August. In Prince Edward Island and in British Columbia, an injury which I have already alluded to as caused by the Apple Aphis, was again this year apparent on apples. This injury is of a serious nature, and takes the form of deep pits which are left on the growing fruit at spots where apples have been punctured by the aphis when they were small. This gives the fruit a distorted, gnarled appearance which renders it quite unsaleable.* As a general thing, except in British Columbia, it is not advisable to go to the expense of spraying bearing apple trees for destroying the Apple Aphis. The insects are most abundant when they first hatch from

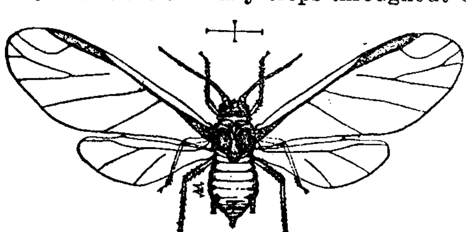


Fig. 14.—The Apple Aphis—enlarged.

*See Fig. 15, next page.

the eggs, in which form they pass the winter. At that time the plant-lice cluster on the buds to such an extent as to almost hide them. With the rapid expansion of the foliage, they are soon lost sight of, and it is very seldom that serious injury results from their presence. Late in the autumn, when they come back again to apple trees after passing some time on grasses and fall wheat, they are again found in large numbers upon apple trees, where they lay their eggs. In British Columbia, this insect is one of the most destructive orchard pests the fruit-grower has to deal with, and treatment of infested trees is frequently a necessity.

It may also be noted that, although the Apple Aphis was troublesome last season in many parts of the Pacific province, Mr. Venables expressly states that the Apple Aphis was less abundant than usual at Vernon, although one might have expected it to have appeared in great force, judging from the large number of eggs laid in 1902. These, however, for the most part failed to hatch last spring. The Apple Aphis is a green plant-louse, having the head, the eyes and the thorax black. The head is pointed in front, and the prothorax has lateral tubercles. The antennæ are shorter than the body. On comparing this species with the Grain Aphis, which very much resembles it, the most striking differences are that in the latter species the eyes are reddish, the head and thorax brown and the head not pointed in front. The antennæ, which are a little longer than the body, are also borne on distinct frontal prominences. A remedy which answers well for the Apple Aphis, is to spray the infested trees thoroughly with whale-oil soap, one pound in six gallons of water, or with a tobacco and soap wash made by soaking ten pounds of tobacco leaves in hot water for a few hours, then straining off the liquid and adding two pounds of whale-oil soap. Stir until all is dissolved and fill up to make 40 gallons. If this wash is applied as a spray two or three times at short intervals, little difficulty will be met with in destroying the Apple Aphis.

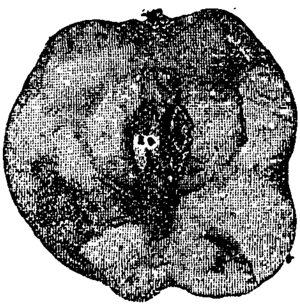


Fig. 15.—Section of Apple showing distortion of outline.

The injury to apples referred to above resembles very closely that of the small British Columbia Apple-fruit Miner *(Argyresthia conjugella, Z.)*, as shown at fig. 15.

The PLUM APHIS *(Aphis prunifolii,* Fitch) was mentioned by correspondents several times during June, and trees infested were sprayed promptly with whale-oil soap or the tobacco and soap wash with good effect. In British Columbia an allied species, *Hyalopterus pruni,* Fab., was reported by Mr. E. P. Venables, of Vernon, B.C., as being in greater numbers than for several years past. The insect was also observed at several other places in British Columbia, both on the mainland and in Vancouver Island.

The CHERRY APHIS (*Myzus cerasi,* Fab.).—This is a black plant-house, which frequently appears in large numbers early in spring and clusters around the young fruit and along the stems of the fruit and leaves, sucking the sap and doing much harm. The eggs are laid upon the twigs during the autumn, the young plant lice not hatching until the following spring. This plant-louse has done a considerable amount of harm in western Ontario for several years, and during the past summer, although in most places it disappeared early in June, in others much loss resulted from its attacks. Mr. J. B. Fairbairn writing from Bowmanville, Ont., says: 'I have two English cherry trees that for years have had their crop ruined by this pest; two seasons ago I planted out three Montmorencys, and I find they also are covered with these insects. It seems almost impossible to destroy them without injuring the trees.' The Cherry Aphis is one of the class known as Black Plant-lice, and it is a remarkable fact which has not been accounted for, that all of these dark coloured plant-lice are much harder to kill than those which are of a green or light colour. For the Apple Aphis, Hop Aphis and other green-coloured species, one pound of whale-oil soap in 8 or 10 gallons of water is sufficiently strong to destroy them; but, for the black species, I have found that six gallons of water to one pound of soap is the greatest dilution which can be used. An important point, too, in fighting this insect, is early work, because, as the egg is upon twigs all through the winter, and the young hatch there in spring, they are easily reached with a small amount of spraying material, and early treatments before the leaves have expanded, have been found most effective. The kerosene emulsion may also be used with great success at any time after the weather becomes warm in spring, and before the leaves expand. For this purpose, the stock emulsion should only be diluted with six parts of water, instead of nine, as in the usual dilution for use upon foliage.

The RED-HUMPED APPLE-TREE CATERPILLAR (*Schizura concinna*, S. & A.).—These voracious caterpillars were sent in from Nova Scotia, Quebec and Ontario, and were reported from British Columbia. Altogether, the species seems to have been rather more abundant than usual. The appearance of these caterpillars is well shown at fig. 16. The colours are as follows:—Head bright red, as is also a conspicuous hump on the fourth segment. The sides are striped with black, yellow and white lines. The blunt spines on the back are black. When at rest, the end of the body is raised and has, when viewed sideways, somewhat the shape of a dog's head. When full grown in autumn, they are a little more than an inch long. They then spin close parchment-like cocoons among the leaves on the ground, or a short distance beneath the surface, in which they remain unchanged until the following spring, when they assume the chrysalis condition, and the moths emerge towards the end of June. These are plainly coloured but prettily marked in varying shades of brown, which make them very inconspicuous when at rest, and, although the caterpillar is common, the moths are very seldom seen. These, when the wings are opened, expand from an inch to an inch and a half, the males, as a rule, being much smaller than the females. The eggs are deposited in clusters on the leaves of apple trees and occasionally on a few other kinds of trees, as willow, birch and oak. They are laid early in July, and by the end of that month the colonies of young caterpillars become conspicuous from the thorough way in which they strip whole branches of their leaves. At this time much good may be done by cutting off the branches and destroying the whole colony at once, as they very seldom wander far from each other, and when at rest, are massed together so as to hide the twigs and stem of the branch. The Red-humped Apple-tree Caterpillar has never appeared in Canada in sufficient numbers to be the cause of much loss to fruit growers, and, where trees are regularly sprayed with insecticides, this will never be the case. The species is much rarer in British Columbia than in the East, but I have on several occasions seen colonies upon wild willows, as well as upon apple trees in orchards. Mr. E. P. Venables reports it as more abundant than usual in 1903 at Vernon in the Okanagan valley. Prof. F. C. Sears sent specimens from Wolfville, N.S., Mr. P. E. Choquette, from St. Jerome, Que., and Mr. E. B. Yarwood, from Picton, Ont. A few colonies were also found at Ottawa.

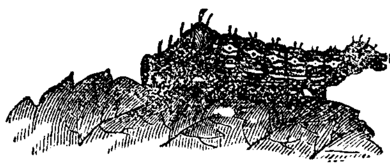


Fig. 16.—The Red-humped Apple-tree caterpillar.

The PEAR-TREE SLUG (*Eriocampa cerasi*, Peck).—The slimy blackish slug-like larvæ were last year, as is too frequently the case with so easily controlled a pest, found very destructive in British Columbia to the foliage of pear and cherry trees. Specimens were also sent from Morrisburg, Ont., by Mr. Gordon Dill. The parent insect is a short, thick four-winged fly, about a quarter of an inch in length. It is glossy black, with pale legs, and has the habit, when an infested

Fig. 17.—The Pear-tree Slug.

tree is touched, of drawing in the legs and falling to the ground. There are two broods in a season, the flies of the first brood appearing and laying their eggs early in June. These are inserted into the tissues of the leaf, where they remain for about a fortnight before the young slugs hatch. The greatest injury is done to fruit trees during July. The larvæ are sometimes, and indeed very frequently, in such enormous numbers as to strip the green cellular tissue from the leaves to such an extent that the foliage of whole trees and even of orchards is destroyed, and the trees are left apparently covered with only dead leaves. This injury, occurring as it does when the trees require the full use of their leaves to bring the fruit to perfection, is a serious one, and its effects last over and affect the crop of the second year. A second brood of larvæ appears in August and September. These, when fully fed, fall to the ground and penetrate a short distance beneath the surface, where they remain until the following year, changing to pupæ about the middle or end of May, and the flies emerge soon afterwards. The Pear-tree Slug, which, as its latin name indicates, attacks also the Cherry-tree, is a very easy insect to control. In properly managed and sprayed orchards it can never be troublesome. Owing to the viscid secretion on the skin any dry, dusty material adheres to it and causes the insect great inconvenience; therefore, dusting trees with freshly slaked lime or even with finely sifted road dust, will have the effect of clearing trees of large numbers. Two or three applications should be made at short intervals. In hot, dry weather dusting trees either by hand or with an insect gun or other implement for the distribution of dry powders, for two days running, I have found quite satisfactory. The material used was freshly slaked lime, to which Paris green was added in the proportion of one pound to fifty, so that in case any of the larvæ, which might have been moulting, escaped, there would still be on the foliage poison to destroy them as soon as they began to feed. The most practical remedy is undoubtedly to spray trees with Paris green or some other arsenical insecticide, one pound to 160 gallons of water. This treatment will not only destroy the Pear-tree Slug but also many other kinds of leaf-eating insects.

The PEAR-TREE FLEA-LOUSE (*Psylla pyricola,* Foerster).—Although up to the present time the Pear-tree Flea-louse, called also the Pear-tree Psylla, has not been the cause of widespread injury, still there are every year complaints of more or less serious loss in pear orchards in western Ontario. I have found this insect to be abundant when looked for in orchards, throughout the Niagara district and along the north shore of Lake Erie. During the last summer I have had it sent to me from two localities in Nova Scotia, and believe it to be also present at other places from which no specimens have been received. Prof. Lochhead, of the Ontario Agricultural College, writes me as follows :—

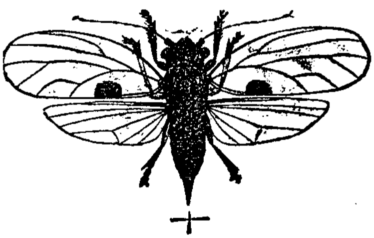


Fig. 18.—The Pear-tree Flea-louse: perfect insect—enlarged.

'This insect has been very injurious this past season, more especially in the Grimsby district.' A correspondent writes:—'When I came home on July 4, many trees were fairly covered with it. The insects were mostly wingless, with a few winged forms. They are found in the axils of the leaves, along the petiole and along the blade, but are chiefly found on the leaves a short distance from the vein or just in the axils of the secondary veins or mid-veins. In the first place, the tissue of the leaves dries up in spots where they are situated; but in the latter case they cause a drying of the tissues along the edge of leaf at the outer extremity of the vein. When the psylla is situated in the secondary axils of the leaf, the petiole seems yellowish in colour and the attachment to the stem seems weak. About July 15 to 25 the psyllas were most abundant—the number of winged forms increasing until the 25th. A heavy rain on the 23rd cleared the trees of the honey-dew, and seemingly of quite a number of the psyllas. After another heavy rain on the night of July 27, I noticed that there were very few of the wingless forms, but a great number of the winged ones. Up to this time very few leaves had fallen off, although the growth of the trees was completely stopped; in fact, our trees have apparently made no growth at all this year, excepting a few that were free from the Psylla. At the time of writing, August 27, the wingless forms have again become numerous and the winged ones few.'—W. R. DEWAR.

Mr. John Chute, of Berwick, N.S., also observed that those of his trees which were infested by the Pear-tree Flea-louse made no growth.

This insect was first noticed as injurious in Canada in 1894, and a short account of it, with the best remedies for controlling it, appeared in my annual report for that year. The attack may be described as follows:—Small clear-winged insects, wedge-shaped like miniature cicadæ, the head being broad, flat in front, and the body pointed behind; one-tenth of an inch in length, of a reddish brown colour, with broad black bands across the abdomen. These insects, at the slightest disturbance, leap from the foliage of infested pear trees and fly for a short distance. With the above described form, there will be found on the leaves the curious flattened oval larvæ, which, when first hatched, are extremely small, only one-eightieth of an inch in length, of a semi-translucent yellow colour, with bright red eyes. These grow rapidly, and in about a month pass through five nymph stages, during which the body retains its flattened form and becomes much darker until, in the full-grown nymph, the large wing-pads and the greater part of the upper surface are black. The eyes and sometimes the body between the black markings are crimson. The presence of this insect upon trees is easily detected by the copious secretion of honey-dew with which the leaves, limbs and trunks of the trees soon become covered, and upon which the dirty looking Sooty Fungus *(Fumago salicina)* develops. After a time the leaves and young fruit fall off and the trees assume an unhealthy, gnarled appearance. Hardly any new growth is made, and in cases of severe attack, trees die.

The life-history of this insect has been carefully worked out by Prof. Slingerland, of Cornell University, and has been fully described in Cornell Bulletin No. 108, published in 1896, as well as in U. S. Div. of Ent., Circular No. 7, 2nd series, by Mr. C. L. Marlatt.

The remedies for this insect are the spraying of the trunks of trees which are known to have been infested, during the winter or early spring, with kerosene emulsion, whale-oil soap solution, or whitewash. This is to destroy the hibernating adults, which pass the winter hidden away beneath flakes of bark or in crevices.

The eggs are laid very early in spring long before the leaf buds expand. After leaving their winter quarters and after the sexes have mated, the females lay their curious pear-shaped and tailed eggs (fig. 19) near the tips of the young wood. The young flea-lice hatch from these about the middle of May or sooner, and immediately begin sucking the sap from such leaves as have unfolded. Mr. Joseph Tweddle, of Fruitland, Ont., tells me that he obtained very satisfactory results in destroying the Pear-tree Psylla in orchards which he had sprayed with the lime and sulphur wash to control the San José Scale. He was under the impression that the mixture destroyed the egg upon the young wood, which is highly probable. It frequently happens that fruit growers do not know of the presence of this enemy in their orchards until they notice their pear trees becoming dirty and black during June, or a little later in the year notice that the leaves are falling. As soon as the insect is noticed in sufficient numbers to cause injury to the trees, these

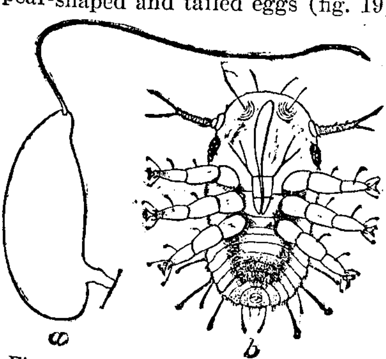


Fig. 19.—Pear-tree Flea-louse: *a*, egg; *b*, larva—both greatly enlarged. (Marlatt, U.S. Dept. of Agriculture.)

latter should be sprayed at once with the ordinary one to nine kerosene emulsion or with a whale-oil soap solution of one pound to six gallons of water. This will destroy large numbers both of the nymphs and also of the mature insects. The most effective work, however, is done during the winter, when nearly all of the adults resort to the trunks and larger limbs for hibernation. In my report for 1900, at page 239, I drew attention to some good work which had been done by Mr. Henry Lutz, of Youngstown, New York State, by spraying with a lime wash. In 1896 a large Duchess orchard belonging to him was almost ruined. In February, 1897, the whole orchard was thoroughly sprayed with whitewash, and two years afterwards this orchard was almost free from Psylla. Mr. Lutz explains his plan as follows:—'During the cold weather in December we spread a canvas under the trees and then scrape off all the rough bark. This dislodges many of the torpid insects, which are burnt with the scrapings. We then give the trees a thorough coating of slushy whitewash made of freshly slaked lime that had been run off in a putty state, as masons usually make it for plastering. We thin this with skimmed milk and put it on the trunks of the trees with a brush, for those parts of the tree which we can reach. We thin down the whitewash with more milk and then give the whole tree a thorough spraying. In this way we destroy a large number of the hibernating Psyllas, and those which are not killed are so well sealed up that they cannot get out to lay their eggs. We spray again in March to coat the wood and buds, so that the few that are alive can find no favourable places to lay their eggs. The orchard where we experimented contained 1,000 trees, which were practically worthless, but since we began using the lime the trees have steadily regained their vigour.'

The PEAR-LEAF BLISTER-MITE *(Phytoptus pyri,* Nalepa).—This enemy has now spread to every part of the Dominion where pears are grown. Specimens were sent from Prince Edward Island by Mr. E. J. McMillan, the secretary of Agriculture for that province, and within the same week in June specimens came in for report from the provinces of Quebec and Ontario. Mr. E. P. Venables, writing from Vernon, B.C., says:—'Pears suffered from the attacks of the Pear-leaf Blister-mite. This insect threatens to become a very serious enemy unless measures are taken to subdue it. I found that the lime, sulphur and salt spray was very useful in destroying it. It was applied just before the buds burst. One tree upon which the leaves were simply black with the work of the mite, was treated thoroughly and the following year was practically free from the insect. A few branches at the top of the tree, however, were as bad as ever. These had not been reached by the spray.'

Frequent experiments have shown that the best treatment for this pest is spraying the trees thoroughly with the lime, sulphur and salt wash just at the time the buds are bursting. The mites pass the winter hidden away securely beneath the bud-scales, which by the expanding of the buds in spring are opened up sufficiently to allow the entrance of liquid. Kerosene emulsion is useful to a certain extent, but sulphur has a specially fatal effect on all mites, and in practice the wash above mentioned has proved the best remedy against the Pear-leaf Blister-mite. See below for receipt of lime and sulphur wash at page 199.

THE SAN JOSE SCALE *(Aspidiotus perniciosus,* Comstock.)

This notorious insect has done much harm in Ontario orchards during the past season. The only part of Canada where the San José scale is now found as an orchard pest is in the Niagara peninsula and in the counties along the north shore of the western end of Lake Erie. The infestation has, however, decidedly increased a great deal during 1903, and has involved new orchards within the area known to be infested at the end of 1902. It is a matter of congratulation that the pest has not spread beyond those limits; for, although most of the leading fruit-growers seem to understand the danger of neglecting this terrible pest, yet there are many owners of small orchards who are doing nothing whatever to save their trees, and these centres are sources of public danger. An interesting occurrence of the small parasitic beetle *Pentilia misella*, Lec., was brought to my notice by Mr. W. O. Burgess, of Queenston, Ont. This useful little coccinellid was found in some abundance on apple and plum trees infested by the San José scale. It is a well known parasite of that scale insect, and although it has on several occasions been found in considerable numbers in infested orchards, I have never been able to see that it affected the abundance of the scales appreciably.

The Minister of Agriculture still maintains the fumigating stations at Vancouver, B.C., Winnipeg, Man., Windsor and Niagara Falls, Ont., St. Johns, Que., and St. John, N.B.; and a great deal of nursery stock has been passed through them during the past season. A rigorous watch has been kept on every kind of nursery stock which could possibly bring in fresh importations of the San José Scale, and I have again this year the greatest satisfaction in reporting that no single instance has been brought to my notice of living scales having been detected on trees which had passed through the fumigating houses. The superintendents at all of the stations have done their work carefully and well, and no complaints have been received from importers, either as to the slight delay which must occur while the stock is being treated, or as to any injury to the trees during the necessary unpacking, handling and repacking. Careful experiments have shown that the formula used at our federal fumigation stations is thoroughly effective in killing the San José Scale, and does not in any way injure the stock submitted to the gas. The formula used is one ounce of cyanide of potassium (98 per cent), one ounce of commercial sulphuric acid and three ounces of water—exposure, 45 minutes.

During 1903 the experiments which had been carried on up to that time by the Ontario government to discover a practical remedy for the San José Scale were discontinued. After having demonstrated by the excellent work and most careful experiments of Mr. Geo. E. Fisher that this insect could be controlled by practical measures, the Provincial Minister of Agriculture considered it wise not to carry on these experiments any longer. Consequently, during the past summer, although helped with advice and publications by the Provincial Department of Agriculture and Prof. W. Lochhead, of the Guelph Agricultural College, fruit-growers have had to attend to this part of their work themselves. Some have applied the recommended measures and have been quite successful in their efforts when the work was done thoroughly, but the scale has increased to an alarming extent during 1903. The consensus of opinion is that when the well known lime, sulphur and salt wash, or the recent modification of it, in which the salt is omitted, is applied thoroughly as a late winter wash, it is a safe and reliable remedy for the San José Scale. It kills by contact with the scale and acts mechanically by coating the trees so that they are unsuitable for the young scales to establish themselves upon. This wash is used as a winter wash, and should be followed in summer with sprayings of the 1 to 6 kerosene emulsion. The preparation, as described in previous reports and as used to-day in many places, consists of about one pound of lime, half a pound of sulphur and six ounces of salt to every gallon of water in the wash when ready for use. Mr. G. E. Fisher, who tried an enormous number of experiments, found that the results of his investigation justified him in recommending that the salt might be omitted without loss of insect killing power. The original formula of the California wash is :

LIME-SULPHUR-SALT WASH.

Lime, unslaked	40 lbs.
Sulphur	20 "
Salt	15 "
Water	60 gallons.

The chief difficulty in making this wash has been the expense and inconvenience of boiling it for two or three hours, so as to thoroughly dissolve the sulphur. This may be done either directly over the fire in iron kettles or in barrels by means of a jet of steam. Mr. G. E. Fisher describes his method of preparing this useful wash on a large scale, as follows:—

'There are a great many ways of preparing lime and sulphur wash for spraying, and nearly every one who does it prefers his own way. When large orchards are to be treated, it is not practicable to cook the material to be used, by boiling it in kettles over the fire. In my practice I found that, with the aid of steam from an ordinary threshing engine, this most effective spraying material could be supplied in large quantity perfectly cooked and at a cost of from one cent to one and a half cents per gallon. A 12-horse power boiler will not furnish steam enough to cook 12 barrels at once, without extra heavy firing, and, with ordinary firing, such a boiler will not properly run more than 8 or 9 barrels, which will cook probably about 1,200 gallons of spraying material in 10 hours. The greatest drain upon the steam is in starting, when the water is all cold, and, to expedite matters and get some of the barrels under weigh, I found considerable advantage in starting about one third of them. We fill four barrels one-quarter full and then turn on the steam. With steam at from 80 to 100 lbs. pressure, these will be boiling in five minutes, when the steam is turned off these and on to four more barrels, and all the lime and sulphur are put into the first four as quickly as possible without making them boil over. It is best to turn off the steam while the lime is being slaked, as it lessens the danger of making the mixture boil over. When the lime is all slaked, the steam is turned on again and the mixture is left boiling until cooked. When the second four barrels are boiling, the steam is turned on to the third lot as with the first two, always returning the steam to the barrels as soon as the lime is all slaked. Managing in this way, we always had some material ready for use. That which is prepared late in the evening will still be warm enough in the morning, even in cold weather. In order to make up for the loss of liquid from boiling and to gradually fill the barrels to the proper depth, a small stream of cold water was kept dribbling into them at a rate which allowed the barrels to fill in the course of the two or three hours' cooking necessary to reduce the sulphur. In this way the mixture was kept boiling all the time and the necessary amount of liquid was added. For boiling the mixture in the barrels, we have a quarter-inch pipe which reaches down to within four inches of the bottom of each barrel, and each pipe is provided with a stop-cock.'

'When using a kettle, if I have only one, it is filled about one-third full and brought to a boil. The lime and sulphur are then added, and an old tin pail with a small hole in the bottom is hung over the kettle, and cold water dribbling from it into the kettle replaces the water which evaporates with boiling and increases the quantity. When kettles are used, if there are two, one may be used for heating water; for, while the mixture is cooking, cold water should not be added in sufficient quantity to check the boiling. I have generally slaked the lime in the barrels or kettles as it was required, but on some occasions we slaked it in another barrel by throwing boiling water over it and with just as good results. We certainly got our best results where each gallon of the wash contained one pound of lime and half a pound of sulphur, which we cooked from two to three hours. It is true Dr. Forbes got his wonderful results from a less quantity cooked one and a quarter hours. Mr. Pease, the California Scale Inspector, says it must be cooked at least three hours and that more cooking is better. He believes that this wash is of little use unless sufficiently cooked. We had good results and perhaps should be satisfied, but I think we have good reasons for using the larger quantity of material and cooking a long time. In Michigan again they used less material even than Dr. Forbes. A very common proportion in the United States is 40 lbs. of lime, 20 lbs. of sulphur, 15 lbs. of salt, in 50 imperial gallons of water.'

Dr. S. A. Forbes, who has been very successful in fighting the San José Scale, uses the Oregon wash and is quite satisfied with it. Writing at the end of the season of 1903, he says: 'I am still using the ordinary Oregon wash of 15 lbs. of lime, 15 lbs. of sulphur and 1½ lbs. of blue vitriol, dissolving the lime and sulphur by boiling for about an hour and then adding the blue vitriol, which has been dissolved in hot water, and boiling for 15 or 20 minutes longer.'

Mr. W. H. Owen, who has done a great deal of work against the San José Scale, on Catawba Island, Ohio, and has tried all of the different remedies which have been suggested from time to time, wrote me recently: 'In 1903 the original California formula was somewhat modified. The quantities of the new formula being lime 15 lbs., sulphur 15 lbs. and salt 15 lbs. to the 50 gallons of water, and this gave equally good results with the old formula. The Oregon wash of 15 lbs. of lime, 15 lbs. of sulphur and 1¼ lbs. of blue vitriol, is what I used during the past season, and I cannot expect to find anything that will do better work than this, both on the San José Scale and the Leaf Curl. When properly made it surely is a perfect insecticide and fungicide. Too much stress cannot be laid upon proper making; for I believe that failure in obtaining satisfactory results can in most cases be traced to careless making.'

The lime-sulphur-and-salt wash, as made in the old method by boiling for a long time, is very fatal to scales, and many other kinds of insects, and there has been a constant effort made to see if the long boiling cannot be avoided. The point aimed at is to dissolve the sulphur thoroughly by means of the lime and heat, and to form a double sulphide of lime. There is an excess of lime in all the formulas used, but this is in no way detrimental. The mixture, however, is not a pleasant one to use, being caustic if it gets on the bare flesh, and is very destructive to clothes of workmen using it. For this reason old clothes should be worn and the hands should be protected with gloves. It must only be used as a winter wash, for if of sufficient strength to destroy the scale, it would injure foliage as well as sensitive stock in autumn before the buds are dormant; but, when buds are quite dormant, it may be used upon all fruit trees and other hard-wooded plants liable to infestation by the San José Scale. Its effectiveness has been proved by several, and one instance which has been seen by many of our Ontario fruit growers, is the case of some plum and peach trees in the orchard of Mr. W. W. Hilborn, at Leamington, Ont. In the spring of 1903, Mr. Hilborn found that a small block of trees was badly infested with the scale. He at once procured a plant for making the lime and sulphur wash and sprayed the trees thoroughly. These trees were examined by me with great care on November 25 last, and I could not find a single living scale. All experimenters recommend that this wash should be applied while it is hot; but, as a matter of fact, this is seldom done in practice, although those who have used hot or warm wash will notice how much more convenient it is to spray when in this condition, and it certainly is more effective in killing the scale.

A simple formula for making this wash in small quantities is 1 lb. lime, ½ lb. sulphur, and 3 gallons of water.

THE NEW LIME-SULPHUR-SODA WASH.

The chief difficulty in making the wash has been the expense and inconvenience of boiling it for such a long time, to thoroughly dissolve the sulphur, and several of our fruit growers have inquired for information concerning some experiments which have been mentioned in the agricultural press and which were undertaken to dissolve the sulphur with caustic alkali and lime, instead of the troublesome and lengthy boiling. These experiments originated with Professors Victor Lowe and P. H. Parrott at the New York Agricultural Experiment Station, Geneva, N.Y., as set forth in the Station Bulletin No. 228, 1902, and consisted of dissolving the sulphur by means of caustic soda or caustic potash in addition to the lime. In making the wash, 40 lbs. lime were slaked in hot water, using only enough water to make it boil rapidly, and while slaking 20 lbs. of ground sulphur, which has been made into a thin paste, is added and thoroughly mixed with the slaking lime. Five pounds of caustic soda in solution is then poured in with more water as needed, and the whole is stirred thoroughly. As soon as chemical action has ceased, hot water is added to make the wash up to 60 gallons, and the mixture is then ready for immediate use. In making the above wash, it was found that to secure the proper chemical action the quantity could not be reduced lower than: lime 4 lbs., sulphur 2 lbs., and caustic soda (the ordinary concentrated lye of commerce) ½ lb., water 6 gallons. The rule is to use one-quarter of a pound of caustic soda, or potash, to each pound of sulphur. With the exception of heating the water, the whole of the cooking of this wash can be done in a half barrel, and takes from ten to twenty minutes. From the ease with which this wash can be made and from the fact that Mr. Parrott tells me that, although 'the results upon the scale differed with different lots of the mixture, some of the applications were entirely satisfactory,' I believe it is well that several people should try this method of manufacture. The trouble of making the lime-sulphur-and-salt wash has certainly prevented the use of such a valuable mixture to a large extent. I regret to say that my own work with it did not begin soon enough for me to report upon it now. I can merely say that the lime and caustic potash do dissolve the sulphur and that the appearance of the wash is what it ought to be.

Mr. F. T. Shutt, the chemist of the Dominion Experimental Farms, has kindly carried out some test preparations by this convenient new method of making the wash and has handed me the following resumé of his work:—

ON A NEWLY-PROPOSED METHOD OF PREPARING THE LIME-SULPHUR WASH.

(BY FRANK T. SHUTT, M.A., F.I.C., F.R.S.C.)

In the report of the Division of Chemistry of the Experimental Farms for 1902, the results of a series of experiments in the preparation of the lime, sulphur and salt wash by boiling, are given. Since the appearance of that report a method has been proposed by the New York (Geneva) Experiment Station, which obviates the necessity of boiling—the chief drawback to the more common use of this valuable remedy. The modification consists in the addition, at a certain stage in the preparation, of strong lye, such as Babbitt's or Gillett's. The proportions and preparation as given in Bulletin No. 228 of the above named Experiment Station are as follows:—

Lime (unslaked)	40 lbs.
Sulphur (ground)	20 "
Lye, concentrated	5 to 10 "
Water	60 gallons.

'In the preparation of the mixture the lime was slaked, preferably with hot water, and while it was slaking vigorously, the sulphur, which had been made into a thin paste, was added and thoroughly mixed with the slaking lime. The caustic soda was then added, with water as needed, and the whole stirred thoroughly. As soon as the chemical action has ceased, the required amount of water, preferably hot water, is added, and the mixture is ready for use.'

It will be noticed that in this process there is no boiling and no salt, an ingredient in the old formula which apparently had no direct value, but was useful in raising the boiling point of the mixture, thus ensuring a more complete union of the sulphur and lime.

At the request of the Entomologist (Dr. Fletcher), we made several trial preparations in the laboratory and found that the proposed method is quite workable and simple, and yields a product in which there is *very little uncombined sulphur.* This latter is an essential point, as undoubtedly it is the sulphur compounds that give this wash its great value for destroying the scale. It is necessary to this end that the sulphur be added (in a thin paste) while the lime is still actively slaking—for which purpose care should be taken to use only a sufficiency of water—and the mass stirred vigorously. As soon as the sulphur paste is poured on to the slaking lime, add the solution of lye, with such further quantities of water as may be necessary, stirring and mixing, until all bubbling ceases. There is now an orange-yellow, pasty, homogeneous mass, which can be diluted to the requisite volume, either at once or at any subsequent time, if kept out of contact with the air.

As far as one can judge from what might be called the chemical or physical point of view, this wash should prove equally effective with that prepared by boiling.

F. T. S.

In an excellent bulletin just issued by Prof. J. B. Smith, of New Jersey, entitled 'Insecticides and their use,' this lime, sulphur and soda wash is mentioned and some valuable suggestions are made. Prof. Smith says: 'This wash has been found quite effective, but it is not so good as the boiled mixture, and costs a little more.' He also draws attention to the fact that warm water must be used as well as a good quality of stone lime and of caustic soda, and further that it must be remembered that a can of lye does not equal a pound.* He further states that 'all these combinations of lime and sulphur are more or less unstable and sooner or later the lime settles and the sulphur forms long spicules. When this occurs, the mixture is ineffective in proportion as the sulphur has become separated out. The best boiled combinations become useless in forty-eight hours, and in all cases the wash is most effective just after it is made.'

The above extracts from Prof. Smith's bulletin indicate the importance of using the lime and sulphur washes while fresh; but the statement that 'the best boiled combinations become useless in forty-eight hours,' is probably too sweeping.

A point upon which too much stress cannot be laid is the great importance of washing out thoroughly all pumps and hoses used for spraying caustic or corrosive insectide and fungicide washes.

FOREST AND SHADE TREES

Forest insects and those which attack shade trees in cities, have been, on the whole, less injurious than usual during the past season. There were, however, one or two outbreaks which require mention. The White-marked Tussock-moth has increased very much in the cities of Toronto, Montreal and Kingston, so much so that remedial measures are now urgently needed, or the beautiful shade trees in those cities will suffer irreparably at no distant date. Something has been done in the past by the city authorities to control this insect, but of late years they seem to have relaxed their efforts, and the insect is increasing in numbers. A remarkable outbreak of the Maple Soft Scale *(Pulvinaria innumerabilis,* Rathvon) occurred on shade trees in the cities of London, Woodstock and Hamilton, as well as in other places in south-western Ontario. The well known Fall Webworm *(Hyphantria textor,* Harr.), which for some years has been occurring only in small numbers, during the last season increased sufficiently in most parts of the Dominion to attract general attention. The unsightly webs were very conspicuous in British Columbia and in many places in Ontario and Quebec. The webs of the caterpillars are so easily seen that this insect, if attended to, can be controlled with comparative ease, by spraying the trees with poisonous applications or by cutting off the webs, each of which contains a whole colony of

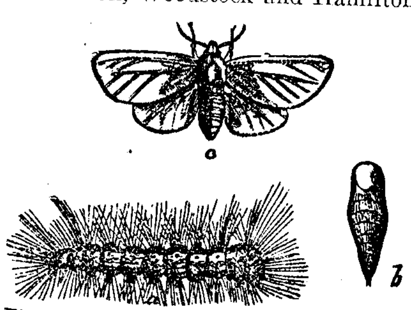


Fig. 20.—The Fall Webworm: *a*, caterpillar; *b*, pupa; *c*, moth.

*The contents of several cans of concentrated lye which were examined here in no case quite came up to 1 lb. avoirdupois.

caterpillars. This must, however, be done before the caterpillars reach full growth, or the work is useless. I have known of one instance where a municipal body with all good intentions employed a man to cut out all of the webs of this insect and those of the Tent Caterpillar in winter time, under the supposition that by this means they were controlling those enemies. It is true the trees were more sightly when these nests had been removed; but the operation in no way affected the abundance of the species the following summer, because the caterpillars only live in the nests until nearing full growth, when they leave them and pupate or build their cocoons in other places. The Tent Caterpillars pass the winter inside the eggs, which may be found on trees, and the Fall Webworms as pupæ buried in the ground. Prof. Lochhead reports 'that the Fall Webworm was very abundant in western Ontario late in summer, not only on shade trees, but on many kinds of fruit trees, and unquestionably did considerable harm. On account of the scarcity of labour in rural sections, few attempts were made to get rid of the ugly webs filled with caterpillars. Unless parasites thin them out very much, there is every likelihood that the Fall Webworms will be very numerous next season.' The Negundo Plant-louse *(Chaitophorus negundinis,* Thomas) was observed as injuriously abundant in Winnipeg, Regina and Calgary, the shade trees, which are largely Ash-leaved Maples, being much disfigured by the copious deposit of honey-dew on the leaves, and the Sooty Fungus which grows upon it. These trees attracted swarms of flies during the daytime and of moths at night. The remedy recommended for clearing these trees was to spray them with kerosene emulsion, 1 to 9, or whale-oil soap, 1 pound in 6 gallons of water, with or without tobacco. The tobacco, however, adds considerably to the killing value of the wash. The Spruce Gall-louse *(Chermes abietis,* L.) has spread widely through the Dominion, and has been the cause of a good deal of injury to spruce trees. In the forest, nothing can be done to check the spread of the insect; but in the case of ornamental trees, good results have followed spraying with a tobacco and soap wash. The Fall Cankerworm was very abundant and destructive in the woods around Ottawa early last spring. The caterpillars were not quite full grown on June 12 last, when the first heavy rains came, which broke the exceptional drought which up to that time had prevailed throughout eastern Ontario. Previous to that they had been literally swarming in many woods along the Ottawa river. After the rains they suddenly disappeared, and the total absence of both male and female moths in the woods in autumn was noticed by many. It is possible, therefore, that there will not be a recurrence of this attack for some time. The Birch Skeletonizer *(Bucculatrix canadensisella,* Cham.) did some harm to birch trees of all kinds again last year in eastern Ontario. The attack, however, was not nearly so severe as in the two previous years, nor was its work supplemented by that of the large aphis, *Callipterus mucidus,* Fitch, and the small green leaf-hopper, *Empoasca smaragdula,* Fall., which for the last two years have perhaps done as much harm to trees on the Central Experimental Farm as was done by the *Bucculatrix* caterpillars. On my return to Ottawa on August 21 last I found the birch trees on the ornamental grounds of the Central Experimental Farm attacked in some places by the Birch Skeletonizer to such an extent that some trees looked about half clothed with foliage. These were at once sprayed with a whale-oil soap and tobacco wash, which was quite effective, and no further injury was done. Should this insect again occur, trees should be examined in July and early August, and, if the small caterpillars or the round white pseudo-cocoons in which the caterpillars pass their moults are seen in numbers, the trees should at once be sprayed before the foliage is injured to a conspicuous extent.

THE WHITE-MARKED TUSSOCK-MOTH

[*Hemerocampa (Orgyia) leucostigma*, S. and A.]

Attack.—Slender, sparsely hairy caterpillars, from one and a quarter to one and a half inches in length, blackish above and paler beneath, with two bright yellow stripes along the back, most conspicuous towards the end of the body. There are four short brush-like tufts of whitish hairs on segments 5, 6, 7 and 8. The head chestnut red; a large patch on segment 2, and two small glandular spots on segments 10 and 11, bright vermilion red. From each side of segment 2, close behind the head, are long plume-like tufts of black, barbed and knobbed hairs; a similar plume ornaments segment 12. When full grown these caterpillars have a decidedly handsome appearance, which is well represented in the accompanying figure.

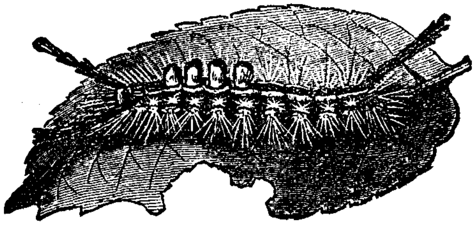


Fig. 21.—The White-marked Tussock-moth: caterpillar.

The male moth measures about an inch and a quarter across the wings, and is marked as shown in Fig. 22. The colour is gray and the wings are crossed by wavy bands. The base of the fore-wings bears a dark patch, and there is another of smaller size towards the tip. The popular name is given to this moth from the presence of a small white spot near the outer hind angle of the fore-wings. The female is a large-bodied wingless pale gray creature, with only rudiments of wings. On emerging from the cocoon she crawls on to it and seldom moves from it. After pairing, she lays a mass of eggs, from four to five hundred in number, generally on the outside of her cocoon, and then dies there. These eggs are covered over as laid with a white frothy fluid, which dries over the eggs and protects them through the winter. There is in Canada only one annual brood of this insect. The eggs may be found during the winter on the trunks of trees upon which the caterpillars had fed the previous season. The young caterpillars emerge from the eggs at the end of May or early in June, and soon crawl up and distribute themselves throughout the foliage of the trees, feeding at first beneath the leaves, and when disturbed letting themselves down by a slender silken thread. By the middle of July the caterpillars have for the most part become full grown and are preparing to spin their cocoons. As they increase in size, they become very ravenous and strip entire trees, eating the cellular tissues between the veins of the horse chestnut leaves, which appears to be the favourite food plant, and producing a characteristic injury, which is easily recognized. These caterpillars have a habit of wandering from branch to branch and from tree to tree, which has given rise to the practice of banding trees with strips of cotton batting. This gives a very untidy appearance to streets and does not do very much good, certainly not enough to atone for the unsightly appearance of the trees. The most effective remedies for the White-marked Tussock-moth are (1) the collection of the conspicuous egg masses from the trunks in winter or before they hatch in spring. This may be easily done by means of a small wire brush on the end of a long pole which will reach up among the larger branches of the trees. Such a brush as this was devised by the late Alderman Hallam, of Toronto, and used to good effect on the city shade trees during a previous outbreak of this insect. (2) Undoubtedly the best remedy is the systematic spraying

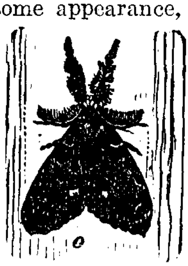


Fig. 22.—The White-marked Tussock-moth: male moth.

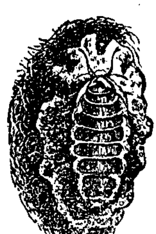


Fig. 23.—The White-marked Tussock-moth: female moth.

of shade trees with some arsenical poison as soon as the young caterpillars hatch from the egg, or as soon afterwards as possible. This work, if properly done, will destroy every caterpillar and render unnecessary the collection of the eggs in winter and the use of unsightly tree protectors, bandages of cotton batting, or sticky substances, all of which are more costly and objectionable. It might be well to point out that, when municipal bodies adopt the plan of collecting the cocoons in winter, it would be well to place these for a time in some place where any parasites which might be passing the winter in the cocoons could emerge and escape, but where the young caterpillars upon emerging would find it impossible to gain access to any trees. This might be done by putting them in an upper room of some building from which the parasites could fly out of the windows, but from which the young caterpillars could not crawl to trees which would serve them as food. Deprived of food, they will soon starve after leaving the egg.

THE APIARY

The Apiary, as in the past, has been under the management of Mr. John Fixter, the farm foreman, whose report I append herewith. The same experiments which have been carried on for some years have most of them been repeated on account of the large amount of interest which has been evinced in the subject by correspondents and visitors to the Central Experimental Farm. The services of Mr. Fixter have been asked for at a great many meetings of bee-keepers, and, whenever his duties at the Central Experimental Farm would permit of it, he has attended these meetings and given addresses.

REPORT OF MR. JOHN FIXTER.

The season of 1903 has been a poor one in the Ottawa valley, but in the greater part of western Ontario the crop has been excellent both as to quality and quantity; parts of the province of Quebec also report good crops, principally where Bokhara clover grows extensively; also in districts which had sufficient moisture in the spring.

The season opened very early; the colonies were set out on their summer stands on March 21. The temperature on that date being 48; and the day bright and mild was most favourable for the cleansing flight of the bees. Then followed several days of cool windy dull weather, which kept the bees confined to their hives; this continued all the rest of March. April was also very unfavourable, being cool and windy. During the greater part of the latter month there was only about three-quarters of an inch of rain, all growth and bloom being thus kept back. May set in warmer; the bees gathered pollen freely, and built up fairly well. It was necessary to feed the bees during May to keep up brood rearing. Only about a quarter of an inch of rain fell during May, and up to June 8 the land was so dry and hard that no clover of any account came in bloom. After June 8, abundance of rain fell, many flowers appeared, and the small amount of surplus honey was gathered after that date. Swarming was light owing to the poor season. There being no fall honey flow from any source all supers were removed on August 26.

On September 1 all colonies were weighed; any that did not weigh 50 pounds and over were fed. When feeding, care must be taken not to feed weak swarms, but the strong ones; then, when these have filled the frames these latter should be given to the weak colonies: otherwise the weak colonies are liable to get robbed. A much better plan of bringing colonies up to the required weight is, in the extracting season, to save some of the well-sealed combs to fill up the light colonies with them. There is then very little danger of their being robbed.

On November 24 all colonies were weighed and found to be in good condition. They were then put into their winter quarters.

Returns from the Experimental Farm apiary averaged 23 lbs. per colony.

Meetings were attended during 1903. The Ontario Bee Keepers' Association at Barrie and Trenton; also farmers' and beekeepers' joint meetings at the following places: Manotick, North Gower, Stittsville, Richmond, Malakoff, Lanark, Wellman's Corners, Bell's Corners, Jockville, Carp, Kinburn, Smith's Falls, Leonard, Metcalf, Balderson and Innisville, in Ontario; Grenville, Lachute, St. Andrews, Como, Buckingham and Templeton in Quebec.

INSULATING HIVES FOR OUTSIDE WINTERING.

Two colonies of equal strength with good laying queens in Langstroth hives were taken for this experiment. The hives were insulated against the winter cold by air cushions in the following manner:—

Slats 1 inch thick are nailed at intervals all round the hive, on these is packed one layer of thick brown building paper and then a layer of oiled paper, which increases the durability and keeps out vermin. In order to provide extra protection to the hive, a box six inches wider and six inches longer was placed over it with an opening cut at the entrance 1 inch by 2 inches, all other openings being closed.

The wooden cover of each hive was removed and replaced with a chaff cushion 3 inches thick, the latter placed on the propolis quilt, and lapping over the sides of the hive; two layers of paper were then placed on the top of the cushion and a second cushion added, with the top of the outside box over it. The bees were put into winter quarters on November 18, 1902. No sound could be heard from those colonies all winter, up to March 10, when a slight hum was perceptible. On March 20, 1903, the first bees made their appearance; there were many dead bees at the entrance of the hives. On March 21, the outside cases were removed, leaving the paper and one chaff cushion on during the cold spring. Upon examination one colony was found to be in fairly good condition, the other very poor, with many dead bees on the bottom board. A few days afterward the latter was found to be deserted. The frames in both cases were all dry and clean and had abundance of honey to carry them through from November to the clover bloom. Weight, when put into winter quarters, 53½ lbs. each; in spring, 37¼ pounds each. Owing to the cool, backward spring, the surviving colony did not build up until May 1, when warmer weather set in; the bees at once began gathering pollen and built up very rapidly. The colony was in excellent condition for a honey flow, but during May and the early part of June the weather was very dry and warm, keeping all bloom backward; the bees, therefore, made but little surplus honey.

This experiment is to be tried again this winter.

EXPERIMENTS TO TEST WHETHER DAMPNESS OR MOISTURE WOULD BE INJURIOUS TO BEES IN THEIR WINTER QUARTERS.

Three colonies were selected for this experiment, all of about equal strength, and all in Langstroth hives, weighing on an average 55½ pounds each. The wooden covers were removed from the hives and replaced with propolis quilts; the bottom of each hive was loosened from the brood chamber and a block two inches square was placed at each corner between the bottom board and the brood chamber, insuring free ventilation from the bottom of each hive. Four pails of water were then put on a table in such a way that the three hives were set resting on the edge of the pails, allowing the full surface of water to be exposed. The cellar was kept at a very even temperature of 42 to 48 degrees, and was well ventilated during the whole winter. The bees could be seen hanging below this frame in a quiet cluster, and there were very few dead bees on the bottom board, and no signs of dysentery.

On March 22, the day being fine, the colonies were removed to the bee yard, where all began flying at once. Average weight of the three colonies when set on their summer stands, 43¼ pounds each. From March 22 to May 1, the weather, although bright, was cool and windy, and very little flying took place. After May 1, the weather became considerably warmer, and the bees began building up rapidly. They were in excellent condition by May 24.

EXPERIMENT IN FEEDING BEES IN THEIR WINTER QUARTERS.

Many letters have been received from people who have only a few colonies of bees, stating that when carrying their bees into winter quarters they had discovered there did not seem to be a sufficient store of honey in the hive to carry the bees through the winter. To gain information as to the best method of overcoming this difficulty the following experiment was tried with six strong colonies of bees:—

Four frames of sealed honey were taken from each of the six hives, leaving the cluster on the four remaining frames. The four frames were left in the centre of the hive with a division board at each side, and some light packing placed between the division boards and the sides of the hives. The wooden covers were removed and replaced by large propolis quilts made of heavy canvas. Over the top of the propolis quilt extra packing was added to keep in the heat, absorb moisture and prevent draughts or upward ventilation. The bottom boards were left on as they came from the bee yard, leaving the entrance wide open. The experiment was made as follows:—

1. Two colonies received maple sugar of the best quality.
2. Two colonies received partly filled sections of honey.
3. Two colonies received candied honey and sugar.

Each colony when put on this test, weighed 31 pounds, and each was given 5 pounds of its respective food to start with. The experiment lasted from November 18, 1902, to March 22, 1903. The two colonies fed on maple sugar consumed 11½ pounds each, they were examined every two weeks and water added to the sugar through holes in the tops of the cakes, keeping it soft and moist.

The two colonies fed on partly filled sections of honey, consumed during the same time 14¾ pounds each. There was for several reasons considerable waste in this test; consequently if partly filled sections could be sold even at a reduced price it would be advisable to sell them instead of feeding back.

The two colonies that were given candied honey and sugar consumed 10¾ pounds each. The candied honey was moistened from time to time, which made it easier for the bees to suck it up. Candied honey is made as follows: Take good thick clover honey, and heat (not boil) it until it becomes very thin; then stir in it fine granulated sugar. When the honey has dissolved the sugar, pour it into another vessel, and, when it has cooled sufficiently, thoroughly knead it with the hands. The kneading makes it more pliable and soft, so that it can take up more sugar. The kneading operation, with the adding of fine sugar, should be continued until the dough is so stiff as to be quite hard to work. It should then be allowed to stand for a day or two, and, if at the end of that time it is so soft as to run or to be sticky, a little more sugar should be kneaded in, so that it may be cut into cakes of a convenient size. These cakes are to be placed on top of the frames in such a way that the bees can get at them easily.

The colonies in all the three tests came through in excellent condition. Any one of the three methods may be safely followed, but I would strongly recommend examining and weighing all colonies the first week in September. At that time every colony should have a good laying queen, and should weigh over 50 pounds. In seasons when there is no autumn flow of honey, all colonies in Langstroth hives weighing less than 50 pounds in September should be fed up to that weight at least. The best method for getting colonies up to the required weight is, when the extracting takes place, to save several full well-sealed combs, then remove some of the light ones out of the hives and replace them with the heavier full frames. If no honey is available, feed sugar syrup. This plan is rather a tedious one and great care must be taken not to daub the hives or appliances, as robbing at this season of the year is very easily started and very hard to stop.

If the colonies that are short of stores are weak or feeble in number of bees, they should then be fed with syrup. In order to provide for them, feed the strongest colonies you have, for instance, by putting in their hives extra frames and feeding the syrup in a Miller feeder. A good strong colony will take down 10 to 15 pounds in a warm night. Continue the feeding until you have sufficient frames well sealed to make up the required weight. The full frames are then removed and given to the weak colonies that are short of stores; by this method there will be very much less danger of robbing, as the strong colonies are well able to look after themselves.

Sugar syrup may be made as follows: Use the best grade of granulated sugar, two parts to one of water by weight. The water should first be brought to a boil, then the pan or vessel set back on the stove so that the boiling will not continue but the water be kept sufficiently hot to dissolve all the sugar. The sugar should be poured in slowly and thoroughly stirred until all is dissolved. The syrup should then be fed in a lukewarm condition..

Foul Brood.

Much attention has been drawn of late to this most destructive disease of bees, which affects particularly the larvæ or brood, causing them to die, mostly at the age of six to nine days. The disease is spread by bees feeding their larvæ with infected food, and is carried to new colonies by bees robbing diseased colonies. It is thought advisable to publish in this report the McEvoy method of detecting the disease and stamping it out when found in an apiary. With reference to this method of treatment of foul brood we have much pleasure in quoting the following from Wisconsin Bee-keeping, Bulletin No. 2, 1902, by N. E. France, State Inspector of Apiaries.

'In Wisconsin I have tried many methods of treatment and cured some cases with each method, but the one that never fails, if carefully followed, and that commends itself, is the McEvoy treatment. It has cured foul brood by the wholesale, thousands of cases.' Mr. McEvoy decribes his method as follows :—

The McEvoy Treatment.

How to detect foul brood.—When any dead brood is noticed in a hive, a sure way to ascertain whether the cause of death is the disease known as foul brood, is to put the head of a pin into a cell of a comb and draw it out; if the matter contained in the cell adheres to the pin's head and can be stretched about three-fourths of an inch, it is undoubtedly a case of foul brood. But every bee-keeper should be able to recognize the disease at a glance without having to use a pin, as above said; he should learn to know the stain mark of foul brood when he sees it. The manner of proceeding to examine an apiary in which foul brood is suspected, is as follows:

Before opening any of the hives give every hive in the vicinity a little smoke at the entrance. This will check the bees for a time from coming from other colonies to disturb you when you have a hive open to examine the combs. After taking a comb out to examine it, turn your back to the sun, and, holding the comb in a slanting position, let the light fall on the lower side and bottom of the cells; look there for the dark scales left in the cells and formed from the dried up, decayed bodies of the dead larvæ. Another sign of the presence of foul brood is that several of the cappings have a small hole in them, but this also appears in the case of cells containing brood killed by other causes than this disease.

[Mr. Charles O. Jones, of Missisquoi, Que., describes the symptoms of foul brood as follows in the Montreal 'Weekly Star' :—

'Of the diseases affecting the brood, the most serious is foul brood, which has appeared in some localities in Ontario in a virulent form, but is being successfully combated. The symptoms of this disease are not easily mistaken by one who is at all familiar with it. The brood hatches unevenly and the cappings have a shrunken appearance, and many of them are perforated as if the bees had begun uncapping the brood. The dead brood will be found adhering to the side (lower side) of the cell, and of a brownish colour. On inserting a small stick, the decomposed brood will adhere, and when withdrawn three-fourths of an inch, will still cling to the stick. Beside this "ropiness," the dead brood has a distinct odour very much like old glue. If the disease has developed sufficiently, this odour may be detected on removing the covering from the bees. These two last symptoms are peculiar to foul brood, and if present, are considered a certain indication of infection.']

HOW TO CURE INFECTED APIARIES.

Every infected apiary should be treated according to the condition in which it is found, and at the same time not only to stamp out the disease, but also so as to induce considerable increase in the colonies, and end by having every colony in first-class condition. I may therefore first explain how I proceed. The best time for this work is while the bees are gathering freely during the honey season.

For this, taking two hives at a time, I shake off the bees from them with one of the queens, and give them a clean hive with foundation starters, leaving in the two original hives one queen and only about a quart of bees to take care of the brood still unhatched in those two hives. I now remove the bottom of one hive and the top of the other, and place the first on the top of the second, so that the bees may unite and, as the young bees hatch out, form one strong colony. By the time that most of the brood is hatched I have from the two colonies, when united, one large swarm of young vigorous bees. This swarm must then be shaken into a fresh clean hive with foundation starters.

I have now two first-class colonies, each containing a queen, one from the bees first shaken out of the two original infected hives, and another from the brood left in the original hives with a queen and a small number of bees to take care of it. Both of these colonies must now be treated to destroy the disease. All handling of diseased colonies, especially during warm days should be done in the evening, when no bees are flying. This will prevent robbing, and also will prevent bees from diseased colonies mixing with those from sound colonies, going into their hives with them. Again, by doing the work in the evening, it gives bees which have been treated a chance to settle and quiet down before the morning.

[Mr. Jones, of Missisquoi, explains the same treatment as follows:—

'The cure, although simple, requires great care to carry it out successfully. A clean hive containing frames with starters of foundation, should be placed on the old stand after removing the affected hive. Remove the combs from the affected colony, and shake the bees in front of the clean hive into which they will run. This should be done at nightfall, when the bees are all at home, and then there will be no danger of robbers getting at any of the tainted honey. Leave the bees in the new hive for at least four or five days, by which time they will have used all the honey they carried with them in comb-building, when you can remove the starters to melt into wax; replacing them with frames filled with sheets of foundation, and your cure is effected. I would advise burning the combs and honey removed from the hive and thoroughly disinfecting the hive by scalding before using again.

'Some authorities advocate caging the queen for ten days or so, to prevent brood rearing until all danger of infection has passed, but I consider this only as an extreme precautionary measure; in fact, hardly necessary.']

Treatment during the Honey Season.—When the bees are gathering freely, remove the combs from the hive in the evening, replacing them by frames with comb foundation starters, as said before; then shake the bees from the combs into a clean hive and let them build comb for four days. By that time they will have made the starters into combs, and will have stored in these the infected honey which they brought from the old combs. On the fourth day, in the evening, replace those combs containing the infected honey with full sheets of fresh comb foundation, and the cure will thus be complete. By this method of treatment, all the infected honey is removed before the full sheets of foundation are used.

When only a few cells are found with foul brood, after shaking off the bees for treatment, two hives may be filled with the combs containing the brood; then place these two hives on top of each other, as explained before, keeping them shaded from the sun until most of the brood is hatched. Then, in the evening, shake the bees from both hives into another single hive and give them frames with comb foundation starters. Let them build comb for four days, as above said, after which, in the evening, take out the new comb and give the bees comb foundation to work out to complete the cure. If the diseased colonies are weak in bees, the bees of two, three or four should be put together, so as to have a strong colony to start the cure with, as it does not pay to spend time over weak colonies.

When bees are not gathering honey.—An infected apiary can be cured of foul brood by removing the infected combs in the evenings and giving the bees frames with comb foundation starters on. Then, also in the evenings, feed the bees plenty of sugar syrup; they will draw out the foundation and store the infected honey which they took with them from the old combs. On the fourth evening, replace the new combs made out of the starters by frames with full sheets of comb foundation, and feed plenty of sugar syrup every evening until all the colonies are in first-class order. The sugar syrup should be made of granulated sugar, using one pound of water to every two pounds of sugar, and bringing it to a boil.

Treatment after all honey gathering is over.—When the disease is discovered in a few good colonies after the honey season is finished, the best plan is to leave them until an evening in October. Then take every comb out of the diseased colonies, replacing them by six combs of all-sealed or capped stores from sound colonies. Place a division board on either side of these all-capped combs. These colonies will thus be in perfect condition for wintering, and the disease will at the same time be stamped out; for, as there are no empty cells, the bees must have kept the infected honey which they took out of the old combs, until it was consumed, as they could not find a place in the all-capped combs to put it.

If there is a scarcity of all-capped combs from the sound colonies, as many as are required can be secured by putting Miller feeders on sound colonies in the evenings in September and feeding the bees all the sugar syrup they can be made to take; then, in October, each of these fed colonies can spare the two outside combs, which will be perfectly capped all over down to the bottom of the frames. These all-capped combs will provide plenty of good stores to carry out this autumn method of treatment.

All the old infested brood combs which have been removed from the hives, must be burned or made into wax, as well as all the combs made on the starters by the bees during the four days of the treatment.

As to the infected honey, I have always been opposed to having it treated and then fed to bees, for fear that the treatment may not be thorough enough. My recommendation is to bury it in the ground, as well as all the refuse from the honey extracted. This applies also, of course, to the honey stored up in the combs during the four days of the treatment.—W. McEvoy.

Treatment of the Hives and Frames.—In Mr. McEvoy's treatment of foul brood, there appears to be a danger that the hives themselves in some of their parts might be tainted with germs of the disease. We would, therefore, strongly recommend to disinfect the hives and the frames that have contained foul brood, by a thorough scalding. This operation is very simple; and, in view of the great losses that have been occasioned by foul brood, it is important to neglect no means to secure success in stamping out the infection.

John Fixter.

DIVISION OF BOTANY

FODDER CROPS.

The season of 1903 was not a good one for the production of heavy crops of fodder of any kind. In the East an exceptionally prolonged drought prevented grass and clover from starting well, and although, when rains came, these crops picked up in a surprising manner, still the yields were below the average in most places. A cool, damp autumn prevented corn from maturing and made it difficult to cure all hay crops.

Among various fodder plants which have been grown on the experimental plots at the Central Experimental Farm, one which has lately received much attention is Sainfoin *(Onobrychis sativa,* DC.). This beautiful plant, which may be known at once by its pinnate leaves and large cones of rose pink flowers on slender stems, is allied to the clovers, and, as a rule, is spoken of as a clover in the same way as Alfalfa or Lucerne is. It was noticed on the experimental plots that the flowers of this plant were extremely attractive to bees, and it is also a producer of good fodder, suitable for all stock. It is not as heavy a cropper as Alfalfa, but like that is a persistent perennial which roots deeply and in localities which suit it, produces heavy crops of hay.

The following notes on the cultivation of this plant have been prepared mainly by Mr. John Fixter, the farm foreman at the Central Experimental Farm.

SAINFOIN.

This clover has attracted much attention on the Central Experimental Farm, both as a fodder plant and also as a honey producer. In its cultivation and manner of growth it resembles alfalfa, but it is slightly finer and grows thicker in the bottom, having a more decided stooling habit, which makes it better for pasture. It is specially liked by sheep. The soil best suited to the growth of this plant seems to be a deep rather dry loam, containing a fair proportion of lime with good natural drainage. It will do well upon almost any soil that is well drained, provided it gets a good start. Heavy clay and light sandy soils both produce excellent crops of sainfoin, but on the latter it naturally requires generous manuring. It should never be sown on land likely to be covered with water at any season of the year. The amount of seed sown under ordinary conditions is about 20 lbs. per acre. Great care should be taken to secure new and plump seed; the hulled seed is preferable when it can be obtained, as it is easier to sow and germinates more quickly. A good seed bed is of great importance, and one of the best methods for preparing this, and also at the same time clearing the land of weeds such as quack grass and thistles, is to cultivate it with a firm-footed cultivator. If the field has been in meadow or grain, do not plough, but simply cultivate and harrow; first cultivate as shallow as possible, then pass the heavy iron harrows at a good sharp walk across the first cultivating. This operation will break up the sod or stubble very fine and leave it on the surface to dry out. The second cultivating should be in the opposite direction to the first, and likewise the harrowing. By this operation two-thirds of the sod will be loosened from its roots. It usually requires about four cultivations and four harrowings to make a perfect job. All this work must be done on fine sunny days, and the sooner after harvest the better. The cultivating and harrowing must be gauged by the growth. If possible, every leaf must be cut off and kept out of sight, and all vegetation brought to the surface to be dried by the sun. This dead but valuable material may, during the autumn, be ploughed under to decay and add to the fertility of the soil. By the next spring this land should be in perfect condition for sowing. The best time to sow is as soon as the ground can be got ready in spring; the seed will then germinate quickly. As sainfoin is a quick-growing and deep-rooting plant, the roots keep going down into the moist earth so that dry weather will not have much effect upon it. If sown with a nurse crop, oats, wheat or barley may be used, but the latter is preferable, as it can be harvested earliest. Not more than half the ordinary amount of grain should be sown per acre with this clover, and better results are usually obtained by sowing it alone. It may be sown broadcast, then harrowed in and rolled so as to render the surface smooth, or it may be sown with the ordinary grain drill with grass seed attachment. The seed should be dropped in front of the drill and the land should afterwards be rolled. The small seeds will thus be covered, and, the surface being smooth, the young plants will come up quickly and regularly. For this crop land may be prepared by late summer-fallowing, or, what is even better, the seeding may follow a hoed crop; but, whatever the preparation of the land, it must be clean, and, as the seeds are small, it is essential to have it in a good state of tilth.

This plant has been grown on the experimental plots at the Central Experimental Farm for several years. The oldest plot now living has been standing for seven years, a second plot for two years, and the third plot was sown in the spring of 1903. The plot which has been growing for seven years is now thin and will soon be ploughed down. It would probably be the most economical plan to plough down this clover after three years and resow. As is well known, clovers of all kinds are the most valuable plants which can be grown and ploughed down as fertilizers, and the benefit of ploughing under this clover would more than pay for the resowing.

The Botanist's records of the experimental plots show that Sainfoin sown May 14, came into bloom on August 12 of the same year, was cut for hay on August 25, and gave a yield per acre of 1 ton 1,700 lbs. of cured hay. The second growth of the first year should be allowed to stand over for the winter as a protection to the roots, In the second year the plants came into bloom on June 1st and lasted up till the 24th of that month, when the plot was cut for hay. These dates might have been extended, had the plants been grown merely for honey; but, as they were at that time in the best condition for hay, they were cut for that purpose. If the crop had been left to stand longer, the hay would have been too woody. The yield of this first cutting was 2 tons 200 lbs. of cured hay per acre—a rather small crop, due to the excessive drought, which lasted up till June 12. The second bloom was on July 27, and lasted until August 17, when it was again cut for hay, giving 2 tons 1,400 lbs. of cured hay, or a total yield for the year of 4 tons 1,600 lbs. A third crop, which will provide some pasture, is allowed to remain on the ground for the winter, or in very favourable seasons might be again cut before winter, although this is not advisable.

From what we have seen of this clover, it is believed that farmers and bee-keepers would find it profitable to grow it.

HAY AND PASTURE MIXTURES.

In the last annual report the results of growing several mixtures of grasses and clovers were published. These experiments were again observed during the past season, and the yields given herewith are from the same plots which were sown in 1901. Last season should have been the large crop from these plots; but, unfortunately, the yields were very much lessened by the exceptionally dry weather which prevailed in spring at the time when meadows most require copious moisture. The yields for 1903 are given, together with those of the previous year, for comparison. It will be seen that several of these mixtures give heavy yields of excellent hay, and all of them are worthy of the consideration of the farmers of Canada.

Number.	Mixtures Sown May 4, 1901.				Cured Hay, per Acre.							
					1903.				Total.			
	Grasses.		Clovers.		July 14.		Sept. 30.		1903.		1902.	
		Lbs.		Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Timothy Meadow Fescue Orchard Grass Kentucky Blue Red Top	6 4 2 1 1	Alfalfa Alsike Mammoth Red Common Red White Dutch	2 2 1 1 2	2	1,160	1	1,360	4	520	4	40
2	Meadow Fescue Timothy Canadian Blue Orchard Grass Red Top	6 3 2 3 3	Alfalfa Alsike White Dutch	4 1 1	2	720	1	840	3	1,560	4	660
3	Timothy Awnless Brome Orchard Grass	5 4 2	Alfalfa Alsike	6 3	2	1,210	1	1,560	4	770	5	120
4	Meadow Fescue Orchard Grass Kentucky Blue	6 2 1	Common Red Alfalfa White Dutch	4 3 1	2	640	1	1,680	4	320	5	1,520
5	Timothy Upright Brome	6 4	Alfalfa Mammoth Red	6 4	2	1,320	1	1,520	4	840	4	960
6	Timothy	10	Common Red	6	1	1,680		1,200	2	880	4	760
7	Timothy	10	Mammoth Red	6	1	520		1,000	1	1,520	3	1,200
8	Orchard Grass	18	Alsike	5	1	840		1,240	2	080	2	1,200
9	Orchard Grass	18	Common Red	8	1	1,800		1,800	2	1,600	3	1,280
10	Meadow Fescue	20	Common Red	8	1	1,320		1,360	2	680	3	40
11	Timothy	12	Mammoth Red	8	2	280		1,120	2	1,400	3	1,760
12	Timothy	12	Common Red	8	2	80		1,840	2	1,920	3	20
13	Timothy Awnless Brome	5 10	Common Red Mammoth Red	5 5	1	1,920		1,920	2	1,840	4	300
14	Awnless Brome	25			1	1,360			1	1,360	3	1,020
15	Awnless Brome	15	Common Red	8	2	40	1	320	3	360	4	760
16	Timothy	8	Mammoth Red	8	2	480	1	680	3	1,160	3	340
17	Alfalfa	15	(weight green, 8 tons 720 lbs.)		3	120	1	1,040	4	1,160	3	1,160

There has been a large correspondence carried on with farmers in all parts of Canada with regard to the best grasses to grow for hay and pasture, and also as to the best crops for late sowing in seasons when drought or other adverse conditions have interfered with the germination or development of corn and other fodder crops. In the drier districts of the West excellent results have been secured from sowing Alfalfa and Brome grass together, 12 to 15 lbs. of the former and 6 of the latter, or mixtures in varying proportions according to the requirements of the growers, of the small grains and some leguminous plant. The mixtures, which have given good satisfaction, are: Tares and oats, a bushel and a half of each, or Peas and oats, in the same proportion; Peas, wheat and oats, one bushel of each; or Peas, wheat and late barley. All of these give heavy crops of excellent hay. A valuable crop which is every day growing in favour, is Fodder Rape. This has been grown with much satisfaction in all parts of Canada. It is best sown alone, two pounds of seed to the acre in drills thirty inches apart, so as to allow of cultivation to destroy weeds and to hold in moisture when the seed has been sown late. Crops of rape are ready for cutting or feeding off in about sixty days after sowing. Two or three crops may be taken before winter sets in.

REPORT OF THE EXPERIMENTALIST.

(CHAS. E. SAUNDERS, B.A., Ph. D.)

DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa

SIR,—I have the honour to submit herewith the first report of the work of this division, which has been in my charge since the commencement of the present year.

The work of cereal breeding occupied a large proportion of my time during the summer season, several weeks being given up almost exclusively to the cross-fertilising of wheat, oats, barley and peas; while the selection of fixed and desirable types from among the progeny of crosses made in previous years demanded considerable attention. The results of the season's work along these lines have been satisfactory.

The uniform tests of new and established varieties of cereals, field roots and fodder corn have been continued in much the same way as usual, and the results are here presented in tables similar to those which annually appeared in your own report during the long period in which this work was under your immediate supervision.

The prolonged drought of spring followed by the extremely wet weather in June proved very unfavourable for most of the early varieties of cereals, and also prevented other crops from giving very large returns; but on the whole the results of the season were fairly good.

The care of those parts of the ornamental grounds which have been assigned to this division occupied a portion of my time. The season was, as a whole, most favourable and flowers: the pansies, roses, pæonies and asters being particularly fine.

During the month of May much time was spent in the hybridising of apples and plums for the production of extremely hardy varieties suitable for the climate of the western prairie country. Thirty-four different crosses were made in apples, yielding 1,021 seeds; one cross was made in plums, yielding 38 seeds; and one cross was made between the plum and the sand cherry, yielding 2 seeds. In the autumn, during your absence in the North-west, a large amount of time was given to studying, comparing and describing the new hybrid apples which were bearing fruit—many of them for the first time.

Considerable time was spent during the winter months in establishing a reference collection of mounted specimens of the heads of cereals. The specimens are attractively and conveniently arranged in a series of shallow cardboard boxes filled with cotton batting and covered with glass. A set of small bottles containing the threshed grain is also being prepared. These collections have already proved very useful for purposes of description, identification, &c.

I acknowledge with pleasure my indebtedness to Mr. George Fixter, whose accurate records of the experimental plots relieved me of a large amount of labour, and to Mr. James Taggart, whose work in the ornamental grounds displayed much care and ability.

The following donations are thankfully acknowledged:—From the United States Department of Agriculture, samples of macaroni wheat, oats and millet; from Haage and Schmidt, Erfurt, flower seeds; from W. Atlee Burpee, Philadelphia, flower seeds; from J. MacGrady, Gatineau Point, seed of choice delphiniums; and from S. P. Hamilton, Bush Glen, samples of grain from India.

I have the honour to be, sir,
Your obedient servant,
CHAS. E. SAUNDERS,
Experimentalist.

CEREAL BREEDING.

This work falls naturally into two divisions, first, the foundation work of cross-fertilising, and second, the work of selection.

Cross-fertilising.—This work in cereals was begun on June 10, and continued until July 14, a considerable proportion of the time being devoted to it. A description of the actual process of cross-fertilising need not be repeated here, as it has been already published in the annual report for the Experimental Farms for 1896 (page 21) and is necessarily of a somewhat technical nature. On account of the great importance and difficulty of this kind of work it is done entirely by the Experimentalist himself, no assistant being employed.

The weather was very favourable and the number of seeds obtained was large. About seventy different crosses between cereals were successfully carried out, producing over 550 kernels. Most of the crosses were made between wheat and wheat, with a view to combining, as far as possible, the extremely desirable qualities of productiveness and earliness with the ability to produce flour of great strength and good colour. The varieties used as parents included some of the most promising of the cross-bred sorts produced at the Experimental Farms, as well as older and standard kinds. Over four hundred kernels of wheat were thus obtained. A much smaller amount of work was done in the crossing of oats, barley and peas. A few mixed crosses, such as between wheat and emmer, were also successfully attempted.

Selection.—Each kernel produced by cross-fertilising generally gives rise, in the course of three or four years, to a number of distinct varieties. So that the foundation work of crossing needs to be followed by persistent and rigid selection for several years afterwards, until the various types are fixed, in order to obtain the best possible results from the cross. Selection, as sometimes practised, without previous crossing, is an easy but comparatively unprofitable process, and has little relation to the work here described, inasmuch as those varieties of cereals which have been in cultivation for long periods show little or no tendency to vary until after they have been crossed with some other sort.

Over one hundred new varieties of wheat were grown this season in very small plots. The best types found among these are being selected to sow again next year. These sorts are the progeny of some crosses (made by the writer in 1900) between Red Fife and some of the macaroni wheats and between Colorado and Common Emmer. Most of the types produced from these crosses are not yet fixed. As an instance of extreme variation it may be mentioned that nearly forty varieties have already arisen among the progeny of one of the original (cross-fertilised) seeds.

The tendency of cross-bred cereals to vary for a number of years after their production is also seen in the case of those varieties produced at the Experimental Farm in the earlier years of its history. Some of these, such as Preston wheat, Stanley wheat, &c., have already attracted a good deal of attention. It is found, however, that each of these, as now grown, is not of one fixed type, but contains a small proportion of kernels which appear foreign. Efforts are being made to improve these varieties by reducing each of them to one type as quickly as possible with the intention of supplying only such improved strains as soon as a sufficient quantity of the seed is available. Descriptions of the varieties will be published when the types are decided upon and fixed.

Attention is also being paid to the elimination of the false kernels and undesirable types which are often found in varieties of cereals obtained from commercial and other sources.

Descriptions of five of the cross-bred varieties of wheat produced at the Experimental Farms are here given.

Preston.—Parentage, Ladoga (female) crossed with Red Fife (male). Kernels red, above medium size. Heads bearded, usually about 3⅞ inches long (at Ottawa). Chaff yellowish (that is, 'white'), smooth. Straw stiff, usually about 44 inches long (at Ottawa). Ripens early (about six days before Red Fife, at Ottawa). Gives a very large yield.

Stanley.—Parentage, Ladoga (female) crossed with Red Fife (male). Kernels red, above medium size. Heads beardless, usually about 3⅞ inches long. Chaff red, smooth. Straw stiff, usually about 44 inches long. Ripens early (about six days before Red Fife). Gives a good yield.

Huron.—Parentage, Ladoga (female) crossed with White Fife (male). Kernels red, above medium size. Heads bearded, usually about 3¾ inches long. Chaff red, smooth. Straw stiff, usually about 45 inches long. Ripens rather carly (about 3 days before Red Fife). Gives a large yield.

Percy.—Parentage, Ladoga (female) crossed with White Fife (male). Kernels red, above medium size. Heads beardless, usually about 4 inches long. Chaff yellowish, smooth. Straw stiff, usually about 47 inches long. Ripens early (about 5 days before Red Fife). Gives a good yield.

Laurel.—Parentage, Red Fife (female), crossed with Gehun (male). Kernels red, above medium size. Heads beardless, usually about 4 inches long. Chaff yellowish, smooth. Straw stiff, usually about 49 inches long. Ripens with Red Fife. Gives a large yield.

UNIFORM TEST PLOTS OF CEREALS, FIELD ROOTS AND FODDER CORN.

The standard and new varieties of cereals which are obtainable commercially are annually grown in plots of one-fortieth of an acre, along with the cross-bred sorts produced at the Farms and a number of other varieties obtained from various sources. The field roots and fodder corn are grown in similar plots, and the yield per acre is estimated from the crop obtained from two rows, each 33 feet long. The object of these tests is to determine the relative productiveness, earliness, &c., of the different varieties. Those which for a series of years are found to be distinctly inferior are rejected, and strong efforts are made to keep the lists within as small bounds as possible without omitting anything which may ultimately prove of value.

The number of plots grown during the past season was as follows :—Spring wheat 112; macaroni wheat, 16; winter wheat, 20; emmer and spelt, 12; oats, 81; six-row barley, 33; two-row barley, 25; pease, 44; rye, 1; soja beans, 2; horse beans, 2; millet, 6; turnips, 42; mangels, 32; carrots, 22; sugar beets, 16, and Indian corn 37; making a total of 503 plots. These represent about 430 varieties, duplicate plots having been necessary, for special reasons, in some cases. Nearly all of these varieties will be found reported on in the tables following, only a few of those which are manifestly inferior having been dropped. Quite a number of those mentioned in the last annual report of the Experimental Farms were not sown this season inasmuch as they had shown a distinct lack of productiveness for a series of years.

Some of the cross-bred sorts produced at this Farm have also been withdrawn for more rigid selection, but will probably be introduced again in the course of a few years.

PREPARATION OF LAND FOR THE UNIFORM TEST PLOTS.

The system of cultivation adopted for the land devoted to the experimental plots is somewhat different from that which is generally considered advisable in ordinary farming. The land used for the plots consists of three separate fields. Each field receives every third year a dressing of fresh barn-yard manure at the rate of about 12 tons per acre. This is placed on the frozen ground in winter in small heaps of about one-third of a cart-load each, and is spread and ploughed under in spring. This field is then used for roots, fodder corn and other hoed crops. In the autumn, after the harvest is over, the land is ploughed about seven inches deep, and is left in that condition until the following spring when it is cultivated twice with a two-horse cultivator and harrowed twice with a smoothing harrow. Cereals are then sown. After the grain is harvested the land is ploughed about three or four inches deep, to start the shed grain and any weed seeds present, and is again ploughed a few weeks later about seven inches deep. In the following spring it is prepared as before and cereals are again sown. It is not, however, the practice to sow the same cereal twice in succession on the same piece of land.

In this way a three-year rotation is kept up which is found to be very satisfactory, the quantity of manure applied maintaining fully and even increasing the fertility of the soil in spite of the great demands made upon it.

WEATHER.

The weather was quite unusual during the past season: an almost unbroken drought from April 4 to June 11, being followed by a long period of very wet weather. The early varieties of grain suffered most, as they were so far advanced when the rains came that they did not recuperate to the same extent as the later ripening sorts. The earliest varieties of wheat suffered particularly, and the yields are therefore in some cases remarkably low. The wet weather proved very favourable for the spread of rust, which materially diminished the grain crop in some instances. In the case of the field roots the principal effect of the drought was to delay the germination of a large proportion of the seed of both sowings until about the middle of June, when the dormant seed of both sowings germinated together.

In such a season as this it will be readily understood that very slight differences in the composition, drainage, &c., of the soil assumed unusual importance.

MOST PRODUCTIVE VARIETIES OF CEREALS.

In order to present in as concise a form as possible the most important conclusions to be drawn from the extensive series of tests made at this Farm, very short lists of varieties recommended for cultivation on account of their large yield have been added. No variety is recommended until it has been grown for at least five years, and the conclusions drawn are taken from the average returns for a series of five years or more. The greatest care is exercised to make these comparisons entirely trustworthy, and it is hoped that these short lists will be found useful for reference by farmers who wish to grow only the most productive sorts.

EARLIEST VARIETIES OF CEREALS.

Brief lists of the earliest varieties of cereals are given in the hope that they may prove useful to farmers in the northern parts of Ontario and Quebec, as well as in other sections of the Dominion where the seasons are comparatively short.

SPRING WHEAT.

Three additional varieties of spring wheat appear in the list this year.

Marvel, which was obtained from the United States, is a beardless variety with downy chaff, and very closely resembles Blue Stem.

Blue Stem was added to the plots this year chiefly for the sake of comparison with Hayne's Selected Blue Stem, which has been further selected at the Minnesota Experiment Station, and is often referred to as Minnesota No. 169.

Oregon Club is a beardless variety obtained from Oregon. It is not a promising sort for this climate.

All the plots of spring wheat were sown on April 14 or 15, except Marvel, which was sown April 16. The seed was used at the rate of 1½ bushels to the acre. The yields given are calculated from plots of one-fortieth of an acre, except in the case of Huron and Marvel, where one-eightieth of an acre was used.

The yield per acre is expressed in 'bushels' of 60 pounds.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Advance*	Aug. 7	115	47 to 49	Stiff	2¾ to 3½	34	40	59½	Slightly.
2	Nixon*	" 10	117	46 " 48	"	3½ " 4	33	20	60	"
3	Australian I.	" 12	119	40 " 42	Medium	3 " 3½	32	40	58	Considerably.
4	Benton*	" 5	113	43 " 45	"	3 " 3½	30	20	58½	"
5	McKendry's Fife (Minn. 181)	" 16	124	43 " 45	Stiff	3½ " 4¼	30	20	59	Slightly.
6	Preston*	" 5	113	35 " 37	Medium	3¼ " 3¾	29	40	59	"
7	Minnesota No. 163	" 16	124	42 " 44	Stiff	3 " 3¾	29	20	59	"
8	Wellman's Fife	" 14	122	44 " 46	"	3¼ " 4	29	..	60	"
9	Marvel	" 16	122	42 " 44	"	3¾ " 4½	28	40	59½	"
10	Robin's Rust Proof	" 10	118	40 " 42	"	2¾ " 3¼	28	20	60	"
11	Australian F.	" 12	119	38 " 40	"	3 " 3¾	28	20	60¼	Considerably.
12	Monarch	" 15	123	40 " 42	"	3¾ " 4½	28	..	58	Slightly.
13	Florence*	" 4	111	43 " 45	"	2½ " 3¼	27	40	58½	Badly.
14	White Connell	" 14	122	43 " 45	"	3 " 3¾	27	20	59	Slightly.
15	Hungarian	" 5	113	41 " 43	Medium	3 " 3¾	27	20	59½	Considerably.
16	Orleans*	" 6	113	42 " 44	"	3 " 3¾	27	20	58¼	"
17	Redpath*	" 15	122	43 " 45	Stiff	3¼ " 3¾	27	20	58¼	Slightly.
18	White Fife	" 15	123	42 " 44	"	3¼ " 4	27	..	59½	"
19	White Russian	" 13	121	37 " 39	Medium	3¼ " 3¾	26	40	58	"
20	Byron*	July 31	108	39 " 41	"	2¾ " 3¼	26	20	59	Badly.
21	Huron*	Aug. 10	118	40 " 42	"	3 " 3¾	26	..	60½	Considerably.
22	Pringle's Champlain	" 9	117	44 " 46	"	3¾ " 4½	26	..	58	Slightly.
23	Australian C.	" 12	119	42 " 44	Stiff	3¼ " 3¾	26	..	58¾	"
24	Australian D.	" 5	112	42 " 44	"	3 " 3¾	26	..	60¼	Considerably.
25	Red Fife	" 15	123	41 " 43	"	3¼ " 4	25	40	59½	Slightly.
26	Herisson Bearded	" 6	114	35 " 37	Medium	1¼ " 2	25	40	57	Considerably.
27	Dawson*	" 14	121	44 " 46	Stiff	3½ " 4¼	25	40	59	Slightly.
28	Norval*	" 10	118	37 " 39	Medium	2½ " 3¼	25	40	58½	Considerably.
29	Essex*	" 13	121	45 " 47	Stiff	3 " 3¾	25	20	59	"
30	Harper*	" 8	115	38 " 40	Medium	2¾ " 3¼	25	20	56	Badly.
31	Clyde*	" 10	118	40 " 42	Stiff	3 " 3½	25	..	58½	Slightly.
32	Blue Stem	" 15	122	46 " 48	"	3¾ " 4½	25	..	60	"
33	Australian No. 1	" 12	119	38 " 40	Medium	3 " 3½	24	40	58½	Considerably.
34	Gehun	July 27	103	39 " 41	Weak	2 " 2½	24	20	57½	"
35	Oxbow*	Aug. 8	115	40 " 42	"	2½ " 3	24	20	59	Badly.
36	Haynes' Blue Stem (Minn. 169)	" 17	125	46 " 48	Stiff	3½ " 4¼	24	20	59½	Slightly.
37	Australian No. 19	" 15	123	41 " 43	"	2¾ " 3¼	24	20	58½	"
38	Australian No. 23	" 14	122	41 " 43	"	3¼ " 4	24	20	58	"
39	Weldon*	" 10	118	42 " 44	"	3 " 3¾	24	..	58½	"
40	Harold*	July 27	103	39 " 41	Weak	2¾ " 3¼	23	20	58	Badly.
41	Crown*	Aug. 10	118	42 " 44	Medium	2½ " 3	23	20	58½	Slightly.
42	Australian No. 27	" 13	121	46 " 48	Stiff	3 " 3¾	23	20	58¼	Considerably.
43	Australian No. 21	" 8	115	39 " 41	Medium	3 " 3¾	23	..	57½	Badly.

SPRING WHEAT—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.		No. of Days maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
					Inches.		Inches.	Bush.	Lbs.	Lbs.	
44	Australian H	Aug	16	123	44 to 46	Stiff.....	3½ to 4¼	23	..	58½	Slightly.
45	Stanley*..................	"	1	109	39 " 41	"	3¼ " 4	22	40	60½	Considerably.
46	Blair*..................	"	7	115	38 " 40	Weak....	3½ " 4	22	40	59½	"
47	Grant*..................	"	5	112	39 " 41	Stiff.....	3¼ " 3¾	22	40	58	Slightly.
48	Countess*..............	July	31	108	39 " 41	Medium..	2¾ " 3¼	22	20	59	Considerably.
49	Australian No. 25..........	Aug.	13	121	40 " 42	Stiff.....	3½ " 4	22	20	58	Slightly.
50	Australian No. 28..........	"	8	115	40 " 42	"	3 " 3½	22	20	61	"
51	Australian E..............	"	12	119	45 " 47	"	3¼ " 4	22	20	58	Considerably.
52	Australian J..............	"	4	111	41 " 43	"	3 " 3½	22	20	60	"
53	Colorado	"	6	114	40 " 42	"	2¾ " 3¼	22	..	59½	Slightly.
54	Ebert*..................	July	28	104	44 " 46	Medium..	3 " 3½	22	..	60	Considerably.
55	Power's Fife (Minn. 149).....	Aug.	16	124	39 " 41	Stiff.....	3 " 3¾	22	..	59½	Slightly.
56	Australian No. 11..........	"	16	123	46 " 48	"	3½ " 4¼	22	..	58	"
57	Red Fern..................	"	10	118	44 " 46	"	3½ " 4¼	21	40	60	"
58	Crawford*................	July	31	108	37 " 39	"	2¾ " 3¼	21	40	59½	"
59	Bishop*..................	"	31	108	42 " 44	Medium..	2¾ " 3¼	21	40	60	Badly.
60	Angus*..................	Aug.	7	115	48 " 50	Stiff.....	3¼ " 3¾	21	40	58½	"
61	Powell*..................	"	5	112	39 " 41	"	2½ " 3¼	21	40	58	Considerably.
62	Cartier*................	July	31	108	40 " 42	"	2½ " 3¼	21	20	60½	"
63	Laurel*..................	Aug.	13	121	42 " 44	"	3½ " 4¼	21	..	59½	Slightly.
64	Boyle*..................	"	12	119	42 " 44	"	3 " 3¾	21	..	58	Considerably.
65	Australian No. 13..........	"	15	123	39 " 41	"	2¾ " 3½	21	..	59	Slightly.
66	Rio Grande................	"	16	124	46 " 48	"	3¼ " 4	20	40	58	"
67	Alpha*..................	"	10	118	37 " 39	Medium..	3 " 3½	20	20	59	Considerably.
68	Morley*................	"	10	117	43 " 45	Stiff.....	3¾ " 4½	20	20	57¾	Slightly.
69	Dawn*..................	"	4	112	38 " 40	"	2¾ " 3½	20	20	59½	Considerably.
70	Australian No. 12..........	"	7	114	38 " 40	Weak....	2½ " 3	20	20	58¼	"
71	Plumper*................	"	6	114	36 " 38	Medium..	2¼ " 2¾	20	..	59½	"
72	Percy*..................	"	7	115	38 " 40	Stiff.....	3¼ " 3¾	19	40	59	Slightly.
73	Hastings*................	"	5	113	38 " 40	Medium..	3 " 3¾	19	40	58¼	Considerably.
74	Fraser*..................	July	28	105	39 " 41	" ..	2½ " 3¼	19	40	59¼	Badly.
75	Chester*................	Aug.	8	116	39 " 41	" ..	3 " 3¾	19	20	58¾	"
76	Admiral*................	"	8	116	44 " 46	Stiff.....	3 " 3½	19	..	58	Considerably.
77	Japanese..................	July	29	106	37 " 39	"	2¼ " 2¾	19	..	59	"
78	Progress*................	Aug.	6	114	40 " 42	"	2¾ " 3½	18	40	59¼	"
79	Vernon*..................	"	10	118	38 " 40	"	2¾ " 3¼	18	40	58½	Slightly.
80	Australian No. 18..........	"	15	122	46 " 48	"	3¼ " 4	18	40	60	"
81	Red Swedish..............	"	13	121	37 " 39	Weak....	2½ " 3¼	18	20	59	"
82	Newdale*................	"	7	114	38 " 40	Stiff.....	3¼ " 4	18	20	59	"
83	Steinwedel................	"	1	108	39 " 41	"	2¾ " 3¼	18	20	57½	Considerably.
84	Australian No. 10..........	"	14	122	34 " 36	"	2¼ " 3	18	..	58½	Slightly.
85	Markham*................	"	10	117	40 " 42	"	3 " 3½	17	40	58	"
86	Australian No. 15..........	"	16	123	40 " 42	"	2¾ " 3½	17	40	61	"
87	Spence*..................	July	28	104	40 " 42	Medium..	2½ " 3	17	..	59	Considerably.
88	Tracey*..................	Aug.	13	120	46 " 48	Stiff.....	3 " 3¾	16	40	59	Slightly.
89	Australian No. 9..........	"	1	109	34 " 36	Medium..	2¾ " 3¼	14	40	58½	Considerably.
90	Cassel*..................	"	10	118	38 " 40	Stiff.....	3 " 3¾	14	20	57½	Slightly.
91	Oregon Club..............	"	3	110	35 " 37	"	1¾ " 2¼	13	20	57	Badly.
92	Dayton*..................	"	4	111	42 " 44	"	3 " 3¾	13	..	59	Considerably.
93	Early Riga*..............	July	28	105	38 " 40	"	2¾ " 3¼	10	..	56½	Badly.

* Cross-bred varieties produced at the Experimental Farms.

MOST PRODUCTIVE VARIETIES OF SPRING WHEAT.

Taking the average of the returns for a series of years, the varieties of spring wheat found to be the most productive at this Farm are Preston, Huron, Pringle's Champlain, Wellman's Fife and Hungarian. Preston stands at the head of the list for productiveness (macaroni wheats being excluded). Red Fife gives a distinctly smaller yield than Preston, but is slightly superior in value from a miller's point of view.

EARLIEST VARIETIES OF SPRING WHEAT.

The earliest varieties now grown at this Farm (as shown by the average of the records for several years) are Harold, Gehun, Early Riga, Fraser and Ebert. These ripen, as a rule nearly two weeks earlier than Red Fife, and about one week earlier than Preston. These earlier varieties are not yet available for general distribution, but their value for the production of flour is being investigated with a view to the propagation of the best variety, or varieties, for those parts of the country where earliness is of the greatest importance.

STUDY OF THE QUALITY OF VARIOUS KINDS OF WHEAT.

The value from a miller's point of view of the various sorts of wheat is so important a consideration that steps are being taken towards the testing of all the varieties grown on this Farm. A rough preliminary test of most of the important sorts of spring wheat has been made and valuable information has been gained, although the results must be regarded as suggestive rather than conclusive.

In the case of some of the most important varieties, where larger quantities of grain were available, actual milling tests have been obtained. The results of some of these tests will be found in the report of the Director for this year.

It is proposed to subject all the new varieties which may be produced at this Farm to a critical examination by the methods indicated, before sending them out for test elsewhere.

MACARONI WHEAT.

It has been thought best to publish the results of the comparative tests of varieties of macaroni wheat in a separate table, rather than in conjunction with the ordinary sorts of spring wheat. While it is possible to make good flour from some kinds of macaroni wheat, such flour is peculiar in its character and is generally unpopular. Furthermore, the extreme hardness of the kernels necessitates special care in the milling of these kinds of wheat. They are naturally, therefore, looked upon with disfavour by millers.

Farmers who grow any of these varieties should exercise the utmost care to prevent them from becoming mixed with the standard sorts used for flour making. Conversely, macaroni wheat in which kernels of other types of wheat are found is regarded as much less valuable for its special purpose.

Macaroni wheat appears to succeed best in rather dry climates, and can often be successfully grown on rather poor and sandy soil, where it is difficult to obtain a good yield of the better varieties of wheat.

Through the courtesy of the Department of Agriculture at Washington, U.S., the following new varieties of macaroni wheat were obtained this year and were tested in the uniform plots :—

Medeah (No. 7579) from Algeria.
Kahla (No. 7794) from Algeria.
Mahmoudi (No. 7792) from Algeria.
Mishriki (No. 7016) from Egypt.
Gejar (No. 7430) from Spain.
Girgeh (No. 7422) from Egypt.

Most of these gave fair yields, except Gejar and Girgeh, both of which proved entirely unsuitable for this climate.

The plots of macaroni wheat were all one-fortieth of an acre in extent. The seed was sown on April 14 and 15, at the rate of 1½ bushels to the acre.

The yield per acre is expressed in 'bushels' of 60 pounds.

MACARONI WHEAT—TEST OF VARIETIES.

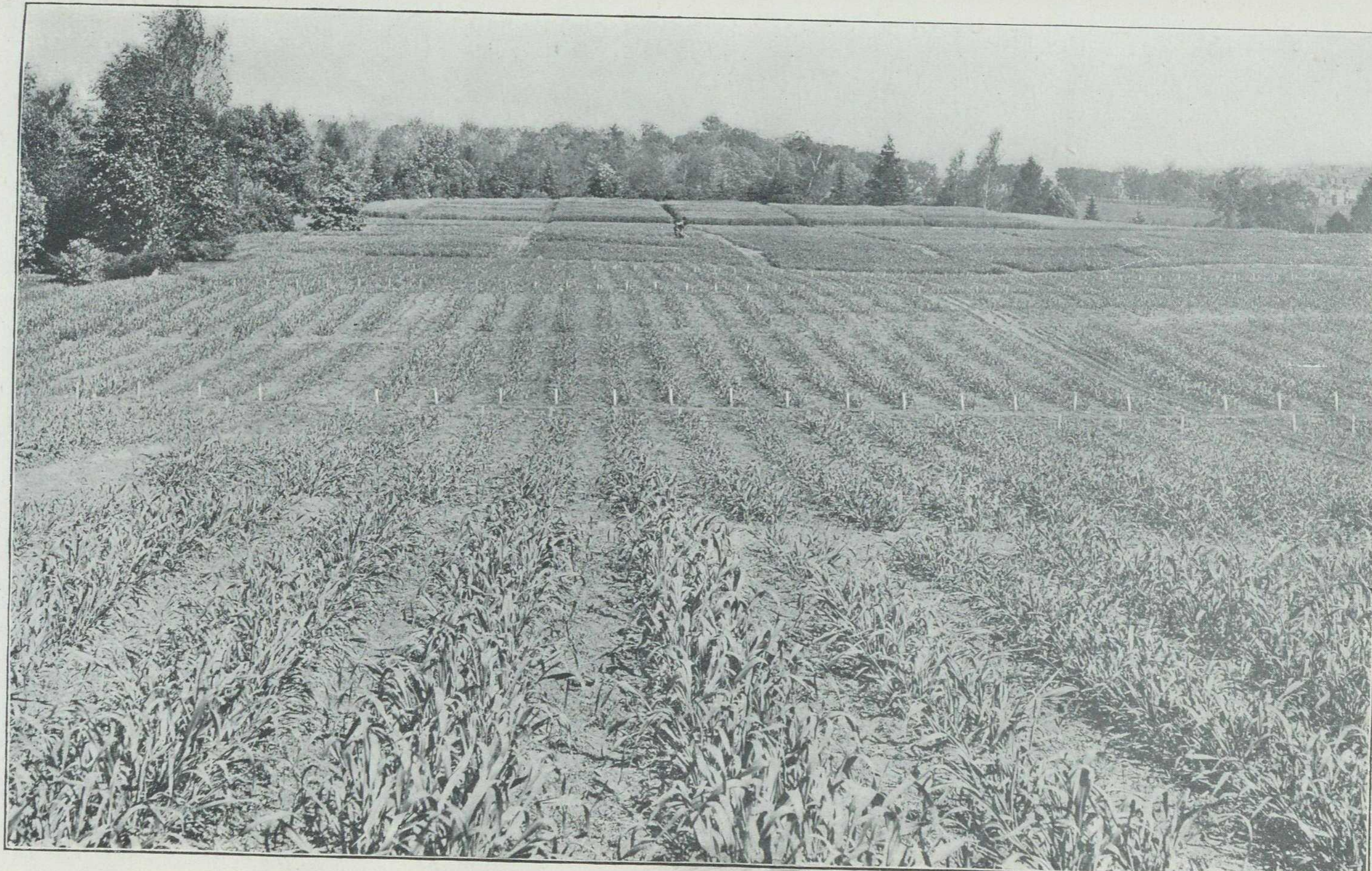
Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
				In.		In.	Bush.	lbs.	Lbs.	
1	Yellow Gharnovka (Washington, No. 5642).......	Aug. 17..	124	44-46	Medium..	3¼-3¾	33	40	59¾	Slightly.
2	Gharnovka (Washington, No. 5646)	" 18..	125	40-42	" ..	2½-3¼	31	20	59	"
3	Beloturka (Washington, No. 5800).............	" 18..	125	45-47	" ..	2¼-3	31	20	58	"
4	Kubanka (Washington, No. 5639)............ ..	" 18..	125	41-43	" ..	2¼-2¾	29	..	61¼	"
5	Black Don (Washington, No. 5645)........	" 7..	114	40-42	" ..	2 -2¾	27	40	61	"
6	Roumanian..............	" 7..	115	40-42	Weak....	2 -2½	27	..	61	Considerably.
7	Medeah.................	" 6..	113	41-43	Medium..	2 -2½	27	..	60½	"
8	Velvet Don (Washington, No. 5644).............	" 11..	118	38-40	Stiff.....	2 -2¾	27	..	60	Slightly.
9	Kahla..................	" 12..	119	36-38	Weak....	1¾-2¼	25	..	58	Considerably.
10	Mahmoudi	" 6..	113	36-38	"	1¾-2¼	23	20	57¾	Slightly.
11	Goose	" 7..	115	40-42	Medium..	2¼-2¾	19	..	58½	Badly.
12	Mishriki	" 5..	112	34-36	" ..	1¾-2¼	14	20	47½	"

WINTER WHEAT.

The plots of winter wheat were sown on September 6, 1902. The size of the plots was one-fortieth of an acre each; and the seed was used at the rate of 1¾ bushels to the acre.

The plots looked well when winter set in; but were found to be considerably injured when growth commenced in spring. The yield of all the varieties except Imperial Amber, Reliable, Egyptian Amber and American Bronze has been estimated from one-eightieth of an acre only, taking the better half of the plot in each case. The yield of the varieties above-mentioned has been calculated from the whole plot. Surprise, Red Velvet Chaff, Poole and Tasmania Red were so largely winter-killed that no accurate estimate of their yield could be made.

The yield per acre is expressed in 'bushels' of 60 pounds.



DOUBLE ROWS OF CEREALS AT EXPERIMENTAL FARM, OTTAWA. (Photo. by C. E. Saunders.)

WINTER WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
				In.		In.	Bush.	lbs.	Lbs.	
1	Turkey Red.............	July 23..	320	37-39	Weak....	3 -3½	45	20	62	Slightly.
2	Dawson's Golden Chaff...	" 21..	318	38-40	Stiff.....	2¾-3¼	41	20	63	"
3	Imperial Amber..........	" 19..	316	44-46	Medium..	3 -3½	39	20	62¾	"
4	Reliable.................	" 23..	320	48-50	" ..	3½-4¼	36	..	62½	"
5	Egyptian Amber........	" 23..	320	38-40	Stiff.....	3 -3¾	35	20	62½	"
6	Early Red Clawson ...	" 19..	316	38-40	"	2¾-3¼	34	40	61½	"
7	Buda Pesth............	" 25..	322	40-42	Medium..	3 -3½	33	20	62½	"
8	Long Berry Red.........	" 19..	316	38-40	Stiff.....	3 -3½	33	20	62	"
9	Bonnell	" 23..	320	47-49	Medium..	3¼-3¾	33	20	62¼	"
10	Treadwell	" 22..	319	41-43	" ..	3 -3½	32	40	62	"
11	Jones' Winter Fife......	" 22..	319	40-42	Stiff.....	3 -3½	32	..	62½	"
12	Golden Cross	" 20..	317	37-39	"	2 -2½	32	..	61	Considerably.
13	Gold Coin	" 22..	319	38-40	"	2¾-3¼	30	40	62	Slightly.
14	Pride of Illinois..........	" 20..	317	40-42	"	3½-4	30	40	62	"
15	American Bronze.........	" 22..	319	43-45	"	3¼-3¾	30	..	62½	"
16	Velvet Chaff............	" 18..	315	38-40	"	2¾-3¼	29	20	62	Considerably.

EMMER AND SPELT.

The different varieties of emmer and spelt are separated in this report from the varieties of wheat on account of their peculiar characteristics. The emmers and spelts are distinguished by the fact that in ordinary threshing the kernels are not separated from the chaff: the chaff generally constituting about 21 to 26 per cent of the total weight of the product in the case of the emmers, and about 27 to 35 per cent in the case of the spelts. The latter are, as a rule, much the coarser. In estimating the yield of these grains, it is obvious that no comparison can be made with wheat until a proper deduction has been made for the chaff present. The neglect of this precaution is one of the reasons why Common Emmer (often incorrectly called Speltz) has attracted an undue amount of attention of late. This grain, after threshing and grinding, makes valuable food for animals, but it seldom gives a yield equal to that of the best varieties of other cereals. Some farmers who have cut their emmer green for fodder report that it is unsatisfactory in that condition, partly, no doubt, on account of the awns which are present.

The only new emmer introduced this year is Triticum monococcum, a variety with very small and pretty heads, presenting a most attractive appearance in the field. It gave the heaviest yield in the plots this season, but will probably not maintain that position in the future as its extreme lateness gave it a distinct advantage this year owing to the peculiar character of the weather.

The plots of emmer and spelt were one-fortieth of an acre, except in the case of Triticum monococcum, which was grown on one-eightieth of an acre only. The grain was sown on April 17, at the rate of about 120 pounds per acre.

As some confusion exists at present in regard to the number of pounds which should be considered as a bushel of emmer or spelt, the yield is given in the following table in pounds per acre :—

EMMER AND SPELT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.	Weight per Measured Bushel after Cleaning.	Rusted.
				In.		In.	Lbs.	Lbs.	
1	Triticum monococcum....	Sept. 11..	147	40-42	Stiff	2¼-3	2720	25	Slightly.
2	Red Spelt (No. 1990)	Aug. 19..	124	45-47	"	3¼-4	2660	27½	"
3	Smooth Spelt (No. 1993)..	" 18..	123	43-45	"	4¼-5	2380	29	"
4	White Spelt (No. 1991)...	" 17..	122	48-50	"	4¼-5	1940	29	"
5	Long Emmer (No. 1994)..	" 29..	134	42-44	"	3 -3¾	1760	28½	"
6	Red Emmer (No. 1989) ...	" 19..	124	40-42	"	2¼-3	1740	32	"
7	White Bearded Spelt (No. 1995)	" 16..	121	34-36	"	3 -3¾	1600	29	"
8	Black Bearded Spelt (No. 1985)	" 16..	121	38-40	Medium..	3¾-4¼	1580	27	"
9	White Emmer (No. 1981)..	" 28..	133	41-43	Stiff	2¼-3	1540	30	"
10	Ufa Emmer (Washington, No. 2959)...............	" 9..	114	34-36	Medium..	1¾-2¼	1320	33½	"
11	Common Emmer ("Speltz")	" 12..	117	31-33	Stiff	1¾-2¼	1300	35	"
12	Thick Emmer (No. 1984)..	" 17..	122	34-36	"	2 -2¾	1020	29	"

OATS.

Five new names were added to the list of varieties of oats in the uniform test this season.

Excelsior is a new black oat produced by Garton Bros. (England). The original sample was remarkably plump and weighed 44 pounds to the measured bushel.

Storm King is another new oat produced by Garton Bros. The seed received was very large but not remarkably plump, weighing 40½ pounds per measured bushel. This variety presents a very striking appearance in the field, producing straw of very large diameter. It, however, lodged slightly in some parts of the plot. The yield obtained was rather small, but the figures are not published, as the quantity of seed on hand was not sufficient to sow the plot as thickly as was desirable. Oats of such remarkable size require a larger quantity of seed per acre than those of smaller dimensions.

Golden Fleece and Sheffield Standard were advertised as two distinct varieties, but the difference, if any, between them is very slight. The original samples of seed received weighed only 33¾ pounds per bushel in each case.

The Chinese Naked oat has the peculiarity of threshing out free from husk. The yield given in the table represents, therefore, free kernels. In order to make this comparable with the yields of the other varieties of oats, the quantity obtained must be considered as about 72 per cent of that which would have been obtained had the hulls remained on the oats, most varieties of oats having only about 72 per cent of kernel as ordinarily threshed. Estimated in this way the yield of Chinese Naked oat becomes 44 bushels 4 pounds per acre.

All the plots of oats were sown April 20, except Chinese Naked, which was sown April 17. The plots were one-fortieth of an acre, and the seed was sown at the rate of two bushels per acre.

The yield per acre is expressed in 'bushels' of 34 pounds.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, includi'g Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleani'g	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Golden Giant	Aug. 14.	116	46—48	Stiff	7½— 9	86	16	34½	Considerably.
2	Probstey	" 16.	118	46—48	Weak	8 — 9½	80	..	36	Badly.
3	Holland*	" 17.	119	45—47	"	8½—10	77	22	35	"
4	Dixon*	" 15.	117	48—50	Stiff	8 — 9½	77	22	35½	"
5	Scotch Potato	" 14.	116	49—51	Medium	9 —10½	77	2	37	Slightly.
6	Bestehorn's Abundance	" 16.	118	44—46	Weak	7½— 9¼	75	30	35	Badly.
7	Virginia White Abundance	" 17.	119	40—42	"	6½— 8	75	10	37½	"
8	Great Northern	" 14.	116	44—46	Medium	7 — 8½	74	24	35½	Considerably.
9	White Giant	" 14.	116	44—46	Stiff	8 — 9½	74	4	35½	Slightly.
10	Golden Beauty	" 12.	114	45—47	"	8 — 9½	73	18	35	Considerably.
11	Golden Tartarian	" 18.	120	46—48	Medium	8 — 9½	71	26	34½	Badly.
12	Banner	" 13.	115	40—42	Stiff	7 — 8½	71	6	36½	Considerably.
13	Abundance	" 13.	115	44—46	Medium	8½— 9½	71	6	36½	Slightly.
14	Twentieth Century	" 17.	119	45—47	"	8½—10	71	6	38	Considerably.
15	Siberian	" 16.	118	44—46	Stiff	8½— 9¾	70	20	34½	Badly.
16	Columbus	" 13.	115	40—42	Weak	7 — 8½	70	20	34½	"
17	Swedish Select	" 17.	119	38—40	Medium	6 — 7½	70	20	36½	"
18	Mennonite	" 15.	117	42—44	"	8½— 9½	70	..	34	"
19	Hazlett's Seizure	" 14.	116	43—45	Stiff	7½— 9	68	28	35	Slightly.
20	Improved Ligowo	" 13.	115	44—46	Medium	8 — [illegible]½	67	22	37	Considerably.
21	Sensation	" 15.	117	44—46	"	7½— 9	67	22	37½	"
22	Excelsior (black)	" 17.	119	42—44	Stiff	7½— 8½	67	22	36½	"
23	Black Beauty	" 13.	115	40—42	Weak	8½—10½	67	2	35	"
24	Kendal White*	" 14.	116	45—47	Medium	8½—10	67	2	34½	"
25	Wide Awake	" 16.	118	42—44	Stiff	6¾— 8	66	16	36	Slightly.
26	Uberfluss	" 16.	118	44—46	Medium	6½— 7¾	66	16	34	Badly.
27	American Triumph	" 18.	120	40—42	Stiff	7½— 8¾	65	30	35	Considerably
28	Sorgenfrei	" 16.	118	43—45	Weak	7¼— 8¾	65	10	36	"
29	Australian	" 17.	119	46—48	Medium	8 — 9½	65	10	35	Badly.
30	Golden Fleece	" 15.	117	46—48	Stiff	7 — 8½	64	24	34	Considerably
31	Pense White*	" 12.	114	47—49	Medium	9 —10½	64	4	37	Badly.
32	Atlantic	" 17.	119	44—46	Weak	7½— 8¾	62	32	35½	"
33	Salines	" 17.	119	47—49	Stiff	7¼— 9	62	32	35	Considerably.
34	Lincoln	" 13.	115	47—49	"	8½— 9	62	12	37½	Slightly.
35	Tartar King	" 10.	112	46—48	"	8½— 9½	61	26	36½	Badly.
36	Improved American	" 13.	115	39—41	"	7 — 8½	61	26	36	Slightly.
37	Waverley	" 14.	116	48—50	"	7½— 9	61	6	35½	"
38	Olive Black*	" 15.	117	44—46	Weak	8½—10	61	6	35½	Badly.
39	Forbes*	" 18.	120	44—46	Medium	8¾— 9½	61	6	34	Considerably.
40	Irish Victor	" 15.	117	39—41	Stiff	7½— 9½	60	20	36	Slightly.
41	Danish Island	" 13.	115	43—45	"	7 — 8½	60	20	35½	"
42	Olive White*	" 14.	116	47—49	Weak	8½— 9½	60	20	35	Badly.
43	Goldfinder	" 16.	118	45—47	Medium	7¼— 8½	59	14	34½	Considerably.
44	Milford White*	" 14.	116	45—47	Weak	9 —10½	59	14	35	"
45	Big Four (Salzer's)	" 16.	118	41—43	Stiff	7½— 8½	57	22	36	"
46	Kendal Black*	" 15.	117	48—50	Weak	8½—10	57	22	35	Badly.
47	Prolific Black Tartarian	" 15.	117	48—50	"	9½—11	57	2	35	"
48	Flying Scotchman	" 15.	117	42—44	"	6 — 7½	56	16	35½	"
49	Bavarian	" 13.	115	41—43	"	7 — 8½	56	16	35	Slightly.
50	American Beauty	" 15.	117	46—48	"	7¼— 9	55	30	36	Badly.
51	Joanette (black)	" 16.	118	37—39	Medium	7 — 8¼	55	10	36½	Considerably.
52	Holstein Prolific	" 14.	116	38—40	Stiff	7½— 9½	55	10	35½	"
53	Thousand Dollar	" 15.	117	44—46	Medium	7½— 9	55	10	36	Badly.
54	Buckbee's Illinois	" 17.	119	40—42	"	7¼— 8¼	54	24	36½	Considerably.
55	Sheffield Standard	" 17.	119	40—42	"	7½— 8½	52	32	37	Badly.
56	White Russian	" 14.	116	39—41	Weak	6½— 7½	51	26	36	"
57	Milford Black*	" 15.	117	45—47	"	7½— 9½	51	6	35½	"
58	New Zealand	" 18.	120	46—48	Medium	7¼— 9	50	..	36½	"
59	Anderbecker	" 16.	118	38—40	"	7 — 8¼	50	..	35	Considerably.
60	White Schonen	" 12.	114	44—46	"	8 — 9½	48	8	35	Slightly.
61	Pioneer (black)	" 16.	118	37—39	Weak	7½— 8½	48	8	36	Badly.
62	Early Golden Prolific	" 14.	116	42—44	Medium	8 — 9½	47	22	37	Considerably.
63	Wallis	" 13.	115	43—45	"	7½— 9	44	4	35½	"
64	Pense Black*	" 15.	117	43—45	"	7½— 9	41	6	36	Badly.
65	Chinese Naked	" 20.	125	50—52	Stiff	9½—11	31	26	46½	"

* Cross-bred varieties produced at the Experimental Farms.

Most Productive Varieties of Oats.—Taking the average of the returns for a series of years, the varieties of oats found to be the most productive at this Farm are White Giant, Holstein Prolific, Banner, Columbus, Mennonite, Golden Giant, American Triumph, Joannette, Black Beauty and Golden Beauty.

Earliest Varieties of Oats.—Wallis is the earliest variety which has been grown at this Farm for the past five years. It ripens, as a rule, about two or three days earlier than White Giant or Banner, but is very much less productive.

Welcome and White Wonder, which were discontinued from the plots at this Farm some years ago on account of their small yield, ripen as a rule about five or six days earlier than Wallis.

SIX-ROW BARLEY.

The plots were all one-fortieth of an acre in extent. The seed was sown at the rate of 1¾ bushels per acre, the date of sowing being April 18.

The yield per acre is expressed in 'bushels' of 48 lbs.

SIX-ROW BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		Number of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
					Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Blue Long Head..........	July	25	98	34—36	Weak...	2½—3¼	58	36	47	Considerably.
2	Summit*..........	"	25	98	46—48	Medium	3¼—3¾	54	28	49½	Slightly.
3	Brome*..........	"	27	100	40—42	Weak...	3 —3½	53	36	49½	"
4	Silver King	Aug.	2	106	32—34	Medium	3¼—4	53	16	49½	"
5	Trooper*..........	July	26	99	39—41	Stiff....	2¾—3¼	52	4	49½	"
6	Garfield*..........	"	25	98	44—46	Medium	2¾—3¼	52	4	50½	"
7	Stella*..........	"	25	98	44—46	" .	3 —3½	51	12	48½	"
8	Albert*..........	Aug.	2	106	34—36	" .	3¼—3¾	47	4	48	"
9	Empire*..........	July	27	100	37—39	" .	2¼—2¾	45	20	50	"
10	Baxter	"	24	97	41—43	" .	2 —2½	45	20	49½	"
11	Yale*..........	"	27	100	37—39	" .	2½—3	45	..	50	"
12	Odessa..........	"	27	100	35—37	" .	2¾—3½	44	28	48	"
13	Common..........	"	25	98	36—38	Weak...	2¾—3¼	44	28	47½	"
14	Norwegian (No. 8)..........	"	26	99	38—40	" .	2¼—2¾	44	28	49	"
15	Oderbruch..........	"	27	100	35—37	Medium	2½—3¼	42	44	49	"
16	Rennie's Improved..........	"	25	98	35—37	Weak...	2¼—2¾	42	44	49	"
17	Nugent*..........	Aug.	3	107	31—33	Stiff....	3 —3¾	42	4	48½	"
18	Royal*..........	"	2	106	35—37	"	2¾—3¼	41	12	48½	"
19	Champion (beardless)..........	July	23	96	40—42	Weak...	3 —3¾	40	20	48	"
20	Mensury	Aug.	1	105	35—37	Stiff....	3¾—4¼	38	36	49	"
21	Sisolsk..........	July	24	97	34—36	Weak...	2½—3¼	38	36	46	Considerably.
22	Claude*..........	Aug.	3	107	27—29	Medium	2½—3	35	40	49	"
23	Argyle*..........	July	27	100	28—30	Stiff....	2¾—3¼	34	28	49	Slightly.
24	Mansfield*..........	"	27	100	27—29	Medium	2 —2¾	34	28	49	Considerably.
25	Chinese Hulless	"	31	104	25—27	" .	2 —2¾	25	40	59½	"
26	Hulless Black..........	"	23	96	26—28	Weak...	1½—2	25	20	60	"

*Cross-bred varieties produced at the Experimental Farms.

Most Productive Varieties of Six-row Barley.—Taking the average of the returns for a series of years, the varieties of six-row barley found to be the most productive at this Farm are Odessa, Blue Long Head, Mensury, Stella and Trooper.

Earliest Varieties of Six-row Barley.—There are no important differences in earliness to be noted among those varieties of six-row barley which have been tested for five years or longer at this Farm. Odessa, Stella and Trooper are about one day earlier than Blue Long Head and Mensury.

TWO-ROW BARLEY.

Attention is called to two new varieties of two-row barley, imported this year, Maltster and Brewer's Favourite. The original seed of both of these was very plump, and weighed 54¾ lbs. to the measured bushel. It will be seen that Maltster has given a good yield of heavy grain, but Brewer's Favourite has not done remarkably well. These varieties were originated by Garton Bros., England.

The plots of two-row barley were sown on April 17, the seed being used at the rate of two bushels to the acre. The yield given is calculated from one-fortieth of an acre except in the case of Princess Sialof, where only one-eightieth of an acre is used, as one-half of the plot ripened somewhat earlier than the other.

The yield per acre is expressed in 'bushels' of 48 lbs.

TWO-ROW BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Maltster	Aug. 11	116	37—39	Medium	3—3¾	48	36	52¼	Slightly.
2	Princess Sialof	" 4	109	31—33	"	3¾—4¼	48	16	49	Badly.
3	Canadian Thorpe	" 2	107	38—40	Stiff	3—3½	46	32	50½	Slightly.
4	Invincible	July 31	105	36—38	"	2¾—3¼	46	32	52	"
5	Jarvis*	Aug. 1	106	45—47	"	4¼—4¾	46	12	52¼	"
6	French Chevalier	July 31	105	33—35	Medium	3½—4¼	44	28	50¼	"
7	Besthorn's Kaiser	Aug. 3	108	36—38	Stiff	2¾—3¼	43	36	51½	"
8	Plumage	" 1	106	36—38	"	2½—3	43	16	53	"
9	Beaver*	July 30	104	45—47	"	3¼—3¾	42	24	51	Considerably.
10	Gordon*	Aug. 1	106	38—40	"	2¾—3¼	41	32	51	Slightly.
11	Harvey*	Aug. 4	109	38—40	Medium	3¾—4¼	40	..	52	Considerably.
12	Fichtel Mountain	July 30	104	28—30	"	2¾—3¼	39	28	48	"
13	Sidney*	Aug. 2	107	38—40	Stiff	3½—4	39	8	52	Slightly.
14	Dunham*	" 3	108	40—42	"	3¼—3¾	37	44	51½	"
15	Danish Chevalier	" 2	107	41—43	"	4¼—4¾	37	4	50	Considerably.
16	Fulton*	" 3	108	36—38	Medium	3—3½	37	4	50	"
17	Logan*	Aug. 4	109	40—42	"	3¼—3¾	37	4	52¼	Slightly.
18	Clifford*	" 4	109	37—39	"	3¼—3¾	36	32	51	Considerably.
19	Brewer's Favourite	" 11	116	32—34	"	3¼—4	35	40	52	Slightly.
20	Standwell	" 4	109	40—42	"	2¾—3¼	35	..	51	"
21	Pelham*	July 28	102	33—35	"	3—3½	34	28	52	"
22	Newton	Aug. 3	108	35—37	Stiff	2¾—3¼	31	12	51½	"

* Cross-bred varieties produced at the Experimental Farms.

Most Productive Varieties of Two-row Barley.—Taking the average of the returns for a series of years, the varieties of two-row barley found to be the most productive at this Farm are: Canadian Thorpe, French Chevalier, Beaver and Danish Chevalier.

Earliest Varieties of Two-row Barley.—The earliest varieties of two-row barley grown at this Farm are Jarvis, Beaver, Gordon. These are all cross-bred sorts produced here. They ripen, as a rule, two or three days earlier than Canadian Thorpe and French Chevalier.

PEASE.

The plots of pease were one-fortieth of an acre each. The seed was sown on April 22, at the rate of from two to three bushels per acre, according to the size of the pea. The yield per acre is expressed in 'bushels' of 60 pounds.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days maturing.	Character of growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Measured bushel after Cleaning.
					Inches.	Inches.	Bush.	Lbs.	Lbs.
1	English Gray...........	Aug. 21..	121	Strong.	67—70	2¼—3	34	20	55¾
2	Crown..................	" 19..	119	"	47—50	2¼—2¾	34	..	60½
3	Prussian Blue..........	" 18..	118	"	62—65	2 —2½	33	40	62
4	Golden Vine............	" 21..	121	"	57—60	2 —2½	32	40	61
5	Daniel O'Rourke........	" 18..	118	"	62—65	1¾—2¼	32	..	61½
6	Paragon*...............	" 17..	117	Medium....	33—36	2¼—2¾	31	20	61½
7	Victoria*..............	" 25..	125	Strong.	70—73	2 —2¾	31	20	60½
8	Picton*................	" 22..	122	"	65—68	2 —2½	31	..	61¼
9	Gregory*...............	" 20..	120	"	63—66	2¼—2¾	30	40	61
10	Duke*..................	" 20..	120	"	70—73	2¼—2¾	30	40	61½
11	Bruce*.................	" 22..	122	"	72—75	2¼—2¾	30	40	61½
12	Chancellor.............	" 18..	118	Medium....	60—63	1½—2¼	30	20	60½
13	Mummy..................	" 22..	122	"	59—62	2 —2½	30	..	60¾
14	Perth*.................	" 18..	118	Strong.	61—64	2¼—3	29	..	61½
15	Kent*..................	" 23..	123	"	67—70	2½—3¼	29	..	60½
16	Pride..................	" 22..	122	"	50—53	2¼—2¾	28	40	61
17	Cooper*................	" 17..	117	Medium....	62—65	2¼—2¾	28	..	61
18	Trilby*................	" 18..	118	Strong.	63—66	2¼—2¾	27	40	62
19	Archer*................	" 23..	123	"	70—73	1¾—2¼	27	20	62
20	German White...........	" 20..	120	"	67—70	2 —2½	27	20	61
21	King*..................	" 21..	121	"	64—67	2¼—2¾	27	20	61
22	White Marrowfat (Large)..	" 19..	119	"	67—70	2½—3	27	20	60½
23	Prince Albert..........	" 19..	119	"	63—66	2½—3	26	20	61¼
24	Prince*................	" 23..	123	"	72—75	2¼—2¾	26	20	60¾
25	Alma*..................	" 17..	117	"	60—63	2¼—2¾	26	..	59
26	Canadian Beauty........	" 18..	118	"	65—68	2½—3	26	..	62
27	Wisconsin Blue.........	" 19..	119	"	57—60	2 —2½	25	40	62
28	Pearl*.................	" 19..	119	"	57—60	2¼—2¾	25	20	61¼
29	Early Britain..........	" 22..	122	"	69—72	2¼—2¾	24	40	58½
30	New Potter.............	" 19..	119	"	67—70	2 —2½	23	40	61½
31	Elliot*................	" 20..	120	"	68—71	2 —2½	23	20	61½
32	Lanark*................	" 19..	119	"	60—63	1¾—2¼	23	20	60½
33	Agnes*.................	" 19..	119	"	62—65	1¾—2¼	23	..	61½
34	Carleton*..............	" 23..	123	"	60—63	2¼—2¾	23	..	61¼
35	Macoun*................	" 20..	120	"	61—64	2¼—2¾	23	..	61½
36	Black-eyed Marrowfat.....	" 18..	118	"	60—63	2¼—3	22	40	61
37	White Wonder...........	" 16..	116	Medium...	38—40	2¼—2¾	22	40	61
38	Arthur*................	" 18..	118	Strong.	59—62	2¼—3	22	40	61½
39	Field Gray.............	" 17..	117	Medium....	57—60	1¾—2¼	22	..	57¾
40	Fergus*................	" 20..	120	Strong.	60—63	2¼—2¾	21	..	61¼
41	Centennial.............	" 22..	122	"	67—70	2 —2¾	20	40	60
42	Mackay*................	" 20..	120	"	65—68	2¼—3	20	..	61½
43	Nelson*................	" 19..	119	Medium....	47—50	2 —2½	15	40	61

* Cross-bred varieties produced at the Experimental Farms.

Most Productive Varieties of Pease.—Taking the average of the returns for a series of years, the varieties of pease found to be most productive at this Farm are Arthur and Paragon.

Earliest Varieties of Peas.—Chancellor and White Wonder ripen, as a rule, about two days earlier than Paragon and Arthur. Chancellor gives a good crop, but White Wonder gives a light yield.

SPRING RYE.

One plot of spring rye (one-fortieth acre) was sown on April 17, the seed being used at the rate of one and one-half bushels to the acre. The rye made a strong and fairly even growth, and ripened on August 10. The straw was stiff, its length (including the head) being 53 to 55 inches. The length of the heads was from three to three and three-quarter inches. The number of days from sowing to harvesting was 115. The yield, expressed in 'bushels' of 56 pounds, was 21 bushels 24 pounds per acre; and the weight per measured bushel (after cleaning) was 55 pounds.

SOJA BEANS.

Two plots of one-fortieth acre each were sown in rows at different distances apart, viz.: 21 and 28 inches, to gain information as to the best distance for sowing. The soil was a light sandy loam, which received a dressing of barn-yard manure during the winter of 1899 and 1900 of about 12 tons per acre. The previous crop was horse beans. After the beans were cut the land was ploughed late in the autumn to the depth of about seven or eight inches, and left in that condition until the following spring, when it was cultivated once with a two-horse cultivator and twice with a smoothing harrow. The beans were sown with a seed-drill on May 9, and cut on September 22. Half of each plot was cut green, when the pods were well formed, but the beans were still soft. The other half of each plot was allowed to ripen.

Plot 1.—Sown in rows 21 inches apart; growth strong and even, leafy; average height, 32 to 37 inches; total yield of green crop, 12 tons 960 lbs. per acre; yield of beans, 14 bushels 40 lbs. per acre.

Plot 2.—Sown in rows 28 inches apart; growth very strong and leafy; average height 34 to 38 inches. Plot all standing; stalks considerably stiffer than in plot No. 1. Total yield of green crop, 15 tons 1,200 lbs per acre; yield of beans, 13 bushels 20 lbs. per acre.

HORSE BEANS.

Two plots of one-fortieth acre each were sown in rows at different distances apart, viz.: 21 and 28 inches, to gain information as to the best distance for sowing. The land was adjoining that used for soja beans, was similar in quality and received the same treatment. The previous crop was flax. The beans were sown with the seed drill on May 9, and cut on September 22.

Half of each plot was cut green before the beans were ripe. The other half of each plot was allowed to ripen.

Plot 1.—Sown in rows 21 inches apart; growth strong, pods fairly numerous; height 50 to 52 inches; crop all standing. Total yield, 13 tons 560 lbs. per acre. Yield of beans, 20 bushels 40 lbs. per acre.

Plot 2.—Sown in rows 28 inches apart; growth very strong; pods numerous; height 51 to 55 inches; crop all standing; stalks considerably stiffer than in plot No. 1. Total yield 13 tons 880 lbs. per acre. Yield of beans, 32 bushels per acre.

MILLET.

The plots of millet were one-eightieth of an acre each. The seed was sown with a hand seed drill on May 19. The plots were cut when the seed was in the doughy state.

MILLET—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Cutting.	Length of Straw.	Character of Growth.	Weight per Acre, Green.		Weight per Acre, Dry.	
			Inches.		Tons.	Lbs.	Tons.	Lbs.
1	Pearl or Cat-tail	Sept. 8	38—42	Weak	8	160	3	1,840
2	Algerian	" 8	65—70	"	6	800	4	1,200
3	Moha Hungarian	" 3	28—32	Medium	5	800	2	1,760
4	White Round French	" 3	38—40	"	5	...	2	1,360
5	Red Orenburg	" 8	35—38	"	3	1,760	2	80
6	Italian or Indian	" 6	54—58	"	3	1,680	1	960

TURNIPS.

Two sowings were made of each variety, the first on May 7 and the second on May 21. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows.

The roots were pulled on two different dates: October 19 and November 2. The yield per acre has been calculated from the weight of roots gathered from two rows, each 33 feet long.

The results obtained this season in the case of turnips and of other root crops do not altogether harmonise with those of previous years. This is no doubt due chiefly to two causes: first, the drought in spring, which delayed the germination of most of the seed of the first sowing, and second, the unusually severe frosts which occurred between October 19 and November 2.

In Canada the ton contains 2,000 lbs.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing, 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	New Century	47	1,865	23	1,850	50	1,970	24	345
2	Jumbo	46	235	24	1,665	46	400	25	325
3	Kangaroo	44	1,430	24	1,005	45	90	24	1,500
4	Mammoth Clyde	41	665	30	1,545	41	1,160	30	390
5	Good Luck	40	1,510	28	1,090	41	665	30	60
6	Emperor Swede	37	1,570	20	425	39	210	20	1,085
7	Elephant's Master	33	1,155	20	260	25	1,315	21	900
8	Drummond Purple Top	33	990	30	225	31	40	30	225
9	Shamrock Purple Top	33	825	26	965	34	805	26	1,955
10	Magnum Bonum	30	555	24	345	25	820	22	550
11	Imperial Swede	30	390	29	740	30	225	28	595
12	Bangholm Selected	29	905	24	15	20	755	23	1,850
13	Selected Purple Top	29	575	28	1,915	32	1,340	24	345
14	Hartley's Bronze	29	245	27	780	24	1,665	25	1,315
15	Carter's Elephant	27	120	17	320	25	490	20	1,745
16	Sutton's Champion	26	1,625	24	1,830	27	285	28	1,750
17	Perfection Swede	25	1,975	24	1,005	29	1,565	24	1,170
18	Skirvings	25	1,480	19	445	23	1,190	20	1,415
19	East Lothian	23	1,520	23	860	26	1,790	24	840
20	Halewood's Bronze Top	23	1,520	21	1,890	28	1.420	26	1,790
21	Hall's Westbury	23	695	19	1,270	26	1,460	15	1,515

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	32	1,126
The average yield from the 1st sowing, 2nd pulling, was	32	460
The average yield from the 2nd sowing, 1st pulling, was	24	974
The average yield from the 2nd sowing, 2nd pulling, was	24	1,508

MANGELS.

Two sowings were made of each variety, the first on May 7, and the second on May 21. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows. The roots were pulled on two different dates: October 19 and November 2. The yield has been calculated in each case from the weight of roots gathered from two rows, each 33 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing, 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Mammoth Long Red	41	335	21	900	37	745	20	1,250
2	Triumph Yellow Globe	40	190	18	1,125	32	1,505	14	1,040
3	Selected Yellow Globe	39	375	17	815	39	1,200	17	1,640
4	Half Long Sugar White	35	620	15	1,350	34	1,300	15	1,185
5	Gate Post	34	1,795	20	1,580	36	1,590	26	140
6	Mammoth Yellow Intermediate	34	1,630	15	1,845	37	1,240	20	590
7	Giant Sugar Mangel	34	1,135	15	1,680	30	885	17	650
8	Giant Yellow Intermediate	34	475	17	815	43	130	16	340
9	Prize Winner Yellow Globe	32	845	18	630	26	1,625	16	1,330
10	Prize Mammoth Long Red	32	350	20	1,250	46	1,720	21	75
11	Lion Yellow Intermediate	30	225	19	1,435	46	70	19	1,270
12	Yellow Intermediate	29	1,730	14	495	39	1,035	25	820
13	Half Long Sugar Rosy	29	740	14	215	22	220	13	1,720
14	Giant Yellow Globe	25	1,645	16	1,990	34	310	20	1,415
15	Selected Mammoth Long Red	24	1,500	22	385	31	1,030	26	965
16	Leviathan Long Red	23	200	13	1,885	24	180	15	690

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	32	1,237
The average yield from the 1st sowing, 2nd pulling, was	35	424
The average yield from the 2nd sowing, 1st pulling, was	17	1,400
The average yield from the 2nd sowing, 2nd pulling, was	19	445

CARROTS.

Two sowings were made of each variety, the first on May 7 and the second on May 21. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled on two different dates : October 19 and November 2. The yield has been calculated in each case from the weight of roots gathered from two rows, each 33 feet long.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing, 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	New White Intermediate	33	1,815	25	160	34	1,300	25	325
2	Mammoth White Intermediate	30	1,875	22	1,210	26	1,625	21	900
3	Ontario Champion	29	1,070	22	550	26	140	22	880
4	Giant White Vosges	29	80	21	570	31	370	21	570
5	Improved Short White	28	430	20	755	33	165	21	1,560
6	White Belgian	27	1,110	19	1,930	28	430	18	630
7	Long Yellow Stump Rooted	26	1,810	18	300	22	880	14	50
8	Half Long White	21	1,890	20	1,745	22	1,870	20	95
9	Carter's Orange Giant	21	1,065	18	135	24	1,995	17	1,640
10	Half Long Chantenay	21	75	16	175	23	1,685	19	1,765
11	Early Gem	16	1,495	15	1,020	20	1,580	17	1,310

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	26	247
The average yield from the 1st sowing, 2nd pulling, was	26	1,640
The average yield from the 2nd sowing, 1st pulling, was	20	50
The average yield from the 2nd sowing, 2nd pulling, was	19	1,975

SUGAR BEETS.

Two sowings were made of each variety, the first on May 7 and the second on May 21. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled on two different dates: October 19 and November 2. The yield has been calculated in each case from the weight of roots gathered from two rows, each 33 feet long. Though all the varieties mentioned here are commonly classed as sugar beets, it should be noted that the only ones recommended for use in the manufacture of sugar are Wanzleben, French Very Rich, and Vilmorin's Improved.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing 1st Pulling.		Yield per Acre from 2nd Sowing 1st Pulling.		Yield per Acre from 1st Sowing 2nd Pulling.		Yield per Acre from 2nd Sowing 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Improved Imperial	39	540	21	900	39	1,035	21	1,230
2	Red Top Sugar	36	105	20	920	31	370	14	380
3	Danish Red Top	35	455	16	1,495	32	1,670	15	525
4	Danish Improved	32	1,010	15	690	30	390	16	505
5	Wanzleben	29	1,565	13	70	30	1,545	13	1,060
6	French Very Rich	23	695	18	1,455	23	1,190	19	1,930
7	Royal Giant	20	1,250	15	1,185	27	450	18	630
8	Vilmorin's Improved	19	610	7	1,180	13	1,885	8	1,820

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	29	1,029
The average yield from the 1st sowing, 2nd pulling, was	28	1,317
The average yield from the 2nd sowing, 1st pulling, was	16	237
The average yield from the 2nd sowing, 2nd pulling, was	16	10

INDIAN CORN.

The corn was sown with the seed drill in rows thirty-five inches apart, and was also sown in hills thirty-five inches apart each way. When the plants were about six inches high they were thinned out, leaving them from six to eight inches apart in the rows, and leaving four or five plants in each hill. The seed was sown May 27, and the corn was cut green for ensilage September 30. The yield has been calculated from the weight of crop cut from two rows, each 33 feet long.

For the making of ensilage the corn should be cut when the kernels are in the late milk or doughy stage; but the summer at Ottawa is not always warm enough to bring the later varieties to this state of maturity before it is necessary to cut the crop to avoid frost.

In Canada the ton contains 2,000 pounds.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Yield per Acre Grown in Rows.		Yield per Acre Grown in Hills.	
			In.			Tons.	Lbs.	Tons.	Lbs.
1	Early Mastodon	Strong	100-110	Leafy	Late milk	27	835	26	800
2	King of the Earliest	"	80- 90	Very leafy	Early milk	21	955	17	155
3	Giant Prolific Ensilage	"	80- 90	Leafy	"	20	755	18	300
4	Mammoth Cuban	"	85- 95	Very leafy	"	19	1,600	19	775
5	Pride of the North	Very strong	95-105	Leafy	"	19	500	18	1,290
6	Early Butler	Strong	90-100	Very leafy	"	19	280	19	500
7	Compton's Early	Medium	80- 90	Leafy	Late milk	18	1,840	17	1,860
8	Champion White Pearl	Strong	80- 90	Very leafy	Early milk	18	355	17	1,200
9	Selected Leaming	"	80- 90	"	"	17	1,970	16	10
10	Thoro'bred White Flint	Very strong	95-105	"	"	17	1,200	17	540
11	Red Cob Ensilage	"	95-105	"	"	17	100	14	160
12	Superior Fodder	"	90-100	"	"	16	780	16	340
13	Cloud's Early Yellow	"	85- 95	"	"	16	560	15	1,955
14	Sanford	Medium	85- 95	Medium	Late milk	15	1,570	13	1,500
15	White Cap Yellow Dent	"	80- 90	Leafy	Early milk	15	1,460	12	1,300
16	Salzer's All Gold	"	75- 85	Very leafy	"	15	1,460	14	1,810
17	Longfellow	"	65- 75	Medium	Late milk	15	1,240	14	1,260
18	Mammoth Eight-rowed Flint	"	70- 75	"	"	15	140	13	1,720
19	North Dakota White	Strong	85- 95	Very leafy	"	14	1,700	15	1,515
20	Eureka	Medium	75- 85	"	Early milk	14	1,370	14	930
21	Evergreen Sugar	"	75- 85	Medium	"	14	600	13	1,555
22	Angel of Midnight	"	75- 85	"	Late milk	13	180	12	860
23	King Philip	"	65- 75	"	Early milk	11	1,100	11	1,760

The average yield from the rows was 17 tons 502 pounds per acre, and from the hills, 16 tons 352 pounds per acre; showing an advantage, this season, of 1 ton 150 pounds per acre in favour of the corn grown in rows.

INDIAN CORN SOWN AT DIFFERENT DISTANCES.

Three varieties were chosen for this test: Champion White Pearl, Selected Leaming and Longfellow. The seed was sown May 27 and the corn was cut for ensilage September 30. Sixteen rows of each variety were sown, that is, four rows at each of the distances mentioned, and the yield per acre has been calculated from the weight of crop obtained from the two inner rows in each case. The length of the portions of the rows cut for weighing was 33 feet.

Name of Variety.	Distance between the Rows.	Character of Growth.	Height when Cut.	Condition when Cut.	Yield per Acre.	
	In.		In.		Tons.	Lbs.
Champion White Pearl	21	Medium	70—80	Early milk	28	1,078
" "	28	Strong	75—85	"	22	626
" "	35	"	85—95	"	19	665
" "	42	"	85—95	"	14	1,140
Selected Leaming	21	"	70—80	"	31	181
"	28	"	80—90	"	21	1,287
"	35	Very strong	85—95	"	17	375
"	42	" "	85—95	"	17	733
Longfellow	21	Weak	55—65	Late milk	15	1,752
"	28	"	55—65	"	14	1,469
"	35	Medium	60—70	"	14	820
"	42	"	70—80	"	14	59

It will be seen that, in every case, the largest yield per acre was obtained from the rows which were closest together. In previous years this has not always been so. The character of the season has evidently an important influence on the results.

GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON SANDY LOAM.

These experiments were all conducted on plots of one-fortieth of an acre each. The wheat was sown on April 25 and was ripe on August 11. The oats were sown April 25 and were ripe August 11. The barley was sown April 25 and was ripe August 8.

The results of the tests in previous years are published, for comparison, along with the figures obtained this year.

Name of Variety.	Quantity Sown per Acre.	Number of Days from Sowing to Harvesting.			Yield Per Acre.					
		1901.	1902.	1903.	1901.		1902.		1903.	
					Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Preston Wheat..........	1 bushel....	100	108	108	10	20	24	..	15	..
" "	1¼ bushels...	100	108	108	15	..	20	40	14	20
" "	1½ " ..	100	108	108	19	40	15	20	20	40
" "	2 " ..	100	108	108	20	20	10	40	15	20
" "	2½ " ..	100	108	108	21	..	20	40	13	20
" "	3 " ..	100	108	108	19	40	17	20	16	40
Banner Oats...........	1½ " ..	96	107	108	41	6	60	..	63	18
" "	2 " ..	96	107	108	59	14	45	30	56	16
" "	2½ " ..	96	107	108	57	2	52	32	79	14
" "	3 " ..	96	107	108	43	18	50	20	84	4
" "	3½ " ..	96	107	108	31	26	50	20	88	8
" "	4 " ..	96	107	108	35	10	54	4	67	22
Mensury Barley..........	1½ " ..	84	95	105	35	35	40	40	61	32
" "	2 " ..	84	95	105	37	19	28	16	60	..
" "	2½ " ..	84	95	105	43	11	27	24	54	28
" "	3 " ..	84	95	105	42	19	37	24	46	12
" "	3½ " ..	84	95	105	39	23	26	32	47	44
" "	4 " ..	84	95	105	43	11	45	..	35	40

GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON CLAY LOAM.

These experiments were all conducted on plots of one-fortieth of an acre each. The wheat was sown April 30 and was ripe August 16. The oats were sown April 30 and were ripe August 18. The barley was sown April 30 and was ripe August 11.

The results of the tests in previous years are published, for comparison, along with the figures obtained this year.

Name of Variety.	Quantity Sown per Acre.	Number of Days from Sowing to Harvesting.			Yield Per Acre.					
		1901.	1902.	1903.	1901.		1902.		1903.	
					Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Preston Wheat..........	1 bushel....	97	108	108	28	20	24	40	28	40
" "	1¼ bushels...	97	108	108	28	20	24	40	30	..
" "	1½ " ..	97	108	108	29	..	29	20	30	40
" "	2 " ..	97	108	108	26	20	28	..	28	..
" "	2½ " ..	97	108	108	26	20	30	..	29	40
" "	3 " ..	97	108	108	25	..	24	40	28	20
Banner Oats...........	1½ " ..	92	111	110	58	28	63	18	72	32
" "	2 " ..	92	111	110	65	30	62	12	78	28
" "	2½ " ..	92	111	110	67	2	72	32	74	4
" "	3 " ..	92	111	110	64	24	67	2	80	20
" "	3½ " ..	92	111	110	61	6	70	20	84	24
" "	4 " ..	92	111	110	57	22	67	2	88	28
Mensury Barley..........	1½ " ..	83	99	103	37	..	64	8	54	28
" "	2 " ..	83	99	103	40	35	70	40	59	28
" "	2½ " ..	83	99	103	44	3	68	16	48	16
" "	3 " ..	83	99	103	45	35	69	8	50	..
" "	3½ " ..	83	99	103	45	35	65	..	50	..
" "	4 " ..	83	99	103	44	3	62	24	58	16

DOUBLE ROWS OF GRAIN.

Important varieties of cereals which have been rejected from the uniform test plots as undesirable for general cultivation are retained for reference purposes, and are grown annually; two rows of each variety being sown, the distance between the rows being about six inches, and the length of the rows 33 feet. Each pair of rows is separated from the neighbouring pairs by a space of about two feet. In these double rows are also sown the new varieties of grain originated at this farm which are available only in very small quantities and which are being propagated for larger plots. A few of the best standard sorts are also grown in the double rows for comparison with the other varieties.

These double rows form an interesting object lesson for visitors, presenting as they do a large number of distinct types in a very small area.

The accompanying plate gives a good idea of the appearance of these double rows in the early stages of growth.

REPORT OF THE POULTRY MANAGER.

(A. G. GILBERT.)

OTTAWA, December 1, 1903.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I submit with pleasure the sixteenth annual report of the Poultry Department of the Central Experimental Farm.

Among other subjects, brought to the notice of the farmers as immediately affecting the poultry interests of the country, are the following:—

1. A rapidly growing demand for new laid eggs in winter and the superior quality of poultry flesh. Is the production in proportionate increase ?

2. Some obstacles to more rapid poultry development. How they may be overcome.

3. The detrimental practice (which is too common) of using birds of the smaller breeds for crossing, or for any other purpose, in preference to those of the utility pure breeds, such as Plymouth Rocks, Wyandottes, Orpingtons, &c., &c.

4. What experience has shown to be the best breeds for the farmer to adopt.

5. The value of building up strains of hardy fowls which will make good winter layers in cold houses, and the progeny of which will make early and rapid growing chickens. Instances of how this has been accomplished are given.

6. The experimental work of the year, in which is shown, in detail, the results of winter laying ; the hatching, rearing and proper feeding of chickens from incubator or nest to marketable age ; the summer and fall management of the young and old stock, and other information of practical import.

A feature of the past year was the high price of new laid eggs during the late summer and fall months. The probable cause of this—in the more general practice among farmers of causing their fowls to moult during the late summer months (the season of low value for eggs)—is pointed out in report, and the still further adoption of this business-like method is urged. It has been found from experience that in order to have fowls lay in winter it is necessary for them to moult during the summer, and as the moulting period is one of non-production it is wise to have that time of non-production when prices are lowest.

Some further experiments in the fattening of chickens in crate and pen, conducted by Mr. F. T. Shutt, chemist, will be found appended. It may be remembered that in experiments of a similar nature, carried on by the same gentleman last year, the advantage seemed to be with the birds kept in pens. This year the crate-kept birds make a slightly better showing. It will be interesting to note further results.

It is with gratification that I note the appointment of Mr. Victor Fortier, of St. Jerome, Que., as assistant in the management of the department under my charge. Mr. Fortier is an experienced poultry breeder and exhibitor, and his assistance will not only afford opportunity for extended usefulness of this department, but for the development of the poultry interests of the province of Quebec, the requirements of which, in this respect, he is so well acquainted.

I have much pleasure in again mentioning the faithful services of Mr. George Deavy, who has for a number of years past assisted me in the care and management of the birds under my charge.

It is to be hoped that the subjects discussed and the information given in this report will be found of practical value by the farmers of the country and act as incentives to greater effort in the production of eggs in winter and the superior quality of poultry flesh in summer, and for which there is such demand.

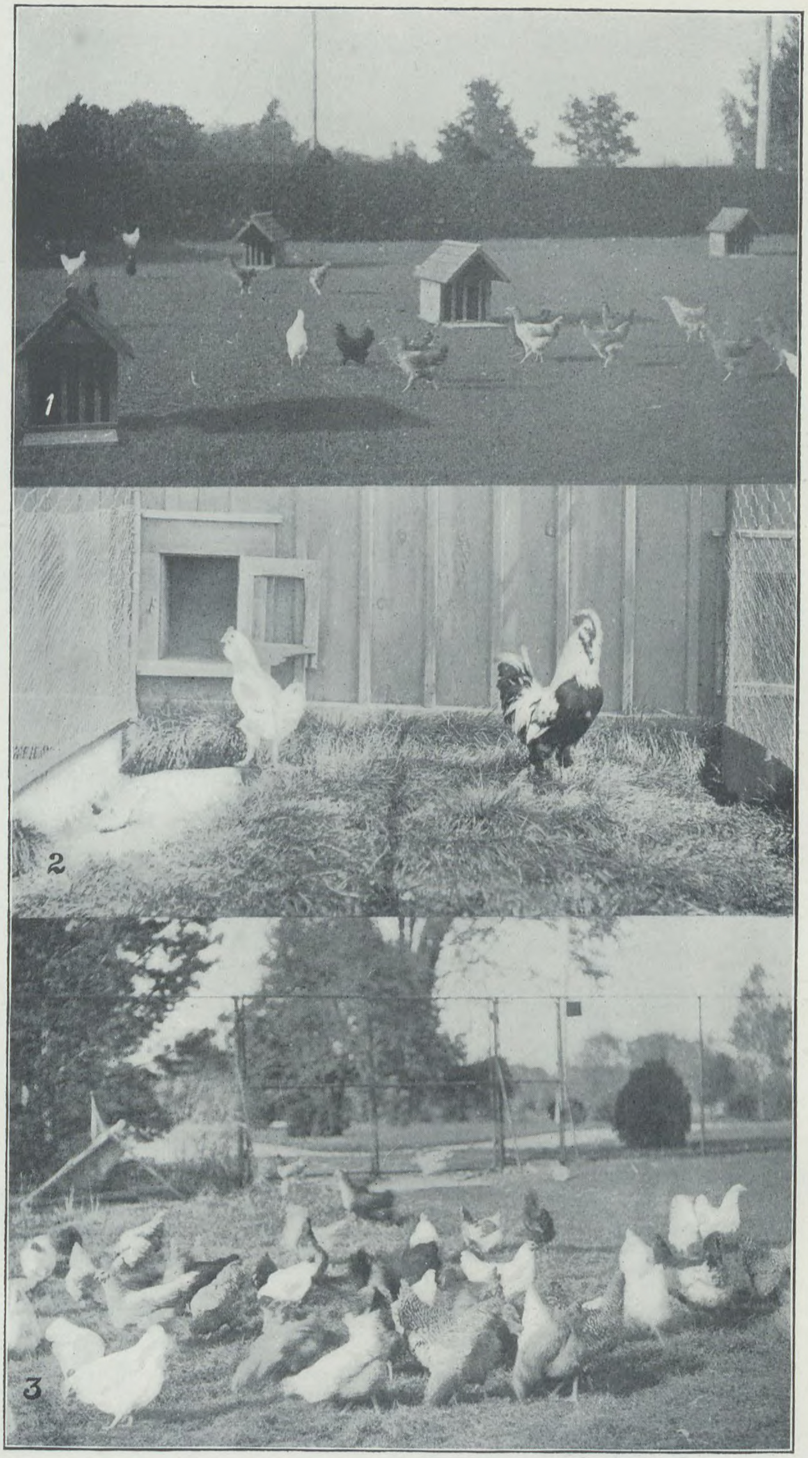
I have the honour to be, sir,
Your obedient servant,

A. G. GILBERT.

Seventeen years ago the first annual report of this department was distributed among the farmers of the country. It contained information as to the breeds best calculated to make winter egg-layers and rapid flesh-forming chickens during summer, so permitting opportunity to make money at both seasons of the year. While the benefit likely to accrue from such a course of action was freely admitted, there was yet—on the part of many persons—a feeling of misgiving which found expression in the exclamation, Oh ! but when the production of winter eggs and the superior quality of poultry is more general, prices will become so low as to be profitless.' Happily such pessimistic foreboding has not been realized. On the contrary prices have either remained stationary or advanced and this notwithstanding an increased production. Comparison with the winter prices of ten years ago and those of last winter will give proof of this. In the case of the city of Toronto, for instance, the advance, during recent years, in winter prices—in face of greatly increased production in the surrounding country—is most marked. In that city eight or ten years ago twenty-five cents would have been considered full value for a dozen of new laid eggs. Last winter the same quality and quantity of eggs sold for forty cents. A corresponding advance in the value of the superior quality of poultry may also be noted. Not only in the district surrounding Toronto has there been increased winter egg and superior quality of poultry production, but throughout the greater part of the Dominion. Why then should prices not have become lower? The answer at once suggests itself, that there has been a greater proportionate increase in the number of consumers. While this is doubtless correct, it is not the only reason. It may be interesting to note some of the causes which experience has shown to mitigate against a greater and more rapid production.

WHY MORE RAPID POULTRY DEVELOPMENT DOES NOT TAKE PLACE.

Experimental work for many years has plainly shown that the obtaining of eggs in winter and a better class of poultry is not so easy as at first glance may seem. Success is dependent upon conditions which are not only more or less exacting according to location, but complete knowledge of which is imperative to success. This is not always realized. The numerous letters received by the writer from different points, show that many are anxious to get results before they know how to do so. And for that reason many try only to fail. On the part of the specialist expert knowledge is requisite. On the part of all, not only knowledge, but patience, perseverance, liking for the occupation and adaptability are necessary factors. Without them success is not likely to be attained.



(Photo. by F. T. Shutt.)

1. Small Colony-houses and Chickens. 2. Faverolle Cockerel and Hen. 3. Breeding Stock. One and two-year-old hens.

A drawback to successful poultry development is often met with in the enthusiast who establishes a plant, buys a number of birds and then writes for information as to proper methods of management and feeding, which should have been first thoroughly learned. A letter received some time ago may be quoted as a case in point. It is is as follows: 'DEAR SIR,—I recently had opportunity to purchase at a bargain one hundred Barred Plymouth Rock pullets and I did so. Will you please tell me how to successfully manage them.—J. M.'

It is hardly necessary to say that in such a case successful results are not likely to follow, and then poultry keeping is at once declared non-profitable.

Another drawback is the practice—frequently on the part of farmers—of keeping more fowls and the hatching of more chickens than can profitably be managed or reared. In report of last year methods of procedure calculated to lead to successful poultry keeping by farmers were given at length. It may be admissible to repeat in this connection, a suggestion made in that report to the effect that 'farmers should keep no more fowls than they can manage profitably, nor should they attempt to rear a greater number of chickens than circumstances will permit of their bringing to saleable age as early in the season as is possible.'

Another too common practice on the farms of the country and which retards poultry development—from winter eggs and better quality of flesh standpoints—is the keeping of 'scrub' stock. Doubtless the practice is not so general as it was, but it should be abandoned. It has been shown in previous reports that 'scrub' poultry are neither as good winter layers as pure bred birds, nor do their chickens make as valuable table fowls. Why have them? It is to be remembered that the cost of feeding a pure bred fowl is no more than that of the nondescript of much less value.

FACTORS IN THE PRODUCTION OF THE SUPERIOR QUALITY OF POULTRY.

More particularly in regard to the superior quality of poultry there is found, as in the case of winter eggs, a far greater demand than there is supply. The demand is from both home and foreign market. That a superior quality of poultry suited to the most exacting tastes of home, or, British market can be produced by the farmers of the country has been demonstrated by the number and quality of the chickens grown in our poultry department and many of which have been killed, dressed and exhibited at farmers' institute meetings, fairs, special meetings and poultry exhibitions throughout the country for many years past.

It has been urged upon our farmers with almost unvarying monotony that not only may they have the desirable chickens of plump and inviting appearance but also excellent winter-laying fowls by their conforming with the following essential conditions, viz.:—

The proper breeds.

Proper management and feeding of the same.

Proper care of the chickens from time of hatching to the saleable age of 3, 3½ or 4 months.

As to suitable breeds it has been shown that no mistake can be made in choosing one of the following varieties, viz.: Barred or White Plymouth Rocks, White Wyandottes or Buff Orpingtons.

Of these varieties and their dual qualifications as egg and flesh producers and the proper caring of their chickens, so as to have the acceptable market type as early as possible, detailed information is given in succeeding pages.

A DETRIMENTAL PRACTICE.

A practice which seriously retards the quicker and greater production of the superior type of market chickens is that of using a Leghorn, Andalusian or Hamburgh male with pure bred or mixed fowls of larger size, presumably with the object of having better layers. While such a course may be permissible from an egg standpoint, it is not advisable for farmers to adopt, who have the dual requirements of eggs and better quality of chickens in view. The result is sure to be chickens of smaller size and much less value than those of the English or American utility breeds. Speaking to the writer on this subject, some months ago, the manager of an extensive purchasing poultry firm of Toronto said 'that the farmers of the country should be strongly urged to abandon the too prevalent custom of using male birds of the Mediterranean breeds for breeding or crossing purposes. We get,' he said, 'so many small chickens of Leghorn or Andalusian cross that we suffer serious loss. These chickens are sent with others and we do not like to refuse them. They cannot be shipped to the English dealers and we cannot put them on the local markets as good quality, so we are glad take what we can get for them.'

Occasionally a case is met with where birds of a large 'first' or 'mixed' cross are kept, and results in winter eggs and large chickens are said to be satisfactory. Inquiry generally elicits the information that all the good points in these fowls are owing to the use of pure bred males of the large breeds, thus conveying the moral that the nearer to the pure breeds the better the birds. In connection with 'first crosses' it must not be forgotten that unless the cross is made every year, by the introduction of new blood, it is apt to degenerate into the nondescript.

WHAT HAS LED TO INCREASED PRODUCTION.

Although not in proportion to the demand there has yet been an increase of production in both winter eggs and better quality of poultry. It may be interesting to note some of the incentives which have led to past, and are likely to lead to still greater future production, viz :—

1. A rapidly increasing demand with continued high price.

2. A better appreciation by farmers of poultry as money makers.

3. Results of tried and successful practical methods given in Experimental Farm reports for the past seventeen years.

4. Practical instruction at farmers' institute, agricultural or special meetings from different sources.

5. Greater attention to and the devoting of more space to poultry matters by agricultural papers.

6. Increased railway facilities whereby the higher price markets may be reached.

HIGH PRICE OF EGGS LAST SUMMER AND AUTUMN.

A remarkable feature of last summer's poultry and egg trade was the high price of new laid eggs throughout the country, but more particularly in city markets. During the months of July and August last, a period heretofore of lowest prices, new laid eggs were worth from 18 to 20 cents per dozen, the value gradually rising until 25 cents were obtained for them in September and 30 cents in October. Speaking of this unusual state of affairs, the Toronto *Telegram*, of 19th October last, says : 'What the householders of our city want to know is why they have to pay 30 cents per dozen for new laid eggs at this season of the year ?' And then follows the statement that one reason may be found in the changed methods of management on the part of many farmers, by which the moulting of their hens in summer is brought about with the view of having them winter layers. And such explanation, so far as it applies, is undoubtedly correct, for as soon as 'bringing on the moult' during the summer is generally practised by farmers, new laid eggs in autumn will surely be in less supply. The moulting period, which occurs once every year, is really one of non-production, and it is only wise to have it at the time of year when values are at their lowest. In the poultry department—Experimental Farms Report—for 1896, page 288, full information is given as to how early moulting for some years previously had been brought about, and farmers are advised to adopt a similar course. In 1901 report the subject is again referred to.

It is quite likely that the shortage of eggs during the autumn months will be followed by an increased winter egg production, and as a probable consequence a slight lowering of prices during that season. Should this take place, the experience of recent years tends to show that any falling off in winter values will be compensated for by increased prices during the moulting period. It is quite possible that a more uniform all-the-year-round price for the new laid article may be the ultimate result.

A QUESTION AS TO POSSIBLE LOWER PRICES.

The question is now being asked : 'Has experimental research shown any likelihood of lower prices in the near future ?'

In reply to this it may at once be said : 'Not as long as the demand is greater than the supply, as it is at present.'

So far instruction from our poultry department, and which is warranted by experience, has been in the way of showing farmers the best and cheapest ways and means of obtaining eggs and the superior quality of poultry at such seasons of the year as will bring them the highest prices. In this connection, observation has shown that there is greater likelihood of a larger and more immediate supply of new laid eggs in winter than of the superior quality of market poultry in later months. For the reason that so many farmers have more time in winter to care for their laying stock (and which attention is absolutely necessary) than they have in the spring and early summer to devote to the hatching and rearing of chickens. This phase of the subject is fully discussed in poultry department report for last year, 1902.

WHAT BREEDS EXPERIENCE HAS SHOWN AS BEST FOR FARMERS—PREVIOUS INSTRUCTION CONFIRMED.

Much experience has been gained since the first report of this department was issued seventeen years ago. Better methods of management and the more effective application of different rations have made themselves evident from time to time, and have been noted in previous reports. But it has not been found necessary to recommend any other than certain breeds which, from the first, have proved themselves best suited to the requirements of the farmers, as winter layers, and the progeny of which make quick growing chickens. Rather has experience shown that a more general adoption of such breeds would be followed by still better results. The fowls of Plymouth Rock and Wyandotte breeds have always been advocated as essentially 'utility breeds' for farmers, because experimental handling of them for many years has proved them to be such. To-day these breeds are placed by practical authorities at the head of the list of fowls best adapted to the wants of the farmer. Other breeds have come to the fore in recent years, notably the Orpington family of English origin, with its numerous varieties, and each with strong claims as prolific egg layers and flesh makers of acceptable market type. We have also Rhode Island Reds, from the eastern states of America, with strong claims from utility standpoints. These breeds are now on their trial. If they have the merit claimed for them, they will take rank with the best. If they cannot hold their own in competition with the other standard breeds named no sentimental regard or 'bolstering up' will be found sufficient to keep them from a lower rating. It is a matter of congratulation that it has not been found necessary to make any change in the advice given as to the breeds best adapted to the requirements of the farmer. To have recommended change without reason would have been to confuse rather than benefit.

STRAIN ALL IMPORTANT.

The importance of *strain* has made itself apparent in no uncertain manner. Letters received from many points of the country show that much of the disease among poultry in recent years may be traced to inbreeding and the resulting lack of constitutional vitality. This has made itself very evident in the case of turkeys, the mortality among which in all parts of the country is much greater than it should be. In summing up the results of an egg laying contest held in England some months ago, the secretary of a leading poultry association of that country remarks 'that the value of strain made itself more evident than ever. It did seem as if strain was as important, if not more so, than breed.' Such being the case, farmers who purchase eggs for hatching, or stock to breed from, should ascertain that both are from strains of noted worth.

THE EXPERIMENTAL WORK OF THE YEAR.

Experience has shown that in order to have hens lay early and well during winter it is necessary that they should moult during the summer months. The numerous inquiries received from time to time, as to how this is accomplished, shows growing appreciation of the importance of the event. A description of the methods which have been sucessfully adopted in our department for the past and several previous summers will best convey the information as follows : 'The sale of eggs for hatching purposes being over during the first week in July the male birds were removed from the breeding pens to another building containing small compartments with outside runs. The breeding stock as well as all other hens were then allowed to run promiscuously in fields in rear of the poultry buildings where there were grass, clover and shade, three important essentials. At this time the rations were reduced to half quantity. The effect of this was immediately to very much reduce and ultimately to almost entirely stop egg production, which was the desideratum. The half rations were continued for two weeks when full quantity was resumed as follows : Mash composed of coarsely ground oats 2 parts; shorts 1 part; gluten meal 1 part with beef scraps in proportion of one pound to 15 fowls. The mash, which in summer was mixed with cold water was fed three times per week. At times a small quantity of linseed meal was added. The beef scraps were used in lieu of cut green bones because it was not convenient to procure the latter. If mash was fed in the morning wheat, or oats or both mixed were given in the afternoon, or, *vice versa*. On such days as mash was not given grain took its place. An excellent summer grain ration is composed of buckwheat and oats mixed. Pure water should always be in abundant supply. In response to this treatment results have always been satisfactory and by the end of September or beginning of October the hens have looked remarkably well. The advice of Dr. Sanborn, a well-known poultry authority, in reference to the moulting period is valuable enough to warrant its repetition. He says: 'A moulting hen is easily fattened. Hence at this period feed lightly of those foods which produce fat. Corn, cornmeal, middlings, potatoes must be used sparingly. Increase the amount of green bone, bran and skim milk. A run in a field of clover will be a help. Keep all males by themselves during the moulting period. Shelter the hens from storms or cold rains. The ideal place for a run is an apple orchard where, in addition to the grass, may be found insects in the fallen fruit, &c. Birds should go into the moult not fat, free from lice and with no red mites in the house.'

EARLY FALL WORK—HANDLING THE PULLETS.

No effort was made to stimulate the hens to lay during October. What eggs there were came from early hatched pullets which, with the other chickens hatched during the season, were kept in location some distance from the older stock. Experience has shown the advisability of keeping the pullets away from the hens of older age. For the reason that the quantity of stimulating food that would be positively beneficial to the pullets would make the more mature laying stock—notably of the heavy breeds—too fat. And the object of every experienced breeder is to avoid such disaster as having his prospective layers go into winter quarters in an overfat condition. It is to be borne in mind that it is far easier to prevent than to remedy an overfat condition. In a previous page it is stated that one of the drawbacks to a greater supply of new laid eggs during winter is a lack of knowledge or appreciation of certain essentials necessary to success. Here is one of these details met with at the beginning of the season of highest prices. If the prospective layers through mismanagement, or, carelessness are allowed to become too fat, it is a matter of weeks to get them into proper condition. The dividing line between too much and too little is very fine. He who knows the happy medium makes the profit. Only a thorough knowledge of conditions and close observation of symptoms will show where the line is to be drawn.

WHEN THE PULLETS BEGAN TO LAY.

The pullets which had been well-fed and cared for from time of hatching, began to lay at age and dates as follows :—

B. P. Rock pullet hatched April 14, laid October 5.

L. Bra-P. R. Cross pullet hatched April 17, laid October 25.

W. P. Rock pullet laid November 19.

Buff Orpington pullet laid November 27.

Faverolle pullet laid November 17.

COMMENCEMENT OF WINTER LAYING

In the early part of November last the first snow fell and remained. The fowls were, in consequence, placed in different pens according to variety. Experience has shown that where a number of fowls are kept in different compartments, when once placed they should be allowed to so remain. Moving them from one place to another has always been found detrimental to early or steady laying. This is known to experienced breeders, but beginners are sometimes apt to indulge in the practice. Winter laying may be said to have begun on the 18th November and was fairly general by the end of the month, when 30 to 37 eggs were laid per day, the number increasing as the month became older. The first fowls to begin laying after moulting were :—

Barred Plymouth Rock, hens and pullets ; White Plymouth Rock, hens and pullets ; Buff Leghorn, hens and pullets ; Faverolle, hens and pullets ; Buff Orpington, hens and pullets; Buff Plymouth Rock, hens and pullets.

TESTING FERTILITY AND STRENGTH OF GERM.

During the months of March and April for some years past investigation has been made with the view of discovering, if possible, the cause, or causes, of so many weak germs found in eggs laid at the latter part of winter, and early spring by hens which were confined to limited quarters in the farm poultry houses. The houses were artificially heated to a moderate temperature, varying from 30 in cold weather to 50 degrees on mild days. The fowls had been gently stimulated to lay, but with no condiment, and had laid fairly well. But these eggs when hatched out in late March or April by incubator or hens, produced few chickens. The eggs on being tested showed a fairly satisfactory percentage of fertility, but on examination, after the hatch was over, a great many chickens were found dead in the shell, the majority of them, at the 'pipping' stage.

With the view of obtaining further *data* a number of pens were mated up on the fowls going into winter quarters. Tests heretofore had been made towards the end of the winter season. The object on this occasion was to test the fertility and strength of germs of eggs laid early in December and before the hens had become enervated by long laying or confinement. Accordingly on December 20, 181 eggs of different breeds (enumerated further on) were placed in an incubator. On the 26th instant 18 clear eggs (i.e., without germs) and 6 with partially developed germs, were removed.

On January 1 (eleven days from date of placing eggs in incubator) a further test was made with the following results:—

Barred Plymouth Rocks—46 eggs showed 69 per cent fertility.

L. Bra-B. P. Rock Cross—54 eggs showed 90 per cent fertility.

Rhode Island Reds and White Plymouth Rock—49 eggs showed 61 per cent fertility.

Buff Leghorns—8 eggs showed 26 per cent fertility.

The rapidly developing germs presented a strong and healthy appearance. This was confirmed by later examination. An unfortunate accident to the incubator two days before the chickens were due resulted in the death of all but 26, which, however, hatched out apparently strong and healthy.

Further experimental tests were made with eggs laid from time to time during the balance of the season and confirmed the conclusions of previous years. These conclusions showed that the longer and closer the term of artificial life of the laying stock the greater was the weakness of the germs. In report of 1901, a mistake frequently made, that of speaking of fertility and strength of germ as of one and the same significance, is pointed out. Experience has shown, with no uncertainty, that it is one thing to have a high percentage of fertility and another to have results in a corresponding number of robust chickens. It is the strong and lively chicken which will make rapid growth, that is wanted. It has been shown by experiment that the germs in eggs from hens closely confined to winter quarters, but laid in spring time, although showing a high percentage of fertility, did not result in many chickens. The germs had died in different stages of development, the greatest number when fully developed, or at the 'pipping stage.' And in many cases the chickens which came out proved weaklings. As warranting the foregoing conclusions, the following results of experimental tests are given:—

On March 27 last (1903), 202 eggs of different breeds (described further on) were placed in one of the most reliable incubators on the market. The result was 39 chicks. The eggs placed in the incubator were laid probably during the third week of the month named, and by hens which were kept in artificially, but moderately heated compartments of our poultry houses. The fowls had received generous rations with a view to egg production, and had laid fairly well for the most part of the previous winter. The following table shows a fairly satisfactory percentage of fertility, but an unsatisfactory number of chickens hatched:—

RESULTS from Early Spring Eggs laid by hens kept in warm houses during winter. Put into an Incubator on 27th March, 1903.

Discription of Eggs.	No. of Eggs put in Incubator.	Eggs Tested Out.	No. of Chickens Hatched.	Eggs which did not Hatch.	Examination of Eggs which did not Hatch and Results.
Rhode Island Reds......	31	10	7	14	Of these one was found clear; remainder contained fully developed chicks dead in shell.
Barred P. Rocks........	29	5	2	22	1 egg apparently without germ; 21 eggs with fully developed chickens dead in shell.
White P. Rocks.........	38	15	11	12	1 egg without germ; 11 chicks dead in shell at pipping stage.
Silver Gray Dorkings ...	34	12	7	15	Eggs with germs dead at various stages of incubation.
White Wyandottes......	20	6	8	6	1 egg without germ; remaining eggs contained well developed chickens dead in shell.
Buff Orpingtons.........	26	9	1	16	2 eggs found without germs; remaining eggs with germs dead in more or less advanced stages of incubation.
L. Bra.-B. P. Rock cross.	24	5	3	16	Unhatched eggs in different stages of incubation.
Total.......... ..	202	62	39	101	

The above table shows a large number of unhatched eggs, which, upon examination, were found, in the great majority of cases, to contain chickens fully developed but dead, presumably too weak to break their way out of the shell, a very discouraging result certainly. Under similar circumstances, the first conclusion would be, on the part of the inexperienced, to blame the incubator. But if it hatched 39 chickens, was it not as capable of hatching out more, if germs were as strong in the unhatched eggs as in those which produced chickens?

SIMILAR EGGS UNDER HENS AND RESULTS.

In order to ascertain results with hens as hatching mediums, on the same day as the incubator was started, three Faverolle hens, which were broody, were given 13 eggs each. The eggs were of the same kind and age as those put into the incubator, as follows:—

Description of Eggs	No. of Eggs Set.	No. of Chicks Hatched.	Remarks.
Barred P. Rock..........	13	1	Eggs were hens' and pullets'. On testing all eggs showed fertility. Examination of eggs which did not hatch showed 8 with fully developed chicks dead in shell at 'pipping' stage; 3 eggs with premature germs; 1 egg was missing.
White Wyandotte........	13	6	Hens' eggs; 2 clear eggs were tested out; 1 fully developed chick was dead in shell; 2 eggs were missing, probably broken in nest; 2 chicks were crushed by hen in nest.
Rhode Island Reds.	13	8	Hens' eggs. On testing one egg was found to contain dead germ; 1 egg was accidentally broken. Examination of eggs which did not hatch showed 2 fully developed chicks dead in shell; 1 egg with partially developed germ.
Barred P. Rock..........	13	2	This hen was set on April 4th, a week later than the preceding ones. On testing 3 clear eggs were found. Remaining 10 eggs all showed fertility. Examination of unhatched eggs showed that two fully developed chicks had been crushed in nest by hen. Remaining 6 eggs contained dead germs.
Total...	52	17	

As compared with results from the incubator this showing is in favour of the hens, but the average experience of several years past does not point to much difference between incubator or hen when conditions are equally favourable to both.

RESULTS FROM EGGS LAID BY HENS IN COLD HOUSES.

The above results, it will be borne in mind, are from eggs laid by hens which had been kept in warm houses and given rations calculated to gently stimulate egg production during winter. It will be interesting, then, to compare these results with those from hens which had not—nor had their parent stock—known what warm winter quarters were. Fowls which were kept under such conditions as are to be met with in the majority of farm-yards throughout the country. Certain conclusions are noted in report of last year. Investigation was continued last winter and spring, as follows:—

On the 11th of last March 13 eggs laid by Buff Orpington pullets from hardy stock —as described above—were set under a B. P. Rock hen. On 2nd of April 10 chickens hatched. On eggs being tested, one clear egg was found. Examination of the two eggs which did not hatch showed two embryos, which had probably died about fourteenth day after eggs were put under hen.

On March 21 (ten days later), 13 eggs, also laid by Buff Orpington pullets, were placed under another B. P. Rock hen. On 11th April, 11 chickens hatched, one chick was crushed in nest by the hen. Examination of the remaining egg showed a fully developed chick dead about 'pipping' time.

On March 21 (same day), 13 eggs of Buff Orpington pullets were given to a Langshan hen. Result, 11 chicks.

The most convincing results were obtained from 16 eggs (half Buff Orpington and half B. P. Rock pullets), which on March 9 were placed under a large hen, and in due course every egg hatched. And what was further satisfactory, every one of the 16 chickens lived and made rapid growth.

The total of 48 chickens from 55 eggs laid by pullets, which had been kept in cold winter quarters—as had their parent stock—and which had been good winter layers, is in favourable contrast with 17 chickens from 52 eggs laid by fowls which had been kept in artificially warmed poultry houses.

It is also an effectual answer to the statement, sometimes made, that strong germs cannot be had in early spring time from hens which have laid steadily during the winter.

To farmers, particularly those in parts of the Dominion where the winters are rigorous, these results are important, as they are strikingly in favour of fresh air and plenty of it, even if it is cold.

They are doubly important, as giving proof that with intelligent effort it is possible and profitable to build up strains of fowls to suit winter conditions, rather than to attempt making winter conditions suit the fowls.

SUMMARY OF EXPERIENCES GAINED RE FERTILITY AND STRENGTH OF GERM OF EGGS LAID IN WINTER.

A summary of the experiences gained in connection with the testing and hatching results of eggs laid during the cold season under conditions described, in detail, in foregoing pages may be given as follows:—

1. The generous and gently stimulating rations given to the fowls kept in cold houses did not seem to affect the strength of the germs of the eggs laid by them, as similar rations apparently did in the case of the hens kept in artificially warmed quarters.

2. Eggs laid in early December by the hens in artificially warmed houses showed a greater percentage of strong germs than did eggs laid by them later in the season.

3. Eggs laid by the same hens in early spring showed a satisfactory percentage of fertility, but the weakest germs.

4. The most striking and gratifying results were obtained from the fowls which, like their parent stock had never known warm quarters. From 55 eggs laid by these fowls in early spring—after laying well during the winter—48 strong chickens were hatched. In contrast with this are 17 chickens from 52 eggs laid by hens kept in warmed, but comparatively limited quarters.

5. Results were strongly in favour of the average farm conditions, such as were described by Mr. Wm. Moe, of South Franklin, Que., on page 318 of 1901 report. Mr. Moe has an open shed attached to his poultry house, and to this shed, which is protected by a curtain in stormy weather, his fowls have access, so obtaining fresh air and exercise. The latter is secured by throwing grain in litter which is always on the floor of the shed.

HOW THE HENS WERE SET.

Although incubators are becoming more general in use, there are yet a number of persons who use hens as hatching mediums. To them the following method as adopted in the poultry department of the experimental farm will be found useful. During the early part of the season several hens became broody, presumably those which had laid well during winter, and they were given eggs. Wooden boxes, without bottoms, and with a hinged door in front, were used to place the sitters in.

These boxes should be roomy and need not be expensive. At the bottom of the box a comfortable nest was made, preferably of oat straw, which was well dusted with insect destroying powder. Three or four imitation eggs were placed in the nest and the sitter, which was also well dusted with powder, was placed on the eggs. She was allowed to remain on these eggs for 24 or 36 hours. The object in so doing was to destroy any vermin that might have been on hen, or in the nest. A lice-infested fowl will not make a good sitter. Should she succeed in bringing out a number of chickens they will likely be seized upon by the lice and will soon dwindle away. Scores of chickens are lost every season in this way, and the cause attributed to any but the right one. Two or three times during the incubating period the sitter should be dusted under the wings, in the fluff and back of the neck with lice-destroying powder. In the case of borrowed sitters some such measures are absolutely necessary. Food, in the shape of mixed grains, water and grit were supplied regularly every day. In the morning the doors of the nest boxes, which had been closed from the previous day were opened, and the sitters allowed opportunity to get to food and drink. Where there are valuable eggs they should be examined every morning when the sitter is off the nest. If any have been broken the remaining eggs should be carefully washed in lukewarm water and returned to the nest, which should also be thoroughly cleansed. In early spring, when the weather is yet cool, the sitter should not be away from the nest longer than eight or ten minutes.

INCUBATORS.

With all incubators are sent full instructions as to their proper management and care. Instructions as to care and feeding of the chickens accompany all brooders, which are generally purchased with the incubator and from the same maker. As is generally known, the chickens, 36 hours after being hatched in the incubator, are removed to the brooder where they will remain until fully feathered, when they will be removed to other quarters. The brooder is really the foster-mother, as it is called in England. The chickens are hatched in the incubator and reared in the brooder.

EGGS SET AND CHICKENS HATCHED.

The following table shows the number of eggs set and chickens hatched. It also gives description of the eggs which did not hatch—as learned by examination after the other eggs had hatched out chickens.

EGGS SET AND CHICKENS HATCHED. DESCRIPTION OF EGGS WHICH DID NOT HATCH.

When Eggs were Set.	Description of Eggs.	Hens or Pullets Eggs.	When chicks were Hatched.	Number of Chickens.	Description of Sitter.	Results of Examination of Eggs during and after Hatching.
1903.						
March 5...	13 Buff Orpington eggs...........	Pullets......	March 26.	5	Buff Orpington	Eggs from Winchester, Ont. Tested out 4 clear eggs. 1 with germ just started. 3 contained half developed germs.
" 11...	13 " "	"	April 2.	10	B. P. Rock hen. ...	Eggs were from hens kept in cold houses with run in shed. Only 3 eggs did not hatch. 1 of these was clear. 2 others contained embryos dead at 14th day.
" 21...	13 " "	"	" 11.	11	" "	Eggs from hens kept in cold house but with run in shed. 1 chick crushed in nest. 1 egg contained fully developed chick but dead.
" 21...	13 " "	"	" 11.	11	Langshan hen.......	Eggs from hens kept as two previous ones. 1 egg broken by hen. 1 chick crushed in shell.
" 24...	13 " "	Hens.......	" 14.	5	Buff P. Rock hen....	These hens were probably a little fat. They were kept in a cold house, but did not lay as well as pullets. 2 eggs were clear. 2 were addled. 1 contained fully developed dead chick. 3 with partially developed germs.
" 24...	13 B. Plymouth Rock eggs..........	Pullets......	" 14.	8	" " ...	From fowls kept in cold house as previous ones. Examination showed 3 clear eggs. 1 chick crushed in shell. 1 egg missing.
" 27...	13 " "	Both.......	" 17.	1	Faverolle hen	Eggs were from hens kept in an artificially heated house. On examination 8 eggs were found to contain 8 fully developed chicks dead in the shell about pipping. 1 egg was missing. 3 contained immature germs.
" 27...	13 " "	Hens	" 17.	6	" "	Hens kept in warm house. On testing 2 eggs were found clear. 2 chicks crushed in nest. 1 dead in shell. 2 eggs missing.
" 27...	13 Rhode Island Red eggs..........	"	" 17.	8	" "	In testing 1 egg accidentally broken. 1 with dead germ. After hatching 2 fully developed chicks dead in shell. 1 partially developed.
April 4...	13 B. Plymouth Rock eggs..........	"	" 25.	2	Orpington hen......	On testing 3 eggs were found clear. All remaining eggs contained apparently strong germs yet results were poor, showing weak germs. 2 chicks were killed by hen. Remaining eggs contained dead germs.
" 9...	13 Jubilee Orpington eggs..........	Pullets.....	" 30.	3	" "	Eggs were imported from New Jersey. Were shaken up in transit. 1 egg broken. 1 chick dead in shell. 4 eggs addled. 4 chicks crushed in shell by hen.
" 9...	13 " "	"	" 30.	5	R. I. Red hen......	2 eggs were broken. 5 eggs were addled. 1 chick dead in shell. Eggs came by express from New Jersey.
" 11...	13 " "	"	May 1.	5	Buff P. Rock hen....	On examination 3 eggs were found addled. 5 eggs were missing.
" 12..	13 Brown Leg—B. P. R. cross eggs ..	"	" 2.	12	S. G. Dorking hen..	Only 1 egg did not hatch. Hens having had run outside for some time germs had become strong.

" 16...	13 B. P. Rock eggs............ ...	"	" 7.	7	White P. Rock pullet	Eggs came from Moosomin, N.W.T., and were probably much shaken up. 1 egg was clear. 1 addled. 1 missing. 3 with partially developed germs.
" 16...	13 "	"	" 7.	3	Buff Rock hen......	Eggs from Moosomin, N.W.T. Probably shaken up *en route.* 5 clear eggs. 3 with dead chicks. 1 addled. 1 egg missing.
" 16...	13 Buff Orpington eggs..............	Hens.......	" 7.	3	S. G. Dorking pullet	Old male bird mated with hens. Result 10 clear eggs.
" 20...	13 Black Minorca eggs...............	"	" 11.	9	Faverolle hen.......	1 egg with fully developed chick dead in shell. 2 chicks crushed in shell by sitter. 1 egg addled.
" 30...	13 Brown Leg—B. P. R. cross eggs ..	Pullets......	" 21.	9	White Wyandotte hen	2 chicks killed.
May 7...	11 White Leghorn eggs..............	"	" 28.	5	B. P. Rock hen.	On testing eggs, which came from Myrtle, Ont., 5 were found to be clear. 3 eggs were broken, thin shells.
" 7...	13 Silver G. Dorking eggs.	"	" 28.	6	S. G. Dorking hen ..	On examination 7 eggs were found with germs in different stages of development.
" 7...	5 B.P.R.-5 W.Wy.-3 Buff P.R. eggs	"	" 28.	13	W. P. Rock hen	All eggs hatched.
" 11...	13 Buff Orpington eggs........... .	"	June 1.	9	" "	Eggs from Winchester, Ont. 1 egg was found clear. 2 with germs partially developed. 1 egg broken.
" 12...	8 Buff Orp.—5 B. P. Rock eggs.....	Hens.......	" 2.	8	B. P. Rock hen.....	On testing all eggs seemed fertile. On examination after hatching 2 eggs were found which did not hatch. 1 chick was crushed in the nest. 2 eggs were missing.
" 23...	13 Buff Orpington eggs..............	Pullets......	" 13.	11	W. P. Rock hen	On examination after hatching 2 eggs were found addled. These eggs were obtained from Mr. J. S. Allen of Ottawa.
June 5...	15 Assorted eggs.....................	Both........	" 26.	5	B. P. Rock hen.....	Bad sitter. 3 chicks killed by hen. 2 eggs were broken. 5 eggs contained partially developed germs.
" 15...	15 Faverolle eggs.......	Hens.	July 6.	9	" "	2 eggs were addled. 2 chicks died in nest. 2 chicks were crushed in nest.
" 16...	13 White Leghorn eggs..	"	" 7.	9	" "	2 chicks dead in shell. 2 eggs were broken. These eggs came from Myrtle, Ont.
" 16...	13 " "	"	" 7.	8	" "	2 eggs were broken by hen. 2 chicks died in shell. 1 egg did not hatch. Eggs came from Myrtle, Ont.
" 16...	13 Jubilee Orpington eggs...	"	" 7.	9	....	Eggs came from W. P. Willett, East Orange, N.J. 4 eggs did not hatch.
Eggs set..	392 Chickens hatched..........	....	... .	215		
	Incubator Hatched Chickens.	....	.. ... .	157		
				372		

From above table it will be seen that the germs of the eggs laid by hens which were confined to limited quarters in artificially warmed houses, during the winter season, did not become strong enough to give a satisfactory percentage of robust chickens until they had run outside and recuperated from their term of indoor winter life. As was the case last year, this seemed to be about the middle of April.

PROGRESS OF THE CHICKENS.

On the chickens being hatched out, if by incubator, they were placed in brooders outside. If by hens they were put with their mother hens, in coops with slatted fronts on the grass in front of the poultry buildings.

The coops were so arranged that they could be securely fastened at night, while ventilation was provided for. The little doors which closed the front of the coops at night made convenient and clean platforms whereon to feed the chicks during the day. Through the slats the chicks could run on the grass, while the hen remained inside. Sand or dry earth to the depth of two or three inches was placed on the floor of the coop. On taking the mother hen from the nest, she was given food and water. She had probably been on the nest, bringing out her chickens, for 36 hours, and required both. Any little attention at this time to the sitter is well bestowed, for it is well known to poultry-raisers that a well-fed mother is likely to brood her chickens satisfactorily. It is most important that the chickens should be well brooded, as well as carefully fed and looked after during the early period of their lifetime. The same rations as used in previous years for brooder and hen-raised chickens were given last season, viz.:—

First few hours very little food is required. If the hen has been well fed, as suggested, she will be inclined to brood her chicks. This is desirable, particularly in the early part of the season. A few stale bread crumbs will be all the food required.

Next day.—Give stale bread soaked in milk and squeezed dry. Feed a little at a time and leave none on the platform. A little hard boiled egg finely cut up may be added with benefit.

Continue this for a day or two and add granulated oatmeal or finely crushed wheat. Many persons feed finely crushed wheat from the first, and with success.

At the end of ten days crushed corn was given. Whole wheat was not fed till after twelfth day and then a little at a time.

As the chicks grew older, they were fed a mash composed of stale bread, shorts, cornmeal, ground meat, &c. A small quantity of finely cut bone was eaten with avidity and with benefit. Skim or sweet milk and water were given for drink.

On the chickens becoming fully feathered, the mother hens were placed with the others and the chicks returned to their coops as usual, and were allowed to remain in them until removed to more commodious quarters in the shape of a colony house, or one of the small pens in No. 2 house.

WEIGHT DEVELOPMENT OF CHICKENS.

Fed and treated as above, the chickens of the different varieties made the following weight development:—

	Lbs.	Oz.
Barred P. Rock Cockerel at 2 months, 3 days of age......	1	12
" " " "	1	7
" " 3 months and 6 days of age ..	3	0½
" " " " ..	2	15½
White P. Rock Cockerel at 2 months, 3 days of age......	1	12
" " " "	1	9
White Wyandotte " " "	1	8½
" " " "	1	7

	Lbs.	Oz
Rhode Island Red Cockerel at 2 months, 3 days of age	1	10
" " " "	1	12
Buff Orpington " " "	1	12
" " " "	1	9
" " 4 months of age..........	3	15½
" " " "	4	8

CROSSES.

Light Bra.-B.P.R. (2nd cross) Cockerel at 2 mos. 3 days of age..................................	1	13
Light Bra.-B.P.R. (2nd cross) Cockerel at 4½ mos. of age..	4	14
" " " " ..	4	6
Bro. Leg.-B.P.R. Cross Cockerel at 2 mos. 3 days of age..	1	10½
" " " " ..	1	5
" " " 3 mos. of age	2	15
" " " "	2	6
" " " 4 mos. of age......	4	7
" " " "	4	4½

JUBILEE ORPINGTONS.

The Jubilee Orpingtons are a new variety of the Orpington family, and were originated by Messrs. Cook & Son, the well known poultry breeders of Kent, England, who are also the originators of the Buff Orpingtons. It is claimed for the Jubilee Orpingtons that the cockerels made rapid flesh development and are acceptable market types at 3 and 4 months of age. It is claimed for the pullets that they are early and good winter layers.

From settings of eggs obtained from Mr. W. P. Willett, of East Orange, N.J., U.S.A., the agent of Messrs. Cook, several chickens were hatched. The weight development of some of the cockerels were as follows:—

	Lbs.	Oz.
Jubilee Orpington Cockerel at 2½ months......	2	2½
" "	1	14
" "	1	14
Jubilee Orpington Cockerel at 3 months....	2	15
" "	2	6
" "	2	4½
Jubilee Orpington Cockerel at 4 months....	3	15
" "	3	4

Another variety of the Orpington breed, named Spangled Orpingtons, has recently been originated, and is exploited as a remarkably promising type of early market chicken.

In the foregoing account of the weight development of chickens of the different varieties named, it may be said that they were in no way forced beyond being regularly fed on rations as described, were well cared for and their coops cleaned every day. When about three months of age several of their number were handed over to the chemical division for fattening experiments on different rations. A detailed account of these experiments by Mr. F. T. Shutt, chemist, will be found in a subsequent page.

EGGS LAID FROM DECEMBER TO JUNE 30.

The following table will show the number of eggs laid by different breeds and their varieties during the months of highest prices. In some cases hens were kept over for breeding or hatching purposes. In others some of the pullets were late, but commenced to lay in the spring when other hens were becoming broody. Experience has, however, shown that it is best for the farmer to keep over the winter the pullets that are likely to make early and continuous layers during that season.

EGGS laid by different breeds from December 1, 1902 to June 30, 1903.

Breeds.	1902.	1903.						Totals.	Remarks.
	December.	January.	February.	March.	April.	May.	June.		
8 White Leghorn hens...	84	71	63	113	126	111	68	636	
10 Black Minorca " ...	64	77	65	128	167	169	62	732	
7 Brown Leghorn " ...	42	31	42	107	116	99	40	477	
12 Langshan " ...	158	135	103	141	120	128	105	890	As the hens of the sitting varieties became broody they were given eggs, as shown in table of eggs set and chickens hatched.
30 Barred P. Rock " ...	225	202	142	260	285	234	165	1,513	
18 " pullets	85	153	126	222	201	182	65	1,034	
15 White P. Rock hens...	120	98	75	141	141	124	111	810	
14 " pullets	82	146	146	164	182	157	75	952	
4 Buff P. Rock hens.....	59	94	64	71	32	32	31	383	
12 White Wyandotte hens	113	112	86	133	126	81	69	720	
4 " pullets	45	75	55	81	35	Brdy.	......	291	
15 Buff Leghorn hens.....	71	38	28	106	116	95	55	509	
3 Buff Orpington hens...	45	50	34	33	50	Brdy.	......	212	
13 " pullets.	35	94	103	107	133	174	118	764	
12 Rhode I. Red hens	126	158	129	180	131	134	95	953	
6 Faverolle hens	67	97	93	73	63	29	39	461	
9 Mixed hens.	57	47	47	127	169	116	44	607	
7 White Ind. Game hens.	...	29	9	17	77	47	31	210	
8 White Leghorn pullets.	.....	55	70	132	126	93	44	520	
11 Silver G. Dorking hens.	50	132	115	115	94	75	42	623	
15 L.B. B.P.R. cross pullets	174	113	88	191	189	168	69	992	
	1,702	2,007	1,683	2,642	2,679	2,248	1,328	14,289	

EGGS LAID DURING THE YEAR.

The number of eggs laid during the different months of the year are as follows:—

1902.

December	1,702

1903.

January	2,007
February	1,683
March	2,642
April	2,679
May	2,248
June	1,328
July	857
August	482
September	386
October	106
November	346
	16,466

LIST OF STOCK IN POULTRY BUILDINGS.

During the month of November, a number of the old and young birds were disposed of and others of different varieties were purchased instead.

The list of stock on hand at the end of the year and their disposition is as follows:—

Pen.	——	Females	Males.
1..	Barred Plymouth Rock hens	10	1
2..	" " "	10	1
3..	White Plymouth Rock hens	10	1
4..	Buff Orpington Rock hens	6	1
5..	White Wyandotte hens	10	1
6..	Silver Grey Dorking hens	10	1
7..	Black Minorca hens	9	1
8..	White Leghorn hens	10	1
9..	Buff Leghorn hens	10	1
10..	Buff Plymouth Rock hens	4	1
11..	Spare Cockerels	..	5
12..	"	..	5
13..	"	..	5
14..	"	..	5
15..	Brown Leghorn hens (Wyandotte male for crossing)	4	1
16..	Silver Spangled Hamburgh pullets	4	1
17..	Black Hamburgh hens	4	1
18..	Faverolle hens	5	1
19..	Light Brahma hens	4	1
20..	Silver Laced Wyandotte pullets	4	1
21..	White Leghorn (Hodson) pullets	5	1
22..	Rhode Island Red hens	7	1
23..	Barred P. Rock pullets	7	
24..	Silver Grey Dorking pullets	7	1
25..	Rhode Island Red pullets	7	1
26..	White Wyandotte pullets	7	1
27..	Jubilee Orpington pullets	7	1
28..	Buff " "	9	1
29..	Mixed hens	9	
30..	" pullets	9	
31..	Brown Leg—B. P. Rock cross pullets	9	
32..	Mixed pullets	9	
33..	Mixed (late hatched) pullets	8	

EXPERIMENTS IN CHICKEN FATTENING.

BY FRANK T. SHUTT, M.A., F.I.C.,

Chemist, Dominion Experimental Farms.

In connection with a series of feeding experiments, made with a view of ascertaining the relative digestibility of certain foods by poultry, we were able during the season of 1902 to obtain data of economic value to those preparing chickens for the market. These results were set forth in the report for that year. In continuing the above mentioned research during the past season, we again accumulated results of practical interest to the chicken fattener. These may now be presented, as follows:—

PEN *vs.* CRATE.

Experiments to ascertain the relative merits of pen and crate fattening were made in 1902, and the results, together with the description of the crates and pens, with yards attached, will be found on pages 226-7 of the report of the farms for that year. The tests were made with Barred Plymouth Rock and Silver-grey Dorking, and both breeds, from the standpoint of economy in feeding gave marked results in favour of pen fattening.

The interest evinced in the results and the criticisms they received led us this season to further investigate this subject, and we can accordingly present additional data towards the solution of this problem that will be of interest to poultry fatteners. In one particular a change was made from the plan adopted in 1902; the crated birds were fed in the basement of the laboratory building, a room sufficiently lighted and ventilated, but in temperature 10°F. to 15°F. lower than the accommodation used in 1902. When we remember that the results of last season showed that the weekly gains were invariably reduced during spells of abnormally high summer temperatures, the significance of this modification will be apparent.

No. 1 (pen) and No. 2 (crate).—The feeding was commenced on August 13, 1903, the birds being between seven and eight weeks old, and the test continued for four weeks. Each lot consisted of six birds, as follows:—2 Orpingtons, 2 Barred Plymouth Rocks and 2 crosses, Brown Leghorn and Barred Plymouth Rocks.

The Ration.—For the first two weeks the following was used :

(a) Ground oats	3 parts.	Protein ratio—1:3·2
Ground barley	1 part.	Cost, 1·54 cents per lb.
Meat meal	1 part.	

Mixed with a sufficiency of skim-milk.

During the last two weeks the ration was :

(b) Ground oats	4 parts	Protein ratio—1:4.
Ground barley	3 parts	Cost, 1·45 cents per lb.
Meat meal	1 part.	

Mixed with a sufficiency of skim-milk.

TABLE I.—PEN *versus* CRATE.

Pen or Crate.	Number of Chicken.	Breed.	Pullet or Cockerel.	Weight.										Gain during Experiment.		Average gain per Chicken per Week.
				Beginning of Experiment.		1st Week.		2nd Week.		3rd Week.		4th Week.				
				Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Oz.
No. 1.																
Pen..........	36	Orpington......	P	3	9	3	14	4	3½	4	6	4	9	1	0	4·0
"	79	"	C	3	15½	4	10	5	5	5	12	6	4	2	4½	9·3
"	62	B. L. & P. R....	C	2	14½	3	7	3	9	3	15	4	5	1	6½	5·6
"	6	" ...	C	3	11½	4	5½	5	0½	5	2	5	7	1	11½	6·7
"	72	Ply. Rock......	C	2	15½	3	4	3	9	3	14	4	4½	1	5	5·0
"	34	"	C	2	7½	3	1½	3	9	3	13½	4	4	1	12½	7·1
No. 2.																
Crate..........	37	Orpington......	C	3	4½	4	0	4	11½	5	3	5	9½	2	5	9·2
"	70	"	C	4	8	5	4½	5	11½	6	4	6	1½	1	9½	
"	76	B. L. & P. R....	C	3	9½	3	13½	4	4½	4	7	5	0	1	6½	5·6
"	65	" ...	C	3	8	4	4	4	13½	5	7	5	12	2	4	9·0
"	71	Ply. Rock......	C	3	0½	3	3½	3	8½	3	12	4	2	1	1½	4·3
"	75	"	C	2	11½	2	13½	3	2½	3	5	3	11	0	15½	3·8
No. 3.																
Pen..........	52	Ply. Rock......	C	3	8½	....		5	0	....		6	0½	2	8	10·0
"	49	"	C	3	11	....		5	6½	....		6	6	2	11	10·7
"	41	"	C	2	9½	....		4	1	....		4	11	2	1½	8·4
"	50	"	C	3	4	....		4	6	....		5	0	1	12	7·0
"	35	"	C	3	13½	....		5	7	....		6	6	2	8½	10·1
"	89	"	C	3	10½	....		5	2	....		5	13	2	2½	8·6
No. 4.																
Crate..........	33	Ply. Rock......	C	3	13	....		5	7	....		6	0	2	3	8·7
"	47	"	C	3	15	....		5	9	....		6	5½	2	6½	9·6
"	43	"	C	3	4½	....		4	7½	....		5	3½	1	15	7·7
"	46	"	C	3	5½	....		4	14½	....		5	8½	2	3	8·7
"	66	"	C	3	7	....		4	11½	....		5	7	2	0	8·0
"	38	"	C	3	4	....		4	8	....		5	6½	2	2½	8·6

From the details given in Table I. it will be seen that the increase in weight varied greatly among the members of each group, though the total increase in weight (see Table II.) made during the fattening period was practically the same for each set. Since the birds in the pen ate more food by 2 lbs. 5 ozs., it follows that the cost per pound of increase exceeded that of the crated birds. A further fact in favour of the crate-fed chickens was that they furnished a somewhat larger percentage (2·3 per cent) of dressed carcase (Table III.)

No. 3 (pen) and No. 4 (crate).—Though not in all particulars exactly a duplicate of the foregoing test, its general conduct and the object with which it was made were the same. The chickens employed were all Barred Plymouth Rocks, of one strain and age and very uniform as to weight and build. It was very largely due to this uniformity and the general excellence of type for feeding, we believe, that led to the more satisfactory results than were obtained in the first experiment. The gains throughout were larger, more uniform and were made more economically. Type or build is a matter that has been emphasized repeatedly by the poultry manager as one of considerable importance in the fattening of chickens for the market, and the results of this test, including the general appearance of the dressed birds, certainly support his contention.

TABLE II.—PEN *versus* CRATE.

—	Number of Chickens.		Weight at beginning of experiment.		Weight at close of experiment.		Total increase in weight.		Average increase in weight per chicken.		Food Consumed.				Total cost of food.	Cost of food per lb. increase in live weight.
	Pullets.	Cockerels.									Meal.		Skim-milk.			
Nos. 1 & 2.			Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Cts.	Cts.
Pen	1	5	19	9½	29	1½	9	8	1	9⅓	36	0½	66	0	63·7	6·7
Crate	... ...	6	20	10	30	4	9	10	1	9⅔	33	11½	66	0	60.0	6·2
Nos. 3 & 4.																
Pen	.....	6	20	9	34	4½	13	11½	2	4½	47	0	60	0	71·1	5·3
Crate	.....	6	21	1	33	15	12	14	2	2⅓	41	0	60	0	68·4	5·6

TABLE III.—Proportion of Edible and Non-edible parts, calculated on weight of chickens as killed.

—	Edible.		Non-Edible.		
	Dressed carcase.	Giblets.	Head and feet.	Feathers.	Entrails, contents of gizzard, &c.
Nos. 1 & 2.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Pen	66·8	5·3	10·7	9·4	7·8
Crate	69·1	4·7	11·8	8·6	5·7
Nos. 3 & 4.					
Pen	68·0	5·3	10·8	8·9	6·9
Crate	69·2	4·9	10·5	9·8	5·6

Nos. 3 and 4.—The ration used throughout these tests was that employed during the second two weeks of the previous experiment (b), a ration that proved highly satisfactory in the feeding experiments of 1902.

Comparing the results of the pen with those of the crate fed birds, we find that the average increase in live weight per chicken during the feeding trial was somewhat greater for the pen fed birds. These chickens, however, to make this gain consumed more food (see table II.), and a simple calculation shows that, as in the former experiment, the crate-fed birds put on flesh somewhat more cheaply ($\frac{3}{10}$ cent per lb.) than those in the pen. It is worthy of note that both 'pen' and 'crate' birds were fattened at less cost than in the first test (Nos. 1 and 2), there being a difference practically of 1 cent per pound in favour of Nos. 3 and 4. This we believe, in large part, as being consequent upon the better fattening type of the latter.

The proportion of dressed carcase was slightly larger in the case of the crate fed birds, though the difference in this respect was not so marked as with tests Nos. 1 and 2. It was noticed that the dressed birds from the pen were slightly yellower than those from the crate.

These results seem to contradict the conclusions reached in 1902. It is possible that the more favourable temperature for the crated birds this season was the predominating factor in altering the relative economy of the two systems of feeding.

The question of temperature appears to be one well worthy of further investigation. There are also other points upon which we need more information. Until a bird has attained its size, that is, as long as growth in frame continues, it seems to the writer that a certain limited amount of exercise is desirable, if not necessary, for the best results. This stage having been reached—and it will vary somewhat in the age of the chicken with different breeds—it may be found that exercise is no longer necessary and that the additional flesh to round out the bird can be more economically put on in the crate.

'All Grain' *versus* 'Grain and Meat.'

This experiment was undertaken to ascertain the value of adding a certain proportion of meat meal to the fattening ration.

Each lot consisted of 5 Barred Plymouth Rocks, the birds at the beginning of the test being about 3 months old and very uniform as to weight and build. The feeding was done in the pens with yards attached, and continued for four weeks.

The ration of those fed 'all grain' (No. 5) was as follows:—

Ground oats—4 parts. Ground barley—3 parts.	Protein ratio, 1:6. Cost, 1·3 cents per lb.

With a sufficiency of skim-milk.

The ration of those fed 'grain and meat' (No. 6) was:—

Ground oats—4 parts. Ground barley—3 parts. Meat meal—1 part.	Protein ratio 1:4. Cost, 1·45 cents per lb.

Table IV.—'All Grain' *versus* 'Grain and Meat.'

Pen No. 5.—'All Grain' Ration.

No. of Chicken.	Breed.	Sex.	Weight. Aug. 27. Lbs.	Oz.	Sept. 3. Lbs.	Oz.	Sept. 10. Lbs.	Oz.	Sept. 17. Lbs.	Oz.	Sept. 24. Lbs.	Oz.	Gain in four Weeks. Lbs.	Oz.
8	Barred Plymouth Rock........	C.	2	11½	3	2	3	9	3	14	4	1½	1	6
4	" "	"	3	8½	4	4	4	12	5	5	5	10½	2	2
10	" "	"	3	4½	3	14	4	2	4	11	5	0	1	11½
14	" "	"	3	5	3	15½	4	7	4	15½	5	6½	2	1½
11	" "	"	3	1½	3	11½	4	3½	4	10	5	0	1	14½

Pen No. 6.—'Grain and Meat' Ration.

No. of Chicken.	Breed.	Sex.	Aug. 27. Lbs.	Oz.	Sept. 3. Lbs.	Oz.	Sept. 10. Lbs.	Oz.	Sept. 17. Lbs.	Oz.	Sept. 24. Lbs.	Oz.	Gain in four Weeks. Lbs.	Oz.
16	Barred Plymouth Rock........	C.	2	15½	3	6	4	0	4	6	4	14½	1	15
17	" "	"	3	0	3	8	4	2	4	9½	5	1½	2	1½
15	" "	"	2	15½	3	10½	4	3½	4	11	5	3½	2	4
24	" "	"	3	2	3	10½	4	3½	4	8½	5	0	1	14
18	" "	"	3	2½	3	15	4	5	4	12½	5	3	2	0½

TABLE V.—'ALL GRAIN' *versus* 'GRAIN AND MEAT.'

Ration.	No. of Chickens.	Weight at beginning of experiment.	Weight at close of experiment.	Total increase in weight.	Average incre'se in weight per Chicken.	Food Consumed. Meal.	Food Consumed. Skim-milk.	Total cost of food.	Cost of food per lb. of increase in live weight.
		Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Cents.	Cents.
All grain................	5	15 15	25 2½	9 3½	1 13½	33 1	46 0	49·8	5·4
Grain and meat..........	5	15 3½	25 6½	10 3	2 0⅝	34 13	46 0	57·2	5·6

TABLE VI.—PROPORTION of Edible and Non-edible parts, calculated on weight of Chicken as killed.

Ration.	Edible.		Non-Edible.		
	Dressed carcase.	Giblets.	Head and feet.	Feathers.	Entrails, contents of gizzard, &c.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
All grain....................	67·7	5·3	11·5	9·6	5·7
Grain and meat.............	67·8	5·3	11·1	9·4	6·3

At the outset, the 5 chickens put on the 'grain and meat' ration weighed in all 11½ ounces less than those to be fed 'all grain'; at the close of the experiment their weight exceeded that of the grain fed chickens by 4 ounces. In other words, the 'grain and meat' birds gained 15½ ounces (or a little more than 3 ounces per chicken) more than the 'all grain' fed chickens, and this gain resulted from the consumption of 1 lb. 12 oz. more food.

Leaving out of consideration for the moment their relative cost, it will be interesting to ascertain the relative value of these two rations in flesh production. Since the amount of skim-milk consumed was the same for each set, we may neglect its consideration in the calculation. In the case of the 'all grain' test, the birds ate 33 lbs. 1 oz. and gained 9 lbs. 2½ oz., or for 1 lb. of increase in live weight 3·586 lbs. of the ration were consumed. With the 'grain and meat' ration, 34 lbs. 13 oz. were eaten, with a concomitant gain of 10 lbs. 3 oz. in live weight, or for 1 lb. of increase, 3·417 lbs. of meal were consumed.

These results show an increased efficiency for the ration containing the meat scrap. When, however, the relative cost of the ration is taken into account, the 'all grain' has slightly the advantage (by reason of it costing less), the difference being two-tenths of a cent per lb. of increase more in the case of the 'grain and meat' ration.

On killing and dressing, the two lots were found to be remarkably similar as regards plumpness and weight, due largely, the writer thinks, to the uniformity of type already referred to. They furnished identical data as regards the percentage of dressed carcase (table VI), and were only distinguished into groups by the slightly yellow tinge of the 'all grain' fed birds; the chickens from the 'grain and meat' ration gave a perfectly white flesh.

SATURATED LIME-WATER FOR THE PRESERVATION OF EGGS.

By Frank T. Shutt, M.A.

Chemist, Dominion Experimental Farms.

The solubility of lime in water at ordinary temperatures is one part in 700 parts of water. Such a solution would be termed saturated lime water. Translated into lbs. and gallons, this means that one lb. of lime is sufficient to saturate 70 gallons of water. However, owing to impurities in commercial lime, it is well to use more than is called for in this statement. It may not, however, be necessary, if good, freshly burnt quick lime can be obtained, to employ as much as was at first recommended, namely, 2 to 3 lbs. to 5 gallons of water. With such lime as is here referred to, one could rest assured that 1 lb. to 5 gallons (50 lbs.) would be ample, and that the resulting lime-water would be thoroughly saturated. The method of preparation is simply to slake the lime with a small quantity of water, and then stir the milk of lime so formed into the 5 gallons of water. After the mixture has been kept well stirred for a few hours, it is allowed to settle. The supernatant liquid, which is now 'saturated' lime-water, is drawn off and poured over the eggs, previously placed in a crock or water-tight barrel.

As exposure to the air tends to precipitate the lime (as carbonate), and thus weaken the solution, the vessel containing the eggs should be kept covered. The air may be excluded by a covering of sweet oil, or by sacking upon which a paste of lime is spread. If after a time there is any noticeable precipitation of the lime, the lime-water should be drawn off or siphoned off and replaced with a further quantity newly prepared.

It is essential that attention be paid to the following points:—

1. That perfectly fresh eggs only be used.

2. That the eggs should throughout the whole period of preservation be completely immersed.

Although not necessary to the preservation of the eggs in a sound condition, a temperature of 40°F. to 45°F. will no doubt materially assist towards retaining good flavour, or rather in arresting that 'stale' flavour so characteristic of packed eggs.

Respecting the addition of salt, it must be stated that our experiments, conducted now throughout three seasons, do not show any benefit to be derived therefrom; indeed, salt appears to impart a limey flavour to the egg, probably by inducing an interchange of the fluids within and without the eggs.

Water glass (sodium silicate), has been extensively experimented with, using solutions varying from 2 per cent to 10 per cent. Although in the main the results have been fairly satisfactory, we are of the opinion that lime-water is fully its equal, if not its superior, as a preservative, and that this latter preservative is both cheaper and pleasanter to use there can be no doubt.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF R. ROBERTSON, SUPERINTENDENT.

NAPPAN, N.S., November 30, 1903.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my annual report of operations on the experimental farm for the maritime provinces at Nappan, N.S.

The season has not been quite as favourable for farm crops as that of 1902. The early part was particularly dry, and crops generally made a poor start, from which they never completely recovered. Hay was quite below the average and the new take of clover is the poorest we have had for years. Owing to favourable weather after about June 25th roots were a fairly good crop, while corn was poor. Pasture was poor the whole season.

I wish to again acknowledge my indebtedness for valuable assistance rendered by Mr. J. Thomas Coates, farm foreman, who has kept all records of crop experiments, and to Mr. R. Donaldson, herdsman, who has kept all records of live stock experiments, each doing so in a careful and painstaking manner.

WEATHER.

December opened with no frost in the ground, but on the 2nd it was well frozen up. A light snow on the 4th was followed by a heavy fall on the 5th, accompanied by high winds, which made it drift badly. The temperature fell to zero on the 7th, and on the 9th 10° below zero, with 16° below on the 10th. The temperature continued below zero to the 16th, with one day only above that point. On the 8th, 6 inches of snow fell. This drifted badly on the 9th, 10th and 11th, when one of the coldest winds and snow-storms experienced in many years blocked the roads so that it was necessary to break them out. The 17th was moderate, with rain, and the snow all went off. This was followed by cold and rain again on the 22nd. Slight snow fell occasionally from the 22nd to the 29th, but not enough to make sleighing. It snowed sufficient for sleighing on the 29th, but it went off again the following day.

January commenced fine, with no very cold weather until the 8th. Snow fell to make good sleighing on the 7th, which continued good for the month. The temperature went below zero on the 10th, 11th, 14th, 19th, 20th, 24th, 25th, 26th and 27th, registering 2°, 4°, 2°, 12°, 9°, 4°, 4°, 2°, 4° on these dates respectively.

February opened cold and fine, with occasional snow and rain to the 17th, when we had a snow storm, followed by cold weather to the 23rd. Another snow and wind storm prevailed on the 23rd and 28th. The temperature went below zero only three times during this month, on the 8th, 18th and 20th, when 2°, 5°, 5°, respectively was registered.

March opened fine but mild, taking off the snow. It snowed on the 6th, but moderated again, and it all went off on the 7th. The weather was fine and mild to the 17th, and it continued more or less broken to the end of the month. Very little snow fell during the month.

April came in cold, but broken weather set in and continued more or less wet until the 20th. Some snow fell on the 16th, 17th, 18th and 20th. The rainfall during the month was 3·57 inches. The first seeding was done April 27th.

May commenced cool but fine. The month throughout was warmer than usual. Frost was recorded seven times during the month, on the 2nd, 3rd, 10th, 13th, 16th, 25th and 26th, there being 3°, 7°, 2°, 1°, 10°, 8° and 4°, respectively on these dates. There was little rainfall during the month, only ·68 inches.

June was unusually fine and dry, continuing with one exception to the 25th. Crops and pastures suffered greatly for want of rain during this period, and many of the June sown roots and vegetable seed failed to germinate quickly on account of a lack of moisture. A slight rainfall on the 14th and 15th, but only ·20 inch, not doing much good. On the 25th and 26th, however, a fall of 1·69 inches thoroughly wet the ground, doing a vast amount of good, and considerable seed that had been in the ground some weeks, and remained dormant, on account of a lack of moisture germinated. From this date forward all roots and grain crops did exceptionally well. From this to the end of the month there were four light rains. The total rainfall for the month was 2·29 inches. The only frosts recorded in the month was on 1st, 2nd, 4th and 5th, when 4°, 3°, 4° and 3° was registered, respectively, at these dates. The month throughout was not as warm as usual, and as a result the corn crop made a poor start.

July was more or less broken, but with no very heavy rains. The rainfall for the month was 2·07 inches. The month generally was not as warm as usual. On the 9th 80° was registered, and on the 11th, 82°, these being the two warmest days.

August was fine to the 7th, when rain fell, followed by another rainfall on the 10th. From the 10th to the 18th was fine, when rain again occurred. The remainder of August was practically free from rain, with the exception of the last day. The rainfall during the month was 2·40 inches. This month throughout was cooler than generally experienced here, and at no time during the month did the temperature go above 76°, that point being reached only once, August 20th. On the 23rd, very high tides, accompanied with high winds, did considerable damage to marsh lands by breaking and flowing over the dykes.

September was showery to the 9th. From the 9th to the 17th was fine, with two days wet weather, on the 17th and 18th, and fine again to the 28th, with showery weather to the end of the month. The total rainfall for the month was 3·63 inches. The month averaged about up to the usual temperature. The thermometer only once went above 76°, and that was on the 14th, when 80° was recorded.

October commenced with fine weather, but we had a heavy rain on the 10th and 11th, of 2·85 inches. This was followed by changeable weather to the 18th, when 2·15 inches of rain fell, accompanied by high winds, which shook many apples off the trees. The remainder of the month was more or less changeable. The rainfall for the month was 5·78 inches. The first frost of the season was October 4th, when 6° of frost was registered. There was little frost during the month.

November up to the 20th was very mild, with very little frost. The month, however, was unusually wet up to that time. On the 17th, 18th and 19th 3·15 inches of rain fell. The total rainfall for the month was 7·98 inches. This made it difficult to harvest root crops on the wet land and made fall ploughing backward. From the 20th to the end of the month was more or less frozen and little ploughing was done after that date.

EXPERIMENTS WITH OATS.

In this uniform test of varieties forty-five different sorts were grown in plots of one-fortieth acre each. These plots all received the same treatment and were on soil practically uniform throughout.

The soil was a clay loam. The previous crop was mangels, for which crop twenty one-horse cart loads of manure were applied. The ground was ploughed in the fall, and in the spring it was harrowed twice with the spring tooth and once with the smoothing harrows. The seed was sown May 4, at the rate of 2½ bushels per acre, with the seed drill. The seed for these plots was from heads selected in the field, at harvest time, before cutting the various plots the previous season. The ground was seeded down with 3 pounds alsike clover, 7 pounds Mammoth Red clover and 12 pounds Timothy seed per acre, by means of a grass seeder attached to the seeder.

No fertilizer was used this season, the grain started slowly and irregularly, made fair growth, did not rust and the seed filled out well. Some smut was noticed in many of the plots; some of the straw lodged, but generally speaking was strong and stood up well.

OATS.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel.
				Inch's		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Sensation	Aug. 26.	114	42—46	Stiff	6—8	Branching	7,040	98	28	37
2	Twentieth Century	" 24.	112	42—46	"	6—8	"	6,600	97	22	38
3	Thousand Dollar	" 26.	114	45—48	"	6—8	"	7,080	97	22	37½
4	Waverley	" 31.	119	45—50	"	6—9	"	5,440	97	22	37
5	Siberian	" 26.	114	45—49	"	6—9	"	6,960	96	16	35
6	Banner	" 25.	113	43—48	"	6—8	"	6,520	95	10	38
7	Joanette	" 22.	110	36—40	Medium	6—9	"	5,800	94	4	36
8	White Giant	" 31.	119	44—48	Stiff	6—9	"	6,600	94	4	37½
9	Abundance	" 25.	113	43—47	"	6—8	"	6,400	92	32	36
10	Goldfinder	" 31.	119	47—52	"	6—9	"	5,800	92	32	35
11	Danish Island	" 27.	115	43—47	"	5—8	"	6,680	90	20	37½
12	Improved Ligowo	" 26.	114	43—48	"	6—8	"	6,400	89	14	37
13	Lincoln	" 25.	113	43—46	"	5—7	"	6,840	89	14	37½
14	Wide Awake	" 26.	114	43—48	"	5—8	"	6,800	88	8	38
15	White Schonen	" 26.	114	42—46	"	5—8	"	6,520	88	8	37½
16	Olive Black	" 28.	116	46—52	"	6—9	Sided	6,600	88	8	37
17	Swedish Select	" 27.	115	41—46	"	5—7	Branching	5,600	87	2	36
18	Pioneer	" 20.	108	40—44	"	6—9	"	5,480	85	30	39
19	Salines	Sept. 2.	121	44—50	"	6—9	"	6,600	85	30	36
20	Black Beauty	Aug. 20.	108	44—48	"	7—9	"	5,000	84	24	35
21	Early Golden Prolific	" 28.	116	46—50	"	6—8	"	6,600	84	24	35½
22	Improved American	" 26.	114	42—46	"	6—8	"	5,720	84	24	35
23	Wallis	" 26.	114	38—42	"	5—8	"	5,400	83	18	37
24	Mennonite	" 25.	113	42—46	"	6—8	"	6,560	82	12	37½
25	Golden Fleece	" 27.	115	40—46	"	6—8	"	5,800	82	12	35
26	Holstein Prolific	" 25.	113	44—47	"	5—7	"	4,960	82	12	36½
27	Bavarian	" 26.	114	42—46	"	5—7	"	6,520	81	6	37
28	Pense Black	" 28.	116	43—52	"	6—9	Sided	6,000	81	6	38
29	Milford Black	" 26.	114	41—45	"	6—8	"	5,600	80	0	39
30	Golden Tartarian	Sept. 2.	121	42—46	"	6—9	"	5,480	77	22	35
31	Kendal Black	Aug. 26.	114	40—45	"	6—8	"	5,400	75	10	39
32	Kendal White	" 26.	114	40—45	"	6—8	"	6,400	75	10	39
33	Milford White	" 26.	114	40—45	"	6—8	"	6,280	74	4	38½
34	Olive White	" 28.	116	46—52	"	6—9	"	5,400	71	26	38
35	American Beauty	" 25.	113	40—45	"	5—7	Branching	4,720	71	26	37
36	Tartar King	" 21.	109	44—49	"	6—8	Sided	4,800	70	20	37
37	New Zealand	Sept. 1.	120	42—46	"	6—8	"	5,200	70	20	35
38	Pense White	Aug. 28.	116	44—52	"	6—9	"	5,600	69	14	39
39	Scotch Potato	" 27.	115	40—44	"	6—8	Branching	5,880	68	8	38
40	Golden Beauty	" 26.	114	38—43	"	5—7	"	4,400	64	24	36
41	Buckbee's Illinois	" 29.	117	40—45	"	5—7	"	5,000	62	12	35
42	Columbus	" 27.	115	38—45	"	5—7	"	3,600	62	12	33
43	Golden Giant	" 31.	119	44—47	"	6—9	Sided	3,800	60	0	35
44	American Triumph	" 29.	117	42—46	"	6—9	Branching	3,880	58	28	34
45	Irish Victor	" 26.	114	36—40	"	6—8	"	3,840	58	28	36

OATS—NOT INCLUDED IN THE UNIFORM TRIAL PLOTS.

These were all sown on May 4 in plots of one-fortieth acre each adjoining the Uniform Trial Plots.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw	Yield per Acre.		Weight per Bushel.
					Inches.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Abysinnia	May 4	Aug. 24	112	42—46	Stiff	6—8	Branching	6,000	88	8	37½
2	Rosedale	" 4	" 24	112	40—45	"	6—9	Sided	6,600	87	2	40
3	Early Blossom	" 4	" 24	112	40—46	"	6—8	"	6,600	85	30	40
4	Cream Egyptian	" 4	" 25	113	42—47	"	5—7	Branching	6,400	84	24	39
5	Salzer's Big 4	" 4	" 22	110	44—48	"	6—9	Sided	5,880	84	24	37
6	White Russian	" 4	" 25	113	42—45	"	6—8	Branching	5,600	74	4	37½
7	Cromwell	" 4	" 29	117	44—48	"	5—7	"	4,800	72	32	34
8	Black Mesdag	" 4	" 17	105	44—48	"	7—9	"	5,080	69	14	35
9	Oderbruch	" 4	" 26	114	42—46	"	6—8	Sided	4,680	68	8	37
10	Newmarket	" 4	" 26	114	42—45	Medium	6—8	Branching	4,200	67	2	37
11	Pense	" 4	" 26	114	40—44	Stiff	6—8	Sided	5,200	64	24	38
12	P.E.I. Black	" 4	" 24	112	38—42	Medium	6—8	Branching	5,400	58	28	36

EXPERIMENTS WITH BARLEY.

These comparative tests were conducted on land similar to that used for the oat plots, which was practically of a uniform character. The soil was a clay loam, having been in mangels last year, and manured for that crop with twenty one-horse cart loads of stable manure per acre. After the mangel crop was removed the land was ploughed, and this spring it was worked twice with the spring tooth and once with the smoothing harrow. No fertilizer was used for the crop this season.

Twenty varieties of six-rowed and fifteen of two-rowed sorts were sown, all on May 13, in one-fortieth acre plots, at the rate of 2 bushels per acre. The seed for these plots was from heads selected in the field, at harvest time, before cutting the various plots, the previous season. Timothy and clover seed was sown at the same time at the rate of 3 pounds Alsike, 7 pounds Mammoth Red clover and 12 pounds of Timothy seed per acre. The plants started slowly and irregular, but good growth was made later in the season. There was no rust and the grain filled out well. Some smut was noticed in some of the plots. The information given in the following table was obtained from the experiments:—

BARLEY, SIX-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Oderbruch	Aug. 19..	98	42—46	Stiff	2 —2½	6,400	66	32	48½
2	Empire	" 21..	100	40—44	"	2 —3	6,520	65	40	48½
3	Trooper	" 20..	99	42—46	"	2 —3	6,400	65	..	48¼
4	Nugent	" 25..	104	38—43	"	2 —2½	6,440	64	8	48
5	Common six-rowed	" 20	99	40—45	"	2 —2½	6,280	63	16	48
6	Odessa	" 18..	97	42—45	"	2 —3	6,200	60	40	48
7	Mensury	" 22..	101	40—45	"	2 —3	6,800	60	..	48
8	Albert	" 20..	99	41—44	Medium..	2 —2½	6,120	59	8	48½
9	Baxter	" 20..	99	40—44	Stiff	2 —3	6,000	59	8	48
10	Stella	" 25..	104	38—42	"	2 —3	5,880	58	16	48
11	Royal	" 20..	99	37—41	Medium..	2 —2½	6,200	58	16	47½
12	Mansfield	" 22..	101	41—46	Stiff	2 —3	6,240	55	40	47½
13	Summit	" 25..	104	38—42	"	2 —3	6,120	54	8	48
14	Argyle	" 21..	100	40—43	"	2 —3	6,040	54	8	47
15	Brome	" 24..	103	40—44	"	2 —3	5,400	53	16	48
16	Yale	" 25..	104	38—42	Medium..	2 —2½	5,880	53	16	48
17	Garfield	" 21..	100	40—43	"	2 —2½	5,400	50	..	48½
18	Champion	" 17..	96	43—48	Stiff	2½—3	5,880	49	8	39
19	Claude	" 20..	99	39—42	Medium..	2 —2½	5,520	48	16	47½
20	Rennie's Improved	" 20..	99	40—43	"	2 —2½	5,800	45	40	48½

BARLEY TWO-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
1	Danish Chevalier	Aug. 22..	101	36—42	Stiff	3 —4	5,400	65	0	51
2	Newton	" 22..	101	41—45	"	2½ —3	4,800	64	8	50
3	Beaver	" 21..	100	35—37	Medium..	2½—3½	4,200	60	40	50
4	Canadian Thorpe	" 22..	101	36—42	Stiff	2 —3	4,400	59	8	49
5	French Chevalier	" 22..	101	38—43	"	3 —4	4,600	58	16	50
6	Invincible	" 24..	103	38—42	"	2 —3	4,480	55	40	50½
7	Standwell	" 24..	103	38—42	"	2 —3	4,400	52	24	50
8	Durham	" 22..	101	40—46	"	2½—3½	4,400	49	8	48
9	Fulton	" 24..	103	39—43	"	2 —3	4,600	48	16	48
10	Gordon	" 22..	101	40—46	"	2 —3	3,720	46	32	48
11	Logan	" 22..	101	40—46	"	2½—3½	4,880	45	40	48
12	Sidney	" 22..	101	38—42	Medium..	2½—3¼	4,720	43	16	48
13	Clifford	" 21..	100	40—44	Strong....	2½—3½	3,600	42	24	49
14	Harvey	" 22..	101	40—46	"	2½—3½	3,800	40	40	51
15	Jarvis	" 22..	101	39—43	Medium..	3 —4	3,600	40	0	48

EXPERIMENTS WITH SPRING WHEAT.

The ground selected for these plots was a light clay loam which was in corn the previous year. The land was manured for the corn crop, with twenty one-horse cart loads of stable manure per acre. The land was ploughed after the corn crop was removed, and this spring was worked by twice harrowing with the spring tooth and once with the smoothing harrow. The seed was sown with the seed drill April 29, at the rate of 1¾ bushels per acre. The seed for these plots was from heads selected in the field at harvest time, before cutting the various plots, the previous season. The land was seeded down at the same time, with a mixture of 3 pounds Alsike clover, 7 pounds Mammoth Red clover and 12 pounds of Timothy seed per acre.

Sixty-one varieties were sown in one-fortieth acre plots, all of which received the same treatment. The seed germinated very slowly, during which time the weeds got a better start than usual. The grain made a fair growth. The straw was rather light, and the grain did not fill out as well as it usually does. There was no rust, but a few heads of smut were occasionally noticed. The yield from these plots is given in the following table:—

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Byron	Aug. 26	119	38—42	Medium	2—3	Bearded	3880	42	40	60½
2	Early Riga	" 22	115	42—47	Stiff	2—3	Beardless	4200	42	0	61
3	Chester	" 27	120	40—45	"	2—3¼	"	3600	40	0	61
4	Wellman's Fife	" 31	124	44—48	"	2½—3½	"	5000	38	0	61
5	Essex	" 29	122	44—48	"	2½—3½	"	4400	38	0	59
6	Minnesota No. 149	" 31	124	40—43	"	2—3	"	4320	37	20	61
7	Crawford	" 29	122	40—44	"	2—3	"	4680	36	40	61
8	Red Fife	" 28	121	40—44	"	2—3¼	"	5200	36	40	60
9	Rio Grande	" 27	120	42—46	"	2½—3½	Bearded	4800	36	40	61
10	Admiral	" 29	122	43—48	"	2½—3	"	4680	36	0	60
11	White Fife	" 31	124	43—48	"	2½—3½	Beardless	4800	36	0	61
12	Laurel	" 31	124	41—45	"	2½—4	"	4400	36	0	61
13	White Connell	" 31	124	38—45	"	2—3	"	4600	35	20	61
14	Monarch	" 29	122	42—46	"	2—3	"	4280	35	20	60½
15	Red Swedish	" 29	122	43—46	"	2½—3¼	Bearded	4640	35	20	59½
16	Norval	" 27	120	40—44	Medium	2—3	"	3800	34	40	60¼
17	Dawn	" 27	120	42—46	"	2—3	Beardless	4600	34	0	60
18	Clyde	" 29	122	40—44	Stiff	2—3	"	4200	34	0	60½
19	Australian, No. 23	" 31	124	40—45	"	2—3	"	4400	33	20	60
20	Advance	" 25	118	43—47	"	2½—3¼	Bearded	4800	32	40	60
21	Minnesota No. 181	" 31	124	44—48	"	2½—3½	Beardless	4720	32	0	60
22	Australian, No. 13	" 31	124	38—42	"	2—3	"	3800	32	0	60
23	Bishop	" 27	120	40—46	"	2—3	"	4200	31	20	60
24	Crown	" 27	120	41—46	Medium	2—3	Bearded	4400	31	20	60
25	Herrison Bearded	" 27	120	38—40	"	1—1½	"	3880	31	20	60
26	White Russian	" 29	122	40—46	Stiff	2—3¼	Beardless	4120	30	40	60
27	Japanese	" 29	122	40—45	"	2—3	Bearded	4920	30	40	60
28	Pringle's Champlain	" 28	121	41—46	"	2—3	"	3720	30	0	60
29	Vernon	" 28	121	43—46	"	2—3	"	3760	30	0	60
30	Alpha	" 27	120	40—46	"	2—3	"	4400	30	0	60
31	Australian No. 9	" 31	124	40—43	"	2—3	Beardless	3800	29	20	61
32	Robin's Rust Proof	" 31	124	38—45	Medium	2—3	"	3320	28	40	61
33	Stanley	" 28	121	40—45	"	2—3	"	4600	28	40	60
34	Minnesota, No. 163	" 31	124	40—45	Stiff	2½—3	"	4400	28	40	60
35	Preston	" 28	121	42—46	"	2—3	Bearded	4400	28	0	60
36	Australian, No. 10	" 31	124	38—43	"	2—3	Beardless	3600	27	20	59½
37	Huron	" 28	121	40—43	Medium	2—3	Bearded	3320	26	40	61
38	Percy	" 29	122	44—48	Stiff	2—3	Beardless	4000	26	40	60
39	Minnesota No. 169	" 31	124	40—45	"	2—3	"	3400	26	0	60
40	Angus	" 29	122	38—41	"	2—3	"	3400	26	0	60
41	Cassel	" 31	124	40—44	"	2—3	"	3200	26	0	61
42	Countess	" 29	122	40—45	"	2—3	"	3400	25	20	59
43	Progress	" 28	121	43—48	Stiff	2—3	"	3640	24	40	59
44	Hungarian	" 28	121	40—44	Medium	2—2½	Bearded	3000	24	40	60
45	Colorado	" 25	118	43—47	Stiff	2½—3	"	4480	24	0	60
46	Weldon	" 29	122	42—46	"	2½—3¼	Beardless	2720	23	20	60
47	Red Fern	" 28	121	40—43	"	2—3	Bearded	4000	22	0	61
48	Goose	" 27	120	40—43	Medium	1½—2	"	3560	22	0	60
49	Roumanian	" 29	122	37—42	"	1—2	"	3240	21	20	60½
50	Benton	" 29	122	40—44	"	2—3	Beardless	3160	20	40	60
51	Australian No. 27	" 31	124	38—42	Stiff	2—3	"	3200	20	0	59½
52	Blair	" 29	122	43—47	"	2½—3	"	3720	20	0	59½
53	Fraser	" 27	120	40—45	"	2—3	Bearded	3480	19	20	59½
54	Cartier	" 28	121	35—40	Medium	2—3	"	3120	18	40	58
55	Australian No. 25	" 31	124	40—43	Stiff	2—3	Beardless	3040	18	0	59
56	Australian No. 19	" 31	124	40—45	"	2—3	"	2920	17	20	59
57	Hastings	" 29	122	35—40	Medium	2—3	"	2540	16	40	58
58	Plumper	" 29	122	40—43	"	2—3	Bearded	2440	16	40	59
59	Medeah	" 29	122	30—35	Weak	1—2	"	2120	16	0	53
60	Mishriki	" 29	122	20—25	"	1—1½	"	2080	16	0	52

EXPERIMENTS WITH EMMERS AND SPELTS.

Experiments have been conducted this season with two varieties of emmer and two of spelt, with the following results. They were all sown on April 29, on land adjoining the wheat plots:—

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Yield per Acre.		Weight per Measured Bushel.
			Bush.	Lbs.	Lbs.
White Spelt	Sept. 8.	132	29	20	35
White Bearded Spelt	" 2.	126	28	40	34
Common Emmer (Speltz)	Aug. 29.	122	25	20	
White Emmer	Sept. 2.	126	23	20	

EXPERIMENTS WITH PEASE.

Forty varieties of pease were sown May 9 in one-fortieth acre plots. The land was a light clay loam, similar to that chosen for the wheat plots. This land was previously in corn and was manured for that crop with twenty one-horse cart loads of stable manure per acre. This ground was ploughed after the corn crop was removed, in the fall of 1902, and the following spring was worked up by harrowing twice with the spring tooth and once with the smoothing harrow.

The seed was sown with the seed drill, and Timothy and clover mixed, at the rate of 3 pounds Alsike clover, 7 pounds Mammoth Red clover and 12 pounds Timothy seed per acre was sown at the same time. The crop was light. The plants did not make strong growth, but the quality of the seed was good. The following results were obtained from this experiment:—

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					In.	In.		Bush.	Lbs.	Lbs.
1	Arthur	Sept. 9..	123	Fair	34—38	2 —2½	Medium	44	40	62
2	Archer	" 10..	124	"	36—40	2 —2¼	"	42	..	62
3	Crown	" 7..	121	"	30—36	1½—2	Small ..	40	..	62
4	Macoun	" 10..	124	Strong	45—48	2 —3	Large ..	38	40	61
5	Mummy	" 9..	123	Fair	36—40	2 —2½	Medium	37	20	62
6	Daniel O'Rourke	" 8..	122	"	38—42	1½—2	Small ..	36	40	61½
7	Agnes	" 9..	123	"	36—40	2 —2¼	Large ..	35	20	62
8	English Grey	" 14..	128	"	36—40	2 —3	" ..	34	..	60
9	Pride	" 7..	121	Medium..	36—40	2 —2½	Medium	34	..	63
10	Elliot	" 12..	126	"	35—40	2 —3	Large ..	33	20	61
11	Nelson	" 9..	123	"	32—36	2 —2½	Medium	32	40	62½
12	Alma	" 8..	122	Fair	34—40	2 —3	Large ..	31	20	62
13	Mackay	" 12..	126	"	35—40	1½—2	Medium	30	40	61
14	Centennial	" 10..	124	"	36—40	2 —2¼	"	30	40	61
15	Carleton	" 10..	124	"	35—39	2 —3	Large ..	30	..	61
16	Bruce	" 8..	122	"	34—40	2 —3	" ..	30	..	62
17	Large White Marrowfat	" 9..	123	Good	41—46	2 —3	" ..	29	20	62½
18	Perth	" 10..	124	Fair	36—40	2 —2½	Medium	28	40	61½
19	Gregory	" 15..	129	"	36—41	2 —3	Large ..	28	40	61
20	Black Eyed Marrowfat	" 10..	124	"	36—42	2 —3	" ..	28	..	62

PEASE—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.	No. of days maturing.	Character of Straw.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per bushel.
					Inches.	Inches.		Bush.	Lbs.	Lbs.
21	Prince Albert	Sept. 7..	121	Medium..	33—38	2 —2¼	Medium	27	20	62
22	Trilby	" 14..	128	" ..	30—35	1½—2	"	26	40	62
23	New Potter	" 12..	126	" ..	35—38	2 —2¼	"	26	..	61
24	Victoria	" 13..	127	" ..	36—40	2 —3	Large..	26	..	60
25	Kent	" 13..	127	" ..	30—36	2 —3	" ..	26	..	61
26	Prussian Blue	" 9..	123	" ..	35—38	2 —2¼	Medium	25	20	60½
27	German White	" 14..	128	" ..	33—38	2 —2½	"	25	20	61
28	Pearl	" 12..	126	" ..	35—40	2 —2¼	"	24	40	60
29	Early Britain	" 8..	122	" ..	30—33	2 —2½	Large..	24	..	60½
30	Wisconsin Blue	" 14..	128	" ..	38—40	2 —2¼	Medium	23	20	60
31	Fergus	" 15..	129	" ..	32—38	2 —2¼	"	21	20	62
32	Duke	" 8..	122	" ..	34—38	2 —2½	Large .	20	40	61
33	Lanark	" 11..	127	Poor.....	30—33	2 —2¼	Medium	20	..	61
34	King	" 10..	124	"	28—32	1½—2	Small..	20	..	60
35	Golden Vine	" 8..	122	"	28—33	1½—2	" ..	18	40	62
36	Prince	" 9..	123	Medium..	32—38	2 —2½	Medium	18	..	61
37	Picton	" 8..	122	" ..	30—35	1½—2	Small..	16	40	62
38	White Wonder	" 8..	122	Poor.....	24—30	2 —2¼	Medium	13	20	61
39	Paragon	" 10..	124	"	30—33	2 —2½	Large..	13	20	61
40	Chancellor*									

*Failed.

EXPERIMENTS WITH BUCKWHEAT.

These experiments were conducted on land similar to and receiving the same treatment as that on which the barley plots were grown. The ground was in mangels the previous year, and received for that crop twenty one-horse cart loads of stable manure per acre. The land was ploughed in the fall of 1902, and this spring was worked up by going over it twice with the spring-tooth and once with the smoothing harrow.

The seed was sown with the seed drill, June 12, in one-fortieth acre plots, and five varieties were included in the test. The land was also seeded down as for the other grain plots, with Timothy and clover. The yield per acre, time of ripening and character of growth are given below:—

BUCKWHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Yield per Acre.		Weight per Bushel.
				Inches.		Bush.	Lbs.	Lbs.
Silver Hull	June 12..	Sept. 3..	83	38—42	Strong....	45	40	52
Rye Buckwheat	" 12..	" 4..	84	35—42	"	45	0	52
Tartarian or Siberian	" 12..	" 4..	84	34—38	"	43	16	50
Japanese	" 12..	" 3..	83	40—44	"	34	8	45
Grey	12..	" 3..	83	38—42	"	31	32	45

FIELD CROP OF GRAIN.

Six acres of field grain were sown May 16, on a light clay loam. The previous crop was turnips, for which thirty-five one-horse cart loads of stable manure had been used per acre. Previous to this manuring for the root crop this land had never received any manure. The ground was ploughed in the fall, after the root crop was removed, and in the spring was worked up with the spade, spring-tooth and smoothing harrows. The grain was sown with the seed drill and seeded down to Mammoth Red clover, 10 pounds per acre. Five acres were seeded to oats and one with barley. The following table gives the names of varieties grown, amount of land to each variety, yield per acre, by measure from the threshing machine, and the weights per bushel. The mixed grain was oats, 2 bushels; barley, 1 bushel, and pease, 1 peck, mixed together and sown at the rate of 2½ bushels per acre:—

—	Weight per Measured Bushel.	Yield per Acre.	
	Lbs.	Bush.	Lbs.
1¼ acre, Sensation oats	37	70	14
1¼ " Cream Egyptian oats	39	65	0
1¼ " Black Tartarian	36	62	12
1¼ " Canadian Thorpe barley	49	45	0
1¼ " mixed oats, barley and pease	43	62	12

FIELD CROPS OF MIXED GRAIN.

Eleven acres of mixed grain were grown on a clay loam soil. The previous crop was clover and Timothy, which was ploughed in the fall, with the aftermath turned under, which was light. The ground was manured in 1900 for a root crop, followed by grain in 1901, and clover in 1902. The soil was worked up into a good tilth and the grain sown with the seed drill. Six acres was sown May 5, with a mixture of the following proportions: Oats, Rosedale, 2 bushels; barley, Surprise, 1 bushel, and Golden Vine pease, 1 peck, sown at the rate of 2½ bushels per acre. This was harvested August 29. Five acres was sown May 11, with Sensation oats, 2 bushels; Canadian Thorpe barley, 1 bushel; Golden Vine pease, 1 peck, mixed together and sown at the rate of 2½ bushels per acre. This was harvested September 3. The following yields per acre of measured bushels from the threshing machine, weighing 41 pounds per bushel were obtained: 6 acres Rosedale oats, Surprise barley, Golden Vine pease mixed, yielded 65 bushels per acre. 5 acres Sensation oats, Canadian Thorpe barley and Golden Vine pease mixed, yielded 72 bushels per acre.

FIELD CROP OF OATS ON MARSH LAND.

Five acres of oats were sown May 8, on marsh land that had been ploughed the previous fall. This was seeded at the time the grain was sown, with clover and Timothy. This made a fairly good growth the early part of the season, but owing to the exceptionally high tides in August, which broke the dykes and overflowed the land, the grain crop was almost a total loss, and the young take of clover and timothy was completely destroyed.

FIELD CROPS OF BUCKWHEAT.

Four and one-half acres of Silverhull buckwheat was sown on land that had been brought into cultivation for the first time last season. The ground was exceptionally poor, 250 pounds of seed was sown June 24, and the crop harvested September 15, yielding 23 bushels 16 pounds per acre.

One-half acre of buckwheat of the Grey variety was grown on clay loam in a fair state of fertility, it having received manure at the rate of twenty one-horse cart loads per acre, the previous year, when a crop of roots was grown. This land was ploughed in the fall of 1902. It was sown June 19, and harvested September 10, and yielded at the rate of 35 bushels per acre.

EXPERIMENTS WITH INDIAN CORN.

Twenty-three varieties of Indian corn were planted June 2. The soil was a light clay loam and had been manured for roots in 1900, followed by grain in 1901 and clover in 1902. The land was manured in the fall of 1902 with twenty-five one-horse cart loads of stable manure per acre. This was not ploughed, however, until the following spring just before planting. The object in letting the land go without ploughing to seeding time was to get the benefit from the spring growth of clover turned under, but owing to the exceptionally dry spring the growth was very light. After ploughing, the ground was worked up by going over it once each with the spade, spring-tooth and smoothing harrows. No commercial fertilizer was used on these plots.

The corn was planted in hills and rows. One set of plots was in hills 3 feet apart each way, and a duplicate lot of plots in rows 3 feet apart. The seed sown in rows was dropped in shallow drills and covered with the hoe, and the plants were thinned to 6 inches apart in the rows. In the hills from three to five plants were left in each hill. The yield per acre is calculated from the weight obtained from two rows each 66 feet long. The crop was harvested October 6, and the following yields obtained:—

CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Height.	When Tasselled.	In Silk.	Condition when Cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
		Inches.				Tons.	Lbs.	Tons.	Lbs.
1	Selected Leaming	95	Sept. 4	Sept. 25	Watery	18	850	15	250
2	Giant Prolific Ensilage	97	" 4	....	Tasselling	17	1,750	17	1,530
3	Red Cob Ensilage	96	" 4	....	"	17	870	15	800
4	Early Mastodon	93	" 5	Sept. 15	Watery	17	650	17	320
5	Eureka	97	" 5	....	Tasselling	17	320	16	1,550
6	Superior Fodder	96	" 5	....	"	17	100	16	1,000
7	Thoroughbred White Flint	92	" 5	....	"	16	1,330	16	450
8	Longfellow	90	Aug. 25	Sept. 2	Glazed	15	1,570	14	950
9	Sanford	84	" 25	" 3	Soft Glazed.	15	1,350	16	1,770
10	Salzer's All Gold	93	" 25	....	Tasselling	15	800	12	750
11	Compton's Early	86	" 25	Sept. 2	Glazed	14	1,370	14	1,150
12	Mammoth Cuban	95	Sept. 5	" 15	Watery	14	1,150	15	250
13	Champion White Pearl	93	" 5	" 15	"	14	600	14	1,370
14	King Philip	81	Aug. 28	" 8	"	14	600	13	1,500
15	Early Butler	92	" 28	....	Tasselling	14	270	14	820
16	King of the Earliest	87	Sept. 1	Sept. 15	Watery	14	50	15	800
17	White Cap Yellow Dent	98	Aug. 29	" 15	"	13	1,500	13	950
18	Angel of Midnight	85	" 25	" 3	Glazed	13	950	12	1,850
19	Pride of the North	94	Sept. 5	" 15	Watery	12	530	12	1,850
20	North Dakota White	83	Aug. 27	" 4	Soft Glazed.	11	1,100	11	550
21	Mammoth Eight-rowed Flint	84	Sept. 1	" 15	Watery	11	1,100	11	
22	Cloud's Early Yellow	90	" 3	" 17	"	11	550	14	600
23	Evergreen Sugar	87	" 6	" 18	"	11		10	1,670

SIX ACRES MIXED GRAIN. YIELD PER ACRE 72 MEASURED BUSHELS.

CORN SOWN IN ROWS AT DIFFERENT DISTANCES APART.

The experiment of growing corn planted in rows at different distances apart was again continued this year. The varieties of corn sown were Champion White Pearl, Selected Leaming and Longfellow. The land on which these were grown was similar to and received the same treatment in every respect as that on which the other corn plots were grown.

The seed was sown June 2, in rows 21, 28, 35 and 42 inches apart. Each plot was one-fortieth acre. The crop was harvested October 6, and the following yields per acre obtained:—

Name of Variety.	Distance Apart.	Yield Per Acre.	
	in.	Tons.	Lbs.
Selected Leaming	42	13	1,840
" "	35	15	910
" "	28	15	720
" "	21	14	905
Champion White Pearl	42	15	1,720
" "	35	17	980
" "	28	18	1,620
" "	21	15	725
Longfellow	42	12	1,800
"	35	15	1,960
"	28	14	432
"	21	14	20

FIELD CROPS OF CORN.

FERTILIZER EXPERIMENTS.

One acre of corn was planted in rows 3 feet apart on a light clay sandy loam. The ground was in clover in 1902. Stable manure at the rate of twenty-five one-horse cart loads per acre was spread on the sod in the fall, and this was ploughed under just before planting. The ground was worked up into good tilth with the spade, spring-tooth and smoothing harrows, and the seed was sown with the seed drill June 1. To one-third of the acre was added complete fertilizer at the rate of 500 pounds per acre, and one-third at the rate of 250 pounds per acre, and the remainder left without commercial fertilizer. The fertilizer was scattered broadcast along the rows after the seed was planted, and harrowed in with the smoothing harrow. The crop was harvested October 3 and the following yields per acre obtained. The variety Longfellow was used.

	Tons.	Lbs.
⅓ acre plot, manure and fertilizer, 500 pounds per acre	17	1,700
⅓ " " " 250 "	15	1,500
⅓ " manure only	14	700

Three acres of corn were grown on a light clay loam soil that had been previously in oats, with which Mammoth Red clover at the rate of 10 pounds per acre was sown and ploughed under in the fall of 1902. Up to this time this field had not received any stable manure. The ground was worked up in the spring with the spade and spring-tooth harrows, and stable manure at the rate of 30 one-horse cart loads per acre spread broadcast and ploughed under. This was worked up to a good tilth, and the seed sown with the seed drill on June 10, in rows 3 feet apart. To one-third of each acre was added complete fertilizer at the rate of 500 pounds per acre, and one-third 250 pounds per acre, and the remainder of the acre was left without commercial fertilizer. The commercial fertilizer was scattered broadcast along the rows after planting, and harrowed in with the smoothing harrow. One acre was planted with Compton's Early, one with Angel of Midnight and one with Dakota White corn. The following yields were obtained from weighing the crop from each one-third acre. It was harvested October 5 to 8:—

FIELD CROP OF CORN—FERTILIZER EXPERIMENT.

Sown June 10. Harvested October 5 to 8.

Name of Variety.	Yield Per Acre.	
	Tons.	Lbs.
⅓ acre Compton's Early, manure and fertilizer, 500 lbs. per acre	16	1,500
⅓ " " " " 250 " "	14	1,200
⅓ " " " only	12	540
⅓ " Angel of Midnight, manure and fertilizer, 500 lbs. per acre	21	0
⅓ " " " " 250 " "	18	1,000
⅓ " " " only	15	1,500
⅓ " Dakota White, manure and fertilizer, 500 lbs. per acre	17	500
⅓ " " " " 250 " "	15	1,350
⅓ " " " only	12	1,140

EXPERIMENTS WITH TURNIPS.

These plots were sown May 15 and a duplicate set planted May 29. Twenty-one varieties were included in the test. The crops on both sets of plots were pulled October 27, and the yields per acre have been calculated from the yield per plot of two rows, each 66 feet long. The ground was a light clay loam and was previously in clover. The land was manured with 15 one-horse cart loads of stable manure per acre on the sod in the fall of 1902 and ploughed under. In the spring this was worked up with the spade harrow and 15 one-horse cart loads of stable manure was again applied, which was ploughed under and the ground harrowed with the spring-tooth and smoothing harrows. Two hundred pounds of complete fertilizer and 200 lbs. of bone meal per acre were sown broadcast and harrowed in with the smoothing harrow. The ground was run into rows 24 inches apart. These rows were raked off and the plots planted with the Planet Jr. No. 5 seed drill. The plants were thinned to about one foot apart in the rows, and following yields per acre obtained:—

TURNIPS—TEST OF VARIETIES.

Number	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Perfection Swede	50	320	1,672	0	43	625	1,443	45
2	Magnum Bonum	49	1,000	1,650	0	41	1,390	1,391	30
3	Halewood's Bronze Top	48	1,845	1,630	45	34	1,465	1,167	45
4	Elephant's Master	48	30	1,600	30	37	910	1,248	30
5	Selected Purple Top	47	1,370	1,589	30	40	955	1,349	15
6	Mammoth Clyde	47	1,040	1,584	0	38	1,055	1,284	15
7	Kangaroo	47	875	1,581	15	34	1,795	1,163	15
8	Emperor	47	710	1,578	30	40	25	1,333	45
9	New Century	47	50	1,567	30	38	725	1,278	45
10	Bangholm Selected	46	235	1,537	15	35	455	1,174	15
11	Jumbo	44	1,925	1,498	45	37	745	1,245	45
12	Good Luck	44	1,760	1,496	0	41	500	1,375	0
13	Skirvings	44	605	1,476	45	38	1,550	1,292	30
14	Drummond's Purple Top	43	1,120	1,452	0	35	125	1,168	45
15	Imperial Swede	43	955	1,449	15	37	85	1,234	45
16	Hall's Westbury	41	1,820	1,397	0	37	1,735	1,262	15
17	Hartley's Bronze	41	1,490	1,391	30	35	455	1,174	15
18	Shamrock Purple Top	41	1,325	1,388	45	35	1,115	1,185	15
19	East Lothian	41	665	1,377	45	36	435	1,207	15
20	Sutton's Champion	39	1,530	1,325	30	38	1,550	1,292	30
21	Carter's Elephant	39	1,365	1,322	45	32	680	1,078	0

FIELD CROPS OF TURNIPS—FERTILIZER EXPERIMENTS.

Five acres of turnips were grown on land that was of a light clay-loam character. The year previous a crop of pease was ploughed under, green. This land was exceptionally poor and had not had any stable manure previously. In the spring of 1903 the land was worked up with the spade and spring-tooth harrows, and 35 one-horse cart loads of stable manure per acre spread broadcast and ploughed under. Five varieties of turnips were sown, one acre to each sort. To one-third of each acre was added complete fertilizer at the rate of 500 lbs. per acre; to another third 250 lbs. complete fertilizer per acre, and on the remaining third no commercial fertilizer was used. The fertilizer was sown broadcast and harrowed in with the smoothing harrow before the rows were run up. The rows were made 24 inches apart. The yield from each ⅓ acre was weighed and the following crops per acre obtained :—

FIELD CROP OF TURNIPS—FERTILIZER EXPERIMENT.

Sown June 6. Harvested October 27.

Name of Variety and Size of Plot.	Yield per Acre.		Yield per Acre.	
Sutton's Champion.	Tons.	Lbs.	Bush.	Lbs.
⅓ acre—Manure and fertilizer, 500 lbs. per acre	30	1,605	1,026	45
⅓ " " " 250 "	27	1,020	917	..
⅓ " " only	28	425	940	25
Kangaroo.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	30	330	1,005	30
⅓ " " " 250 "	28	1,870	964	30
⅓ " " only	27	1,815	930	15
Hartley's Bronze.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	29	1,025	983	45
⅓ " " " 250 "	28	325	938	45
⅓ " " only	27	1,755	929	15
Elephant Swede.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	27	1,350	922	30
⅓ " " " 250 "	26	395	873	15
⅓ " " only	24	....	800	..
Rennie's Prize Purple Top.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	27	330	905	30
⅓ " " " 250 "	26	1,610	893	30
⅓ " " only	26	1,880	898	..

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels were sown May 15, and a duplicate set sown May 29, two weeks later. Each plot was two rows, each 66 feet long. The land on which these were grown was adjoining the turnip plots and received the same treatment in every respect. The rows were 24 inches apart. They were raked off and the seed sown in bunches one foot apart with the Planet Jr. seed drill No. 5. The crop of both sets of plots was harvested October 21, and the following yields were obtained. On account of the extremely dry weather at planting time the seed germinated very irregularly and quite a number of the plants were destroyed by the cutworm when from 3 to 5 inches high:—

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth Yellow Intermediate	46	1,225	1,554	25	37	745	1,245	45
2	Lion Yellow Intermediate	46	235	1,537	15	41	5	1,366	45
3	Giant Yellow Intermediate	45	1,575	1,526	15	36	600	1,210	..
4	Giant Yellow Globe	45	585	1,509	45	36	1,425	1,223	45
5	Prize Mammoth Long Red	45	255	1,504	15	37	1,240	1,254	..
6	Selected Yellow Globe	45	90	1,501	30	35	475	1,174	35
7	Prize Winner Yellow Globe	43	1,450	1,457	30	37	415	1,240	15
8	Selected Mammoth Long Red	43	1,120	1,452	..	39	1,365	1,322	45
9	Leviathan Long Red	42	1,800	1,430	..	35	125	1,168	45
10	Triúmph Yellow Globe	41	1,325	1,388	45	30	225	1,003	45
11	Half Long Sugar Rosy	41	170	1,369	30	32	185	1,069	45
12	Mammoth Long Red	41	5	1,366	45	36	1,755	1,229	15
13	Half Long Sugar White	40	1,675	1,361	15	30	1,710	1,028	30
14	Yellow Intermediate	40	850	1,347	30	32	1,175	1,086	15
15	Giant Sugar Mangel	33	495	1,108	15	25	985	849	45
16	Gate Post	32	1,670	1,094	30	22	550	742	30

FIELD CROP OF MANGELS—TEST OF VARIETIES.

The land on which these were grown was previously in clover, and was ploughed in the fall of 1902. The soil was a light clay loam. The ground was worked up with the spade and spring-tooth harrows in the spring of 1903, and stable manure at the rate of twenty-five one-horse cart loads per acre spread broadcast and ploughed under. This was worked up to a good tilth and 250 lbs. of complete fertilizer per acre sown broadcast and harrowed in with the smoothing harrow before the rows were run. The rows were made with the double mould-board plough 24 inches apart. The rows were raked off by hand and the mangel seed at the rate of 8 lbs. per acre, sown in bunches one foot apart with the hand Planet Jr. seed drill No. 5. Three varieties of mangels were sown, one half acre each. Owing to the continued dry spring the seed germinated slowly and irregularly. The cutworms did considerable damage to the young plants, leaving a number of blanks. The entire yield of each variety was weighed and the following crops per acre obtained. The seed was sown May 16, harvested October 19 and 20.

FIELD CROP OF MANGELS—TEST OF VARIETIES.

Manure and fertilizer 250 lbs. per acre.	Yield per acre.			
	Tons.	lbs.	Bush.	lbs.
Mammoth Long Red	21	936	715	36
Giant Yellow Half Long	20	1,100	685	..
Giant Yellow Globe	19	1,300	655	..

FIELD CROP OF MANGELS—FERTILIZER EXPERIMENTS.

The land on which these were grown was a light clay loam. The previous crop was oats, with which 10 lbs. Mammoth Red Clover was sown per acre, and what growth it made was ploughed under in the fall of 1902. This was worked up in the spring with the spade and spring-tooth harrows, and 30 one-horse cart loads of stable manure per acre spread broadcast and ploughed under. The land was then worked up into good tilth. Three varieties were grown in ¾ acre lots. One-third of each lot had complete fertilizer added at the rate of 500 lbs. per acre sown broadcast ; one-third complete fertilizer at the rate of 250 lbs. per acre, and the remaining third no commercial fertilizer. The fertilizer was sown broadcast and harrowed in with the smoothing harrow, before the rows were run 24 inches apart. The seed germinated slowly and the plants came up irregularly, due to the dry weather. The seed was sown May 26 and harvested October 19 and 20. The following yields per acre were obtained.

FIELD CROP OF MANGELS—FERTILIZER EXPERIMENT.

—	Yield per Acre		Yield per Acre	
	Tons.	lbs.	Bush.	lbs.
MAMMOTH LONG RED.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	25	250	837	30
⅓ " " " 250 "	24	350	805	50
⅓ " " only	23	1,750	795	50
GIANT YELLOW HALF LONG.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	28	1,250	954	10
⅓ " " " 250 "	28	250	937	30
⅓ " " only	26	....	866	40
GIANT YELLOW GLOBE.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	19	1,350	656	10
⅓ " " " 250 "	18	450	607	10
⅓ " " only	21	100	701	40

EXPERIMENTS WITH CARROTS.

The plots chosen for this test were similar in every respect and received the same treatment as the turnip and mangel plots. Eleven varieties were sown. One set of plots on May 15 and a duplicate set on May 29. The rows were 24 inches apart. They were raked off by hand and the seed was sown with the Planet Jr. No. 5 seed drill. Each plot was two rows, 66 feet long. They were harvested October 27 and gave the following yields:—

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Ontario Champion	30	225	1003	25	22	1,375	756	15
2	Giant White Vosges	29	905	981	45	19	1,600	660	..
3	Mammoth White Intermediate	27	615	910	15	24	675	811	15
4	New White Intermediate	24	675	811	15	22	880	748	..
5	Half Long Chantenay	23	200	770	..	18	300	605	..
6	Long Yellow Stump rooted	22	880	748	..	21	1,375	723	15
7	Improved Short White	20	1,580	693	..	20	920	682	..
8	Early Gem	19	1105	651	45	19	445	640	45
9	Half Long White	19	415	640	15	18	1,620	627	..
10	White Belgian	18	1,950	632	30	17	155	569	15
11	Carter's Orange Giant	17	650	577	30	15	1,350	522	30

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties of sugar beets were planted in plots consisting of two rows each 66 feet long, on May 15, and duplicate ones on May 29. These were on land similar in every respect and receiving the same treatment as the turnip, mangel and carrot plots. The seed was sown in rows 24 inches apart. The rows were raked off and the seed sown in bunches one foot apart, with the Planet Jr. No. 5 seed drill. The crop was gathered October 22 and the following yield obtained:—

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Royal Giant	37	415	1,204	15	30	390	1,006	30
2	Danish Red Top	31	40	1,034	0	21	1,395	723	15
3	Red Top Sugar	29	575	976	15	19	445	640	45
4	Vilmorin's Improved	28	925	948	45	24	675	811	15
5	Improved Imperial	28	595	943	15	18	1,620	627	0
6	Danish Improved	28	265	937	45	22	1,375	756	15
7	Wanzleben	24	1,005	816	45	20	425	673	45
8	French 'Very Rich'	21	75	701	15	17	650	577	30

EXPERIMENTS WITH POTATOES.

The land on which these were grown was clay loam, having been in timothy and clover the year before. The ground was manured with 20 one-horse cart loads of stable manure per acre in the fall of 1902, and ploughed under. This was worked up in the spring following, with the spade, spring-tooth and smoothing harrows and ploughed again. Rows were run 30 inches apart and from 3 to 5 inches deep, and potato fertilizer at the rate of 300 lbs. per acre sown in the rows before the planting was begun. The sets were planted May 22 one foot apart in the rows and covered with the plough. The tubers were cut so as to have from two to three eyes in each piece. The drills were harrowed down once before the plants were above the ground, to destroy weeds, and again drilled up in a few days and kept loose with a cultivator until the vines were quite large. An unusual number of sets rotted in the ground, making the plots somewhat irregular. The plots were sprayed with bordeaux mixture and paris green combined July 21, August 8, and August 28. The potato blight did not strike these plots, which kept green throughout the whole season, while considerable damage was done by late blight in surrounding districts.

Fifty-five varieties were included in this test. Each plot consisted of two rows, each 66 feet long. The crop was harvested September 25, and the following yields obtained:—

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Description of Variety, Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Pearce	Medium	605	0	572	0	33	0	Long, pink and white.
2	Vanier	"	550	0	451	0	99	0	Long, dark pink.
3	Vick's Extra Early	Good	534	36	451	0	83	36	Oval, pink.
4	Seedling No. 7	Medium	528	0	448	48	79	12	"
4	McIntyre	"	517	0	462	0	55	0	Long, blue and white.
6	Enormous	"	506	0	446	36	59	24	Oblong, white.
7	Rochester Rose	"	495	0	444	24	50	36	Oblong, pink.
8	Clay Rose	"	492	48	444	36	46	12	Round, pink.
9	Everett	Good	433	24	356	24	77	0	Flat, round pink.
10	Troy Seedling	Medium	429	0	319	0	110	0	Round, white.
11	Penn Manor	"	418	0	297	0	121	0	Long, pink.
12	Burnaby Seedling	"	411	24	352	0	59	24	Round, pink.
13	Late Puritan	"	407	0	374	0	33	0	Long, white.
14	Early Envoy	"	407	0	352	0	55	0	Oblong, pink.
15	Swiss Snowflake	"	404	48	360	48	44	0	Round, white.
16	Rose No. 9	Good	378	24	341	0	37	24	Oblong, pink.
17	Maule's Thoroughbred	Medium	374	0	330	0	44	0	Long, pink.
18	Early Puritan	Good	367	24	314	36	52	48	Long, pink and white.
19	Early Norther	"	365	12	316	48	48	24	Long, white.
20	I. X. L.	Medium	363	0	314	36	48	24	Long, pink and white.
21	Irish Cobbler	Good	358	36	297	0	61	36	Round, white.
22	Bovee	"	347	36	297	0	50	36	Oblong, pink and white.
23	State of Maine	"	345	24	297	0	48	24	Round, flat and white.
24	Sharpe's Seedling	Medium	341	0	301	24	39	36	Long, white.
25	Up to Date	"	336	36	297	0	39	36	Long, flat, white.
26	Delaware	Good	330	0	286	0	44	0	Round, flat, white.
27	Pingree	Medium	325	36	272	48	52	48	Oblong, white.
28	Empire State	Good	314	36	268	24	46	12	Long, white.
29	Canadian Beauty	"	312	24	279	24	33	0	Long, round, pink and white.
30	Early Andes	"	310	12	250	48	59	24	Oblong, pink.
31	Green Mountain	"	308	0	257	24	50	36	Round, white.
32	Uncle Sam	"	308	0	275	0	33	0	"
33	Sabean's Elephant	Medium	301	24	268	24	33	0	Long, round, white.
34	Holborn Abundance	"	297	0	253	0	44	0	Round, white.
35	Irish Daisy	"	294	48	242	0	52	48	Oblong white.
36	Brown's Rot Proof	"	286	0	220	0	66	0	"
37	Money Maker	Good	272	48	220	0	52	48	Long, white.
38	Carman No. 3	"	270	36	237	36	33	0	Round, flat, white.
39	Early White Prize	"	264	0	231	0	33	0	Long, white.
40	Dreer's Standard	"	259	36	220	0	39	36	Oblong, white.
41	Early Rose	"	253	0	209	0	44	0	Long, pink.
42	Prolific Rose	"	250	48	213	24	37	24	"
43	American Wonder	"	248	36	213	24	35	12	Long, white.
44	Reeve's Rose	"	242	0	187	0	55	0	Long, pink.
45	American Giant	Medium	235	24	191	24	44	0	"
46	Cambridge Russet	"	231	0	198	0	33	0	Long, white.
47	Early St. George	Good	231	0	198	0	33	0	Long, pink.
48	Early Sunrise	"	228	48	182	36	46	12	"
49	Country Gentleman	"	228	48	191	24	37	24	Long, pink and white.
50	Carman No. 1	"	226	36	191	24	35	12	Round, flat and white.
51	General Gordon	Medium	222	12	171	36	50	36	Long, pink.
52	Lee's Favourite	"	222	12	162	48	59	24	Long, pink and white.
53	Burpee's Extra Early	Good	202	24	165	0	37	24	Long, round, pink and white.
54	Early Michigan	"	202	24	160	36	41	48	Oblong, white.
55	Rawdon Rose	"	198	0	169	24	28	36	Oblong, pink and white.

POTATOES—NOT IN UNIFORM TEST PLOTS.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Date of Planting.	Date of Digging.	Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.			
1	Peachblow	539	0	495	0	44	0	May 22.	Sept. 25.	Oval, light red.
2	Shenango	446	36	396	0	50	36	" 22.	" 25.	Long, blue and white.
3	Garnet Chili	440	0	385	0	55	0	" 22.	" 25.	Round, light red.
4	Thorburn	429	C	330	0	99	0	" 22.	" 25.	Long, pink and white.
5	Dark Blue	426	48	391	36	35	12	" 22.	" 25.	Round, flat, blue.
6	Rural No. 2	407	0	374	0	33	0	" 22.	" 25.	Round, white.
7	Quaker City	352	0	308	0	44	0	" 22.	" 25.	Round, white.
8	Sir Walter Raleigh	330	0	297	0	33	0	" 22.	" 25.	Round, flat, white.
9	White Beauty	259	36	209	0	50	36	" 22.	" 25.	Long, pink and white.

FLAX—TEST OF VARIETIES.

Two varieties of flax were grown on a clay loam soil which was in mangels the previous year. The land was ploughed in the fall of 1902 and worked up to a good tilth in the spring of 1903, and the seed sown with the seed drill at the rate of 30 lbs. per acre June 12. The plots were one-twentieth acre each and were harvested September 3. The following yields were obtained :—

	Weight per Bushel.	Yield per Acre.
	Lbs.	Bush.
Riga Flax	50	22
White Russian Flax	50	24

EXPERIMENTS WITH SOJA BEANS.

The soil selected for these plots was a heavy clay loam. The previous crop was oats and vetches for green feed, the land having been manured for that crop in the spring of 1902 with 25 one-horse cart loads of stable manure per acre. It was ploughed in the fall of 1902 and this spring was worked up by ploughing and harrowing with the spring-tooth and smoothing harrows. The beans were sown with the Wisner seed drill June 13 in rows 21, 28 and 35 inches apart. The crop was cut and weighed October 6.

The object of this experiment is to obtain information as to the value of this plant as a forage crop, and to ascertain the yields per acre from seed sown in rows at different distances apart. The plots were one-fortieth acre each. The crop made only fair growth and did not mature well.

	Yield per Acre.	
	Tons.	Lbs.
Soja Beans, 21 inches apart	6	200
" 28 "	5	1,600
" 35 "	5	1,000

EXPERIMENTS WITH HORSE BEANS.

The land on which these were grown was similar to that used for the Soja Beans, and received the same treatment. The beans were sown with the seed drill June 13 in rows 21, 28 and 35 inches apart. The variety 'Tick' was used. Each plot was one-fortieth acre. The plants, on account of the cool summer, did not mature as well as usual. The following yields per acre were obtained from the crop harvested October 6 :—

	Yield per Acre. Tons.	Lbs.
Horse Beans, 21 inches apart	15	800
" 28 "	14	680
" 35 "	12	1,400

CLOVER EXPERIMENTS.

The object in view in these experiments was to show the value of growing clover with grain crops, and determine the gain, if any, from, ploughing the clover of one year's growth under for future crops. Another object sought this year was to find out whether the yield of grain would be affected by the clover growing with it. On account of this season being an exceptionally dry one, the growth of clover was less than usual, and it may be well to repeat these experiments next year, with the same object in view. The Mammoth Red Clover was sown with the grain at seeding time at the rate of 10 lbs. per acre, by means of a seeding attachment to the grain seed drill. The grain was sown May 13; the barley was harvested August 18, the oats September 3 and the wheat September 8. The plots were one-twentieth acre each. The land was a clay loam in a good state of fertility, having been in roots the previous year, being manured for that crop with 25 one-horse cartloads of stable manure per acre. The following grains were grown, giving the following yields :—

	Yield per Acre. Bush.	Lbs.
Plot Banner Oats—		
No. 1, without clover	98	28
No. 2, with clover	104	14
No. 3, without clover	111	6
No. 4, with clover	102	17
Plot White Fife Wheat—		
No. 1, without clover	41	..
No. 2, with clover	39	30
No. 3, without clover	41	40
No. 4, with clover	40	20
Plot Odessa Barley—		
No. 1, without clover	59	28
No. 2, with clover	59	38
No. 3, without clover	61	12
No. 4, with clover	60	40

SPECIAL EXPERIMENTS WITH FERTILIZERS.

These experiments which have been conducted for the past four years were continued this year. The object of these tests is to ascertain the relative usefulness of fertilizers commonly used for field crops of various kinds. The plots were one-eighth acre each, 38 x 143⅓ feet for each kind of fertilizer used. These were subdivided into ten strips 14 feet wide, each running lengthwise across all the different fertilized plots. These strips were sown with ten different kinds of crops, namely, potatoes, turnips, carrots, mangels, oats, wheat, barley, pease, corn and mixed grain, making in all 140 plots. A margin of two feet was left between each plot and one foot between each crop plot. Two plots were left without any fertilizer to serve as check plots. The strips that are in grain one year are planted to roots, potatoes and corn the following year. The quantity and kind of fertilizer used is applied each year. Each of the crops were sown at the same time as the uniform test plots, with the same amount of seed per acre, and were cultivated in the same manner. The following table gives the yield per acre of these various crops :—

Fertilizer Used per acre.	Barley, Canadian Thorpe.		Oats, Tartar King.		Wheat, Colorado.		Barley, oats and pease.		Pease, Golden Vine.		Corn, Longfellow.		Turnips, Purple Top.		Mangels, Giant Yellow Intermediate.		Carrots, Half Long White.		Potatoes, Delaware.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Manure, 30 tons	62	4	54	8	36	40	57	20	51	40	12	500	30	1,500	33	1,300	21	1,800	380	
Manure, 15 tons, fertilizer, 250 lbs.	60	0	50	0	33	20	55		53	20	12	1,000	31	1,500	33	200	22	100	370	
Complete fertilizer, 1,000 lbs	45	40	39	28	30		47	20	48	20	11	500	23		18	1,500	19	400	328	20
Complete fertilizer, 500 lbs	41	32	37	24	28	20	42	10	48	20	10	1,000	22	1,000	18	200	20	500	306	40
Check	37	24	27	4	23	20	37	20	38	20	6	700	17	1,500	11	1,500	14	900	196	40
Bone meal, 1,000 lbs	43	36	39	28	26	40	50		46	40	10	1,500	30		22		17	600	290	
" 500 "	47	44	37	24	25		47	20	50		10	1,200	29		19	800	15	1,200	260	
Ashes 2,500 "	52	4	35	20	28	40	50		50		11	700	25	500	21	700	18	400	435	
Manure, rotted, 20 tons	68	36	58	16	41	40	70		58	20	14	500	32	1,000	34	1,300	21	1,900	540	
Check	39	28	25		13	20	25		33	20	5		4	500	1	500	5	1,700	228	20
Land plaster, 500 lbs	41	32	27	4	16	40	30		30		6	1,500	6	700	1	700	6	400	203	20
Salt, 500 "	45	40	33	16	20		43	30	36	40	7		21	1,500	7	500	13	1,800	175	
Marsh mud, 100 tons	62	24	41	32	25		50		40		10	1,500	23		27	600	21	1,300	223	20
Manure, green, 20 "	72	44	62	24	43	20	67	20	56	40	13	1,700	35	500	43	200	28	900	483	20

HAY.

The crop of timothy and clover hay was light—twenty-four acres of upland yielded 44 tons 837 lbs.

Twelve acres of underdrained marsh land yielded 18 tons 1,775 lbs., and 33 acres, not underdrained, yielded 39 tons 660 lbs. This made a total of 102 tons 1,272 lbs. about one-third less than an average crop. This was all secured in good condition.

SUMMARY OF CROPS ON EXPERIMENTAL FARM, NAPPAN.

Grain Field Crops.	Bushels.
Oats	291
Barley	56½
Mixed grain	812
Buckwheat	124½
	1,284

From Uniform Trial Plots.	Bushels.
Oats	96
Wheat	46
Barley	42½
Pease	24½
Buckwheat	3½
	212½

Roots, &c., Field Crops.	Bushels.
Turnips	4,609
Mangels	2,818
	7,427

From Uniform Trial Plots.	Bushels.
Turnips	408
Mangels	216
Carrots	102
Sugar beets	86
Potatoes	237
	1,049

Indian Corn Cut Green for Ensilage.	Tons.
Field crops	63½
From uniform trial plots	2½
	66

	Tons.	Lbs.
Hay	102	1,272

GRAIN AND POTATO DISTRIBUTION.

Some of the most promising varieties of grain and potatoes were again distributed this year to farmers who made application. The following number of three-pound packages were sent out for trial :—

Potatoes	354
Oats	212
Barley	62
Wheat	68
Pease	42
Buckwheat	16
Rye	1
Total	755

EXHIBITIONS, AGRICULTURAL MEETINGS AND EXCURSIONS TO FARM

An exhibit was made of farm produce at the Nova Scotia provincial exhibition, Halifax, September 9 to 17; at Fredericton, N.B., September 21 to 26, and Sussex, N.B., September 30 to October 1. Charlottetown, P.E.I., was unavoidably omitted on acount of its being on the same date as Fredericton, and as no exhibit of experimental farm products had ever been made at Fredericton it was thought best to give that place the preference.

I have attended and given addresses at quite a number of agricultural meetings throughout the provinces of Nova Scotia and New Brunswick during the year, besides delivering a series of lectures to the students at the Sussex, N.B., dairy school in March.

As in other years, many visitors have visited the farm, and there have been several farmers' excursions, the largest of which was that of the Pictou County Farmers' Association on July 9, when about 1,200 were present. Smaller excursions from the surrounding country, of about 20 to 100 persons, have been common. Although railway rates are quite reasonable for large excursions, smaller parties do not find the rates so favourable, and the fact of no hotel accommodation being available, no doubt tends to hinder many from visiting the farm.

CORRESPONDENCE.

During the year 1,840 letters were received and 1,685 sent out.

HORSES.

The stock of horses at present on the farm consists of three teams of heavy working horses, one express horse and one driver. Total, 8. One draught horse was bought during the year. All are in good condition.

CATTLE.

The herd of dairy cattle on the farm at present numbers 46 head, as follows:—

1 Guernsey bull, 5 years old.
1 Ayrshire bull, 2½ years old.
1 Jersey cow.
3 Holstein cows.
2 Guernsey cows.
1 Guernsey heifer, 2½ years old.
5 Ayrshire cows.
2 Ayrshire heifers, 1½ years.
4 Grade Ayrshire heifers, 2½ years.
16 Grade milch cows.
3 Ayrshire heifers, 8 to 10 months.
1 Holstein heifer, 8 months.
8 Grade Ayr. heifers 8 to 10 mos.

Steers have also been secured for experiment to the number of 36, as follows:—

12 three-year-old steers, short-horn grades.
9 two-year-old steers, short-horn grades.
10 one-year-old steers, short-horn grades.
5 steer calves, short-horn grades.

Total number of cattle, 82.

EXPERIMENT WITH DAIRY COWS.

This experiment was again carried on with a view to further determine whether a fairly good dairy herd, well fed and cared for, would leave a credit balance after paying for feed consumed, their milk being sent to the creamery and their food being charged at current market price.

The different feeds were charged at the following prices:—Wheat, bran, $20 per ton; oats, $25 per ton; oil cake, $33 per ton; gluten meal, $28 per ton; making an average price of mixed meal ration, as per proportion fed to cows, of 1⅓c. per pound. Roots at $2 per ton, ensilage at $2 per ton, and hay at $8 per ton.

The ration fed to cows in full milk was: Ensilage or roots, 50 lbs.; meal, 10 lbs; hay, 10 lbs., making a cost of 21 cents per cow per day.

In summer months, while milking, they were charged $2.50 per month, and when dry $1 per month.

When dry in winter they were charged $3 per month. Different quantities were fed to different cows, according to their capacity to consume and produce, and charged accordingly.

They were kept in the stable from November 1, 1902, to June 1, 1903, except on occasional fine days, when they were allowed out in the yard.

They were fed, watered and milked each day at as nearly regular intervals as possible, and by the same persons.

The summer feed was practically all summer soiling crops, rye, clover, oats, pease and vetches, grown together and sown at different times.

The milk of each cow was weighed at milking twice each day, and a careful record kept of the number of pounds given.

The percentage of fat in the milk of each cow was determined by the Babcock milk tester, and the fat credited to the cows on the basis that 85 pounds of fat produces 100 pounds of marketable butter.

The milk was sent to the Nappan dairy station, and the cows were credited with the butter produced at the prices paid to all patrons of that station, which averaged for the winter months 24c. per pound and for the summer months 21½c. per pound, which, after deducting 4 cents per pound for manufacturing and hauling milk, leaves 20 cents per pound for winter butter and 17½ cents per pound for summer butter.

The skim-milk was fed to calves and pigs, and credited to the cows at the rate of 15 cents per 100 pounds.

The following table will show the results obtained during the year :—

Name.	Age.	Breed.	Date of Dropping last Calf.	Days in Milk.	Milk.	Fat.	Butter.	Value Skim Milk	Total Credit.	Cost Feed.	Cost making Butter at 4 c. p. lb.	Total Cost	Profit.
					Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Eva Rooker	8 yrs.	Holstein	Jan. 1, 1903	285	10,040	3·3	389·78	10 04	100 95	50 75	15 59	66 34	34 61
Corie	6 "	Ayrsh. Grade	Dec. 15, 1902	310	10,010	3·6	400·40	10 01	103 21	53 30	16 01	69 31	33 90
Aiton	8 "	"	Jan. 1, 1903	270	8,860	3·6	375·24	8 86	95 93	50 00	15 00	65 00	30 93
Molly	10 "	"	" 3, 1903	270	8,530	3·8	369·56	8 53	94 33	50 00	14 78	64 78	29 55
Lucy	10 "	"	Feb. 1, 1903	245	8,110	3·5	333·93	8 11	86 04	46 40	13 35	59 75	26 29
Curly	4 "	Ay. Gn. Grade	Dec. 1, 1902	240	6,920	4·0	325·64	6 92	82 43	45 00	13 02	58 02	24 41
Ida Rooker	4 "	Holstein	" 10, 1902	280	8,850	3·3	343·58	8 85	88 55	51 80	13 74	65 54	23 01
Rex's Maud	8 "	Guernsey	" 20, 1902	285	6,110	4·7	337·82	6 11	85 29	50 15	13 51	63 66	21 63
Carrie	10 "	Ayrsh. Grade	Feb. 1, 1903	260	7,140	3·7	310·79	7 14	79 82	47 90	12 43	60 33	19 49
Sonsy	7 "	Ayrshire	" 1, 1903	270	7,110	3·6	301·12	7 11	75 71	46 70	12 04	58 74	16 97
Yellow Kate	3 "	"	Jan. 1, 1903	300	7,300	3·6	309·17	7 30	79 24	50 00	12 36	62 36	16 88
Daisy	8 "	Ayrsh. Grade	" 1, 1903	270	7,340	3·4	293·60	7 34	75 63	48 50	11 74	60 24	15 39
Jessie P.	9 "	"	March 4, 1903	260	6,810	3·6	288·42	6 81	72 85	46 70	11 53	58 23	14 62
Rae	2½ "	Ay. Gn. Grade	Dec. 1, 1902	270	5,970	3·9	273·91	5 97	69 73	48 50	10 95	59 45	10 28
Lizzie	2½ "	"	" 1, 1902	270	5,810	3·9	266·57	5 81	67 64	48 50	10 66	59 16	8 48
Blue Bell	2½ "	Ayrsh. Grade	" 1, 1902	270	5,910	3·6	250·29	5 91	63 93	48 50	10 01	58 51	5 42
Betsy	2½ "	"	" 1, 1902	270	5,740	3·5	236·35	5 74	60 70	48 50	9 45	57 95	2 75
Rose	10 "	Jersey Grade	Mar. 15, 1903	255	5,400	3·8	241·17	5 40	57 91	46 10	9 64	56 64	2 17
Mary	10 "	Holstein Grade	April 1, 1903	240	5,540	3·4	221·60	5 54	53 67	44 30	8 86	53 16	0 51
Ida B.	11 "	Ayrsh. Grade	" 1, 1903	240	5,240	3·6	221·92	5 24	53 41	44 30	8 87	53 17	0 24

EXPERIMENTS WITH STEERS.

TIED IN STALLS *VS.* FED IN LOOSE BOX.

This experiment was again carried on with the view of testing the advisability of feeding in loose boxes, as contrasted with similar steers fed tied in stalls.

Sixteen three-year-old steers were used for this test in two lots of eight each, of as nearly as possible equal form, fatness and weight (Shorthorn grades.)

All weights were taken after a fast of 14 hours, that is, at 9 a.m., without feed.

All were dehorned previous to beginning of test.

All lots were fed alike, as nearly as possible, from start to finish of test, and kept in the stable all the time, except on occasional fine days, when they were let out for a time, averaging not more than once a week.

The feeds were charged at the following prices: Hay, $8 per ton; roots, $2 per ton; ensilage, $2 per ton; mixed meals averaged $24 per ton; as per proportion fed.

RECORD of steers fed from Dec. 1, 1902, to April 30, 1903.

EXPERIMENT I—LOT I—DEHORNED, FED IN LOOSE BOX.

Numbers.	Dec. 1.	Dec. 31.	Gain.	Jan. 30.	Gain.	Mar. 1.	Gain.	Mar. 31.	Gain.	Apr. 30.	Gain.	Total Gain.
	Lbs.	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.
9	1,240	1,310	70	1,370	60	1,450	80	1,510	60	1,555	45	315
10	1,260	1,340	80	1,400	60	1,450	50	1,500	50	1,540	40	280
11	1,285	1,370	85	1,440	70	1,500	60	1,550	50	1,585	35	300
12	1,265	1,360	95	1,450	90	1,510	60	1,570	60	1,600	30	335
13	1,220	1,320	100	1,400	80	1,475	75	1,520	45	1,550	30	330
14	1,240	1,330	90	1,410	80	1,480	70	1,530	50	1,545	15	305
15	1,170	1,230	60	1,300	70	1,340	40	1,375	35	1,400	25	230
16	1,100	1,200	100	1,260	60	1,340	80	1,400	60	1,440	40	340
	9,780	10,460	680	11,030	570	11,545	515	11,955	410	12,215	260	2,435

EXPERIMENT I—LOT II—DEHORNED, TIED IN STALLS.

1	1,545	1,625	80	1,700	75	1,770	70	1,810	40	1,855	45	310
2	1,335	1,440	105	1,510	70	1,580	70	1,640	60	1,665	25	330
3	1,200	1,260	60	1,325	65	1,400	75	1,470	70	1,510	40	310
4	1,150	1,200	50	1,240	40	1,300	60	1,350	50	1,385	35	235
5	1,120	1,190	70	1,230	40	1,280	50	1,320	40	1,340	20	220
6	1,160	1,220	60	1,270	50	1,330	60	1,400	70	1,435	35	275
7	1,200	1,290	90	1,350	60	1,400	50	1,450	50	1,490	40	290
8	1,060	1,140	80	1,200	60	1,260	60	1,310	50	1,340	30	280
	9,770	10,365	595	10,825	460	11,320	495	11,750	430	12,020	270	2,250

EXPERIMENT I—AVERAGE COST OF 1 STEER PER DAY FOR ENTIRE PERIOD.

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
1902.				
Dec. 1 to Dec. 31	Roots 90 lbs.	0 09	2 70	
	Hay 10 "	0 03⅗	1 08	
	Meal 3 "	0 04	1 20	4 90
1903.				
Dec. 31 to Jan. 30	Roots 60 lbs.	0 04	1 80	
	Hay 10 "	0 04	1 20	
	Meal 4 "	0 04⅘	1 44	4 44
Jan. 30 to Mar. 1	Roots 40 lbs.	0 04	1 20	
	Hay 12 "	0 04⅘	1 44	
	Meal 6 "	0 07⅕	2 16	4 80
Mar. 1 to Mar. 31	Roots 30 lbs.	0 03	0 90	
	Hay 15 "	0 06	1 80	
	Meal 8 "	0 09⅗	2 88	5 58
Mar. 31 to April 30	Roots 20 lbs.	0 02	0 60	
	Hay 15 "	0 06	1 80	
	Meal 10 "	0 12	3 60	6 00
Cost of feed 1 steer				25 72
" 16 steers				411 52

SUMMARY OF EXPERIMENT 1.

Financial Part.

Original weight of 16 steers, 19,550 lbs., at 4⅛c. per lb.	$ 806 18
Weight at finish of 16 steers, 24,235 lbs. at 5¼c.	1,272 33
Balance	$ 466 15
Cost of feed for lot, 150 days	411 52
Net profit	$ 54 63
Daily rate of gain per steer	Lbs. 1·94
Cost of 1-lb. gain	Cts. 8·78
Cost of feed per day per steer	" 17·14
Profit per steer	$3.41

STEER-CALF EXPERIMENTS.

(Continued from December 1, 1902.)

This experiment, with a view to determine the comparative economy of feeding calves a full fattening ration from the start, as contrasted with a limited growing ration, begun in 1901 and repeated in 1902, was continued with 10 calves in each experiment, in two lots of five each. Those commenced in 1901, termed experiment 1, being continued so. Those commenced in 1902, termed experiment 11, also continued so.

Owing to the difficulty in securing suitable calves for this experiment, it was not repeated in the spring of 1903, but suitable calves were secured December 1 at six months old, and were put in at that age and date, with a view to continuing this experiment from that age instead of from birth.

In estimating the cost of feeding calves, the following values were placed on the different feeds:—Wheat bran, $20 per ton; crushed oats, $24 per ton; oil cake, $33 per ton; gluten meal, $28 per ton; roots or ensilage, $2 per ton; hay, $8 per ton; straw, $4 per ton.

STEER CALF EXPERIMENT.

Experiment 1.—Continued from December 1, 1902.

The full fattening lot of this experiment were considered finished April 30, 1903, and sold. The limited growing lot will be kept until April 30, 1904, when they are expected to be finished, when a comparison of the relative cost from birth to block can be made.

The following tables show the gains per month and the amount of food consumed :

EXPERIMENT I.—FULL FATTENING RATION. CALVES MAY 1901, CONTINUED FROM DECEMBER 1, 1902.

Lot I.	Weight at Start.	Weight at Finish.	Gain.
Period.	Lbs.	Lbs.	Lbs.
December 1 to December 31	4,620	4,955	335
December 31 to January 30	4,955	5,335	380
January 30 to March 1	5,335	5,735	400
March 1 to March 31	5,735	6,095	360
March 31 to April 30	6,095	6,355	260

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
December 1 to December 31	Roots, 60 lbs	0 06	1 20	
	Hay, 8 lbs	0 03⅕	0 96	
	Meal, 3 lbs	0 04	1 20	3 36
December 31 to January 30	Roots, 60 lbs	0 06	1 80	
	Hay, 10 lbs	0 04	1 20	
	Meal, 4 lbs	0 04⅘	1 44	4 44
January 30 to March 1	Roots, 40 lbs	0 04	1 20	
	Hay, 10 lbs	0 04	1 20	
	Meal, 5 lbs	0 06	1 80	4 20
March 1 to March 31	Roots, 30 lbs	0 03	0 90	
	Hay, 10 lbs	0 04	1 20	
	Meal, 6 lbs	0 07⅕	2 16	4 26
March 31 to April 30	Roots, 20 lbs	0 02	0 60	
	Hay, 12 lbs	0 04⅘	1 44	
	Meal, 7 lbs	0 08⅖	2 52	4 56

SUMMARY OF EXPERIMENT 1.

		Lbs.
Weight at start, Dec. 1, 1902, 5 steers		4,620
Weight at finish, April 1, 1903, 5 steers		6,355
Gain for period		1,735
Daily rate of gain per steer		2·32
Cost of feed per day per steer	$	0 12·54
Cost of 1-lb. gain		0 06
Cost of feed for lot, 150 days		104 10

EXPERIMENT I.—LIMITED GROWING RATION. CALVES MAY 1901. CONTINUED FROM DECEMBER 1, 1902.

Lot II.	Weight at Start.	Weight at Finish.	Gain.
Period.	Lbs.	Lbs.	Lbs.
December 1 to December 31, 1902	3,485	2,665	180
December 31 to January 30	3,665	3,840	175
January 30 to March 1	3,840	4,000	160
March 1 to March 31	4,000	4,190	190
March 31 to April 30	4,160	4,395	205
April 30 to May 30	4.395	4,495	100
May 30 to November 1	4,495	4,700	205
November 1 to December 1	4,700	5,160	460

EXPERIMENT I.—LIMITED GROWING RATION.—CONTINUED FROM DECEMBER 1, 1902. LOT II.

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
December 1 to December 31	Roots, 40 lbs	0 04	1 20	
	Hay, 2 lbs	0 00$\frac{4}{5}$	0 24	
	Straw, 5 lbs	0 00$\frac{2}{10}$	0 06	
	Total . . 47 lbs.	0 05	1 50	1 50
December 31 to January 30	Roots, 40 lbs	0 04	1 20	
	Hay, 2 lbs	0 00$\frac{4}{5}$	0 24	
	Straw, 5 lbs	0 00$\frac{1}{5}$	0 06	
	Total.... 47 lbs.	0 05	1 50	1 50
January 30 to March 1	Roots, 40 lbs	0 04	1 20	
	Hay, 5 lbs	0 02	0 60	
	Total.... 45 lbs.	0 06	1 80	1 80
March 1 to March 31	Roots, 40 lbs	0 04	1 20	
	Hay, 5 lbs	0 02	0 60	
	Total.... 45 lbs.	0 06	1 80	1 80
March 31 to April 30	Roots, 30 lbs	0 03	0 90	
	Hay, 8 lbs	0 03$\frac{1}{5}$	1 08	
	Total.... 38 lbs.	0 06$\frac{1}{5}$	1 98	1 98

EXPERIMENT I.—LOT II.—*Concluded.*

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
April 30 to May 30	Roots, 30 lbs	0 03	0 90	
	Hay, 10 lbs	0 04	1 20	
				2 10
May 30 to November 1	At pasture @ $3 per steer			3 00
November 1 to December 1	Roots, 60 lbs	0 06	1 80	
	Hay, 8 lbs	0 03½	1 08	
	Meal, 3 lbs	0 04	1 20	
	Total .... 71 lbs.	0 13½	4 08	4 08
Cost of feed for 1 steer 365 days				17 76

SUMMARY OF EXPERIMENT I.—LIMITED GROWING RATION.

Continued from December 1, 1902.—Lot 11.

		Lbs.
Weight at start, December 1, 1902, 5 steers		3,487
Weight at finish, December 1, 1903, 5 steers		5,160
Gain for period		1,675
Daily rate of gain per steer	lbs.	·86
Cost of feed per day per steer (winter)	cts.	7
Cost of feed per day per steer (summer)	"	1·50
Cost of feed per day per steer for period	"	4·87
Cost of 1 lb. gain	"	5·30
Cost of feed for lot 1 year		$88 80

STEER-CALF EXPERIMENT.—EXPERIMENT II.

(Continued from December 1, 1902.)

The following tables show results to December 1, 1903.—

FULL FATTENING RATION.—EXPERIMENT II.—CONTINUED FROM DECEMBER 1, 1902.

LOT I.

Period.	Weight at Start.	Weight at Finish.	Gain.
1902.	Lbs.	Lbs.	Lbs.
December 1 to December 31	2,580	2,800	220
1903.			
December 31 to January 30	2,800	3,010	210
January 30 to March 1	3,010	3,200	190
March 1 to March 31	3,200	3,450	250
March 31 to April 30	3,450	3,600	150
April 30 to May 30	3,600	3,800	200
May 30 to June 30	3,800	4,100	300
June 30 to July 30	4,100	4,295	195
July 30 to August 30	4,295	4,410	115
August 30 to September 30	4,410	4,700	290
September 30 to October 30	4,700	4,980	280
October 30 to December 1	4,980	5,220	240
Total gain five steers for one year		2,640	

FULL FATTENING RATION.—EXPERIMENT II—CON. LOT I.

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
Dec. 1 to Dec. 31	Roots, 15 lbs	0 01½	0 45	
	Meal, 2 lbs	0 02⅖	0 72	
	Hay, 2½ lbs	0 01	0 30	
				1 47
Dec. 31 to Jan. 30	Roots, 20 lbs	0 02	0 60	
	Meal, 2 lbs	0 02⅖	0 72	
	Hay, 2½ lbs	0 01	0 30	
				1 62
Jan. 30 to Mar. 1	Roots, 25 lbs	0 02½	0 75	
	Meal, 3 lbs	0 04	1 20	
	Hay, 2½ lbs	0 01	0 30	
				2 25
Mar. 1 to Mar. 31	Roots, 25 lbs	0 03	0 90	
	Meal, 3 lbs	0 04	1 20	
	Hay, 2½ lbs	0 01	0 30	
				2 40
Mar. 31 to April 30	Roots, 30 lbs	0 03	0 90	
	Meal, 3 lbs	0 04	1 20	
	Hay, 4 lbs	0 01⅗	0 48	
				2 58
April 30 to May 30	Roots, 30 lbs	0 03	0 90	
	Meal, 3 lbs	0 04	1 20	
	Hay, 4 lbs	0 01⅗	0 48	
				2 58
May 30 to June 30	Roots, 30 lbs	0 03	0 90	
	Meal, 3 lbs	0 04	1 20	
	Hay, 5 lbs	0 02	0 60	
				2 70
June 30 to July 30	Green feed, 40 lbs	0 04	1 20	
	Meal, 2 lbs	0 02⅖	0 72	
				1 92
July 30 to Aug. 28	Green feed, 40 lbs	0 04	1 20	
	Meal, 2 lbs	0 02⅖	0 72	
				1 92
Aug. 28 to Oct. 1	Green feed, 40 lbs	0 04	1 36	
	Meal, 3 lbs	0 04	1 36	
				2 72
Oct. 1 to Nov. 1	Roots and G. F., 40 lbs	0 04	1 20	
	Meal, 3 lbs	0 04	1 20	
				2 40
Nov. 1 to Dec. 1	Roots, 40 lbs	0 04	1 20	
	Meal, 3 lbs	0 04	1 20	
	Hay, 5 lbs	0 02	0 60	
				3 00
	Cost to feed 1 steer, 1 year			27 56

SUMMARY, FULL FATTENING RATION, EXPERIMENT II. LOT I.

		Lbs.
Weight at start, December 1, 1902		2,580
Weight at finish, December 1, 1903		5,220
Total gain for period		2,640
Daily rate of gain per steer	lbs.	1·44
Cost of feed per day per steer	cts.	7·55
Cost of 1 lb. gain	"	5·21
Cost of feed for lot 1 year		$137 80

LOT II.—EXPERIMENT II.—CALVES OF 1902.—LIMITED GROWING RATION.—CONTINUED FROM DECEMBER 1902.

Period	Weight at Start.	Weight at Finish.	Gain.
	Lbs.	Lbs.	Lbs.
December 1 to December 31	1,945	2,150	205
December 31 to January 30	2,150	2,420	270
January 30 to March 1	2,420	2,725	305
March 1 to March 31	2,725	2,975	250
March 31 to April 30	2,975	3,195	220
April 30 to May 30	3,195	3,300	105
May 30 to November 1	3,300	3,480	180
November 1 to December 1	3,480	3,690	210
Gain of lot for year			1,745

LOT II.—LIMITED GROWING RATION.

Period.	Daily Rations.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
December 1 to 31	Roots, 15 lbs.	0 01½	0 45	
	Meal, 1 lb.	0 01⅕	0 36	
	Straw, 2½ lbs	0 00½	0 15	0 96
" 31 to Jan. 30	Roots, 20 lbs.	0 02	0 60	
	Meal, 1 lb.	0 01⅕	0 36	
	Straw, 2½ lbs	0 00½	0 15	1 11
January 30 to March 1	Roots, 25 lbs.	0 02½	0 75	
	Meal, 1 lb.	0 01⅕	0 36	
	Hay, 2½ lbs.	0 01	0 30	1 41
March 1 to March 31	Roots, 30 lbs.	0 03	0 90	
	Meal, 1 lb.	0 01⅕	0 36	
	Hay, 2½ lbs.	0 01	0 30	1 56
" 31 to April 30	Roots, 30 lbs.	0 03	0 90	
	Meal, 1 lb.	0 01⅕	0 36	
	Hay, 2½ lbs.	0 01	0 30	1 56
April 30 to May 30	Roots, 30 lbs.	0 03	0 90	
	Hay, 4 lbs.	0 01⅗	0 48	1 38
May 30 to November 1	Pasture at $3 per steer			3 00
November 1 to Dec. 1	Roots, 40 lbs.	0 04	1 20	
	Hay, 2 lbs.	0 00⅘	0 24	
	Straw, 5 lbs.	0 01	0 30	1 74
Total				12 72

SUMMARY.

	Lbs.
Weight at start, December 1, 1902	1,945
Weight at finish, December 1, 1903	3,690
Total gain for period	1,745

Daily rate of gain per steer.. .. ..lbs.	·95
Cost of feed per day per steer (winter).. .. ..cts.	4·52
Cost of feed per steer (summer).... .... "	1·50
Cost of feed per day per steer for period..	$ 3 48
Cost of 1 lb. gain.. .. ..cts.	3·64
Cost of feed for lot, 1 year..	$63 60

PIGS.

The herd of pigs on the farm consists of Yorkshires, Berkshires, and their grades and crosses, in all 60 head, as follows:—

1 Yorkshire boar, registered.

4 Yorkshire sows, registered.

1 Berkshire boar, registered.

2 Berkshire sows, registered.

6 grade brood sows.

46 grade pigs, from 1 to 6 months' old.

EXPERIMENTS WITH SWINE.

FEEDING IN PASTURE COMPARED WITH FEEDING IN PENS.

The experiment carried on in the summer of 1902, was repeated this year with 20 pigs of from 1 to 2 months old, in 2 lots of 10 each, of various breeds and crosses, each lot consisting of an equal number from each litter and termed lot 1 and lot 11:— lot 1 in pasture and lot 11 in pens.

They were fed an average ration of 2 lbs. buckwheat meal, shorts and wheat-bran, and 3 lbs. skim-milk, from July 1 to November 1, and pasture, which consisted of 1 acre of equal parts of rape, hairy or sand vetch, and spring vetch and peas mixed, sown side by side lengthwise of the field, and divided with hurdles crosswise of the field into six divisions.

The pigs were moved from division to division once every week. A portable house was used for shelter.

On November 1 the pigs were taken into pens, and fed a ration of 3 lbs. per day of a mixture of shorts, corn-meal and wheat-meal, until December 1.

The results are as follows;

EXPERIMENTS WITH SWINE.—EXPERIMENT I.—LOT I.

FED ON PASTURE, JULY 1 TO NOVEMBER 1; FED IN PENS, NOVEMBER 1 TO DECEMBER 1.

Number.	Breed.	Weight, July 1.	Weight, November 1.	Weight, December 1.	Days Fed.	Gained.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1	Yorkshire	35	172	233	153	198
2	" (D) Berkshire (S)	30	158	198	153	168
3	" (D) Tamworth (S)	24	137	184	153	160
4	Berkshire (D) Yorkshire (S)	29	148	192	153	163
5	Chester (grade)	27	120	160	153	133
6	Yorkshire	34	191	243	153	209
7	" (D) Berkshire (S)	31	151	192	153	161
8	" (D) Tamworth (S)	30	115	157	153	127
9	Berkshire (D) Yorkshire (S)	24	118	184	153	160
10	Chester (grade)	21	139	175	153	154

LOT II.—FED IN PENS, JULY 1 TO DECEMBER 1.

Number.	Breed.	Weight, July 1.	Weight, November 1.	Weight, December 1.	Days Fed.	Gained.
1	Yorkshire	32	152	178	153	146
2	" (D) Berkshire (S)	30	140	161	153	131
3	" (D) Tamworth (S)	26	119	146	153	120
4	Berkshire (D) Yorkshire (S)	28	122	153	153	125
5	Chester (grade)	22	86	118	153	96
6	Yorkshire	31	129	157	153	126
7	" (D) Berkshire (S)	24	128	152	153	128
8	" (D) Tamworth (S)	27	108	138	153	111
9	Berkshire (D) Yorkshire (S)	26	116	144	153	118
10	Chester (grade)	18	102	141	153	123

	Lbs.
Lot 1—average daily gain on pasture, July 1 to Nov. 1	·95
" " in pens, Nov. 1 to Dec. 1	1·51
" " entire period	1·06
Cost per lb. gain entire period, exclusive of pasture	3·04c.

	Lbs.
Lot 11—average daily gain in pens, July 1 to Nov. 1	·76
" " Nov. 1 to Dec. 1	·92
" " entire period	·80
Cost per lb. gain entire period	4·05c.

SHEEP.

The flock of sheep at present consists of:—

1 pure bred Leicester ram.

5 pure bred Leicester ewes.

5 pure bred Shropshire ewes.

4 grade Shropshire ewes.

2 cross bred Leicester-Shropshire ewe lambs.

POULTRY.

During the year four breeds of poultry were kept: B. P. Rocks, Black Minorcas, White Leghorns and Buff Wyandottes.

Two additional breeds were the number added this year, and now on hand is six. Barred P. Rocks, Black Minorcas, White Leghorns, Buff Wyandottes, White Wyandottes and Silver Grey Dorkings.

The breeding pens were made up as follows:—

	Hens.	Cocks.
B. P. Rocks	4	1
Black Minorcas	3	1
W. Leghorns	4	1
Buff Wyandottes	3	1

The season's chicks were all hatched by incubator, the incubator being filled 5 times.

During the winter season they were fed on corn-meal, shorts and crushed oats mashed in the morning, and whole grain in the afternoon. Green-bones, meat-scraps and oyster shells were regularly given and free access to water and dust bath.

The eggs laid during the year by the different breeds were as follows:—

Variety.	Eggs laid.	Av. per hen.
4. B. P. Rocks	260	65
4. W. Leghorns	340	85
3. B. Minorcas	160	53
3. Buff Wyandottes	250	83

In past years they were only allowed a run out part of the time as they were quite destructive to flowers and shrubs that grew close to their buildings, and as a consequence had to be kept in small yards the greater part of the summer.

This summer a yard of about ½ acre in extent was fenced off close to their building, which will serve as a run for the future, thus improving the conditions under which they have been kept.

BEES.

Six colonies were put into winter quarters last December; all died through the winter.

EXPERIMENTS TO TEST THE VALUE OF BUG DEATH AS COMPARED WITH PARIS GREEN AND BORDEAUX AND PARIS GREEN ON POTATOES.

The object of this experiment was to test the value of Bug Death as an insecticide as compared with Paris green, and also as an insecticide and fungicide as compared with bordeaux mixture and Paris green.

For this experiment a piece of ground was chosen adjoining the potato plots. The land was similar in character and had the same treatment. It was divided into three plots, each one-twentieth of an acre. The variety of potato used was the Delaware, and the plots were all planted May 22 and dug September 23. The vines were sprayed or dusted three times, July 21, August 4 and August 28.

Plot A.—Paris green, ½ lb., 1 gallon lime water, and water added to make 40 gallons. This was sprayed on the plants twice only, as no bugs were present after the second application.. For the first application 6¾ gallons were used; for the second 7½ gallons were used, making a total of 14½ gallons per plot of one-twentieth acre, or 290 gallons per acre for both applications, the mixture containing for the acre 3 lbs. 10 oz. of Paris green.

Plot B.—Bug Death dry was dusted on the leaves with a cheese cloth dusting bag. The vines were nicely covered, but not given an excessive amount. For the first application 4½ lbs. of Bug Death was used per plot; for the second, 5 lbs. per plot, and for the third, 4¾ lbs. per plot, making a total of 14¼ lbs. per plot, or 285 lbs. per acre in the three applications.

Plot C.—Bordeaux and Paris green mixture, made as follows:—Bluestone, 4 lbs.; lime, 4 lbs.; Paris green, ½ lb., and water added to make 40 gallons. For the first application seven gallons of the mixture was used, second application 8 gallons per plot, and third application 7½ gallons of Bordeaux alone, as it was not considered necessary to add Paris green, no bugs being present. This made a total of 22½ gallons to the plot of one-twentieth acre at three applications, or equal to 450 gallons of the mixture to the acre, for which 45 lbs. of bluestone, 45 lbs. lime and 3¾ lbs. of Paris green would be used.

MATERIAL USED AND COST PER ACRE.

Plot A.—3 lbs. 10 oz. Paris green at 20c. per lb.	$ 0 72½
Plot B.—285 lbs. Bug Death at $7 per hundred	$19 95
Plot C.—45 lbs. bluestone at 7c. per lb.	$ 3 15
45 " rock lime at 1c.	0 45
3¾ " Paris green at 20c.	0 75
	$ 4 35

For killing bugs alone two applications of either Paris green or Bug Death are sufficient. Therefore, the cost of Plot A, as compared with Plot B per acre, is as follows:—

Plot A.—3 lbs. 10 oz. Paris green at 20c.	$ 0 72½
" B.—190 lbs. Bug Death at 7c.	13 30

There was no blight on any of these plots. The following yields per acre were obtained.

How Treated.

	Bus.	Lbs.
Plot B.—Bug Death	373	20
" C.—Bordeaux and Paris green	310	..
" A.—Paris green	290	20

METEOROLOGICAL RECORD.

The maximum and minimum thermometrical observations for the year beginning December 1, 1902, and ending November 30, 1903 :—

Month.	Maximum.	Minimum.
1902.		
December	22nd 52° above zero	10th 16° below zero
1903.		
January	21st and 27th 41° above zero	19th 12° "
February	28th 50° above zero	18th and 20th 5° below zero
March	14th 53° "	3rd 2° above zero
April	29th 65° "	7th 13° "
May	28th 74° "	16th 22° "
June	10th 80° "	4th 28° "
July	11th 82° "	29th 40° "
August	20th 76° "	3rd 36° "
September	14th 80° "	10th 32° "
October	1st 69° "	31st 23° "
November	1st 4th 5th 57° above zero	21st 11° "

RAINFALL.

April	3·57	inches.
May	·68	"
June	2·29	"
July	2·07	"
August	2·40	"
September	3·63	"
October	5·78	"
November	7·98	"
Total	28:40	"

I have the honour to be. sir,
your obedient servant,

R. ROBERTSON,
Superintendent.

REPORT OF THE HORTICULTURIST.

(W. S. BLAIR.)

NAPPAN, N.S., December 1, 1903.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit hereith a report of some of the work done in the horticultural department of the Experimental Farm for the maritime provinces for the year 1903.

The spring generally was very favourable for getting work done, on account of more than usual dry weather. The mean average temperature for May was about equal to that of other years. June was not as warm as usual. July was about up to the average temperature, while August was considerably cooler. This made it unfavourable for plants that require plenty of heat to develop properly. The following table gives the mean average temperature for the months of May, June, July, August and September, as compared with those months of the years 1900-1901 and 1902:—

Month.	Mean Temperature at Nappan.				Rainfall, 1903.
	1903.	1902.	1901.	1900.	
	°	°	°	°	Inches.
May	47·7	47·6	48·1	46·1	0·68
June	53·6	54·5	59·3	57	2·29
July	62·7	61·7	65·2	64·5	2·07
August	59·3	63·4	65·3	62·1	2·40
September	57·5	57·5	58·4	53·4	3·63

The exceptionally dry weather in May and to the latter part of June caused a slow and uneven germination of garden seeds. In some cases where there was not sufficient moisture to start them they remained dormant for several weeks. The dry weather was exceptionally trying to annual flowering plants; both those started from seed in the open ground and transplanted plants. There were frosts in June on the 1st, 2nd, 4th and 5th, doing considerable damage. Frost kept off unusually well in the fall, the first being on October 4 of 6°.

The apple crop here was about up to the average, and of excellent quality. The apple crop in the Annapolis and Cornwallis valleys and western end of the province was a good one. The apple spot was not so prevalent as usual, the season not favouring its development. The fruit developed well, and the percentage of inferior fruit is small. The fruit crop in the eastern end of the province is small. Prince Edward Island reports would indicate that on the average not one-third of a fair crop was gathered. New Brunswick reports a good crop of apples of excellent quality.

In plums we have to report a complete failure, due to the late frosts killing the blossoms. The report is an average crop in the Annapolis and Cornwallis valleys. Prince Edward Island reports that on the average one-half of a good yield was harvested.

Cherries here all suffered from late frosts. The frost and birds together have made it difficult to obtain a quart of ripe cherries the past three years. The pear crop was also a failure this year.

Strawberries, owing to the extremely dry weather, gave only one-half an average crop. A considerable shortage in this crop is also reported from all over the maritime provinces. The gooseberries, raspberries and currants were only a fair crop. Cranberries are reported one-third of a fair yield, due to the injury of blossoms from the late frosts.

The fruit trees have made a fair growth this season. The shrubs and ornamental trees made an average growth. An addition was made this season to the area devoted to ornamental trees and shrubs and many new varieties sent from the Central Farm at Ottawa were planted, all of which did well.

The collection of annuals and perennials are each year a source of much pleasure and profit to visitors. In this report I am presenting some of the information obtained from the annuals tested here during the past four years. I am also reporting the growth of hedges under test here. Experiments were again conducted with different varieties of vegetables, some of which are included in this report.

I beg to acknowledge the following donations: From John Byrne, Esq., Kentville, N.S., scions of 'Cornish Aromatic' apple. From Mr. A. S. Banks, Waterville, N.S., scions of 'Black Ben Davis,' and 'Apple of Commerce.' From Mr. Wm. Sangster, Falmouth, N.S., two trees of 'Stark' apples. From Stark Bros., Louisiana, Mo., ten varieties of peach trees.

I addressed several agricultural meetings in Nova Scotia and New Brunswick during the year; also a series of two weeks' institute meetings in Prince Edward Island, from February 17 until March 3.

HEDGES.

In the spring of 1896 twenty-three different kinds of hedges were planted. The plants were from 6 to 8 inches high, and were set 18 inches apart, in rows 50 feet long,

The hedges were placed ten feet apart, and have been trimmed more or less every year. This is done once about the last of June to head in rank growing shoots, but the principal clipping is done the last of July or early in August.

The system of clipping adopted here with deciduous hedges is to produce rounded top and sides, and this has given satisfactory results. Where the sides are clipped square with almost a square top, as is sometimes seen, hedges so treated usually have many dead bottom branches.

In pruning the evergreen hedges, the aim is to give a gradual rounding from the top to the ground, giving the tips of all branches access to sunlight and rainfall, which doubtless aids their proper development, and in this way well grown vigorous branches to the bottom are usually obtained. Severe clipping when the hedges are young is not necessary, but some trimming should be done every year.

Sometimes hedges are planted with two rows, 8 or or 10 inches apart. This does not appear to be necessary, as one row of plants 18 inches apart will give excellent results. Plants not more than 18 inches high, well branched to the bottom, are the best. The common spruce makes one of the best and most easily obtained hedges, and no prettier hedge can be had if kept in proper shape. The Amur Privet, *Ligustrum amurense,* is one of the best of the deciduous hedges tested here. The Ginnalian maple is a stronger and quicker growing hedge; but it requires more clipping to keep it in shape.

EVERGREEN HEDGES.

Name of Variety.	Present height of hedge.	Present width of hedge at bottom.	Character of Hedge.
	Feet.	Feet.	
Thuya occidentalis, common Arbor vitæ or White Cedar	2½	3¼	Good.
Picea nigra, Common Black Spruce	2¾	3	"
Picea excelsa, Norway Spruce	3½	4	"
Picea pungens, Rocky Mountain Blue Spruce	2½	2¾	"
Pinus Cembra, Swiss Stone Pine	2¾	2½	Fair.
Pseudotsuga Douglasii, Douglas Fir	3½	3¼	Good.

DECIDUOUS HEDGES.

Ligustrum amurense, Amur Privet	3¾	5½	Good.
Rhamnus cathartica, Common Buckthorn	3¼	4	"
Acer tataricum Ginnala, Ginnalian Maple	5¼	6	"
Acer glabrum, Smooth Western Maple	3	3	Very poor.
Cotoneaster acutifolia, Sharp-leaved Cotoneaster	3	3¼	Fair.
Cotoneaster integerrima, Common Cotoneaster	2½	3½	"
Berberis Thunbergii, Thunberg's Barberry	2¾	4	Good.
Rosa rubrifolia, Purple-leaved Rose	4¾	3	Very poor.
Berberis Vulgaris purpurea, Purple-leaved Barberry	2¾	2¾	Fair.
Lonicera tatarica, Tartarian Honeysuckle	4	4	"
Caragana arborescens, Siberian Pea tree	3	3	"
Caragana frutcsens, Woody Caragana	2½	2¼	"
Viburnum Lantana, Wayfaring Tree	2¾	2¾	"
Syringa vulgaris, Charles X. seedling lilac	4	3½	"
Spirœa Van Houttei, Van Houtte's Spiræa	3	3½	"
Neillia opulifolia aurea, Golden-leaved Nine bark	3½	4	"
Neillia opulifolia, Nine Bark	4¾	5¼	"

ANNUAL FLOWERING PLANTS.

The object in growing a number of annual flowering plants is to beautify the grounds, and to obtain information as to their relative value for bedding, massing, or mixed planting. Some bedding work is done, but the majority of the flowers are grown in masses in beds, 3 by 12 feet. These are easily kept weeded, and one-half of each bed is usually given to a variety. The plants grown are generally of mixed colours, and little attention has thus far been devoted to varieties in special colours. The mixed will be found to give general satisfaction, and the best strains obtainable of the different kinds are used.

A large number of annuals will start easily in the open ground, but for early bloom those grown in the hot-bed and once transplanted there to develop stocky, well rooted plants, will be found the most satisfactory. The difficulty in sowing the seed in the open ground is to get the young plants started early enough. The seed generally is sown shallow, and a few dry days will thoroughly dry out the surface soil. In some instances careful and frequent watering is needed; very dry weather is also unfavourable for transplanting. This year strawberry boxes were used to shade the plants for a few days until they were rooted. The show of flowers was good this season, and the selection an excellent one, containing many new and interesting things.

LIST OF ANNUAL FLOWERS GROWN AT NAPPAN.

Propagated in hot-beds, grown March 15: transplanted into shallow boxes about April 15 and put out in open ground May 15.

Asters (12 varieties)—Flowered profusely and made an excellent display.

Ageratum coyzoides.—Made a nice show with its brush-like blue flowers.

Amarantus superbus.—Gave excellent results.

Brachycoma iberidifolia,—A graceful plant; fine for edging, flowered abundantly,

Chrysanthemum coronarium, Chrysanthemum carinatum tricolor, Chrysanthemum aureum.—These all flower freely and are very attractive. *C. aureum* is an excellent border plant.

Celosia plumosa, Celosia plumosa superba, Celosia plumosa (dwarf).—All good varieties; flowered freely; very useful for bedding.

Dianthus chinensis, Dianthus Heddewiggii, Dianthus laciniatus, Dianthus diadematus, Dianthus imperalis.—All good sorts; produce flowers in great variety of form and colour in great abundance. In bloom from early in August to frost.

Gaillardia picta, Gaillardia picta Lorenziana.—Produce brilliant flowers in great abundance.

Lobelia erinus (Crystal Palace).—Valuable for bedding and edging.

Antirrhinum majus, Antirrhinum majus manum, Antirrhinum (Tom Thumb).—Beautiful free flowering varieties of Snapdragon.

Nicotiana affinis, Nicotiana colossea, Nicotiana sylvestris.—Free blooming and effective, especially in large beds.

Phlox Drummondii (many varieties).—Excellent for bedding; free bloomers with a wide range of attractive colours.

Petunias (many sorts, single and double).—Very showy flowers, abundant bloomers, useful for bedding.

Portulaca grandiflora.—Produces brilliant flowers in great abundance.

Pansies (many varieties.)—Flower most freely, make an excellent display.

Stocks (many varieties).—Give fine flowers; useful for bedding.

Verbenas (in great variety).—Profuse bloomers, very pretty.

Zinnias.—Showy annuals; flowers purple and orange.

LIST OF ANNUAL FLOWERS GROWN AT NAPPAN.

SOWN IN THE OPEN GROUND ABOUT MAY 15.

China Asters, 12 varieties.—Made a fine show in the autumn.

Abronia umbellata.—In bloom August 6. A handsome trailing plant.

Agrostemma cœli rosea—In bloom last of July. Bloomed well.

Amarantus superbus.—Flowered freely in the autumn.

Alyssum Little Gem.—Succeeds well; a fine border plant.

Bartonia aurea.—In bloom July 18 to September 8; made a fine show.

Cacalia coccinea.—Produces scarlet flowers in abundance.

Cacalia lutea.—An orange flowered sort; very desirable.

Calendula officinalis (Royal Trianon.).—In bloom July 24; flowers very fine and abundant.

Coreopsis tinctoria, Coreopsis Drummondii, Coreopsis Atkinsoniana.—Very showy. Flowers bright yellow; produced in abundance from last of July to frost.

Iberis coronaria, Iberis odorata, Iberis umbellata.—Plants useful for bedding; bloom freely from July 18 until frost.

Centaurea cyanus, Centaurea moschata, Centaurea alba.—All bloom well from July 18 until late in autumn. Make a fine display.

Godetia rubicunda splendens, Godetia Whitneyi.—Produce showy flowers of a satin-like texture, beginning July 20.

Eschscholtzia californica, Eschscholtzia mandarin, Eschscholtzia Douglasi.—Known as California Poppies; remarkable for the abundance and brilliance of their flowers.

Gypsophila elegans, Gypsophila elegans rosea.—Produces small flowers in abundance, valuable for bouquets.

Helichrysum bracteatum.—Everlasting flowers; very desirable.

Helianthus multiflorus fl. pl., Helianthus cucumeri folius Stella.—Produce showy bright yellow flowers in abundance.

Larkspur hyacinth-flowered, Larkspur ranunculus-flowered, Larkspur candelabrum, Larkspur Emperor.—These different forms of larkspur are all desirable. They vary in height and colour, but are free bloomers and very ornamental.

Lupinus sulphureus, Lupinus hybridus fl. pl. Lupinus nanus fl. albus, Lupinus nanus albo coccinea.—Different forms of Lupin, producing in August large spikes of flowers of different colours.

Nigella damascena.—Produces interesting and attractive flowers..

Papaver somniferum, Papaver Rhoeas, Papaver carnation-flowered, French Shirley.—All desirable forms of Poppy; very free bloomers, with a wide range of colours.

Scabious major, Scabious major dwf.—Produce flowers in great abundance.

Salpiglossis var. grandiflora, Salpiglossis var. superbissimus.—Both very fine varieties and free bloomers.

Tagetes signata pumila.—A very fine bloomer, good for massing.

GARDEN VEGETABLES.

EXPERIMENTS WITH GARDEN PEASE.

Comparative tests have been carried on for a number of years with varieties of garden peas obtained from different seedsmen. This season eighty-two sorts were under test including many of the newer sorts advertised. The information obtained from these tests has been reported from time to time, and varieties considered of less value than others have been discarded. This season fifty sorts have been thought not worthy of further test, and a table of those kinds found to be the best is given below.

The seed was sown in rows 3 feet apart, and 33 feet long. No stakes or brush was used as support to the vines, they being allowed to spread between the rows. Two rows, each 33 feet long, were planted of each variety—one row was allowed to ripen for seed, and the other was picked when fit for eating green, and the weight of unshelled pods fit for market obtained. The seed was sown May 4, in drills 2 inches deep, 1½ inches apart.

The ground was previously in corn, having been manured for that crop in the spring of 1902. Complete commercial fertilizer, at the rate of 100 lbs. per acre, was scattered along the rows at time of planting. The land was well worked up before seeding, and the rows were kept cultivated and hoed until the first of July, after which on account of the vines covering the ground it could not be worked.

Peas can be grown in almost any kind of soil, but for the best results a fairly rich loam should be selected. The pea plant likes a cool moist soil, and can be planted as early in the spring as the land is fit to work. No gain, however, is made by planting on ground that has been worked before it is dry enough.

The wrinkled sorts of peas are generally better in quality than the smooth, round kinds, but the majority of very early peas put upon the market are of the latter character. The Alaska, or green smooth pea, and Station, a green wrinkled variety, are the two best very early peas to grow. They are as early and as good croppers as any of the very early sorts tested. They are not large podded, as, in fact, none of the very early sorts are. Following these as market sorts are, Prosperity, or Gradus, Thomas Saxton and King Edward VII., all about the same class and coming in at the same time. These are practically of the same season as Nott's Excelsior and American Wonder, but have much larger pods. We could not see any difference between Thomas Saxton and King Edward VII. pea. These varieties can be safely recommended for either home use or market purposes, surpassing in vigor and productiveness either the Gradus or Prosperity, and if anything a little earlier.

GARDEN PEASE.

Name of Variety.	When First Fit to Use.	Date of Last Picking.	Length of Vine.	Length of Pods.	Number of Peas in Pod.	Size of Pea.	Kind of Pea.	Total weight of marketable peas in pod.
			in.	in.				lbs.
Alaska	July 15	July 30	36	2½ to 3	6 to 7	Small	Smooth	28
Station	" 15	" 30	38	2¾ " 3	6 " 7	"	Wrinkled	28
Surprise	" 15	" 30	37	2½ " 3	6 " 7	"	"	23
First of All	" 15	" 30	40	2½ " 3	6 " 7	"	Smooth	21
Claudit	" 21	Aug. 4	42	3 " 3½	6 " 8	Medium	"	21½
Exonian	" 21	" 4	42	2¾ " 3	6 " 7	"	Wrinkled	26
Ameer	" 21	" 4	37	3 " 3½	6 " 8	Large	Smooth	19¾
Prosperity	" 21	" 6	43	3½ " 4	6 " 8	"	Wrinkled	25½
Thos. Saxton	" 21	" 4	47	3¼ " 4	6 " 8	"	"	32¼
King Edward VII	" 21	" 4	47	3¼ " 4	6 " 8	"	"	31¼
Gradus	" 21	" 6	43	3½ " 4	6 " 8	"	"	22½
A 1	" 21	" 6	42	3¼ " 3¾	6 " 7	"	"	23½
American Wonder	" 21	" 6	28	2¾ " 3	5 " 7	Medium	"	23½
Nott's Excelsior	" 21	" 6	22	2½ " 2¾	5 " 7	"	"	23½
Juno	Aug. 3	" 13	30	3½ " 4	7 " 8	Large	"	27½
Hurst's Reliance	" 3	" 8	46	3 " 3¼	5 " 7	"	"	30¼
Dwarf Defiance	" 3	" 8	20	3½ " 4½	7 " 9	"	"	25½
Advancer	" 3	" 13	48	2¾ " 3	6 " 7	Medium	"	32
Daisy	" 3	" 13	20	3¼ " 4	6 " 8	Large	"	35½
Prolific	" 3	" 13	36	3½ " 4½	7 " 9	"	"	37
Admiral Dewey	" 3	" 13	40	3½ " 4½	7 " 9	"	"	40¼
American Champion	" 3	" 13	54	3½ " 4	7 " 8	"	"	27½
Prince Edward	" 3	" 13	54	3¾ " 4¾	7 " 9	"	"	27½
Dwarf Telephone	" 3	" 18	24	3 " 3½	6 " 8	"	"	26½
Prodigious	" 10	" 18	52	3¾ " 4½	7 " 9	"	"	39½
Fillbasket	" 10	" 25	48	3¾ " 4½	7 " 9	"	"	33¼
Perfection	" 10	" 28	52	3½ " 4½	7 " 9	"	"	22½
Heroine	" 10	" 20	53	3¾ " 4½	7 " 9	"	"	39¾
Duke of Albany	" 10	" 25	50	3 " 3¾	6 " 7	"	"	39¾
Stratagem	" 10	" 25	49	3 " 3¾	7 " 8	"	"	34
Stanley	" 10	" 25	52	4 " 4½	7 " 9	"	"	26¾
Perpetual	" 10	" 30	49	3 " 3¾	5 " 7	"	"	38

EXPERIMENTS WITH TOMATOES.

Seventy-one varieties were included in this comparative test. The seed was sown April 7, in boxes 3 inches deep with 2½ inches of soil. These boxes were set on a hot-bed having a moderate heat. The plants did not make a rapid growth, but strong, vigorous plants were ready for pricking out; one plant in a strawberry box filled with fairly rich garden soil, on April 27. These boxes were set closely together in a hot-bed having moderate heat, and having about 2 inches of sand over the manure.

These plants were carefully watched, giving a judicious amount of water, and allowing plenty of ventilation on warm days. The boxes were moved in the hot-bed once a week to prevent the roots of the plants from fastening on the manure below the boxes, for the roots will quickly penetrate into it through the openings in the boxes.

ORCHARD PROTECTED BY NATURAL SHELTER BELT OF SPRUCE TREES. THE APPLE TREES WERE PLANTED IN 1897.

It is not well to force the plants too much in the hot-bed, but a moderate, continuous growth is important. To be the most successful, this character of growth should be maintained if practicable, without check from the time the plants are started until the fruit is ripe. Before planting out, the sash was left off the plants as much as possible, this making them hardy and more stocky. The tomato requires a uniformity of heat and moisture to develop properly. There is usually no gain in setting the plants in the open ground before towards the middle of June. This year, however, the soil was fairly warm, and weather conditions favourable, and they were put out June 10. The boxes were cut, and the plants set with the earth attached. They were set on the level and not mounded up.

Usually it is not necessary to water the plants when they are planted this way, but this season a drying wind with exceptionally dry soil made it necessary to water once. This was done by making the soil cup-shaped around the plant to hold the water, and pouring about a quart around each plant. After the water had been soaked up well, dry earth was put around each plant to conserve the moisture by preventing evaporation. Out of the 400 plants set none were lost. Although the season kept dry it was not found necessary to water again.

The practice followed by some of keeping the soil around the plants soaked with water, is not good, as an excess of water and lack of heat checks the growth of the plants very materially.

The plants when set were from 8 to 10 inches high, and some of them were in blossom. A lath was driven into the ground by each plant, to which it was tied. The lateral branches were kept cut off as they appeared, and the plant trained to the stake, allowing only one stalk to grow. Each plant was tied to the stake three times as they grew, and each plant was about 4 feet high at the end of the season.

This method gives more perfect fruit which ripens earlier than where the plants are allowed to run untrained over the ground; but, the yield of fruit is not so large. Five plants of six varieties were allowed to grow without stakes to compare with five similar plants of the same variety staked. Those trained were not affected with rot nearly so much as those not staked, and there was a much larger percentage of perfect marketable fruit. The unstaked plants require more room, and should be set 4 by 4 feet apart each way, while those staked can be set 30 inches apart each way.

The practice followed by some is to let the vines grow until about the first of August, when three stakes each about 3 feet long are set pyramid shape over the plant, and tied at the top. The vines are gathered together and tied with binder twine to the top of these stakes. This keeps the fruit from the ground and prevents so much dampness around the fruit, thereby materially lessening the loss of fruit from rot.

Sufficient cultivation and hoeing was given to keep the ground in a loose condition. The land had not been manured since the spring of 1901, and had tomatoes on it in 1902. The usual practice is to grow tomatoes where the previous crop has been manured, and not use stable manure directly for the crop, as it is apt to produce too rank a growth in the plant. The soil on which these plants were grown was a light clay loam, not very fertile, and potato fertilizer at the rate of 300 lbs. per acre was sown broadcast and harrowed before planting. In addition to this, one teaspoonful of nitrate of soda was scattered around each plant on June 26 before a rain, and a similar amount on July 14. This quantity of nitrate of soda will be found sufficient to give the plant a good start.

The object of the experiment was to find out which kinds are earliest maturing and best for market purpose. The requirement of the market is for an even, round fruit, not too small. The varieties found best were Sparks Earliana, a scarlet, medium-sized round, smooth tomato; Bond's Early Minnesota, a smooth purplish pink, medium-sized tomato; Early Ruby, medium, quite smooth, scarlet, and Extra Early Advance, medium, smooth, scarlet.

The season being short at best for tomatoes in the maritime provinces, earliness is of great importance. Any fruit that will mature at Nappan is likely to mature in almost any part of the maritime provinces, if given similar treatment.

Five plants of a variety were planted in each plot, and the following yield of ripe and green fruit was obtained. For fear of frost, all unpicked fruit was gathered September 21.

TOMATOES.

Name of Variety.	Sept. 4.	Sept 14.	Sept. 21.		Total Ripe Fruit from 5 Plants.	Total Green Fruit from 5 Plants.	Character of Fruit.
	Ripe Fruit from 5 Plants.	Ripe Fruit from 5 Plants.	Ripe Fruit from 5 Plants.	Green Fruit from 5 Plants.			
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Autocrat	3½	4	1½	5	9	14	Smooth.
Atlantic Prize	4	2¾	2½	6¼	9¼	15½	Medium smooth.
Acme	8¾	3¼	4	10¼	16¾	27	Smooth.
Acme—Improved	5¾	11¾	¾	7¾	18¼	26	"
Brinton's Best	1½	3½	4	12½	9	21½	"
Bright and Early	2	4	1	7	7	14	"
Baltimore Prize Taker	1¾	3¼	4	11¼	9	20¼	"
Bolgiano's Best	½	2½	3	8¼	6	14¼	"
Best of All	½	4	2¾	15	7¼	22¼	"
Crimson Cushion	1¼	4	8	13	13¼	26¼	Medium smooth.
Century	3	3	5¼	11¾	11¼	23	Smooth.
Comrade	2¼	5¾	2½	13¼	11½	24¾	Medium smooth.
Combination	3¾	3	5	11¼	11¾	23	Smooth.
Climax	2¼	8½	3½	8	14¼	22¼	"
Canada	1½	2½	3¼	19¾	7¼	27	Medium smooth.
Cream City	2	5½	½	11	8	19	Smooth.
Democrat	1¼	3	2	6¼	6¼	12½	"
Dominion Day	3½	12¼	1½	8	17¼	25¼	Medium smooth.
Diadem	1¾	3½	3½	10½	8¾	19¼	Smooth.
Dwarf Champion	¾	2½	3	12¼	6¼	18½	"
Earliana	5½	4	2	12	11½	23½	"
Early Minnesota	1½	2¼	6	10.	9¾	19¾	"
Extra Early Advance	6	13¾	1½	9¾	21¼	31	"
Enormous		4	2¼	8	6¼	14¼	Medium smooth.
Early Richmond	4¾	11½	5½	7	21¾	28¾	Rough.
Early Leader	8	2½	6	8½	16½	25	"
Early Jersey	4½	7½	3¾	12	15¾	27¾	"
Early Jewel	3	4	2	8½	9	17½	Smooth.
Early Ruby	4	4	9	14	17	31	Medium smooth.
Essex Hybrid	2¾	2½	2	8¾	7¼	16	"
Earliest-Maule	1¼	4½	1	16¾	6¾	23¼	"
Early Bermuda	2¼	5½	3	9	10¾	19¾	"
Favourite	4	2½	1¾	10¾	8¼	19	Smooth.
Frogmore	2¾	4½	3	16½	10¼	26¾	"
Fordhook First	2¾	6	1½	5½	10¼	15¾	"
Freedom	¾	4	½	9¼	5¼	15	Medium smooth.
Fordhook Fancy	1¾	2¼	3¼	7¾	7¼	15	Smooth.
Creekside Glory	2½	5½	5½	14¼	13½	27¾	Medium smooth.
Garden Sowing	1¾	2	1	11	4¾	15¾	Smooth.
Golden Jubilee	3¼	5½	3	15	11¾	26¾	Medium smooth.
Great Mississippi	4¾	7½	4½	9½	16¾	26¼	Medium smooth.
Honor Bright	1½	6½	3¾	8	11¾	19¾	Smooth.
Ignotum	1	3½	3¾	17¾	8¼	26	"
King Humbert	½	2	6	14	8½	22½	Medium smooth.
Long-keeper	4	5½	2	12	11½	23½	"
Lorillard	3¾	3	5	11¼	11¾	23	Smooth.
Landreth's Earliest	3	3¼	4½	6¼	10¾	17	Medium smooth.
Livingston's Stone	3½	2½	4½	13½	10½	24	Smooth.
Maule's—No name		4½	5¾	16¾	10¼	27	Medium smooth.
Marvel	1	5½	3	8¼	9½	17¾	Smooth.
Magnus	2¼	5½	1¼	6½	9	15½	Medium smooth.
Matchless	½	2¼	2	18	4¾	22¾	Smooth.

TOMATOES—*Concluded.*

Name of Variety.	Sept. 4. Ripe Fruit from 5 Plants.	Sept. 14. Ripe Fruit from 5 Plants.	Sept. 21. Ripe Fruit from 5 Plants.	Sept. 21. Green Fruit from 5 Plants.	Total Ripe Fruit from 5 Plants.	Total Green Fruit from 5 Plants.	Character of Fruit.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
New Imperial	2	2¾	2	16½	6¾	23¼	Smooth.
Nolte's Earliest	5	9¼	2	4	16¼	20¼	"
New Buckeye State	....	1¾	2½	12¾	4¼	16¾	"
New Liberty Bell	2	5	4¼	11	11¼	22¼	Medium smooth.
Plentiful	4	4½	2½	14	11	25	"
Ponderosa	2½	5	4½	11¼	12	23¼	"
Perfection	1¼	3	3	9½	7¼	16¾	Smooth.
Picture Rock	¾	4½	7	11½	12¼	23¾	"
Quick-sure	4	2¾	3	7¾	9¾	17½	"
Quarter Century	1¼	5½	2¾	5	19½	24½	"
Royal Red	5½	9¼	1½	5	16¼	21¼	"
South Jersey	7½	1½	4	7	13	20	Medium smooth.
Success	½	2	2¼	15¼	4¾	20	Smooth.
Spark's Earliana	8¾	3	1½	10	13¼	23¼	"
Simmer's Earliest	3¼	14¾	1	4	19	23	Medium smooth.
Thorburn's Earliest	2½	3¼	6¼	12	12	24	"
Table Queen	3¼	7	9	18	19¼	37¼	Smooth.
Thorburn's 1902	1	5½	3	14	9	23	Medium smooth.
Waldorf	1½	1½	4¼	9	7¼	16¼	Smooth.

TOMATOES Staked compared with those not Staked.

Number.	Name of Variety.	Ripe Fruit from 5 Plants.—Sept. 4.	Total Ripe Fruit from 5 Plants, Sept. 21.	Total Green Fruit from 5 Plants.	Total Fruit from 5 Plants.
		Lbs.	Lbs.	Lbs.	Lbs.
1	Brinton's Best—Not staked	2½	8	27½	35½
2	" Staked	1½	9	12½	21½
3	Early Leader—Not staked	4	14½	26	40½
4	" Staked	8	16½	8½	25
5	Early Ruby—Not staked	6¾	13¼	24	37¼
6	" Staked	4	17	14	31

EXPERIMENTS WITH GARDEN CORN.

Forty-five varieties of garden corn were planted May 28 on a clay loam soil. This land was previously in strawberries. No stable manure was used this season. The land was ploughed and worked up a few days before planting. Complete fertilizer, at the rate of 350 pounds per acre, was sown broadcast and harrowed in with the smoothing harrow. The corn was planted in rows three feet apart, and three kernels of corn planted in a group a foot apart and 1½ inches deep.

Each plot was two rows 16½ feet long. The corn was thinned to one plant to a foot by cutting out the weakest plants. It is better to thin by cutting off the plant than to pull it up, for by pulling, the remaining plant is liable to be disturbed. The season was not favourable for this crop, and many of the varieties did not mature sufficiently for table use. The following notes were taken of these varieties :—

CORN.

Name of Variety.	Length of Ears.	Size of Ears.	Remarks.
	Inches.		
Extra Early Beverly	5 to 6	Small to medium	All fit for table use.
Peep O'Day	5 " 6	" "	" "
Extra Early Cory	5 " 7	Medium	90 p. c. fit for table use.
Red Cob Cory	5 " 7	"	90 " "
Ringleader	5 " 6	"	90 " "
Eastern Extra Early	4 " 5	Small	80 " "
Ford's Early Sugar	5 " 6	"	80 " "
Tom Thumb	5 " 7	"	80 " "
Burbank's Early Maine	5 " 6	"	80 " "
Fuller's Early Yellow	7 " 10	Medium	80 " "
Vick's Extra Early	6 " 7	Medium to large	80 " "
Crosby's Early	5 " 7	Medium	60 " "
Early Six Weeks	3 " 4	Small	50 " "
Extra Early Premo	6 " 7	Large	40 " "
Oakview	6 " 7	Medium to large	40 " "
Extra Early Minnesota	7 " 8	Large	40 " "
Early Adams	6 " 7	"	40 " "
Mammoth White Cory	7 " 8	"	30 " "
New Champion	7 " 8	"	10 " "
Golden Bantam	4 " 6	Small	10 " "
Metropolitan	6 " 8	Large	10 " "
Nelson's Yellow	8 " 9	Medium	10 " "
Cosmopolitan	6½ " 8	Large	10 " "
Early Essex	6 " 8	"	10 " "
Kendall's Early Giant	6 " 7	"	5 " "
Stabler's Extra Early	7 " 8	"	5 " "
Honey Dew	6 " 8	"	5 " "

None of the following produced any heads fit for table use:—

Ne Plus Ultra, Potter's Excelsior, None Such, Earliest Sheffield, Marblehead Mammoth, Burlington Hybrid, Henderson, Landreth's Sugar, Lackey's Early, Quincy Market, Hickox Improved, Perry's Hybrid, Old Colony, Early Landreth Market, Early Concord, Early Amber Pop Corn, White Rice Pop Corn, White Pearl Pop Corn.

EXPERIMENTS WITH CABBAGE.

The seed was sown in shallow boxes April 3. The boxes were placed in a cold frame. This cold bed was earth two feet deep put into a frame set on the ground. The bed was used for a hot-bed the previous season, and was covered during the winter, and about March 1 glass sashes were put on it, and by April 1 the soil was all thawed out and quite warm.

The seed germinated slowly, but the plants were stocky and strong. They were fit to prick out April 27. They were set 3 by 3 inches apart into the cold frame bed, and by setting out time, May 19, were good, strong, healthy plants, well rooted. Twenty-five plants of a variety were planted, but the ravages of the root Maggot made it necessary to reduce the selection to 15 plants of each variety for the test.

The ground on which these were planted was manured in the fall of 1902 with 20 one-horse cart loads of stable manure per acre and ploughed. This was ploughed again in the spring and worked up, and 300 pounds of complete fertilizer per acre sown broadcast and harrowed in with the smoothing harrow. On June 15 a teaspoonful of nitrate of soda was scattered around each plant. The plants were set in rows three feet apart and thirty inches apart in the rows on level ground.

The cabbage thrives in a cool, moist atmosphere. The failure of plants to head is seldom experienced in these provinces. This condition is usually the result of very hot weather and a dry atmosphere, which we are not generally subjected to. The cabbage plant is a gross feeder, and if well supplied with food and a proper supply of moisture will generally succeed on any kind of soil. Unlike the tomato, it can be set out as early in the spring as the soil will permit of working properly; that is, providing the plants have been started under good conditions. If the plants have been forced in a green-house and set out May 1 a frost of over three degrees is liable to injure them, while if grown under cool conditions and well hardened up before planting, they will stand any spring frosts to which they are likely to be exposed after May 1. If the plants are to be set out before the middle of May they must be started early enough to make strong and well rooted plants by that time.

The object of this experiment was to find out what sorts are best for early market. The heads were cut as soon as fit for market and the weights obtained. Forty-six varieties were included in this test.

CABBAGE

Name of Variety.	July 31.		Aug. 8.		Aug. 12.		Aug. 19.		Aug. 28.		Average weight of Heads, lbs.	Remarks.
	No. of Heads.	Lbs.	No. of Heads.	Lbs.	No. of Heads.	Lbs.	No. of Heads.	Lbs.	No. of Heads.	Lbs.		
Gregory's Earliest	3	6¾	7	18¾	4	13½	1	4½	....	....	2·90	Conical.
Earliest	4	9¾	3	8	3	10¼	4	11½	1	2½	2·80	"
Jersey Wakefield	4	8½	6	16	5	23	....	....	....	....	3·16	"
Paris Market	5	11¼	7	15½	....	....	3	6½	....	....	2·21	"
Early Express	5	12¾	4	13½	3	10¼	3	10	....	....	3·10	"
Miniature Marrow	3	4¼	8	13	4	6	....	....	....	....	1·55	Round.
Cracker Jack	3	8½	5	13¾	2	7	3	7	2	4½	2·71	Conical.
Charleston	1	3½	3	9¾	6	19	2	6½	3	10¼	3·26	"
Early Baseball	2	4½	5	9¾	4	9½	4	10	....	....	2·23	Round.
Etampes	7	14	4	7¾	4	9	....	....	....	....	2·05	Conical.
Bamberg's Earliest	1	2½	3	8	3	8½	4	15	4	9¼	2·88	Round, not compact.
Premier	....	....	....	....	3	14½	12	51½	....	....	4·40	Flat, round.
Early Eureka	....	....	3	10	4	10½	5	20	3	15	3·70	"
Early Dwarf York	1	2¼	....	....	4	14½	7	22	3	9	3·25	"
Improved Early Spring	....	....	....	....	6	19	6	22¾	3	12	3·58	"
Early Spring	....	....	....	....	6	21	5	21½	4	17	3·96	"
Winningstadt	....	....	....	....	6	18½	4	15	5	19¾	3·55	Conical.
Early Summer	....	....	3	9	4	18	5	19¾	3	10¼	3·80	Round.
First Early	....	....	....	....	6	23¾	6	22	3	11¾	3·83	"
	Aug. 19.		Aug. 28.		Sept. 2.		Sept. 10.		Sept. 14.			
Taber's Nonpareil	5	14½	5	17¾	3	10	2	7¾	....	....	3·33	"
Bismarck	2	11	1	4¾	4	19¾	4	31	4	22	5·90	Flat, round.
Reedland Early Drumhead	6	28	6	18¼	....	....	....	....	3	16	4·16	Round.
Early Flat Dutch	3	14½	2	9	3	13¾	7	28½	....	....	4·38	Flat, round.
Midsummer	6	26	1	4	2	12¼	2	9½	4	18½	4·68	Round.
Premium Flat Dutch	3	12	2	9	2	12½	5	33	3	18	5·63	Flat, round.
All Seasons	4	22¼	4	19½	3	13	2	11¼	2	16	5·46	"
All Head	3	16¾	3	16¼	5	18¼	4	14½	....	....	4·38	Flat, round.
Market Gardeners	2	7½	3	15	4	20½	3	14	3	14¾	4·78	Round.
Enkhuisen	4	12	6	21½	2	8	3	12½	....	....	3·60	"
Improved Brunswick	2	10¼	4	20¾	1	3¾	3	15	5	23	4·85	Flat, round.
Dutch Winter	1	4½	4	28½	2	10¼	2	11	6	32	5·75	"
Stone Mason	1	5½	2	12½	2	11	2	22	8	44½	6·36	"
	Aug. 28.		Sept. 2.		Sept. 10.		Sept. 14.		Sept. 30.			
Late Flat Dutch	3	23	3	14½	....	....	5	44	4	29½	7·40	Flat.
Lupton	1	5	2	9½	4	28	8	41½	....	....	5·56	Flat, round.
Mammoth Rock Red	1	5¼	1	4	....	....	4	33	9	51¾	6·26	Round.
Large Red Drumhead	1	6	1	5½	2	11	6	52½	5	32	7·13	Flat, round.
Hard Heading	2	7¾	....	....	4	20	4	18	5	23½	4·61	Round.
Cannon Ball	1	4¾	....	....	4	27	5	28¼	5	26½	5·76	"
White Giant	....	....	3	12¾	2	14	3	17½	7	25¾	4·66	"
Danish Baseball	1	3	....	....	4	26¼	2	15	8	42¾	5·80	"
Vandergaw	3	16½	1	7½	1	9	2	12	8	52¼	6·48	Flat, round.
Houser	4	22	....	....	2	10¼	3	26	6	33¾	6·13	Round.
Succession	3	12	....	....	3	14½	2	9¾	7	37¾	4·93	"
Hartford	....	....	4	32	....	....	2	10	9	42	5·60	"
Autumn King	....	....	4	28	....	....	3	23¼	8	67	7·88	Flat, round.
Solid Emperor	....	....	....	....	10	72	2	14	3	19½	7·03	"

EXPERIMENTS WITH EARLY POTATOES.

The object of this experiment was to gain information as to the relative earliness of different sorts of early potatoes. Seventeen sorts were selected and planted in rows, 26 inches apart, and the seed dropped one foot apart in the rows. They were given cultivation similar to the field crop of potatoes.

The ground was previously in vegetables. It was manured in the fall of 1902 with twenty one-horse cart loads of stable manure per acre and ploughed under. This was worked up in the spring by ploughing and harrowing with the disc and springtooth harrows, and once with the smoothing harrow, after 300 lbs. per acre of complete fertilizer had been sown broadcast. Drills were run with the plough, the seed dropped, and covered with the plough.

The seed started regularly and a strong vigorous growth was made up to the first of August, when the Early Blight or leaf spot disease *(Macrosporium solani)* made its appearance. This blight is different from the late blight *(Phytophthora infestans)*. The plants had been dusted with Bug Death at the rate of 100 lbs. per acre July 20, and on the appearance of this blight Bordeaux mixture was sprayed on the plants August 4. The plants, however, had already been infected and this did little good. The field plots of potatoes, which were thoroughly sprayed with Bordeaux mixture July 20, showed no signs of the disease. The plants made no practical gain after August 20, as will be seen from the results given below, and the vines were nearly all dead by September 4. There were no rotten tubers in the field. This disease, unlike the late blight, is not accompanied by a decay of the tubers.

A plot of each variety was dug August 8, and duplicate ones August 20 and September 4. The yield from each plot, one row 66 feet long; is given in the following table, also the average yield of all the plots at the different dates of digging. It will be seen that the yield per acre increased 84 bushels per acre in the twelve days from August 8 to August 20.

EXPERIMENTS WITH EARLY POTATOES.

Name of Variety.	Dug Aug. 8.		Dug Aug. 20.		Dug Sept. 4.	
	Marketable per plot.	Not marketable per plot.	Marketable per plot.	Not marketable per plot.	Marketable per plot.	Not marketable per plot.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Irish Cobbler	46	6	66½	8	65½	13
Early Andes	37	6	61½	9	48	8¼
Early Michigan	35¾	4	45½	8	47¾	11¼
Reeves' Rose	35	7¾	47½	11	48	8½
Crown Jewel	34½	8	55	8½	45¼	13
Beauty of Hebron	34	7	56¾	9	45	9¾
Bovee	33½	6	45¼	5¼	42¼	11
Pearce's Extra Early	33½	5	53½	7¼	50¾	11
Canadian Beauty	33	4¼	51½	3¾	54½	7¾
Early Harvest	32	6½	42½	7¾	43¼	11¼
Early Sunrise	31¼	5	33¼	6¼	39¾	6
Earliest of all	30½	3	42	3¾	42	7
Early Ohio	29½	3½	41¾	2¾	58	4½
Early Gem	27	3¾	44½	5½	52½	6¼
Rawdon Rose	26¼	3	50	5½	41¾	10½
Early Rose	25	2½	31½	6	28¼	8½
Early Norther	17¾	3½	60	3	60½	6

AVERAGE YIELD OF ALL THE PLOTS.

When Dug.	Marketable.		Not Marketable.	
	Bush.	Lbs.	Bush.	Lbs.
August 8	157	56	24	34
" 20	241	56	32	9
September 4	237	7	44	46

POTATOES CUT IN DIFFERENT WAYS FOR PLANTING.

The object of this experiment was to ascertain whether any gain was made by cutting potatoes in different ways for seed. The variety Bovee was used. The land on which these tests were made was similar to that on which the early potatoes were grown, and received the same treatment in every particular.

On plot No. 1 small whole potatoes were planted; No. 2 medium whole potatoes; No. 3 the potatoes were cut in two crosswise, and both halves of the potato planted; No. 4, the potatoes were cut in two lengthwise and both halves planted; No. 5, the potatoes were cut in two crosswise, and the seed end half only planted; No. 6, the potatoes were cut in two crosswise, and the butt end half only planted; No. 7, a piece with only one eye; No. 8, a piece with two eyes, and No. 9 a piece with three eyes.

Each plot was one row 33 feet long. They were dug on August 20, and duplicate plots dug September 4. The following yields were obtained:—

Number.	How Cut.	Dug Aug. 20		Dug Sept. 4.	
		Marketable per plot.	Not marketable per plot.	Marketable per plot.	Not marketable per plot.
		Lbs.	Lbs.	Lbs.	Lbs.
1	Small whole	18¼	6	12½	10½
2	Medium whole	28	13½	32	18¼
3	Cut in two crosswise	20¾	6½	24¼	10
4	Cut in two lengthwise	30	4	36	8¼
5	Seed end half	24½	9	32	11
6	Butt end half	22¾	5½	27½	9
7	One eye	10½	½	12	2
8	Two eyes	24	½	22¾	2
9	Three eyes	22	2	26	4½

LIMING *versus* NOT LIMING POTATO SEED FOR PLANTING.

This experiment was for the purpose of testing the value of rolling cut tubers ready for planting in air-slacked lime. For this test the early potato plots were divided into two plots, on one-half of which seed rolled in lime was planted, and the other half planted with seed not limed. The seed was cut just before planting.

These plots were dug August 20, and duplicate ones September 4. Each plot dug in this test was 17 rows (each row a variety), 33 feet long and 26 inches apart. The yield per acre has been calculated from the weight of marketable and unmarketable tubers obtained. As these plots were the same as the early potato plots, the premature decay of the vines already mentioned resulted in no practical increase of yield after the digging of August 20.

How Treated.	Dug Aug. 20.						Dug Sept. 4.					
	Marketable per acre.		Not marketable per acre.		Total Yield per acre.		Marketable per acre.		Not marketable per acre.		Total Yield per acre.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Limed	246	19	33	50	280	9	242	31	49	52	292	23
Not limed	235	19	30	29	265	48	232	10	39	40	271	50

I have the honour to be, sir,
Your obedient servant,

W. S. BLAIR,
Horticulturist.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MANITOBA, November 30, 1903.

Dr. WILLIAM SAUNDERS,
Director Dominion Experimental Farms,
Ottawa, Canada.

SIR,—I have the honour to submit herewith my fifteenth annual report, with details of experiments undertaken and work accomplished on the Brandon Experimental Farm during the past year.

The past winter was a very favourable one, snow came fairly early and remained all winter; severe storms were rare and the weather was generally favourable for out of door work. Spring opened up on April 3, and a small area of wheat was sown on that date in some parts of the province, but colder weather followed and seeding did not commence on this farm until about April 16. May began fine, but cool; by the middle of the month the temperature had increased, and a much-needed rain fell on the 16th; the remainder of the month was showery and favourable for growth.

The early part of June set in very warm, and growth was very rapid, but later in the month grain on fall and spring ploughing was in great need of rain, particularly in the eastern portion of the province.

July and August were unusually cloudy and cool, with much east wind and frequent showers; fogs were also prevalent.

September opened with a severe frost on the 4th, injuring all tender vegetation; fortunately the bulk of the grain throughout the province was cut by this date, but much fodder corn and other tender vegetation was injured. On the 12th and 13th of this month occurred one of the worst snow storms ever recorded here during September. The storm found nearly all the grain in the stook, and stacking was delayed for about two weeks and the quality of wheat reduced two, and in some cases, three grades.

During the last week of September and nearly all October the weather was unusually fine and gave opportunity for threshing and fall ploughing, which had been much delayed.

WHEAT.

This important grain has had much to contend with during the past season; drought threatened it during June, rust was very prevalent on some of the stronger soils, and unseasonable weather in September threatened to spoil the sample, but in spite of all these drawbacks, the sample is generally a fair one, and the prices are above the average; so that farmers will realize nearly an average return for their crop. On this farm both the yield and sample were greatly injured by rust, so prevalent, especially on the valley land during the close, moist days of August; the uniform test plots suffered most from this cause, possibly this was owing to the well compacted summer-fallow soil retaining the moisture and causing an over-rank growth.

On the larger fields of grain where the soil was ploughed later in the season and was somewhat drier, the straw was fairly bright, and there was scarcely any injury from this cause; the sample was plump and weighed the full standard weight.

As usual, the Goose and Roumanian wheats were practically free of rust, and were for this reason much more productive than any of the other varieties and also heavier per bushel.

The following varieties of wheat were sown here for the first time this year, but none of them promise to equal our standard varieties, Red and White Fife.

Velvet Don wheat has some resemblence to Goose wheat, but was somewhat earlier, and the beard is dark in colour.

Mishriki and Oregon Club were on trial for the first time this year, but neither of them are promising.

Gejar is evidently a fall wheat, and it produced only a few scattered heads.

The Blue-stem grown among the uniform test plots this year is from the western states, and is quite distinct from the variety with blue tinted straw and velvet chaff usually grown by that name in this province.

Owing to rust many of the kinds of wheat in the uniform test of varieties ripened prematurely, and for that reason the dates of ripening given are only approximate.

Sixty-four varieties of spring wheat were tested this year. These were sown from April 20 to 27, on black loam soil, in plots of one-twentieth acre each. All the seed was treated with bluestone, and all the varieties were quite free of smut.

SPRING WHEAT.—TEST OF VARIETIES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Heads.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
Goose	Apr. 24	Aug. 28	126	41	Weak	3	Bearded..	5,620	46	20	63½	None
Roumanian	" 24	" 26	124	51	"	2½	" ..	5,120	44	40	63	Slightly.
Velvet Don	" 27	" 28	123	42	Stiff..	2½	" ..	6,200	40	00	63	None.
Australian No. 9	" 21	" 20	121	49	"	3	Beardless.	4,560	34	00	60	Slightly.
Chester	" 21	" 19	120	37	Fair..	3¾	" ..	3,190	33	30	60¼	Badly
Blair	" 21	" 21	122	45	"	3	" ..	2,710	31	30	59	Consid'rably
Fraser	" 24	" 18	116	41	Weak	3	Bearded..	3,320	31	20	59	Badly.
White Russian	" 22	" 24	124	45	Fair..	4	Beardless"	4,860	30	40	58	Slightly.
Wellman's Fife	" 22	" 23	123	44	Stiff..	4	" ..	5,580	30	20	57½	"
Dawn	" 21	" 18	119	40	"	3½	" ..	2,980	30	20	58	Badly.
Angus	" 22	" 20	120	39	Fair..	3	" ..	4,600	30	00	58	Consid'rably
Benton	" 24	" 24	122	43	Weak	4	" ..	3,440	29	20	58½	Slightly.
Percy	" 20	" 20	122	47	Stiff..	3½	" ..	4,850	29	10	58	"
Crawford	" 21	" 19	120	44	Fair..	4	" ..	3,260	29	00	59½	"
Bishop	" 21	" 21	122	37	Stiff..	3½	" ..	3-680	28	40	60	"
Weldon	" 20	" 18	120	47	Fair .	4	" ..	4,680	28	40	58	Badly.
Herisson Bearded	" 24	" 26	124	40	Weak	2	Bearded..	3,500	28	20	57	"
Hungarian	" 24	" 24	122	48	Fair .	3	" ..	4,300	28	20	56	Slightly.
Advance	" 22	" 21	121	46	"	4	" ..	4,310	28	10	59	"
Alpha	" 21	" 22	123	50	Stiff .	3½	Beardless.	4,120	28	00	58	"
Plumper	" 22	" 25	125	42	Fair .	3½	Bearded..	3,720	28	00	59	Badly.
Admiral	" 21	" 21	122	42	Stiff .	3¾	Beardless.	3,540	27	40	58	Slightly.
Huron	" 22	" 23	123	41	"	4	Bearded..	3,540	27	40	59	Consid'rably
Stanley	" 21	" 19	120	44	"	3	Beardless.	4,540	27	40	59	Badly.
White Fife	" 22	" 23	123	42	Fair .	3	" ..	2,340	27	40	58	Consid'rably
Cartier	" 24	" 21	119	41	Weak	3	Bearded..	3,740	27	40	58½	Badly.
Byron	" 22	" 23	123	27	"	3	" ..	4,240	27	40	59	"
Norval	" 22	" 22	122	41	Stiff .	3	" ..	3,580	27	00	59½	Slightly.
Vernon	" 24	" 24	122	45	"	3	" ..	4,280	27	00	57	"
Cassel	" 21	" 21	122	46	"	4	Beardless.	3,390	26	50	57½	Badly.
Minnesota No. 149	" 21	" 23	124	49	"	4	. .	3,390	26	50	58½	Slightly.
Japanese	" 24	" 18	116	36	Weak	3	Bearded..	3,200	26	40	58	Badly.
Laurel	" 22	" 23	123	43	"	4	Beardless.	6.840	26	00	56½	"
White Connell	" 22	" 23	123	41	Fair .	4	" ..	3,840	26	00	58	"
Rio Grande	" 22	" 22	122	48	"	3	Bearded..	5,040	26	00	58¼	"
Monarch	" 22	" 23	121	45	Stiff "	3½	Beardless.	3,640	26	00	58½	"
Red Fern	" 24	" 24	122	54	"	4	Bearded..	4,450	25	50	58	Slightly.
Hastings	" 21	" 19	120	40	Fair .	3	Beardless.	2,460	25	40	58	Consid'rably
Robin's Rust Proof	" 22	" 22	122	44	"	3½	" ..	3,670	25	30	59	Slightly.
Clyde	" 22	" 24	124	45	Weak	4	" ..	3,770	25	30	56½	"

SPRING WHEAT.—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Heads.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
Minnesota No. 181....	Apr. 21	Aug. 23	123	43	Stiff .	4	Beardless.	3,500	25	00	59½	Badly.
Mishriki............	" 22	" 19	119	27	"	2½	Bearded..	3,700	25	00	60½	"
Crown..............	" 24	" 22	120	48	Weak	3	" ..	5,040	24	50	55	"
Pringle's Champlain..	" 24	" 21	119	47	"	4	" ..	5,310	24	50	55	Slightly.
Red Fife............	" 22	" 23	123	44	Stiff .	4	Beardless.	5,140	24	20	57	"
Preston.............	" 22	" 23	123	47	Fair .	3	Bearded..	3,580	23	40	59	"
Progress......... ...	" 22	" 23	123	42	"	3	Beardless.	2,580	23	40	58½	"
Australian No. 27.....	" 21	" 21	122	48	Stiff .	3	" ..	3,400	23	20	59	"
Blue Stem...........	" 22	" 22	122	45	Fair..	3¾	" ..	4,520	23	00	60	Badly.
Early Riga....	" 21	" 18	118	38	"	3	" ..	4,260	22	20	58	"
Australian No. 19....	" 21	" 24	125	42	"	3	" ..	3,060	22	20	58½	Slightly.
Australian No 25......	" 22	" 24	124	46	Stiff .	4	" ..	3,080	22	00	58	"
Australian No. 23.....	" 22	" 24	124	43	Fair .	4	" ..	2,890	21	50	57	Badly.
Australian No. 10.....	" 21	" 24	125	42	"	4	" ..	2,900	21	40	58½	Slightly.
Essex...............	" 22	" 22	122	47	Weak	4	" ..	4,910	21	30	57	Badly.
Minnesota No. 163....	" 21	" 24	125	48	Stiff .	4	" ..	4,320	21	20	58	Slightly.
Countess............	" 22	" 21	121	44	Weak	3½	" ..	3,030	20	50	56	Badly.
Colorado.	" 24	" 24	122	51	Fair .	3½	Bearded..	4,440	19	20	57	"
Minnesota No. 169....	" 21	" 24	125	47	"	3	Beardless.	4,930	18	30	50	"
Red Swedish..........	" 24	" 22	120	44	Weak	3	Bearded..	5,110	18	10	55½	"
Australian No. 13.....	" 21	" 24	125	46	Stiff..	4	Beardless.	3,720	18	00	56	Slightly.
Oregon Club..........	" 22	" 19	119	43	Fair..	2	" ..	4,080	15	20	43½	Badly.
Sejar................	" 22	....	...	44	Stiff..	4	" ..	5,000	5	00	53	Slightly.

AVERAGE Results of a Test of Nine Varieties of Wheat for the past Seven or Eight Years.

Varieties.	Years under Test.	Yield per Acre.	
		Bush.	Lbs.
Goose........	8	41	58
White Fife....	8	36	35
Crown..........	8	35	29
Monarch........	8	35	26
Red Fife........	8	34	43
White Russian....	8	33	58
White Connell....	8	33	47
Rio Grande........	8	33	24
Preston........	7	32	58

VARIETIES OF WHEAT GROWN FROM SELECTED AND UNSELECTED SEED.

As in former years, the largest heads were selected from standing grain of last year, and the seed was sown this year for a comparison with unselected seed, from the same plots.

The plots were all one-twentieth acre, and each pair were sown in close proximity; the soil was a black loam. The accompanying table gives the result of each individual variety. A summary is also given, which shows the average yield from the selected wheat to be eleven pounds per acre more than the unselected.

All were sown on summer fallowed land from April 20 to 27.

WHEAT.

Variety.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Variety.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
	Lbs.	Bush.	Lbs.	Lbs.		Lbs.	Bush.	Lbs.	Lbs.
Goose—Unselected	5,620	46	20	63	Advance—Unselected	4,310	28	10	58
" Selected	5,060	45	40	63¾	" Selected	4,520	29	40	56½
Roumanian—Unselected	5,120	44	40	63½	Alpha—Unselected	4,120	28	..	58
" Selected	5,100	48	20	63½	" Selected	4,100	21	40	57½
Speltz—Unselected	5,050	43	50	47½	Plumper—Unselected	3,720	28	..	57
" Selected	6,340	54	20	47½	" Selected	4,300	28	20	58½
Australian No. 9—Unselected	4,560	34	..	58	Admiral—Unselected	3,540	27	40	57½
" Selected	2,540	31	..	57½	" Selected	3,190	20	10	58
Chester—Unselected	3,190	33	30	60½	Huron—Unselected	3,540	27	40	58¾
" Selected	3,030	32	50	60	" Selected	3,720	28	..	58
Blair—Unselected	2,710	31	30	57½	Stanley—Unselected	4,540	27	40	57½
" Selected	3,600	30	..	57½	" Selected	3,230	29	30	58
Fraser—Unselected	3,320	31	20	59	Norval—Unselected	3,580	27	..	59½
" Selected	3,740	32	40	60	" Selected	3,200	26	40	60½
Dawn—Unselected	2,980	30	20	57	Japanese—Unselected	3,200	26	40	57½
" Selected	3,460	29	..	58	" Selected	2,940	27	40	58
Percy—Unselected	4,850	29	10	59	Rio Grande—Unselected	5,040	26	..	59
" Selected	4,010	29	50	59¼	" Selected	5,180	23	40	58
Crawford—Unselected	3,260	29	..	55½	Red Fern—Unselected	4,450	25	50	58½
"	3,330	31	10	56	" Selected	4,910	21	50	59
Bishop—Unselected	3,680	28	40	57½	Hastings—Unselected	2,460	25	40	56
" Selected	3,980	33	40	58	" Selected	2,640	27	40	58½
Weldon—Unselected	4,680	28	40	59	Preston—Unselected	3,680	23	40	59
" Selected	2,340	27	40	58½	" Selected	3,520	24	40	59½
Herisson Bearded—Unselected	3,500	28	20	56	Early Riga—Unselected	4,260	22	20	57
" " Selected	3,260	27	20	57½	" Selected	4,210	26	30	57

	Bush.	Lbs.
Average yield of 26 varieties (selected)	30	10
" 26 " (unselected)	29	59

FIELD PLOTS OF WHEAT.

The larger fields of wheat were ploughed late last summer, and did not receive as much surface cultivation as the test plots; probably this accounts for the smaller amount of rust in these fields; the sample of grain was much heavier per bushel and better in every respect.

All were sown on summer fallow, in the proportion of one and one-half bushels of seed per acre.

Variety.	Character of Soil.	Size of Plot.	Date of Sowing.	Date of Ripening.	Weight per Bush.	Yield per Acre.	
					Lbs.	Bush.	Lbs.
Preston	Clay loam	5 acres	April 17	August 21	62	31	27
White Fife	"	3 "	" 21	" 28	61	38	10
Monarch	"	2 "	" 21	" 26	62	30	20
White Connell	"	2 "	" 20	" 26	63	41	20
Red Fife	"	3 "	" 20	" 28	62	26	50
Percy	.	2 "	" 18	" 20	62	31	30
Stanley	"	2 "	" 18	" 20	62	31	20

DIFFERENT METHODS OF PREPARING LAND FOR SPRING WHEAT.

In this series of tests the result is somewhat unusual, the summer fallowed plot giving the smallest return. This was no doubt owing to the grain on this plot growing unusually rank and rusting more than the others.

The plots in this experiment were all one-twentieth acre each; the soil a rich clay loam. All were sown on April 18.

Name of Variety.	Previous Crop.	Rust.	Date of Ripening.	Yield per Acre.		Weight per Bush.
				Bush.	Lbs.	Lbs.
Wheat—Red Fife..................	Turnips........	Little......	August 20..	30	10	58
" "	Millet..........	"	" 20..	29	..	54
" "	Sunflowers.....	Badly......	" 20..	28	40	54
" "	Flax...........	"	" 20..	28	20	52
" "	Horse Beans....	"	" 20..	28	10	51
" "	Pease..........	"	" 20..	26	40	55
" "	Summer fallow..	Very badly.	" 20..	26	10	54

A TEST OF GRAIN DRILLS.

Disc-drills, a comparatively new implement, are becoming extensively used in many parts of the province, and some extravagant claims are made for them. From the following table it would appear that there is very little difference in yield between the two ways of sowing.

The size of the plots was one-twentieth acre; the soil a sandy loam, which had been summer fallowed.

Variety.	Kind of Drill.	Sown.	Ripe.	Days Maturing.	Yield per Acre.		Weight per Bush.
					Bush.	Lbs.	Lbs.
Red Fife..............	Shoe drill.......	April 24....	August 25..	123	28	10	57
"	Disc drill.......	" 24....	" 25..	123	27	20	56½

EXPERIMENTS WITH THE USE OF BARN YARD MANURE.

During several seasons experiments have been carried on with fertilizers on the lower portion of this farm, but with very unsatisfactory results. This year a series of plots for this purpose were laid out on the upper portion of the farm, where the soil is quite light and somewhat exhausted. It will be seen from the accompanying table that the result is again somewhat contradictory.

The size of the plots in this series was one-twentieth acre, and the soil a very light sandy loam, the previous crop being wheat.

The varieties of grain sown were Red Fife wheat and Mensury barley.

Number	Kind of Grain.	How Treated.	Sown.	Ripe.	Yield per Acre.		Weight per Bush.
					Bush.	Lbs.	Lbs.
1	Wheat	10 loads per acre rotted manure	April 20....	August 23..	13	30	58
2	"	No manure..........................	" 20 ...	" 23..	16	10	58
3	"	10 loads per acre fresh manure.........	" 20....	" 23..	18	..	58
6	"	No manure..........................	" 20....	" 23..	16	30	58
11	Barley	No manure..........................	May 14.....	" 14..	20	..	47½
12	"	10 loads per acre fresh manure.........	" 14.....	" 14..	16	12	47½
13	"	10 " rotted "	" 14.....	" 14..	18	6	47½

EXPERIMENTS WITH ARTIFICIAL FERTILIZERS.

The tests with chemical fertilizers carried on for the past three years were again undertaken this year, but owing to an unusual interference the test was spoilt. The plots were laid out in a somewhat secluded location, and shortly after the crop was cut, it was nearly all destroyed by prairie chickens.

SMUT PREVENTIVES IN WHEAT.

Although it is now generally recognized by the older residents that injury from smut can be prevented, many new-comers are either ignorant of the risk in sowing untreated grain or else do not know of a preventive, and every year there is still considerable loss from this cause.

This year's test included the use of both bluestone and formalin, and both of these preparations were effective in preventing injury from this cause whether they were applied by steeping or sprinkling.

The seed used was badly 'tagged' with smut, and it will be noticed from the accompanying table that nearly 20 per cent of the crop from untreated seed was destroyed, while the treated seed was practically free of smut.

Variety.	How Treated.	Good Heads on 9 Sq. Ft.	Smutty Heads on 9 Sq. Ft.
Red Fife	Steeped for 5 minutes in 4½ oz. formalin to 10 galls. of water ..	306	None.
"	Sprinkled with 9 oz. of formalin to 10 galls. of water	419	"
"	Steeped for 5 minutes in 1 lb. of bluestone to 3 pails of water.	264	1
"	Sprinkled with 1 lb. bluestone to 1 pail of water.............	253	None.
"	Not treated..........................	383	65

EXPERIMENTS WITH SPELT AND EMMER.

Three newly introduced varieties of emmer and spelt were tested this year; none of these are as promising as the common emmer in general use here, the yield of grain being smaller and the weight per bushel less.

The size of the plots was one-twentieth acre for the common spelt and one-fortieth for the others. The soil was a sandy loam which had been summer-fallowed.

Variety.	Sown.	Ripened.	Length of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.
			Inches.	Inches.	Bus.	Lbs.	Lbs.
White Emmer (Common Emmer known also as Spelt)..........................	April 24..	Aug. 29..	42	2½	43	50	47½
Red Emmer....	" 27..	" 28..	43	3	38	40	39
Smooth Spelt	" 27..	" 26..	41	6	29	20	26
White Bearded Spelt	" 27..	" 25..	41	6	27	00	26

In all these varieties the yield per acre is based on a bushel of 60 lbs. No allowance, however, has been made for the husk. When comparing these yields with clean wheat at least 20 per cent should be deducted from the emmer or spelt to make the comparison a fair one.

A CROP OF SPELT AS A PREPARATION FOR OTHER GRAIN.

Very little is known regarding the influence of spelt (emmer) on the succeeding crop; with a view of gaining some light on this subject, three sets of plots were laid out. One was sown with wheat, one with oats, and one with barley; the result was fairly uniform, and in each series the plot sown the previous year with spelt gave the largest return, followed by summer-fallow; the wheat stubble giving the smallest crop in each case.

The spelt shelled badly in 1902, and the volunteer crop was very apparent this year, both in the field and threshed grain, and probably increased the yield of grain.

The size of the plots was one-twentieth acre, and the soil a sandy loam.

Grain sown 1903.	Previous Crop.	Sown.	Ripened.	Yield per Acre.		Weight per Bushel.
				Bus.	Lbs.	Lbs.
Wheat Red Fife	Spelt (Emmer)	April 18	Aug. 24	51	40	57½
" "	Summer fallow	" 18	" 24	29	40	57
" "	Wheat	" 18	" 24	26	00	58
Oats, Banner	Spelt (Emmer)	" 27	" 25	100	30	37½
" "	Summer fallow	" 27	" 24	92	12	37
" "	Wheat	" 27	" 21	88	28	37
Barley, Mensury	Spelt (Emmer)	May 11	" 7	57	24	47½
" "	Summer fallow	" 11	" 7	55	20	48
" "	Wheat	" 17	" 7	28	16	47½

ROTATION OF CROPS.

In acordance with your instructions arrangements were made during 1899 for a series of rotation plots on one-half acre each, the principal object in view being the maintenance of the fertility of the soil, by ploughing under a leguminous crop every third year, instead of the usual summer-fallow.

The soja beans were sown in rows 14 inches apart, using 60 pounds of seed per acre; the red clover was sown in the proportion of 12 pounds of seed per acre and the mixed clovers in the proportion of eight pounds of alfalfa and six pounds of alsike per acre. These leguminous plants were ploughed under each year when they reached their fullest development. The order of rotation is as follows :—

No.	First Year.	Second Year.	Third Year.
1	Wheat	Oats	Soja Beans.
2	"	Wheat	Pease.
3	"	Oats	Tares.
4	"	Wheat	Red Clover.
5	"	Barley	Alfalfa and Alsike.
6	Pease	Wheat	Wheat.
7	Tares	"	Oats.
8	Soja Beans	"	"
9	Red Clover	"	Wheat.
10	Alfalfa and Alsike	"	Barley.
11	Rape	"	Summer-fallow.
12	Wheat	"	"
13	"	Oats	"
14	"	Barley	"
15	"	Wheat	Oats.
16	"	Barley	"
17	Oats	Soja Beans	Wheat.
18	Wheat	Pease	"
19	Oats	Tares	"
20	Wheat	Red Clover	"
21	Barley	Alfalfa and Alsike	"
22	Rye	Summer-fallow	"

In 1901 the first series of three years was completed. Owing to the unusual high water in the Assiniboine river last year the field was left fallow. This year the second series of three years of rotation was commenced, with the following result:—

ROTATION OF CROPS.

FIRST year of the second series.

No.	Name of Varieties.	Date of Sowing.	Date of Ripening.	Yield per Acre.		Weight per Bushel.
				Bush.	Lbs.	Lbs.
1	Wheat—Red Fife	April 22	August 25	26	45	58
2	" "	" 22	" 25	31	45	58
3	" "	" 22	" 25	23	25	58
4	" "	" 22	" 25	28	39	58
5	" "	" 24	" 25	30	45	58
6	Pease—Golden Vine	" 24	Ploughed under			
7	Tares	May 11	"			
8	Soja Beans	June 11	"			
9	Clover—Red	April 23	"			
10	Clover Alfalfa and Alsike	" 23	"			
11	Rape	June 11	"			
12	Wheat—Red Fife	April 24	August 25	28	45	58
13	" "	" 24	" 25	27	13	58
14	" "	" 24	" 25	30	45	58
15	" "	" 24	" 25	28	01	58
16	"	" 24	" 25	29	40	58
17	Oats—Banner	May 7	" 25	56	24	37
18	Wheat—Red Fife	April 24	" 25	24	30	58
19	Oats—Banner	May 7	" 28	54	00	37
20	Wheat—Red Fife	April 24	" 25	26	15	58
21	Barley—Mensury	May 7	" 28	44	20	47
22	Rye—Spring	April 25	Ploughed under			

EXPERIMENTS WITH OATS.

The past season has been favourable for this grain in all parts of the province. On the experimental farm the yield is above the average, and the sample plump but slightly discoloured.

Swedish Select, grown this year for the first time, is a promising white variety with a very handsome branching head, and it proved very productive.

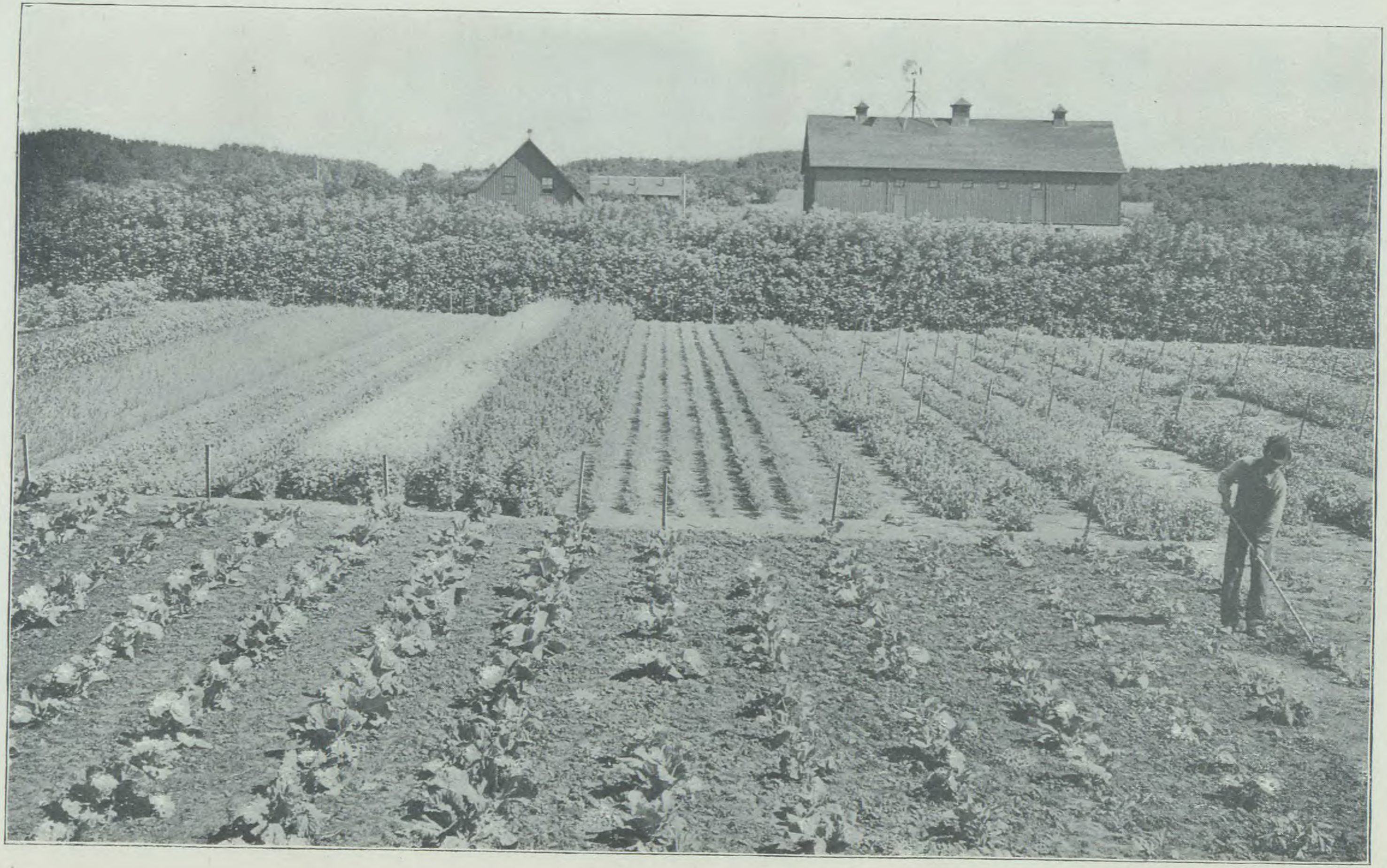
Golden Fleece, another new variety, did not prove nearly so productive.

Since the four cross-bred varieties, viz., Kendal, Milford, Pense and Olive, have been divided into white and black kinds, they have a much more uniform appearance, but were not very productive this year.

The plot of Banner oats was adjoining a well travelled road, and the grain was badly injured by vehicles. This accounts for the reduced yield of this variety.

The Tartar King oats used as seed for this test was very large and plump; this, combined with an almost total absence of stooling, made the sowing much too thin and reduced the yield.

The tests were made with forty-five varieties, on plots of one-twentieth acre each. The soil was a sandy loam; the previous crop Brome grass, and two bushels of seed per acre was used, sown with a drill. Golden Fleece was sown on May 14, and all the others on May 5 and 6.



(Photo. by C. E. Saunders.)

PLOTS OF VEGETABLES AT BRANDON.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per acre.		Weight per Bushel.	Rusted.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Buckbee's Illinois...	May 5	Aug. 21	108	47	Stiff..	10	Branching..	3,940	119	14	36	Slightly
2	Early Golden Prolific	" 5	" 22	109	47	" ..	10	" ..	4,280	115	10	37½	"
3	New Zealand........	" 5	" 27	115	51	" ..	10	Sided......	4,700	114	24	35	Badly
4	Wide Awake.......	" 5	" 23	110	49	" ..	7½	Branching..	4,340	113	18	37½	Slightly
5	Golden Giant.......	" 5	" 29	116	48	" ..	10	Sided.......	4,580	109	14	37	"
6	Abundance........	" 5	" 20	107	51	" ..	9	Branching..	4,480	109	14	38½	"
7	Waverley.....	" 5	" 20	107	52	" ..	8	" ..	4,780	109	14	38½	"
8	Lincoln............	" 5	" 22	109	47	" ..	9	" ..	4,700	108	28	38	"
9	Danish Island	" 5	" 22	109	49	" ..	9	" ..	4,720	108	8	38	"
10	Holstein Prolific....	" 5	" 22	109	47	" ..	7	" ..	4,430	107	32	36	"
11	Irish Victor........	" 5	" 22	109	47	" ..	10	" ..	4,140	107	22	38	"
12	Golden Tartarian....	" 5	" 25	112	49	" ..	10	Sided.......	4,390	106	6	37	Badly
13	Improved Ligowo...	" 5	" 20	107	49	" ..	8	Branching..	4,810	105	20	42	Slightly
14	Thousand Dollar	" 5	" 20	107	52	" ..	7	" ..	4,520	105	10	39½	"
15	Columbus...........	" 5	" 21	108	44	" ..	8	" ..	4,150	104	14	36½	"
16	Twentieth Century..	" 5	" 22	109	45	" ..	10	" ..	4,050	104	14	38½	"
17	White Giant	" 5	" 22	109	45	" ..	8	" ..	4,270	103	28	37	"
18	White Schonen.......	" 5	" 22	109	48	" ..	7	" ..	4,680	100	20	36	"
19	American Beauty....	" 5	" 22	109	44	" ..	8	" ..	3,920	99	14	36½	"
20	Wallis.............	" 5	" 23	110	47	" ..	8	" ..	4,230	99	4	36	"
21	Siberian	" 5	" 23	110	45	" ..	8	" ..	4,240	98	28	35½	"
22	Mennonite..........	" 5	" 18	105	46	" ..	6	" ..	3,840	98	28	39	"
23	American Triumph..	" 5	" 22	109	44	" ..	8	" ..	3,650	98	18	37	"
24	Salines......	" 5	" 24	111	51	" ..	8	" ..	4,400	95	10	36	"
25	Improved American.	" 6	" 21	107	50	" ..	7½	" ..	4,360	95	10	36½	"
26	Swedish Select......	" 6	" 20	106	43	" ..	6	" ..	3,700	94	4	42	None
27	Golden Beauty......	" 5	" 22	109	47	Fair..	8	" ..	3,460	93	18	36½	Slightly
28	Black Beauty.	" 6	" 20	106	43	" ..	8	" ..	3,840	93	8	37½	"
29	Bavarian...........	" 6	" 23	109	47	Stiff..	9	" ..	4,360	91	26	36½	"
30	Scotch Potato.......	" 5	" 22	109	39	" ..	8	" ..	4,680	91	26	38	"
31	Kendal White......	" 6	" 26	109	44	" ..	9	Sided.......	2,780	91	26	36	"
32	Sensation..........	" 5	" 21	108	46	" ..	7	Branching..	3,900	91	6	41	"
33	Pioneer............	" 6	" 20	106	40	Fair..	8	" ..	3,130	88	18	36	"
34	Olive Black........	" 6	" 26	112	45	" ..	7	" ..	3,700	88	8	37½	"
35	Milford Black.......	" 6	" 26	112	43	" ..	9	Sided.......	3,630	87	12	36	"
36	Pense Black........	" 6	" 26	112	44	" ..	9	"	3,700	85	10	35½	"
37	Banner.............	" 5	" 20	107	49	Stiff..	9	Branching..	5,540	84	4	38	"
38	Golden Fleece......	" 14	" 23	99	45	" ..	8	" ..	4,540	84	4	35½	None
39	Goldfinder.........	" 5	" 24	111	48	" ..	8	" ..	5,060	83	18	36	Slightly
40	Joanette.	" 6	" 21	107	34	Fair..	8	" ..	4,160	83	18	35	"
41	Kendal Black.......	" 6	" 26	112	43	" ..	8	Sided......	3,400	82	12	37	"
42	Olive White	" 6	" 26	112	45	" ..	8	"	3,660	80	20	38	"
43	Pense White..	" 6	" 26	112	47	Stiff..	9	"	2,680	80	..	38	None
44	Milford White......	" 6	" 26	112	47	" ..	9	"	2,760	77	22	37½	Slightly
45	Tartar King........	" 5	" 20	107	49	.	9	"	3,860	77	22	39	Considerably.

AVERAGE RESULTS OF A TEST OF SEVEN VARIETIES OF OATS FOR THE PAST SEVEN OR EIGHT YEARS.

Varieties.	Years Under Test.	Yield per Acre.	
		Bush.	Lbs.
American Beauty..	8	91	10
Mennonite..	7	90	00
Banner..	8	88	29
Early Golden Prolific.....................................	8	88	18
Bavarian..	8	87	19
Holstein Prolific..	8	86	56
Golden Giant..	8	83	13

FIELD PLOTS OF OATS, 1903.

These were all sown on summer fallow with a drill, in the proportion of two bushels of seed per acre.

Variety.	Character of Soil.	Size of Field.	Date Sown.	Date Ripe.	Weight per Bushel.	Yield per Acre.	
					Lbs.	Bush.	Lbs.
Banner	Clay loam	7 acres	April 28	Aug. 15	37	83	15
Improved Ligowo	"	7 "	May 9	" 20	37	73	18
Tartar King	"	$6\frac{1}{2}$ "	" 1	" 17	$38\frac{1}{2}$	82	30
Waverley	"	5 "	" 8	" 28	38	86	05
Abundance	"	3 "	" 13	" 28	36	86	18

DIFFERENT METHODS OF PREPARING LAND FOR OATS.

Name of Variety.	Previous Crop.	Rust.	Date of Ripening.	Yield per Acre.		Weight per Bush.
				Bush.	Lbs.	Lbs.
Banner Oats	Flax	Little	Aug. 26	117	12	37
"	Millet	"	" 19	115	00	$37\frac{1}{2}$
"	Summer fallow	Bad	" 18	102	32	37
"	Turnips	Little	" 20	85	10	38

EXPERIMENTS WITH BARLEY.

The past season has been favourable for a heavy yield of barley, but the wet weather discoloured the sample. As nearly all the barley grown in this province is used for feed, the loss arising from discoloration was not serious.

Among the many varieties of barley grown on this farm, the Mensury is one of the best; the plant is vigorous and productive, the straw is stiff, and the head and kernels seldom fail to reach full development.

Twenty varieties of six-rowed barley were tested. The size of the plots used for this test was one-twentieth acre. The soil was a sandy loam which had been summer fallowed. All were sown on May 7 and 8, in the proportion of two bushels per acre. There was no rust on any of the plots.

BARLEY—SIX ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per bushel.
								lbs.	Bush.	lbs.	lbs.
1	Nugent	May 8	Aug. 10	94	34	Stiff	4	3,540	73	4	48½
2	Mensury	" 7	" 10	95	41	"	3½	2,760	71	32	50
3	Yale	" 8	" 10	94	38	"	3	4,440	70	..	48½
4	Summit	" 7	" 13	98	40	Fair	3	3,570	67	14	49
5	Brome	" 8	" 11	95	30	Weak	3	3,000	66	32	49½
6	Mansfield	" 7	" 11	96	36	Stiff	2¾	3,820	66	12	48
7	Odessa	" 8	" 10	84	35	Fair	3	3,820	66	12	48
8	Oderbruch	" 7	" 7	92	33	Stiff	3	2,860	63	16	51
9	Empire	" 8	" 12	96	66	Weak	3	3,140	61	32	48
10	Common	" 8	" 7	91	38	Stiff	3	3,440	61	32	46
11	Albert	" 8	" 11	95	34	"	3	3,380	58	36	48¼
12	Argyle	" 7	" 10	95	37	"	3	2,720	55	40	48½
13	Claude	" 8	" 10	94	33	"	2½	3,140	55	20	48½
14	Garfield	" 8	" 10	94	38	"	3½	3,540	55	20	46½
15	Rennie's Improved	" 7	" 7	92	36	"	3	3,810	53	46	48½
16	Stella	" 8	" 10	94	30	"	3	4,410	53	46	48½
17	Trooper	" 7	" 10	95	35	"	3	4,240	53	16	47½
18	Royal	" 7	" 10	95	38	"	3	3,160	50	40	48
19	Baxter	" 8	" 11	95	38	"	2½	2,240	41	12	50
20	Champion	" 8	" 4	88	39	"	3	2,840	32	24	47

AVERAGE RESULTS OF A TEST OF FOUR VARIETIES OF SIX-ROWED BARLEY FOR THE PAST SEVEN YEARS.

Varieties.	Number of Years under Test.	Yield per Acre.	
		Bush.	Lbs.
Mensury	7 years	56	17
Nugent	7 "	53	27
Trooper	7 "	52	30
Summit	7 "	52	24

BARLEY, TWO-ROWED—TEST OF VARIETIES.

The first sowing of two-rowed sorts of barley was made on May 8, but a very heavy fall of rain occurring before the plants were well rooted, a large portion of them in each plot were washed out, and a second sowing was made on June 5; these did not mature before severe frosts and the yield on this account was much smaller than the six-rowed varieties and the weight per bushel less.

Fifteen varieties of two-rowed barley were tested this season.

The plot of Newton barley was one-fortieth acre in size; all the others were one-twentieth acre.

The soil was a sandy loam which had been summer-fallowed; all were sown on June 8, in the proportion of two bushels of seed per acre.

BARLEY, TWO-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Dunham	Sept. 15..	102	34	Stiff..	3	4,650	40	30	48	None.
2	Sidney	" 13..	100	34	" ..	4	3,410	39	18	47½	Slightly.
3	Logan	" 14..	101	36	" ..	3	3,790	37	34	47½	"
4	Harvey	" 13..	100	40	" ..	4	3,520	35	..	47½	None.
5	Fulton	" 14..	101	34	" ..	4	3,580	33	36	48	"
6	Newton	" 17..	104	34	" ..	6	4,400	33	16	47½	Slightly.
7	Invincible	" 14..	101	37	" ..	4	4,040	32	24	38	"
8	Beaver	" 17..	104	34	" ..	3½	3,460	32	4	46½	"
9	Standwell	" 19..	106	35	" ..	4	3,270	31	42	41	"
10	Clifford	" 18..	105	34	" ..	6	3,370	31	42	45	"
11	Jarvis	" 13..	100	38	" ..	5	4,730	30	30	50	None.
12	Gordon	" 18..	105	37	" ..	4	3,560	30	..	48	Slightly.
13	Danish Chevalier	" 18..	105	35	" ..	5	3,410	28	46	47	"
14	French Chevalier	" 18..	105	35	" ..	5	3,470	27	34	44½	"
15	Canadian Thorpe	" 15..	102	30	" ..	3	4,220	24	28	40	"

DIFFERENT METHODS OF PREPARING LAND FOR BARLEY.

Name of Variety.	Previous Crop.	Rust.	Date of Ripening.	Yield per Acre.		Weight per Bushel
				Bus.	Lbs.	Lbs.
Mensury—Barley (six-rowed)	Millet	None	Aug. 19..	67	4	48
" "	Summer-fallow	"	" 18..	62	4	48½
" "	Flax	"	" 26..	58	16	48
" "	Turnips	"	" 7..	47	4	48½

EXPERIMENTS WITH PEASE.

Forty varieties of pease were on trial this year, and the yield has been above the average.

Although some of the varieties were ripe a full month before they were harvested, there was scarcely any shelling and the sample was bright and heavy.

Pease are usually very productive here; the sample is bright and quite free from the attacks of pea wevil; the cost of harvesting and threshing is apparently the only drawback, and this can be largely overcome by sowing one or two pecks of oats per acre with the pease; the combined crop can then be cut with a binder, and threshed like other grain.

The size of the plots used for this test of varieties was one-twentieth acre. The soil was a clay loam, summer-fallowed. All were sown from April 25 to 29, in the proportion of two bushels of seed per acre for the small kinds and three bushels for the larger ones.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel.
						in.	in.				Lbs.
1	Alma..	Apr. 25..	Aug. 29..	126	Weak....	57	2	Small	64	40	62½
2	English Grey	" 25..	Sept. 1..	129	Medium..	35	2¼	"	63	..	61
3	Early Britain	" 25..	Aug. 21..	118	Weak. ...	53	2½	Large	60	20	61¼
4	Macoun	" 25..	Sept. 1..	129	Medium..	67	3	"	57	..	62¼
5	Victoria	" 25..	" 4..	132	Rank....	55	3	"	54	40	62½
6	German White	" 25..	Aug. 29..	126	Medium..	55	2½	Small	54	40	63
7	Pearl	" 27..	Sept. 3..	129	Rank....	45	2½	Medium..	54	..	63¼
8	Golden Vine	" 27..	Aug. 25..	120	Fair.....	46	2	Small	53	40	62½
9	Crown	" 27..	" 22..	117	"	47	2	"	53	..	62
10	Archer	" 27..	Sept. 1..	127	Medium..	50	2½	Medium..	51	40	62½
11	Mackay	" 27..	" 1..	127	Fair.....	53	2½	Large	50	20	63
12	Pride	" 27..	Aug. 29..	124	Weak	53	2½	Medium..	50	..	62¾
13	Wisconsin Blue	" 27..	" 30..	122	Rank....	48	3	Small ...	50	..	62½
14	Trilby	" 27..	Sept. 2..	128	"	60	2½	"	49	40	62¼
15	Black-eyed Marrowfat	" 24..	" 1..	130	Weak ...	55	2	Large	48	..	63¼
16	White Wonder	" 25..	Aug. 19..	116	"	29	2½	Medium..	47	20	62½
17	King	" 27..	" 29..	124	Rank....	54	2	" ..	47	..	63
18	Prince Albert	" 25..	" 27..	129	Fair.....	56	2½	Small	47	..	62
19	Arthur	" 25..	" 27..	124	Weak	37	3	Large	46	40	63
20	Picton	" 25..	" 29..	126	Fair.....	48	3	"	46	40	63
21	Kent	" 25..	Sept. 1..	129	Rank....	41	2½	" ...	45	20	63½
22	Mummy	" 27..	Aug. 29..	124	Fair.....	45	2	Small	45	20	63
23	Nelson	" 27..	" 26..	121	"	43	2	"	44	..	62½
24	Large White Marowf't	" 24..	" 30..	128	Rank....	58	3	Large	43	40	63½
25	Fergus	" 25..	Sept. 2..	130	" ...	55	3	Small	43	20	61½
26	Elliot	" 27..	" 1..	127	"	60	3	Large	43	20	63
27	Agnes	" 25..	Aug. 28..	125	Weak	41	3	"	43	..	63¼
28	Chancellor	" 27..	" 20..	115	Fair.....	44	2	Small	41	40	62½
29	Daniel O'Rourke	" 27..	" 29..	124	Medium..	65	3	Medium..	41	..	61½
30	Paragon	" 25..	Sept. 1..	129	Fair.....	43	2	Small	38	40	62½
31	Prince	" 25..	" 1..	129	"	55	2½	Medium..	37	..	63½
32	Perth	" 25..	Aug. 27..	124	Weak	51	3½	Large ...	36	..	64
33	Duke	" 25..	Sept. 1..	129	Rank....	70	3	"	34	20	62¾
34	Gregory	" 25..	Aug. 29..	126	"	52	3	Medium..	34	20	63
35	Prussian Blue	" 25..	" 27..	124	" ...	56	2¾	" ..	34	..	63
36	Carleton	" 25..	Sept. 2..	130	"	54	2	" ..	33	40	63
37	New Potter	" 27..	Aug. 29..	124	Fair.....	48	2	" ..	31	40	62
38	Bruce	" 25..	Sept. 1..	129	"	47	3	Small	28	20	62¾
39	Centennial	" 27..	" 1..	127	Rank....	44	2½	Medium..	27	40	62
40	Lanark	" 25..	" 1..	129	Medium..	38	3	Large	24	..	62½

FLAX—TEST OF VARIETIES.

The several varieties of flax tested last year were again sown this year.

Novarossick has again proved the most productive, closely followed by La Plata. Our common flax is very similar to the varieties from Russia, viz., Russian, Riga and St. Petersburg; but the other kinds given in the following table are quite distinct. La Plata is a late variety with wide-spreading branches, and unusually large seed; Novarossick is also a coarse plant, but ripens with common flax. Bombay is so short and unproductive that it is not worthy of cultivation.

The size of plots for this test was one-fortieth acre, and the soil was a clay loam which had been summer-fallowed except in the case of the last plot on the list.

FLAX—TEST OF VARIETIES.

Varieties.	Date Sown.	Date Ripe.	Length of Straw.	Yield per Acre.		Weight per Bushel.
			In.	Bush.	Lbs.	Lbs.
Novarossick	June 2	Aug. 25	25	26	44	55½
La Plata	" 2	Sept. 1	25	20	40	46
Common	" 2	Aug. 25	31	19	36	55½
Russian	" 2	" 25	26	18	32	55½
Riga	" 2	" 25	28	13	32	53½
St. Petersburg	" 2	" 25	31	12	28	54½
Bombay	" 2	" 28	15	8	32	53
Common on new breaking	" 2	Sept. 1	25	19	6	55

FLAX—THICK AND THIN SOWING.

Last year from 15 to 50 pounds of seed was used in this series of experiments, with the result that the yield increased in about the same ratio as the increase of seed.

This year much larger quantities of seed were used, but sixty pounds of seed gave a larger yield than any thicker sowing. The plots for this test were one-fortieth acre, and the soil a black loam, summer-fallowed.

All were harvested on September 3, 1903.

Varieties.	Amount sown per Acre.	Date of Sowing.	Length of Straw.	Yield per Acre.		Weight per Bushel.
	Lbs.		In.	Bush.	Lbs.	Lbs.
Common Flax	40	June 2	29	20	40	55
"	50	" 2	29	18	32	55
"	60	" 2	29	22	28	55
"	70	" 2	29	21	4	55
"	80	" 2	29	20	20	55
"	90	" 2	29	19	36	55
"	100	" 2	29	17	48	55

EXPERIMENTS WITH INDIAN CORN.

The crop of Indian corn was heavier than usual this year, some of the plants being twelve feet high; but owing to lack of sunshine during midsummer it was not as well matured as usual, only five out of about twenty-five varieties reaching the late milk stage.

In addition to the test plots a field of Pearce's Prolific was grown for feeding purposes. About seventy-five tons of this corn was harvested with a corn binder and made into ensilage; the remainder was stooked in the field and will be drawn in as it is required and fed dry.

The seed was sown on May 28, in rows 30 inches apart, using about half a bushel of seed per acre. The crop was cut on September 4. Twenty-five varieties were under trial, the soil was a black sandy loam, and the previous crop was corn. The yields were calculated from two rows each 66 feet long.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Height — Inches.	When Tasselled.	In Silk.	Condition when cut Sept. 2.	Weight per Acre grown in rows. Tons.	Lbs.	Weight per Acre grown in hills. Tons.	Lbs.
1	Eureka	132	Aug. 30		In tassel	28	1,532	22	1,672
2	Thoroughbred White Flint	100	" 26		"	28	232	21	1,032
3	Champion White Pearl	108	" 25		"	24	312	18	960
4	Superior Fodder	85	" 21	Aug. 30	In silk	21	1,824	20	1,712
5	Early Mastodon	108	" 20	" 30	"	21	768	21	1,032
6	Compton's Early	116	" 20	" 22	Early milk	20	392	17	1,112
7	Early Butler	120	" 24		In tassel	19	1,336	17	320
8	Red Cob Ensilage	108	" 26		"	19	1,072	22	1,672
9	Mammoth Cuban	144	" 22	Sept. 1	In silk	19	1,072	18	432
10	Angel of Midnight	97	" 18	Aug. 24	Early milk	19	1,072	16	1,792
11	Giant Prolific Ensilage	110	" 26		In tassel	19	280	16	472
12	Longfellow	100	" 11	Aug. 20	Early milk	19	280	19	16
13	King Philip	96	" 19	" 25	Late milk	18	1,752	16	1,528
14	White Cap Yellow Dent	100	" 22	" 26	Early milk	18	1,752	15	1,680
15	North Dakota White	110	" 12	" 20	Late milk	18	960	16	1,528
16	Selected Leaming	109	" 24	" 30	In silk	18	432	15	1,680
17	Sanford	85	" 18	" 21	Late milk	16	1,000	15	1,680
18	Cloud's Early Yellow	120	" 23	" 30	In silk	16	472	13	1,192
19	Squaw Corn	91	" 18	" 22	Late milk	15	1,944	18	960
20	Evergreen Sugar	90	" 25		In tassel	15	1,680	13	400
21	Pride of the North	114	" 20	Aug. 27	Early milk	15	1,680	15	360
22	Mammoth 8-rowed Flint	106	" 15	" 25	Late milk	15	1,152	14	1,832
23	King of the Earliest	96	" 21	" 31	In silk	15	360	16	472
24	Salzer's All Gold	107	" 22	" 30	"	14	248	22	352
25	North Dakota Yellow Flint	95	" 11	" 20	Early milk	11	1,760	14	248

INDIAN CORN—SOWN AT DIFFERENT DISTANCES APART.

Name of Variety.	Distance apart. Inches.	Height. Inches.	Condition when cut.	Weight per Acre, cut green for ensilage, in rows. Tons.	Lbs.
Longfellow	24	114	Late milk	18	300
"	30	114	"	14	1,832
"	36	114	"	15	800
"	42	114	"	11	275
Selected Leaming	24	120	In silk	19	1,600
" "	30	120	"	17	320
" "	36	120	"	18	960
" "	42	120	"	12	750
Champion White Pearl	24	116	"	21	900
" "	30	116	"	20	1,712
" "	36	116	"	19	1,600
" "	42	116	"	13	895

INDIAN CORN.

Average Yield at Different Distances Apart.	Tons.	Lbs.
Average yield of green corn at 24 inches apart	19	1,600
" " 30 "	17	1,288
" " 36 "	17	1,786
" " 42 "	12	640

POP-CORN.

Two varieties of pop-corn were grown, but neither of them matured grain before the frost. They were sown on June 3, and cut September 3.

The Early Amber Rice pop-corn reached the early milk stage, was 75 inches high, and yielded 14 tons 1,600 pounds of green fodder per acre.

The White Pearl pop-corn was only in silk when cut, and 80 inches high. It yielded 18 tons of green fodder per acre.

The size of each plot was one-twentieth acre, and the soil sandy loam, summer-fallowed.

EXPERIMENTS WITH TURNIPS.

Twenty varieties of turnips have been on trial at the experimental farm this year. The yield was much above the average, and the quality excellent.

The soil chosen for this experiment was a sandy loam, and the previous crop potatoes. Ten loads of well rotted manure per acre were applied in the autumn of 1902, and ploughed under at once.

Two sowings were made of each variety; in every instance the early sown plots gave the largest return; in some instances the early sown plots yielded twice as much as the late sown ones.

The first plots were sown on May 30, the second on June 13, and the roots from both were pulled on October 7. The estimate of yield has been made from the product of two rows, each 66 feet long.

TURNIPS.—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
			Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Magnum Bonum	Strong	43	1,120	1,452	..	18	960	616	..
2	Drummond Purple Top	"	42	480	1,408	..	14	1,040	484	..
3	Mammoth Clyde	Weak	41	1,160	1,386	..	16	1,000	550	..
4	Elephants Master	Fair	40	1,312	1,355	12	15	1,680	528	..
5	Selected Purple Top	Strong	40	520	1,342	..	16	736	545	36
6	Skirvings	"	40	520	1,342	..	20	920	682	..
7	Imperial Swede	Fair	40	520	1,342	..	19	1,600	660	..
8	Kangaroo	Strong	39	1,200	1,320	..	17	320	572	..
9	Sutton's Champion	Fair	39	1,200	1,320	..	15	360	506	..
10	Hall's Westbury	Strong	39	1,200	1,320	..	21	240	704	..
11	New Century	"	39	672	1,311	12	14	1,040	484	..
12	Halewood's Bronze Top	"	38	1,880	1,298	..	17	320	572	..
13	Emperor Swede	Fair	38	560	1,276	..	14	1,568	492	48
14	Hartley's Bronze	"	38	560	1,276	..	22	880	748	..
15	East Lothian	Strong	36	1,920	1,232	..	15	1,680	528	..
16	Good Luck	Fair	36	864	1,214	24	14	1,040	484	..
17	Shamrock Purple Top	"	36	600	1,210	..	19	280	638	..
18	Perfection Swede	Weak	35	1,280	1,188	..	16	1,000	550	..
19	Bangholm Selected	Fair	34	1,960	1,166	..	15	360	506	..
20	Jumbo	Strong	32	680	1,078	..	16	1,000	550	..

EXPERIMENTS WITH MANGELS.

Sixteen varieties of these useful field roots were tested this year; the yield was above the average and the quality good.

Mangels are found to be one of the most serviceable field roots grown on the farm; all animals are partial to them, even chickens will consume a large quantity of them during the winter months.

About the only objection to their cultivation is the risk from injury from early fall frosts.

The soil chosen for this crop was a sandy loam fertilized the previous year with ten loads per acre of barn-yard manure; the previous crop was potatoes.

The first plots were sown on May 30, and the second on June 13; all were harvested on September 21.

The estimate of yield has been made from the product of two rows, each 66 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth Long Red	42	744	1,412	24	23	1,520	792	..
2	Half Long Sugar White	36	1,392	1,223	12	28	760	946	..
3	Triumph Yellow Globe	36	1,584	1,126	24	20	656	677	36
4	Mammoth Yellow Intermediate	33	1,320	1,122	..	24	1,368	822	48
5	Selected Mammoth Long Red	32	1,736	1,095	36	23	1,784	796	24
6	Prize Mammoth Long Red	32	1,472	1,091	12	22	88	734	48
7	Prize Winner Yellow Globe	31	1,360	1,056	..	21	1,560	726	..
8	Yellow Intermediate	30	720	1,012	..	20	712	695	12
9	Lion Yellow Intermediate	29	1,400	990	..	22	880	748	..
10	Leviathan Long Red	28	232	937	12	18	960	616	..
11	Gate Post	27	1,968	932	48	23	200	770	..
12	Selected Yellow Globe	27	1,704	928	24	23	728	778	48
13	Giant Sugar Mangel	27	912	915	12	20	1,712	695	12
14	Half Long Sugar Rosy	27	912	915	12	20	1,712	695	12
15	Giant Yellow Globe	25	1,480	858	..	21	1,560	726	..
16	Giant Yellow Intermediate	25	160	836	..	23	992	783	12

EXPERIMENTS WITH CARROTS.

The soil selected for this crop was not a suitable one, being too stiff and hard, giving the roots little opportunity of penetrating it.

Eleven varieties were tried; the first sowing was made on May 16 and the second on June 6. With one exception, all the first sown plots gave the largest yield.

The soil was a stiff clay loam, which had been summer-fallowed; all were pulled on October 19.

The yield per acre has been calculated from the product of two rows, each 66 feet long.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Improved Short White	22	1,320	755	20	12	640	410	40
2	New White Intermediate	21	240	704	..	10	900	348	20
3	Ontario Champion	21	240	704	..	11	1,760	396	..
4	White Belgian	17	1,640	594	..	10	1,780	363	..
5	Half Long Chantenay	17	320	572	..	10	1,120	352	..
6	Half Long White	16	1,440	557	20	8	720	278	40
7	Giant White Vosges	15	1,680	528	..	12	1,300	421	40
8	Mammoth White Intermediate	14	1,700	495	..	8	60	267	40
9	Early Gem	14	600	443	20	11	1,320	388	40
10	Carter's Orange Giant	11	880	381	20	9	1,800	330	..
11	Long Yellow Stump Rooted	10	900	348	20	11	1,320	338	40

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties of sugar beets were on trial this year; the soil was a sandy loam, on which a crop of potatoes was grown in 1902; the soil was fertilized with ten loads per acre of barn-yard manure in the fall of 1902.

The first plots were sown on June 1, and the second on June 15. All were pulled September 21.

The yield has been calculated from two rows, each 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Danish Red Top	25	160	836	..	19	1,660	660	..
2	Red Top Sugar	24	312	805	12	20	920	682	..
3	Danish Improved	23	464	774	24	16	1,000	550	..
4	Improved Imperial	22	1,936	765	36	21	504	708	24
5	Wanzleben	20	128	668	48	15	360	506	..
6	Royal Giant	19	1,600	660	..	21	504	708	24
7	French "Very Rich"	13	1,720	462	..	13	1,720	462	..
8	Vilmorin's Improved	13	1,456	457	36	14	776	479	36

EXPERIMENTS WITH POTATOES.

Fifty-six varieties of potatoes were under trial this year; the season was a favourable one. The yield was large and the quality excellent.

On this farm the following system of cultivation has given excellent yields of potatoes, with the minimum amount of labour, and leaves the field to a large extent free of weeds.

Stubble land is ploughed deep and as early in spring as possible; this is harrowed at once, and again as the weeds germinate, until about May 20, when the field is rolled and ploughed shallow, the potatoes being planted in every third furrow. The land is then harrowed every few days until the potato plants are three inches high; by this plan little or no hoeing is necessary, and good yields are assured.

The soil selected this year was a stiff clay loam, and the previous crop was mangels. The potatoes were planted on May 21 and dug October 16 and 17. There was no injury from rot; the yield has been estimated in each case from the product of one row 66 feet long.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Average Size.	Total yield per acre. Bush.	Lbs.	Yield per acre of Marketable. Bush.	Lbs.	Yield per acre of unmarketable. Bush.	Lbs.	Form and Colour.
1	General Gordon..	Rank ..	Medium to large.	630	40	539	..	91	40	Long round deep pink
2	Delaware	V. rank.	" "	586	40	535	20	51	20	Long, oval, white.
3	Enormous	"	Medium	509	40	440	..	69	40	Roundish, white.
4	Uncle Sam	"	Medium to large	498	40	462	..	36	40	Flattish, oval, white.
5	American Wonder	"	Large	495	..	462	..	33	..	Long, round, white.
6	Seedling No. 7	"	Medium to large	487	40	439	..	58	40	Long, deep red.
7	Irish Daisy	Fair	" "	484	..	432	40	51	20	Long, oval, white.
8	State of Maine	Rank ..	Small to medium	484	..	432	40	51	20	Flat, oval, white.
9	Money Maker	Fair	" "	480	20	429	..	51	20	Round, oval, white.
10	Canadian Beauty	Rank	Medium to large	469	20	436	20	33	..	Long, round, l't pink.
11	Cambridge Russet	Fair ...	" "	465	40	429	..	36	40	" " dp russet
12	Early Puritan	Rank ..	" "	462	..	429	..	33	..	" " white.
13	Early Norther	Fair	" "	462	..	403	20	58	40	" flat, pink.
14	Green Mountain	Rank. .	Small to medium	451	..	414	20	36	40	Flat, oval, white.
15	Reeve's Rose	" ..	Medium to large	451	..	432	40	18	20	Flat, oval, light pink.
16	Empire State	"	" "	451	..	429	..	22	..	Long, white.
17	Brown's Rot Proof	Fair....	" "	447	20	414	20	33	..	Round oval deep pink
18	Country Gentlemen	"	" "	447	20	407	..	40	20	Long, deep pink.
19	Irish Cobbler	"	" "	447	20	392	20	55	..	Flat, white.
20	Everett	Rank ..	" "	447	20	407	..	40	20	Long, oval, pink.
21	Rose of the North	"	" "	440	..	403	20	36	40	Round, oval, l't pink.
22	Rawdon Rose	Fair	Small to medium	440	..	399	40	40	20	" " "
23	Maule's Thor'ghbred	Rank ..	Medium to large	440	..	344	40	95	20	Long, deep, pink.
24	Holborn Abundance	"	" "	436	20	418	..	18	20	Round, white.
25	Lee's Favourite	Weak ..	Small to medium	432	40	392	20	40	20	Long, oval, light pink
26	Late Puritan	Rank ..	Medium to large	430	50	388	40	42	10	Long, round, white.
27	Rose No. 9	"	" "	429	..	396	..	33	..	Long, flat, deep pink
28	Burnaby Seedling	"	" "	429	..	414	20	14	40	Flat, oval, pink.
29	Sharpe's Seedling	Fair..	" "	425	20	381	20	44	..	Long, oval, l't pink.
30	Vanier	Rank	Small to medium	425	20	385	..	40	20	Round, oval, pink.
31	Early White Prize..	Fair	Medium to large	418	..	385	..	33	..	Round, oval, l't pink
32	Prolific Rose	"	" "	418	..	396	..	22	..	Round, deep pink.
33	Swiss Snowflake	Rank	Small to medium	414	20	396	..	18	20	Irregular, white.
34	American Giant	"	Medium to large	414	20	381	20	33	..	Round, oval, white.
35	Dreer's Standard	"	" "	414	20	381	20	33	..	Flattish, oval, white.
36	I. X. L.	"	" "	414	20	377	40	36	40	Long, round, pink.
37	Early Michigan	Fair	" "	410	40	366	40	44	..	Long, white.
38	Penn Manor	Rank..	" "	407	..	355	40	51	20	Long, oval, deep pink
39	Pearce..	"	" "	407	..	374	..	33	..	Round, pink.
40	Carman, No. 1	Fair	" "	399	40	370	20	29	20	Flat, white.
41	McIntyre	Rank	" "	388	40	363	..	25	40	Long, round, white.
42	Carman No. 3	Fair . ..	" "	381	20	348	20	33	..	" " "
43	Early Sunrise	"	Large	377	40	341	..	36	40	Long, oval, l't pink.
44	Troy Seedling	Rank	Small to medium	377	40	355	40	22	..	Irregular, white.
45	Sabean's Elephant	"	Medium to large	366	40	341	..	25	40	Long, round, white.
46	Early Andes	Fair	Small to medium	363	..	330	..	33	..	Round, oval, white.
47	Clay Rose	Rank	Medium to large	355	40	308	..	47	40	Flat, oval, deep pink
48	Rochester Rose	Weak ..	Small to medium	341	..	308	..	33	..	Long, round, l't pink
49	Early Rose	Fair. ...	" "	335	30	251	10	84	20	Round, pink.
50	Early St. George	"	Medium to large	330	..	297	..	33	..	Long, oval, deep pink
51	Bovee	"	" "	319	..	282	20	36	40	Long, oval, l't pink.
52	Vicks Extra Early	"	Small to medium	315	20	289	40	25	40	Flat, pink.
53	Burpee's Extra Early	Weak ..	Medium to large	311	40	297	..	14	40	Oval pink.
54	Early Envoy	Fair	" "	271	20	253	..	18	20	Round pink.
55	Up To Date	Rank ..	Small to medium	258	30	232	50	25	40	Flat, white.
56	Pingree	Weak ..		113	40	106	20	7	20	Flat, oval, white.

GRASSES.

Owing to the very dry weather in June, the yield of grasses is below the average this year.

A new variety, *Bromus Arvensis,* was on trial for the first time this year. It is a biennial with a very handsome panicle; its suitability for feeding purposes has not yet been tested on this farm. The grasses were sown on spring-ploughed stubble, without a nurse crop. Size of plots, one-twentieth acre; soil, a sandy loam.

Varieties.	When sown.	Seed per Acre.	Yield of Hay per Acre.	
		Lbs.	Tons.	Lbs.
Austrian Brome (*Bromus inermis*)	1900	12	2	—
" " (" ")	1902	12	1	300
Field Brome (*Bromus Arvensis*)	1902	12	1	900
Hard Fescue	1900	10	1	1,850
Western Rye Grass (*A. tenerum*)	1902	12	1	220
Wheat Grass (*E. Virginicus*)	1902	12	—	1,500

EXPERIMENTS WITH CLOVERS.

As usual, a number of the hardiest clovers have wintered here, and given a fair return of fodder. The plan usually followed in the eastern provinces of sowing clover seed with a nurse crop of grain has always proved a failure on this farm, our heavy crops of grain so completely shade the ground that the clover plant has no opportunity of developing and is too small and weak to withstand the severe winter.

The system adopted here is to plough grain stubble land late in May or early in June, harrow once, sow the clover seed broadcast, then harrow a second time and roll, when the weeds and volunteer crop is about one foot high a mower is run over the land and the cuttings left on the ground as a mulch. By autumn the clover plants are, by this plan, commonly about two feet high, well rooted, and they usually pass the winter without loss.

Red Clover will give a paying crop for about three years without resowing. Alfalfa can be cut twice in a season but the other clovers only once.

Crimson Clover has been found too tender for this climate. Sweet or Bokhara Clover is hardy and a rank grower, but the plant is of little use for fodder purposes.

Test of varieties sown May, 1902, on spring ploughed wheat stubble, size of plots one-twentieth acre, soil sandy loam.

Varieties.	Seed per Acre.	Aftermath thickness.	Yield of Hay per Acre.	
	Lbs.		Tons.	Lbs.
Mammoth Red	20	Fair	2	700
Common Red	20	Thick	1	1,600
Alfalfa, 1st cutting	25	"	2	1,000
" 2nd "	25	"	1	500
Alsike	20	Thin		1,800
White Dutch	20	Very thin	Not weighed	

MILLETS.

Under proper treatment several varieties of millet have proved very satisfactory on this farm. The early maturing and finer strawed kinds have been the most successful, such as Common Millet, Hungarian Grass, German Millet and Golden Millet.

Common Millet is the only variety that will ripen its seed here every year. Much of the imported seed is mixed with the seed of wild mustard, but if a small plot is sown with the imported seed and the noxious weeds pulled by hand, pure seed can be obtained for future use. It has not been found advisable to feed millet in large quantities to horses, but during the past winter the work horses on this farm were each fed one sheaf of common millet each day, with excellent results. For this purpose the crop should be cut directly it is in the head, and before the seed has fully formed.

Millet seed is small and the germ rather feeble, and for that reason it should be sown only in well pulverized and moist loam; hard clay, gumbo, dry sandy or gravelly soils are not suitable for it.

Summer-fallowed land or the first crop after field roots makes a good preparation for Millets, and from May 20 to June 15 is the proper time to sow them.

The size of the plots for this test were one-fortieth acre and the soil was a rich sandy loam which had been summer-fallowed; all were sown on June 3 and cut on September 3.

MILLETS.

Varieties.	Height.	Length of Head.	Stage when Cut.	Yield per Acre of Hay.	
	Inches.	Inches.		Tons.	Lbs.
Algerian or Early Pearl	75	5	Fully headed	5	1,600
Moha Hungarian	45	5	"	5	600
Italian or Indian	43	None.	Not headed	4	1,000
Round French	63	8	Nearly ripe	3	600
Pearl or Cat-tail	30	None.	Not headed	3	400
Common Millet	39	4	Nearly ripe	2	800
Red Orenburg	47	6	Fully headed	2	600

HORSE BEANS AND SUNFLOWERS.

A one-twentieth acre plot of each of these plants were grown, but the frost of September 3 and 4 injured them so severely that they were not worth cutting.

CATTLE.

The herd of cattle on the Brandon experimental farm now consists of the following animals:—

Name of Animal.	Breed.	Age.	Weight.
			Lbs.
Red Knight of Brandon	Shorthorn	19 months	1,210
Brandon Myrtle	"	4 years	1,595
Nancy	"	3 "	1,240
Alice May	"	3 "	1,420
Rose of Brandon	"	5 months	465
Haron	Ayrshire	7 "	550
Lily of Brandon	"	19 "	865
Denty	"	19 "	760
Ottawa Prince	Guernsey	21 "	1,090
Brandon's Maid	"	2 years	965
Christie	Shorthorn-grade	6 "	1,365
Gretchen	"	5 "	1,355
Carrie	"	8 "	1,420
Jennette	"	7 "	1,290
Jenny	"	3 months	270
Pet	Ayrshire-grade	6 years	925
Sis	"	5 months	370

EXPERIMENTS IN FEEDING STEERS.

BROME GRASS COMPARED WITH FODDER CORN.

Of the ten steers selected for this test, two were Aberdeen Angus grades, and the balance Shorthorn grades; all were two and one-half years old when the test began.

When purchased in November, 1902, the steers cost $3.50 per hundred pounds live weight, and they sold in April, 1903, for $4.25 per hundred; both lots were then choice export cattle.

After two weeks of preparatory feeding, they were divided into two uniform groups. All were tied in double stalls and fed all they would eat of the following rations:—

Ration fed Group No. 1.

During the first four weeks, December 12, 1902, to January 9, 1903, each steer received per day—

	Pounds.
Brome hay	20
Turnips	10
Chop	6
Bran	5

During the second four weeks, January 9 to February 6, 1903, each steer received per day—

	Pounds.
Brome hay	20
Turnips	7
Chop	7
Bran	5

During the third four weeks, February 6 to March 6, 1903, each steer received per day—

	Pounds.
Brome hay	20
Turnips	7
Chop	8
Bran	5

During the fourth four weeks, March 6 to April 3, 1903, each steer received per day—

	Pounds.
Brome hay	20
Turnips	7
Chop	9
Bran	5

Ration fed Group No. 2.

During the first four weeks, December 12, 1902, to January 9, 1903, each steer received per day—

	Pounds.
Fodder corn	24
Turnips	10
Chop	6
Bran	5

During the second four weeks, January 9, to February 6, 1903, each steer received per day—

	Pounds.
Fodder corn	26
Turnips	7
Chop	7
Bran	5

During the third four weeks, February 6 to March 6, 1903, each steer received per day—

	Pounds.
Fodder corn	30
Turnips	10
Chop	8
Bran	5

During the fourth four weeks, March 6, to April 3, 1903, each steer received per day—

	Pounds.
Fodder corn	30
Turnips	10
Chop	9
Bran	5

DESCRIPTION OF FODDER.

The brome was cut early and well cured.

The fodder corn was Pearce's Prolific, cut when in the late milk stage, well cured in the stooks outside and only drawn in as it was wanted. The chop consisted of one-third each of wheat screenings, oats and barley.

COMPARATIVE GAINS.

Brome Grass Hay.	Date.	Weight.	Gain.	Total Gain.
Original weight of steers	Dec. 12, 1902	6,030 lbs		
Weight at end of 1st period	Jan. 9, 1903	6,205 "	175 lbs	
" 2nd "	Feb. 6, 1903	6,490 "	285 "	
" 3rd "	March 6, 1903	6,810 "	320 "	
" 4th "	April 3, 1903	6,965 "	155 "	935 lbs.

Fodder Corn.	Date.	Weight.	Gain.	Total Gain
Original weight of steers	Dec. 12, 1902	6,000 lbs		
Weight at end of 1st period	Jan. 9, 1903	6,210 "	210 lbs	
" 2nd "	Feb. 6, 1903	6,505 "	295 "	
" 3rd "	March 6, 1903	6,810 "	305 "	
" 4th "	April 3, 1903	7,010 "	200 "	1,010 lbs.

COST OF FEEDING.

Lot No. 1.—Brome Grass Hay.

11,200 pounds of hay at $5 per ton	$28 00
79⅕ bushels of turnips at 5c. per bushel	3 96
4,200 pounds of chop at 75c. per 100 pounds	31 50
2,800 pounds of bran at $12 per ton	16 80
Total cost of five steers	$80 26
Cost of one steer	$16 05

Lot No. 2.—Fodder Corn.

16,050 pounds of fodder corn at $4 per ton	$32 10
79⅕ bushels of turnips at 5c. per bushel	3 96
4,200 pounds of chop at 75c. per 100 pounds	31 50
2,800 pounds of bran at $12 per ton	16 80
Total cost for five steers	$84 36
Cost for one steer	$16 87

SUMMARY OF RESULTS.

——	First Cost per Steer.	Value of Feed consumed.	Price per Steer sold for.	Gain per day.	Profit per Steer.
	$ cts.	$ cts.	$ cts.	Lbs. oz.	$ cts.
Fed Brome Grass Hay	42 51	16 05	59 20	1 10	0 64
Fed Fodder Corn	42 00	16 87	59 58	1 12	0 71

CONCLUSIONS.

The results of this experiment would lead us to the following conclusions:—

First, that there is very little profit in feeding steers when the difference between the buying and selling price is only about 75 cents per steer.

Second, that cattle require more pounds of fodder corn per day than they do of brome grass hay.

Third, that the comparative value of these two fodder crops is about $4 per ton for fodder corn and $5 for brome hay.

EXPERIMENTS WITH SWINE.

SPELTZ (EMMER) COMPARED WITH MIXED GRAIN.

The area sown with speltz in this province has increased very largely during the past year, but very little is known of its value as a pig feed.

Eight pigs were used for this test, two Yorkshires and two Berkshires in each group.

The mixed grain used was composed of one-fifth oats, two-fifths wheat screenings, and two-fifths barley; both it and the speltz were ground and fed.

Both kinds of feed were valued at 75c. per hundred pounds. Reports have been received of injury to young pigs from feeding speltz, but no difficulty was experienced from this cause here.

At the close of the test the pigs were sold at $5.25 per hundred pounds, live weight.

RATION FED.

Amount and value of food consumed during the fattening term of 81 days from January 15 to April 9, 1903 :—

——	Grain fed.	Value of feed.
	Lbs.	$ cts.
Pen 1, fed speltz	1,525	11 43
Pen 2, fed mixed grain	1,550	11 62

SUMMARY.

——	Weight when bought.	Value when bought.	Weight when sold.	Value when sold.	Value of food.	Profit on each pen.
	Lbs.	$ cts.	Lbs.	$ cts.	$ cts.	$ cts.
Pen 1, fed speltz	432	22 68	821	43 10	11 43	8 99
Pen 2, fed mixed grain	402	21 10	809	42 47	11 62	9 75

CONCLUSIONS.

First, the pen of animals fed on mixed grain consumed 25 pounds more grain during the fattening period than those fed on speltz.

Second, the same pen also made a gain of 18 pounds more than those fed on speltz.

Third, the amount of profit was practically the same from each class of food, the difference being only 76c. per pen in favour of the mixed grain ration.

POULTRY.

Three breeds of poultry have been kept on this farm during the year, namely, Barred Plymouth Rocks, White Wyandottes and Light Brahmas. All have kept quite healthy and seventy-three chicks were raised during the summer.

INCUBATOR.

A trial was made this year with an incubator, as this is the first year it has been tried on the farm, and the operator inexeprienced, it was deemed advisable to await the results of another year's test before reporting on its success.

FATTENING OF BARRED PLYMOUTH ROCKS COMPARED WITH WHITE WYANDOTTES.

Four Barred Plymouth Rock cockerels and an equal number of White Wyandottes were shut up in slatted pens each 2 x 3 feet, and fed all they would eat of finely ground grain consisting of one-third each of wheat, oats and barley. This was given in troughs mixed with skim-milk to the consistency of thin porridge.

In the following tables the meal has been estimated at 75 cents per hundred pounds. The fattening period covered 28 days.

Barred Plymouth Rocks.

Weight Nov. 25.		Weight Dec. 23.		Gain.		Cost of food.		Cost per lb. live weight.
Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	$	cts	cts.
19	00	24	8	5	8	0	22	4

Wyandottes (white).

Weight Nov. 25.		Weight Dec. 23.		Gain.		Cost of food.		Cost per lb. live weight.
Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	$	cts.	cts.
17	10	21	10	4	00	0	21	5¼

SUMMARY.

First. The pen of Barred Plymouth Rocks consumed one and one-half pounds more grain during the fattening period than the White Wyandottes.

Second. The Barred Plymouth Rocks gained one and one-half pounds more flesh during the month, and the cost of the added flesh was one and one-quarter cents per pound less than in the case of the White Wyandottes.

BEES.

The colonies of bees were removed from the cellar to their summer stands on April 4, ten days earlier than usual; of the twelve hives placed in the cellar last fall one died from inadequate stores.

A large number of farmers in this province are starting in bee-keeping.

For this reason the apiary was run for swarms more than for honey and still the demands for colonies could not be met. Some of the colonies were shipped long distances; this gave opportunity for the testing of different ways of packing hives for shipment; some of the plans tried proved disastrous to both comb and bees.

The most successful shipping was accomplished with the Langstroth hive, as follows: The reversible bottom board is placed so as to give the largest possible entrance which, with this hive is seven-eighth inches. This entrance is then covered with mosquito wire netting. A piece of comb section is placed on each corner of the hive body just under the cover; this raises the cover just enough to permit of ventilation, but not enough to allow the escape of bees. Malleable bale wire is then wrapped around the hive and twisted tight to keep the cover and bottom board firmly attached to the hive. By the above plan colonies have invariably reached their destination safely.

A trial was made this year of growing two different plants, as bee food, namely, Sweet Clover (Melitotus Alba) and Borage, the sweet clover is a biennial, and during the second summer blooms freely and continuously until frost. Bees are very partial to it, and the yield of nectar is large.

Borage is an annual garden herb, with bright blue flowers, which are very abundant throughout the summer. The plot of one-twentieth acre grown on the farm this year was fairly swarming with bees every bright day, and apparently the yield of honey from it is considerable.

Thirteen colonies were placed in the cellar on November 13, 1903.

HORTICULTURE.

The season of 1903 was a very favourable one from a horticultural standpoint. The total absence of spring frosts contributed to a very heavy setting of fruits, and the generous rains throughout the season materially assisted in producing one of the best crops of fruit and vegetables of recent years.

A very large crop of crab-apples and plums were harvested, the yield from these being one of the heaviest recorded on the experimental farm; while raspberries and currants also gave fair returns.

The vegetable garden was very satisfactory, all varieties giving an exceptionally heavy yield of excellent quality.

Only one serious check was experienced during the season and this, fortunately, was near the close. On September 12, we were visited by a severe snow storm, accompanied by much wind, after which the thermometer registered 10° of frost, which damaged the late ripening vegetables as well as the later ripening varieties of cross-bred apples.

The bright weather experienced during the spring months was very favourable to hot-bed work, and exceptionally strong flowering plants were available at transplanting time, the flower garden presenting a mass of colour throughout the season.

Following will be found the results of portions of the work undertaken in this department.

STANDARD APPLES.

The following standard apples grafted on Pyrus baccata, together with some Russian seedlings, were received from the Central Experimental Farm at Ottawa and planted here during the past season:—

Hibernal.
Wealthy.
North-west Greening.
McMahon White.
Longfield.
Russian Seedling, No. 18.
Russian Seedling, No. 22.
Russian Seedling, No. 7.
Russian Seedling, No. 3.
Russian Seedling, No. 26.
Yellow Transparent.
Pointed Pipka.
Duchess of Oldenburgh.
Scott's Winter.
McIntosh Red.

All became well established before the winter set in.

APPLES (PYRUS BACCATA).

Although a heavy crop of fruit of the several varieties of Pyrus baccata was harvested last year, we were again favoured with an enormous crop during the present season. Of these the largest were the Pyrus baccata sanguinea, Pyrus baccata xanthocarpa, Pyrus baccata yellow, Pyrus —— No. 529. These made excellent preserves when cooked whole, while the smaller ones were unexcelled for jelly.

SEEDLINGS OF THE MARTHA CRAB.

A considerable number of these seedlings fruited for the first time this season, among which were some excellent varieties. The best of these will be propagated for distribution by grafting on roots of Pyrus baccata.

GRAFTING

In the spring of 1902, scions of the following varieties were grafted on Pyrus baccata:—

Transcendent.
Pride of Minneapolis.
Wealthy.
Duchess of Oldenburgh.

Excellent unions were made in all cases, and the following shows the condition of the scions after having passed through one winter.

Transcendent.—100 per cent alive to tips.
Pride of Minneapolis.—100 per cent alive to tips.
Wealthy.—All killed back three-fourths.

Duchess.—50 per cent killed back three-fourths. Balance alive to tips.

The scions that came through in good condition made splendid growth during the present season, and their condition will be reported upon next year. In connection with the Duchess of Oldenburgh, we desire to state, that the percentage of scions of this variety which wintered successfully, was greatly reduced by reason of the fact that two of the *Pyrus baccata* on which these were grafted, afterwards died and were destroyed.

ROOT GRAFTING.

A number of root grafts were made on *Pyrus baccata* with scions taken from the surviving trees of the old apple orchard. These made good unions, and successfully passed through the winter of 1902-03. They were planted in the *Pyrus* orchard this spring and made good growth during the season.

TOP GRAFTING.

Scions of the following were received from the Central Experimental Farm and top grafted on *Pyrus baccata* during the past spring:—

Yellow Transparent.
McMahon White.
Hibernal.
Duchess of Oldenburgh,
Malinda.
Wealthy.
Patten's Greening.
Charlamoff.
North-western Greening.

In addition to these a few scions were received from Miss Fowler, of Headingly, Manitoba, of an unnamed red apple. The following named cross-bred apple scions were received from the Central Experimental Farm, Ottawa:—

Charles, Pioneer, Northern Queen,
Carleton, Ruby, Aurora, Derby.

There were no cases of failure to unite, and a good growth was made during the season.

CROSS-BRED APPLES.

A large number of cross-bred apples fruited for the first time this season, and though none of the named varieties were included, some very fair samples were noted. The most satisfactory of these will be found under the heading of 'Descriptive list of apples.'

A large addition of cross-bred apple seedlings and grafted specimens of the named varieties of cross-breds was made to the *Pyrus* orchards during the past season. Nearly every specimen became established and we have now growing on the farm a large representative collection of this class of apples, which should prove most interesting on coming into bearing.

The following is a descriptive list of the more meritorious varieties of apples fruited this season. All of these make excellent preserves when cooked whole.

Martha Seedling, No. 1.—Colour, deep yellow slightly streaked with red; diameter, $1\frac{1}{8}$ inches; flattish; seed cavity medium; ripe middle August; flesh firm, sweet and juicy; calyx persistent.

Martha Seedling, No. 2.—Colour, deep yellow slightly streaked with red; diameter, $1\frac{3}{8}$ inches; seed cavity very small; flesh firm, sweet and juicy, with a pleasant aroma; shape, flattish oval; ripe late September; calyx persistent.

Martha Seedling, No. 3.—Colour, bright red; diameter, $1\frac{1}{4}$ inches; seed cavity medium; flesh somewhat soft, rather dry but sweet; ripe, early August; calyx persistent.

Martha Seedling, No. 4.—Colour, deep yellow; diameter, $1\frac{3}{16}$ inches; seed cavity rather large; flesh soft and mealy; sweet; ripe early in September; calyx persistent.

Martha Seedling, No. 5.—Colour, bright yellow, dotted and streaked with red; diameter, $1\frac{2}{16}$ inches; seed cavity, small; flesh firm, sweet and juicy, slightly astringent; shape, flattish; ripe early September; calyx persistent.

Martha Seedling, No. 6.—Colour, deep yellow, streaked heavily with red on sunny side; diameter $1\frac{1}{16}$ inches; seed cavity small; flesh firm, sweet and juicy; shape flattish oval; ripe late in August; calyx persistent. The best of the Martha seedlings yet fruited.

Martha Seedling, No. 7.—Colour, deep yellow, slightly streaked with red; diameter, $1\frac{3}{16}$ inches; seed cavity large; flesh firm, sweet and juicy, with a pleasant aroma; shape, flattish; ripe late in August; calyx persistent. One of the best flavoured varieties.

Snyder Seedling, No. 8.—Colour, deep yellow, slightly streaked with red on sunny side; diameter, $1\frac{3}{16}$ inches; flesh firm, sweet and juicy; seed cavity small; shape roundish; ripe early September; calyx persistent.

Pyrus baccata x *Wealthy, No. 9.*—Colour, deep red on sunny side, reverse side light yellow slightly streaked with red; diameter, $1\frac{1}{4}$ inches; seed cavity, medium; ripe second week in September; flesh firm and juicy, slightly astringent; calyx persistent; skin very thin and susceptible to bruising.

Cross-bred Pyrus Seedling, No. 10.—Colour very bright red; diameter $1\frac{3}{16}$ inches; shape roundish; seed cavity medium; flesh crisp and juicy and slightly astringent; ripe late August; calyx persistent.

No. 116, Pyrus baccata x Tetofsky, No. 11.—Colour bright red; diameter, $1\frac{3}{16}$ inches; seed cavity small; flesh, soft and mealy, sweet; shape flattish; ripe, middle of September; calyx persistent.

Pyrus baccata x *Talman's Sweet, No. 12.*—Colour deep yellow, very slightly streaked with red on sunny side; diameter, $1\frac{5}{16}$ inches; seed cavity, medium; flesh, firm and juicy, sub-acid, slightly astringent; shape, flattish round, ripe early in October; calyx persistent.

Pyrus baccata x *Talman's Sweet, No. 13.*—Colour, deep red; diameter, $1\frac{5}{16}$ inches; seed cavity small to medium; flesh, firm, sweet and juicy, very slightly astringent; ripe late in August, calyx persistent. A good variety.

Pyrus baccata x *Talman's Sweet, No. 14.*—Colour, deep yellow. fairly streaked with red on sunny side; diameter, $1\frac{5}{16}$ inches; seed cavity, medium; flesh firm, sweet, no astringency; ripe early October; calyx persistent. A good sort.

Pyrus baccata, No. 529, No. 15.—Colour, bright yellow, streaked with red on sunny side; diameter, $1\frac{3}{16}$ inches; flesh firm, juicy and sweet; seed cavity, medium; ripe, early August; calyx persistent.

No 125, Parker.—Colour, deep yellow, heavily splashed with red on sunny side; diameter, $1\frac{7}{16}$ inches; flesh firm, juicy and slightly astringent; seed cavity, medium; ripe middle of September; calyx persistent.

Transcendent crab.—The large tree of this variety growing on the hillside again produced a fair crop of excellent fruit. On account of having been used as a source of supply for scions, the crop was not as heavy as it it would otherwise have been.

PLUMS.

The plum crop of 1903 was the heaviest ever recorded on the Experimental Farm. The fruit set in such profusion that the branches were weighted to the ground, many of them breaking when the fruit attained full size. The trees of the native plum (*Prunus nigra*), ripened practically all their fruit, but those of the American plum (*Prunus Americana*), failed to ripen, authough some large fruit was produced on some specimens of this class.

SMALL FRUITS.

RASPBERRIES.

The raspberry crop was only a fair one during the past season, though the crop throughout the province was much above the average. An interesting test was made in order to determine the efficacy of laying down the canes in the fall of the year in order to prevent winter-killing. One-half the row of each variety was laid down, the tips of the canes being held down by a light furrow thrown on them with the plough, the balance being left standing. On the approach of spring the canes were lifted, and while the covered canes were found to be in good condition, those unprotected were dead to snowline. It is evident that, in exposed positions it would be wise to lay down the canes and partly cover them, as described.

CURRANTS.

The currant crop was an excellent one throughout the province the past season, although, on account of change of location of the currant plantation at the Experimental Farm, the crop was below the average.

TREES, SHRUBS, HEDGES, &c.

HEDGES.

No additions were made to the list of trial hedges during the past season, but we would call attention to one or two which have been planted quite recently.

Cedar or Arbor-Vitæ (Thuya occidentalis), planted 1900.—Though somewhat slow growing, this is proving quite hardy, and gives promise of making a most symmetrical hedge in the near future, and it bears clipping well.

Rhamnus cathartica (Buckthorn).—This plant is receiving considerable attention from the farmers as a hedge plant and seems to promise well for that purpose. The branches are more or less spined, and it should make a good hedge. It is hardy here.

One of the best thorn hedges growing on the farm is that composed of the native Buffalo Berry *(Shepherdia argentea)*. Though not a rapid grower, the numerous spines with which it is covered render it a very impervious hedge even when quite small, and its beautiful silvery foliage makes it a striking object during the summer season.

The large hedge of Native Spruce *(Picea alba)*, planted in 1893, and now 14 feet high continues to prove very satisfactory and does not show the slightest signs of deterioration on account of crowding, being green from top to base.

The large double-rowed maple hedges *(Acer Negundo)*, surrounding the shelter blocks at the south end of the farm, were given a good pruning this season, which greatly added to their appearance.

Several of these sample hedges, which were in a low portion of ground near the superintendent's house, were injured by the heavy floods of a year ago, and it seems doubtful if they will ever thoroughly recover.

ARBORETUM.

No additions were made to the Arboretum during 1903. The following is a list of varieties planted in 1902, together with notes on their condition this year.

Crataegus oxyacantha (English Hawthorn).—Killed to snow-line; strong growth; 1903.

Ostrya virginica (Ironwood).—Wintered well; very small growth; 1903.

Banksian Pine *(Pinus banksiana)*.—Wintered well; fair growth; 1903.

Red Pine *(Pinus resinosa)*.—Wintered well; fair growth; 1903.

CANKER ON RUSSIAN POPLAR.

This disease continues to make rapid progress on the Experimental Farm, many of the trees of Russian Poplar being more or less seriously affected by it. The canker (a fungus growth), rots the wood tissue, causing the limbs and trunk to break off at the diseased point during high winds. There seems to be no question, but that cuttings made from the affected trees soon exhibit symptoms of the disease, consequently it may be advisable to make a new commencement from seed. This tree is a very rapid grower.

CRATAEGUS—NIEMETZ (HAWTHORN).

Several of these thorns, procured by Dr. Saunders from Russia from Mr. Niemetz, are growing in the arboretum here, and are well worthy of special notice on account of their comparatively rapid growth, handsome appearance and great hardiness.

Many inquiries are received as to suitable material for thorn hedges, and it seems probable that these would be suitable for this purpose. They are similar in growth to our native thorn *(Crataegus coccinea)* and produce similar offensive spikes, which would render a hedge of this sort almost impenetrable.

FLOWERING SHRUBS.

Owing to the absence of spring frosts the numerous varieties of flowering shrubs on the farm were much above the average this season, and brought forth enthusiastic comment from visitors, the lilacs, spireas and honeysuckles being especially fine.

LILAC—CHARLES X.

This is a magnificent form of the common lilac, with very large heads of flowers, which are produced much more abundantly than with the common variety. It has also the advantage of flowering when comparatively young. It may be propagated by grafting on the common stock.

SEEDLINGS OF LILAC CHARLES X.

The hedge composed of seedlings of Charles X. lilac surrounding one of the Pyrus orchards, flowered heavily for the first time last season, and was very interesting from the fact that they are the first seedlings of this variety yet flowered on the farm. A large percentage of the plants produced flowers quite equal to the parent variety, but the most noticeable peculiarity was the great range of colour, a large number of shades being represented. It is evident that this is a very satisfactory method of propagation.

EUONYMUS LINEARIS.

This dwarf growing shrub flowered for the first time this year. The flowers are very striking both in colour and form, and the plant blooms when quite young.

JAPAN LILAC (SYRINGA VILLOSA).

A very distinct form, flowering later than the other varieties, and of a different form and colour. The flower spikes are large, and of a reddish white colour. Its late flowering greatly lengthens the period of lilac blooms.

PHILADELPHUS GRANDIFLORUS (MOCK ORANGE).

A test was made during the fall of 1902, in order to ascertain the possibility of flowering this beautiful shrub, by means of covering; though the roots are perfectly hardy, the branches are usually killed to snow line, hence the total absence of flowers the following season. The test was partially successful, and a number of flowers were produced during the past summer. A more thorough covering was given before the present winter set in, and we hope thus to still further increase the value of this beautiful flowering shrub.

SPIRAEAS.

We would call special attention to a few varieties of this hardy flowering class, which is one of the most satisfactory for the North-west.

Spiraea hypericifolia.
Spiraea Van Houttei.
Spirae sorbifolia.

These are arranged in order of earliness, the flowers being produced during a considerable period.

FALL SOWING OF SEEDS COMPARED WITH STRATIFICATION.

A test was undertaken to find out whether the fall sowing of seeds of flowering shrubs and fruits would be as advantageous, as the means usually adopted, viz., stratification. The latter method is accomplished by filling a box in the fall with alternate layers of the seed and sand, and leaving it in the open where it will be exposed to the full rigour of winter. The boxes are opened, and the seed sown as early as possible in the spring. It is expected that the action of the winter's frost will conduce to quick germination. It will be readily seen that fall sowing would lessen the amount of labour. There is also a drawback to be considered when stratification is resorted to, and that is, that germination sometimes begins in the boxes before spring sowing is possible, and when the box is opened a mass of intergrown, attenuated seedlings are sometimes brought to light. Included in this test were the following varieties:—*Acer ginnala, Acer tatarica, Lonicera tatarica* and *Pyrus baccata.*

The seed germinated readily in the spring, and the seedlings successfully stood a fairly severe frost. From the results of this experiment it would appear that fall sowing may be resorted to with good prospect of success.

DISTRIBUTION.

A large number of seedlings of flowering shrubs and hedge plants are grown on the farm every year for distribution the following spring. The demand, however, is so great that it is not often that all the applicants can be supplied.

THE VEGETABLE GARDEN.

GARDEN PEASE.

Thirty-nine varieties of garden pease were sown in the open ground on May 3, the seed having been grown on the Brandon Experimental Farm in 1902. It was very satisfactory to note that the percentage of germination was in every case excellent, corroborating former experience that Manitoba-grown pease are much above the average.

All varieties again ripened their own seed, and the results of the test follows, arranged in order of earliness.

GARDEN PEASE.

Varieties.	Length of Pod.	Length of Vine.	Peas in Pod.	Flavour.	Productiveness.
	In.	In.			
Steele Briggs' Extra Early	2 to 2¼	16	4 to 5	Fairly sweet	Very productive.
Tom Thumb	2¼ " 2½	24	6 " 7	"	Fairly "
Philadelphia Extra Early	2¼ " 2½	36	6 " 7	"	" "
Bruce's Early Conqueror	2 " 2¼	24	4 " 5	"	Not "
Alaska	2¼ " 2½	26	6 " 7	"	Fairly "
Rural New Yorker	2¾ " 3	28	5 " 6	"	" "
Extra Early Daniel O'Rourke	2 " 2½	30	5 " 6	"	Very "
Carter's First Crop	2½ " 3	26	5 " 6	"	Fairly "
McLean's Little Gem	2 " 2¼	18	5 " 6	"	" "
McLean's Blue Peter	2½ " 3	14	5 " 6	Sweet	" "
Gregory's Surprise	2½ " 3	36	6 " 7	Fairly sweet	" "
Extra Early Exonian	2 " 2¼	18	4 " 5	Sweet	Very "
Admiral	2½ " 3	36	6 " 7	"	" "
American Wonder	2½ " 3	14	6 " 7	Very sweet	" "
Surprise	2 " 2¼	26	4 " 5	Sweet	Not "
Nott's Excelsior	2½ " 3	14	6 " 7	"	Very "
Prosperity or Gradus	3 " 3½	30	5 " 6	Very sweet	Not "
William Hurst	3 " 3½	18	7 " 8	"	Very "
Horsford's Market Garden	2¾ " 3	30	6 " 7	"	" "
Blue Imperial	2½ " 3	24	5 " 6	Fairly sweet	Fairly "
Laxton's Supreme	3¼ " 3½	36	8 " 9	Sweet	" "
Blue Beauty	2½ " 3	18	5 " 6	Fairly sweet	" "
Rennie's Queen	3 " 3¼	30	8 " 9	Very sweet	" "
Pride of Market	2½ " 3	30	7 " 8	Fairly sweet	" "
Rennie's Perfection	3 " 3¼	30	6 " 7	Very sweet	" "
Juno	3 " 3½	30	8 " 9	Excellent	Very "
Thomas Laxton	3¼ " 3½	30	6 " 7	Very sweet	Fairly "
Fillbasket	2½ " 3	36	6 " 7	"	Very "
C. P. R.	3 " 3¼	18	5 " 6	"	" "
Telephone	3½ " 3¾	36	7 " 8	"	" "
Stratagem	3¼ " 3½	24	7 " 9	"	" "
Duke of York	3¼ " 3½	36	8 " 9	"	" "
Duke of Albany	3 " 3¼	36	7 " 8	"	Fairly "
Champion of England	3¼ " 3½	40	8 " 9	Fairly sweet	Very "
Allen's Dwarf Telephone	3¼ " 3½	20	8 " 9	Very sweet	Fairly "
Yorkshire Hero	3¼ " 3½	28	8 " 9	"	" "
Shropshire Hero	3½ " 3¾	30	8 " 9	"	" "
Early Dwarf Brittany	Edible podded varieties.			"	Very "
Tall Scimitar	" "			"	" "

ONIONS.

Seven varieties of onions were sown on April 14 in rows 12 inches apart, with Planet Junior hand drill. The germination was excellent in all cases, and the product above the average both in yield and quality. The yield of the Red Prize Taker, a variety tested here for the first time this season, has been large, and this may be a valuable onion for this province. Following will be found the result of this test, arranged in order of productiveness:—

ONIONS.

Varieties.	Sown.	Pulled.	Colour.	Shape.	Yield per Acre. Bush.	Lbs.
Prize Taker (Red)	May 14	Sept. 8	Deep red	Globular	871	12
Red Wethersfield	" 14	" 8	"	Flattish	671	13
Trebon's Yellow	" 14	" 8	Light yellow	Globular	544	30
Yellow Globe, Danvers	" 14	" 8	Dark "	"	508	17
Gibraltar	" 14	" 8	Light "	"	471	54
Paris's Silverskin Market	" 14	" 8	White	Flattish	435	33
Favourite Keeping	" 14	" 8	Light yellow	Globular	381	9

SQUASH AND PUMPKINS.

Forty-six varieties of squash and pumpkins were sown in the open on May 28, in hills ten feet apart each way. The coolness of the summer prevented the best results being obtained, although a very fair yield was had, many of the varieties coming quite up to the average.

We would again point out the special value of the Bush forms of squash as compared with the running varieties, on account of their earliness and ease of cultivation. Extra Early Orange Marrow continues to merit our good opinion, as to its being the best substitute for a pie pumpkin yet tested here.

The following results were obtained:—

SQUASH AND PUMPKINS.

Varieties.	Sown.	Ripe and Ready.	Colour of Skin.	Colour of Flesh.	Form.	Weight. Lbs	Quality.
Grey Mammoth	May 28	Sept. 20	Green'h white.	Light yellow	R	30	Rough for feed.
Jumbo	" 28	" 20	Bright yellow.	"	R	25	"
Golden Oblong	" 28				R	....	Did not mature fruit.
Japanese Pie	" 28	Sept. 15	Dark yellow	Light yellow	R	10	Fine for pies.
Cushaw	" 28				R	....	Did not produce fruit
Sweet or Sugar	" 28	Sept. 15	Dark yellow	Light yellow	R	8	Fine for pies.
Mammoth Tours	" 28	" 20	Green'h white.	Green'h yellow	R	20	Rough for feed.
Jonathan	" 28	" 20	Bright yellow.	Light yellow	R	25	"
Red Etampes	" 28				R	....	Did not mature fruit.
Large Field	" 28	Sept. 10	Deep yellow	Light yellow	R	32	Rough for feed.
Nantucket or Negro	" 28	" 15	Deep green	"	R	15	"
Winter Luxury	" 28	" 20	Light yellow	"	R	10	Fine for pies.
Mammoth King	" 28	" 20	Deep yellow	Med. yellow	R	35	Rough for feed.
Japan Crookneck	" 28				R	....	Did not produce fruit
Mammoth Globe	" 28	Sept. 20	Deep green	Light yellow	R	33	Rough for feed.
Golden Bronze	" 28				R	....	Did not mature fruit.
Turban	" 28	Sept. 20	Orange	Light yellow	R	6	Fair quality.
Chicago Warted Hubbard.	" 28				R	....	Did not mature fruit.
Perfect Gem	" 28				R	....	" "

SQUASH AND PUMPKINS—*Concluded.*

Varieties.	Sown.	Ripe and Ready.	Colour of Skin.	Colour of Flesh.	Form.	Weight.	Quality.
						Lbs	
Pike's Peak or Silby......	" 28	Sept. 25	Green'h white.	Green'h yellow	R	10	Good quality.
Mammoth Whale........	" 28	" 15	Deep green....	Light yellow..	R	38	Rough for feed.
Winter Crookneck....	" 28	....	....	....	R	....	Fruit did not ripen.
Summer Crookneck......	" 28	Aug. 20	Orange.......	Deep yellow..	R	7	Valueless.
Canada Crookneck.......	" 28	" 20	"	" ..	R	7	"
Boston................	" 28	....	....	....	R	...	Did not produce fruit
Cocoanut..............	" 28	....	....	....	R	....	" "
Golden Hubbard........	" 28	Sept. 10	Deep yellow.	Light yellow..	B	11	Good.
Italian Marrow.........	" 28	" 10	Light yellow.	Cream yellow.	B	9	Excellent.
Faxon.................	" 28	....	....	....	R	....	Did not produce fruit
Long White Bush Marrow	" 28	Aug. 12	Yellow'h white	Yellow'h white	B	12	Excellent.
Der Wing..............	" 28	....	....	....	R	...	Did not produce fruit
Long Isd. Bush Scalloped.	" 28	Sept. 1	White.......	Yellow'h white	B	3	Fair.
Fordhook..............	" 28	....	....	....	R	....	Did not mature fruit.
Early Golden..........	" 28	Aug. 25	Deep yellow..	Light yellow..	B	5	Valueless.
Warren................	" 28	....	....	....	R	....	Did not mature fruit.
English Vegetable Marrow	" 28	Aug. 25	Yellow'h white	Yellow'h white	R	7	Excellent.
Cocozelle Bush........	" 28	" 15	Green'h white.	" "	B	12	"
Silver Custard........	" 28	Sept. 5	White........	Whitish......	B	4	Fair.
White Bush Scalloped....	" 28	" 5	"	"	B	4	"
Marble Head..........	" 28	....	....	....	R	....	Did not produce fruit
Delicata..............	" 28	....	....	....	R	....	" "
Ex. Early Orange Marrow	" 28	Sept. 1	Deep orange..	Light yellow..	R	10	Fine for pies.
Golden Custard Bush....	" 28	Aug. 25	" yellow..	" ..	B	5	Valueless.
Pine Apple............	" 28	....	....	....	R	....	Did not mature fruit.
Delicious.............	" 28	....	....	....	R	....	" "
Bay State.............	" 28	....	....	....	R	....	" "

BEANS.

Seven varieties of beans were sown in the open on May 29, in rows 30 inches apart; and with one exception a most satisfactory crop was obtained. The exception was the variety, Henderson's Dwarf Bush Lima, the earliest bean of this type which is listed by American seedsmen, but it failed to arrive at a fit condition for table. The results of this test are given below, the varieties being arranged in order of earliness.

Varieties.	Sown.	Colour Pod.	Length of Pod.	Texture and Flavour.	Ripened.
Dwarf Golden Skinless........	May 29....	Light yellow....	5 inches..	Fairly tender good.....	None.
Dwarf French matchless....	" 29....	"	5 " ..	Very tender good......	"
Bagnolet..............	" 29....	Green........	6 " ..	" "	"
Dwarf Inexhaustible........	" 29...	"	6 " ..	Tender good.........	"
Fame of Vitry..........	" 29....	"	$6\frac{1}{2}$ " ..	Fairly tender good.....	"
Emperor of Russia........	" 29...	"	$6\frac{1}{2}$ " ..	Tender...........	"
Henderson's Bush Lima......	" 29....	Did not reach condition for table.			"

CABBAGE.

Eight varieties of cabbage were sown in cold frames on April 20, and transplanted to the open on May 23. All varieties did well, but special attention is called to the Savoy cabbage (Green Globe). This is a late variety which has proven to be excellent for winter storage, far better than the others in this respect.

The following results were obtained:—

Variety.	Sown.	Transplanted.	Early or Late.	Texture.	Average weight.
					Lbs.
Paris Market, very early	April 20	May 23	Very early	Fairly firm	8
Early Express	" 20	" 23	Early	Somewhat loose	7
Early Jersey Wakefield	" 20	" 23	"	Firm	8
Early Winningstadt	" 20	" 23	Summer	Very firm	9
Midsummer Savoy	" 20	" 23	"	Loose	5-6
Fottler's Drumhead	" 20	" 23	Late	Very firm	13
Green Globe Savoy	" 20	" 23	"	Fairly firm	8
Red Drumhead	" 20	" 23	"	Very firm	9

PARSNIPS.

Three varieties of parsnips were sown on April 14, in rows 30 inches apart, with a Planet Junior hand drill. Hollow Crown gave the heaviest yield, and ranked first in regard to quality. The Student is a turnip-shaped variety of fair quality, and very easy to harvest, this with the long varieties being a somewhat difficult operation.

The following results were had :

Varieties.	Sown.	Lifted.	Shape.	Flavour.	Yield per Acre.	
					Bush.	Lbs.
Hollow Crown	April 14	October 5	Long	Good	667	55
Half Long	" 14	" 5	Half-long	Fair	435	36
Student	" 14	" 5	Short	"	412	9

TOMATOES.

Two varieties of tomatoes were sown in the hotbed on April 20, and transplanted to the open on May 27. The most noticeable point in connection with this test was the early planting out (May 27).

The plants escaped frost, and a larger quantity of ripe fruit was harvested than usual.

Varieties.	Sown.	Transplanted.	Ripe.	Colour.	Shape.	Flavour.
Century	April 20	May 27	August 25	Bright red	Smooth	Meaty, very juicy.
Earliana	" 20	" 27	" 10	"	Ribbed	Fair.

Representatives of all standard varieties of vegetables not referred to in the foregoing, were tested during the past season, including radish, citron, &c., with uniformly good results. The twenty varieties of rhubarb under trial gave heavy returns. A quantity of rhubarb seed of the best varieties was gathered for distribution.

LIST OF VARIETIES OF VEGETABLES ESPECIALLY SUITABLE FOR MANITOBA.

Many inquiries are made of the officers of the Experimental Farm regarding the most profitable varieties of vegetables to grow in this province. Following will be found a list of selected varieties compiled from the results of several years' trial on this farm:—

Asparagus.—Conover's Colossal, Columbia, Mammoth White.

Beans (Dwarf).—Canadian Wonder (yellow podded), Scarlet Flageolet Wax (yellow podded), Stringless Green Podded (green podded).

Beans, Broad.—Broad Windsor.

Beets.—Early Blood Turnip (early), Long Smooth Deep Blood Red (for winter storage).

Cabbage.—Paris Market Very Early (early), Early Jersey Wakefield (early), the Lupton (late), Marblehead Mammoth (late), Large Red Drumhead (late), Drumhead Vertus (Savoy).

Carrots.—Early Scarlet Horn (early), Half-long Danvers (late).

Celery.—White Plume (early), Giant Pascal (early), London Red (early).

Cauliflower.—Early Snowball (early and medium), Extra Early Paris (early and medium).

Cress or Pepper-grass.—Extra curled.

Cucumbers.—Early Cluster, Cumberland, White Wonder

Corn, Sweet.—Early Cory.

Corn, Flint.—Mitchell's Extra Early.

Lettuce.—Neapolitan (cabbage), White Paris Cos (cos).

Kohl Rabi.—Early White Vienna.

Musk Melon.—Extra Early Green.

Citron.—Colorado Mammoth.

Parsnip.—Hollow Crown (long), Student (short).

Onion Sets.—Yellow Dutch, English Multipliers, Shallots.

Onion (Seed).—Yellow Globe Danvers (large), Red Prize Taker (large), Gibraltar (large), Adriatic White Barletta (pickling).

Peas.—Extra Early Exonian (1st early), William Hurst (2nd early), American Wonder (2nd early), Juno (late), Shropshire Hero (late).

Parsley.—Moss Curled.

Radish.—Early Scarlet Turnip, French Breakfast.

Spinach.—Victoria.

Squash.—Extra Early Orange Marrow, English Vegetable Marrow, Long White Bush Marrow.

Salsify.—Sandwich Island.

Tomatoes.—Earliana, Earliest of All, Early Ruby.

Turnip (Garden).—Early Snowball, Robertson's Golden Ball.

Herbs.—Sage, Savory, Thyme, Parsley.

SAVORY AND MEDICINAL HERBS.

Twenty-three varieties of herbs were sown in the open on May 28. Owing to the somewhat cool summer and late date of sowing, few of them arrived at maturity, and several failed to germinate. Among those which succeeded best were, Tansy, Lemon Thyme, Coriander, Rosemary, Borage, Rue, Sweet Basil, Winter Savory, Dill and Anise Seed.

PEANUTS.

A small quantity of peanuts, catalogued as a very early variety, was purchased from a Canadian seedsman and sown in the open on May 28.

They germinated promptly, but although they made excellent growth, they failed to produce the slightest signs of tubers.

FLOWERS.

The usual representative collection of annuals was again sown on the Farm during the past season, with excellent results. Owing to the very bright weather experienced during the early spring, large healthy plants were available at planting out time, and as there were no late frosts the annuals came quickly into flower, presenting a mass of colour throughout the season. Petunias (single and double), Phlox, Verbenas and Stocks were especially fine, and called forth much favourable comment. In consequence of the disastrous results to the garden experienced last season by reason of the accumulation of water in the valley, the beds were raised from 12 to 18 inches, which proved to be very satisfactory, and it is hoped that the results will be permanent.

HARDY ROSES.

Two varieties of hardy roses at present growing on the farm continue to prove hardy, and gave an exceptionally heavy crop of flowers during the summer. It is unfortunate that both these varieties were received from individuals who had lost their names, as they are likely to be of special value to Manitoba and the North-west, on account of their hardiness. The colour of one is a light pink, that of the other a deep red, and both are double. Propagation is readily effected by means of suckers which are produced abundantly by both these varieties.

LILIES.

The following varieties of lilies planted in 1902 have proved thoroughly hardy without the slightest protection:—

Lilium Dahuricum Gretchen.
" " atrosanguineum.
" " incomparabile.
" " Brittanicum.
" " grandiflorum.
" Hansoni.
" tigrinum, fl; pl.
" Tottenhami.
" Sensation.
" elegans Van Houttei.
" " aureum.

These are very free flowering varieties, with large individual flowers of bright colouring. They come into bloom early in the season and remain in flower for a considerable period.

TULIPS AND OTHER SPRING FLOWERING BULBS.

Tulips made an exceptionally fine display during the past season, and the large collection of named varieties was much appreciated by all lovers of flowers. This is no doubt the most satisfactory spring flowering bulb for the North-west, and by a judicious selection of varieties, the blooming period can be prolonged for a considerable time. Tulips are quite hardy here without protection.

SNOWDROPS.

Bulbs of this beautiful harbinger of spring, planted on the farm in the fall of 1902, have now successfully passed through two winters. It is gratifying to know that this old-fashioned flower can be satisfactorily grown in Manitoba.

SCILLA SIBIRICA ALBA.

This is similar to the well known blue Squill, with the exception of colour, which is a pure white, and as an edging for a bed, alternated with the blue variety, it is very useful, and is perfectly hardy without protection.

COLCHIUM AUTUMNALE (FALL CROCUS).

This bulbous flower deserves special mention on account of its being the last plant of the season to come into bloom. After the ground is covered with snow the flower will push itself through, resembling (at a casual glance) our spring Anemone, and being thoroughly hardy, is a welcome addition to our list of bulbous perennials.

PUSCHKINIA SCILLOIDES.

Special attention is called to this beautiful spring flowering bulb, which has now come through two winters at the Experimental Farm in good condition without protection. As its name implies, it is squill-like in appearance, but differs in having a distinct white band down the centre of each petal, rendering it very attractive.

CROCUS.

These bulbs, planted in the fall of 1902, have now passed successfully through two winters, and it appears that they may be considered as hardy in the North-west. They make a decided acquisition to our list of spring flowering bulbs.

FRITILLARIAS.

Of a large number of these bulbs planted in 1901, two came through the winter of 1901-02, but did not flower. The same bulbs also wintered successfully in 1902-03, but again failed to produce flowers.

HERBACEOUS PERENNIALS.

None of the varieties under test succumbed during the past winter, and a very creditable show of flowers was made during the summer, the large number of varieties of Iris and Peonies being especially fine. This branch of floriculture is becoming more popular with farmers each year.

PROPAGATION OF TREES FOR THE FORESTRY BRANCH OF THE DEPARTMENT OF THE INTERIOR.

All the 876,000 trees grown here in 1902 for the above department were distributed this spring to farmers in different parts of the province, and the percentage of loss, I understand, was very small.

About one million and a half trees were grown here this year for future distribution by the Forestry Branch, nearly all the young trees were dug in the fall and healed in ready for spring shipping.

DISTRIBUTION OF GRAIN, POTATOES, &c.

The usual distribution was made of grain, potatoes, maple seed, rhubarb seed and flower seeds. The following quantities were sent out to applicants:—

Grain of all kinds in 3-pound bags	161
Seedling trees and shrubs, packages	555
Potatoes in 3-pound bags	241
Maple seed in ½-pound bags	137
Rhubarb seed, packages	64
Flower seeds, packages	117

The following reports have been received from parties to whom Manitoba maple seeds were sent in 1-pound packages during the spring of 1902:—

Number of applicants supplied	216
Number of reports received	74

	Successes.	Failures.
Seeds sown on summer-fallow	21	4
" " spring ploughing	9	4
" " backsetting	10	5
" " garden (dug with spade)	10	2

Maximum number of trees grown from one packet	2,500

INJURIOUS INSECTS.

Red Spider *(Tetranychus telarius)* was very numerous and destructive on the native White Spruce during the early summer; many of the lower branches were discoloured, and in some instances the needles were stripped from them.

Green Lice *(Aphis)* were also plentiful on the native Ash-leaved Maple for a short time, but these disappeared during the heavy rains of August.

The Western Blister-Beetle *(Cantharis Nutalli)* was very numerous on English Horse Beans, and a few were also found on potatoes. In a very few days they stripped the leaves from the plants, but quickly succumbed to a spraying of Paris Green and water; a teaspoonful of the poison to a pail of water.

NEW BRIDGE.

During the year a new traffic bridge has been built across Lake Percy, replacing the unsafe pontoon foot bridge in use for many years, and making the southern portion of the farm easy of access.

SAMPLES FOR EXHIBITION PURPOSES.

Twenty large cases of exhibits have been prepared and forwarded to Ottawa for the exhibition to be held at St. Louis next year. These contain grain in the straw, grasses and preserved fruits and vegetables; a portion of this exhibit was grown on the Experimental Farm and the balance collected from farmers throughout the province. In every instance the name of the grower is attached to the exhibit. In addition to the above, a large collection of threshed grain has been prepared for the same purpose.

The usual exhibits were made at the Brandon Agricultural and Horticultural Shows, and a display was also made at the Western Horticultural Exhibition at Winnipeg.

The Department of the Interior was supplied with a quantity of millets and grain for the use of their immigration offices in both Europe and the United States.

FARMERS' MEETINGS.

During the year meetings were attended and addresses given at the following places:—

Winnipeg, December 30, 1902.
Oak Lake, January 2, 1903.
Winnipeg, February 19, 1903.
Winnipeg, February 26, 1903.
Deloraine, March 17, 1903.
Boissevain, March 19, 1903.
Killarney, March 19, 1903.
Cartwright, March 20, 1903.
Crystal City, March 20, 1903.
Manitou, March 21, 1903.

VISITORS.

The number of visitors to the Experimental Farm during the past year has exceeded all previous records, approximating 12,000. In addition to the large number of delegates from the United States, the farm was honoured with a visit from the 200 British delegates attending the fifth Congress of the Chambers of Commerce, held at Montreal. They spent some time on the farm, and appeared much interested in the experiments in progress.

Representatives of some of the largest British flour mills were particularly interested in the production of No. 1 wheat, which they spoke very highly of. A field of Banner oats just harvested attracted the attention of the oatmeal millers in the party.

The usual provincial ploughing match and picnic was held on the farm, and the attendance was above the average.

METEOROLOGICAL TABLES.

Months.	Highest temperature.		Lowest temperature.		Total rainfall.	Total snowfall.	Total amount of sunshine.
1902.	Day.	Deg.	Day.	Deg.	Inches.	Inches.	Hours.
December	31	32	25	—40	....	13	84·3
1903.							
January	25	38	30	—35	....	19	87·8
February	15	30	16	—44	....	6	157·8
March	31	47	20	—21	....	1	151·9
April	18	80	29	10	·41	2	190·1
May	14	88	2	18	4·29	....	195·4
June	26	87	22	35	·67	....	237·9
July	23	94	13	39	2·13	....	258·4
August	20	89	29	38	3·93	....	178·5
September	28	73	14	22	1·97	12	140·3
October	24	70	17	14	·89	....	181·8
November	2	67	24	—18	....	....	112·8
					14·29	53	1977·0

CORRESPONDENCE.

This year 3,767 letters were received and 2,848 despatched, irrespective of circulars sent out.

I have the honour to be, sir,
Your obedient servant,

S. A. BEDFORD,
Superintendent.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF ANGUS MACKAY, SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.,
November 30, 1903.

DR. WM. SAUNDERS,
Director, Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you the sixteenth annual report of the operations of the Experimental Farm for the North-west Territories at Indian Head, Assiniboia, during the year 1903.

Like all its predecessors, the past season has had its drawbacks, and though the crops throughout the Territories have not realized what they promised at one time, many districts have given good returns, though a good deal of the grain is inferior.

With the exception of one or two seasons, the soil was never so dry as in the fall of last year, in the wheat-growing districts of Assiniboia, and this spring being without rain till May 17, the grain, though sown early, was in many cases very late in germinating, and August being cold and wet, all the late germinating crops were slow in maturing, and were caught by frost on morning of September 5, and injured according to the stage of ripeness they were in. In most cases the injured grain was on fallowed land, especially where fallows were ploughed deep, just before or after harvest last fall, causing the soil to dry out,, leaving it loose and subject to the dry winds of winter and early spring. Crops on breaking and backsetting were in some cases injured also from the same cause as operated against the crops on fallowed land. Grain on stubble land invariably ripened before frost visited the country, and as a rule gave satisfactory returns.

Harvest started from August 20 to 25, but was often delayed by heavy rain storms, which were more or less prevalent during all of September. October was fine, and permitted threshing to be carried on with few interruptions, and in many districts it was completed in that month.

Stock throughout the territories did well the past season, though at present prices do not rule as high as last year.

EXPERIMENTAL FARM CROPS.

The crops on the Experimental Farm were, with a few exceptions, extra good. In grain the yields were large, especially in oats and barley. The wheat yields also were satisfactory, but the late varieties were injured by the frost and rust.

Corn, potatoes and roots, with carrots excepted, gave large returns.

The hay crop, on account of the dry spring, was not heavy.

In cultivated fruits, raspberries and crab apples gave good crops. Currants, gooseberries and plums were failures. Native fruits were completely destroyed by May frosts.

I wish to draw the attention of territorial wheat growers to the varieties of wheat, Preston, Stanley and Huron, which have been tested for some years on the Experimental Farm. These varieties were sown later than Red Fife, and were ripe, cut and in stook five or six days before frost came, while Red Fife was injured by the cold wave that passed over on the morning of September 5. The two varieties, Preston and Stanley, are cross bred wheats, originated by Dr. Saunders, Director of Experimental Farms, Preston being bearded and Stanley bald. The parents of both varieties were Red Fife and Ladoga. The leading milling authorities in Great Britain and the United States, after thorough tests, pronounce both wheats about equal to Red Fife in milling qualities.

Huron, a bearded sort, is also a cross-bred, originated by Dr. A. P. Saunders, Ladoga and White Fife being the parents. It has always been near the top in yield, and this year heads the list in productiveness. It also matured before the frost came. Preston, Stanley and Huron were the only sorts, out of nine varieties sown, that will grade N. 1 Hard, Monarch and Percy, though fairly ripe, had heads not matured, which the frost injured.

EXPERIMENTS WITH WHEAT.

Sixty-two varieties of wheat were tested on 1-20 or 1-40 acre plots. These were sown by hoe drill on April 18 on fallowed land, 1½ bushels seed was sown per acre, the soil being a clay loam. As will be seen, many of the sorts were too late in maturing. In comparing Preston, Stanley and Huron in this list, and in the field lots, it will be seen that they correspond fairly well in yield and ripening. A number of the varieties were struck by rust, causing sample to be very poor.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.		
1	Mahmoudi	Sept. 8	143	45	Strong.	3½	Bearded	4,080	46	..	60½	
2	Weldon	" 8	143	50	"	4½	Bald	3,260	43	40	60	Slightly.
3	Preston	" 1	136	50	"	3½	Bearded	4,250	43	10	60½	"
4	Kahla	" 8	143	46	"	2	"	2,880	42	40	61	
5	Hungarian	" 2	137	50	"	3	"	3,240	42	..	59	Considerably.
6	Pringle's Champlain	" 4	139	49	"	4	"	4,100	41	40	63	Very slightly.
7	Roumanian	" 8	143	50	"	3	"	3,940	41	..	61⅓	
8	Fraser	Aug. 26	130	47	"	3¼	"	5,005	39	35	62½	Slightly.
9	Stanley	Sept. 1	136	50	"	4	Bald	4,370	39	10	59	Very slightly.
10	Huron	" 1	136	50	"	3¼	Bearded	4,700	39	..	60	Slightly.
11	Adjini	" 8	143	42	"	2	"	2,860	39	..	61	
12	Angus	" 1	136	47	"	3¼	Bald	4,870	38	50	60	Slightly.
13	Norval	Aug. 29	133	49	"	4	Bearded	5,375	38	45	61½	"
14	Red Fife	Sept. 7	142	50	"	3½	Bald	4,090	38	30	57½	"
15	Hastings	" 7	142	48	"	3¼	"	4,900	38	20	60	Considerably.
16	Advance	" 7	142	48	"	3½	"	5,920	38	..	58	Slightly.
17	Alpha	" 1	136	48	"	3½	Bearded	3,060	37	40	57	"
18	Australian No. 27	*	* ..	51	"	4¼	Bald	5,585	37	35	56	"
19	Crawford	Aug. 29	133	45	"	3	"	3,685	37	15	61	"
20	Crown	Sept. 4	139	49	"	3½	"	6,320	37	..	57½	"
21	Benton	" 3	138	48	"	3	"	5,610	36	30	62	"
22	Percy	" 1	136	53	"	4	"	3,570	36	30	56	"
23	Laurel	*	* ..	46	Medium	4	"	5,560	36	20	54	
24	Chester	Sept. 1	138	46	Strong.	3½	"	5,025	36	15	61	
25	Goose	" 6	141	46	"	2½	Bearded	2,630	36	10	61½	
26	White Fife	" 6	141	48	"	3¼	Bald	4,435	36	5	59	
27	Clyde	Aug. 29	133	50	"	3½	"	4,840	36	..	60½	
28	Countess	" 29	133	46	"	2¾	"	5,590	35	50	60½	"
29	Colorado	Sept. 3	138	46	"	3	Bearded	4,075	35	25	61	
30	Byron	Aug. 29	133	44	"	3	"	3,880	35	20	62	"
31	Herisson Bearded	*	* ..	46	Medium	2	"	6,400	35	20	58½	
32	Early Riga	Aug. 25	129	45	Strong.	2¾	Bald	4,110	35	10	60¼	Considerably.
33	White Connell	Sept. 6	141	49	"	3½	"	4,700	35	..	57½	
34	Monarch	" 4	139	47	"	3	"	4,060	35	..	57	Slightly.
35	Plumper	" 1	136	45	"	3¼	Bearded	4,710	34	50	61	"
36	Girgeh	Aug. 25	129	30	"	2¼	"	4,310	34	50	51	"

SPRING WHEAT—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.		
37	Progress	Sept. 1	136	46	Strong..	3	Bald ...	4,910	34	30	58	Considerably.
38	Red Fern	" 7	142	49	"	4¼	Bearded	5,710	34	10	57	Slightly.
39	Blair	Aug. 29	133	43	"	2¾	Bald ...	3,090	33	50	62	Considerably.
40	Australian No. 19	* ...	* ..	51	"	3¼	" ...	5,215	33	45	53½	Slightly.
41	Dawn	Aug. 28	132	43	"	3	" ...	5,480	33	40	59½	"
42	Cartier	" 29	133	45	"	2¾	Bearded	2,950	33	30	62½	"
43	Wellman's Fife	Sept. 7	142	51	"	4½	Bald ...	2,650	33	10	57½	"
44	Admiral	" 1	136	49	"	3½	Bearded	3,250	32	30	61	
45	Minnesota No. 149	*	* ..	48	"	3½	Bald ...	5,490	32	30	58	
46	Essex	*	* ..	50	"	4	" ...	5,300	32	20	55	Considerably.
47	Australian No. 9	*	* ..	51	"	4	" ...	3,880	32	..	57	
48	White Russian	*	* ..	48	"	3½	" ...	4,890	31	50	55	Slightly.
49	Rio Grande	Sept. 7	142	51	"	4½	Bearded	3,630	31	30	56¼	
50	Australian No. 25	*	* ..	48	"	4	Bald ...	5,745	31	15	54	"
51	Cassel	Sept. 1	136	52	"	3¾	" ...	4,645	30	55	61	
52	Robin's Rust-proof	" 1	136	47	"	3½	Bald ...	3,550	30	50	62½	"
53	Minnesota No. 181	*	* ..	49	"	3½	" ...	5,835	30	25	57	"
54	Red Swedish	*	* ..	49	Weak ..	4	Bearded	5,520	29	20	58	
55	Bishop	Sept. 1	136	46	Strong..	3¼	Bald ...	4,065	28	15	61½	"
56	Japanese	Aug. 26	130	42	"	2¾	Bearded	4,840	27	40	57	"
57	Minnesota No. 163	*	* ..	51	"	3½	Bald ...	7,880	27	..	54½	"
58	Australian No. 23	*	* ..	52	"	3½	" ...	5,385	26	55	53	"
59	Australian No. 10	*	* ..	48	"	3½	" ...	5,295	26	45	55	"
60	Vernon	Sept. 1	136	45	"	3	Bearded	6,270	25	30	57	Considerably.
61	Australian No. 13	*	* ..	50	"	3¾	Bald ...	5,005	22	35	52	Slightly.
62	Minnesota No. 169	*	* ..	54	"	4¾	" ...	5,205	21	35	49	"

*These varieties were not fully ripe, but were cut on Sept. 8 on account of frost. They would have required 4 or 5 days more to ripen. The number of days from sowing to cutting was 143.

WHEAT.

TEST OF VARIETIES IN FIELD LOTS.

In this test nine varieties were used. On account of very strong winds, the varieties could not be all sown on the same day. The field used was uniformly even in soil, and had been fallowed the previous year. The cultivation consisted of one deep ploughing (seven to eight inches) in May, and four cultivations during the growing season. Two to three inches on top were stirred after the first ploughing, iron harrows, spring-tooth cultivator and three-furrow ploughs being used. One and one-half bushels seed was sown per acre, by hoe drill, with no harrowing or cultivating before or after seeding. Soil, clay loam.

WHEAT—FIELD LOTS.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
	Acres				In.		In.		Bush.	Lbs.	Lbs
Huron	1	April 16....	Aug. 31....	137	49	Strong ...	3½	Bearded..	40	24	62
Monarch	⅓	" 16....	Sept. 2....	139	50	Medium..	3¾	Bald	38	19	59
Preston	4	" 14....	Aug. 29....	137	53	Strong ...	3¼	Bearded..	38	..	62½
Laurel	⅓	" 16....	Sept. 7....	144	52	" ...	4	Bald	37	56	59½
Stanley	3	" 14....	Aug. 29....	137	52	" ...	3½	"	37	18	61
Red Fife	10	" 9....	Sept. 4....	148	50	" ...	4	"	35	49	61
Wellman's Fife	4	" 9....	" 7....	151	53	" ...	4	"	35	10	60
White Fife	⅓	" 16....	" 7....	144	51	" ...	3½	"	34	50	57½
Percy	3	" 14....	Aug. 31....	139	53	" ...	3½	"	30	18	59

WHEAT CROP AND AVERAGE YIELD.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Huron	Fallow	1	40	24	40	24
Monarch	"	⅓	38	19	12	46
Preston	"	4	38	..	152	..
Laurel	"	⅓	37	56	12	38
Stanley	"	3	37	18	111	54
Red Fife	"	10	35	49	358	15
Wellman's Fife	"	4	35	10	140	40
White Fife	"	⅓	34	50	11	36
Percy	"	3	30	18	90	54
		26			931	7

Or an average of 35 bush. 48 lbs. per acre.

SPRING WHEAT.

TEST OF FERTILIZERS.

Six plots of one-fortieth acre each were sown May 14. Five of these were treated with artificial manures, and the sixth used as a check plot. They were sown with Red Fife wheat, by hoe-drill, at the rate of 1½ bushels per acre.

All plots in this test were so badly injured by rust that results of any value could not be obtained. Apparently there was no difference in the growth of straw. The check plot was as badly injured as those on which fertilizers were used. The land used for this test was summer-fallow; soil, clay loam.

WHEAT—TEST OF FERTILIZERS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Rusted.
				In.		In.		
Plot No. 1—Nitrate of soda, 100 lbs. per acre (halt sown when grain was 2 in. high, balance when 6 in. high)	May 14.	Sept. 1.	110	46	Strong	4	Bald	Badly injured by rust.
Plot No. 2—Nitrate of soda, 200 lbs. per acre (half sown when grain was 2 in. high, balance when 6 in. high)	" 14.	" 1.	110	46	"	4	"	"
Plot No. 3—Superphosphate No. 1, 400 lbs. per acre (sown before grain and harrowed)	" 14.	" 1.	110	46	"	4	"	"
Plot No. 4—Check plot, unfertilized	" 14.	" 1.	110	46	"	4	"	"
Plot No. 5—Muriate of potash, 200 lbs. per acre (sown before grain and harrowed)	" 14.	" 1.	110	46	"	4	"	"
Plot No. 6—Superphosphate No. 1, 200 lbs per acre; muriate of potash, 100 lbs. per acre; nitrate of soda, 100 lbs. per acre (half sown before grain and harrowed, and the balance when the grain was 2 in. high)	" 14.	" 1.	110	46	"	4	"	"

FALL WHEAT.

Two varieties were sown on October 7, 1902. The soil being dry, little or no growth took place before winter set in; and this spring, both sorts being dead, the land was re-sown with flax.

EXPERIMENTS WITH EMMER AND SPELT.

Two varieties of emmer and two of spelt were sown on one-twentieth or one-fortieth acre plots, and common emmer was also sown on one-quarter acre lot. They were sown on fallowed land, clay loam, by hoe-drill, at the rate of two bushels seed per acre.

SPELT AND EMMER—TEST OF VARIETIES.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel Measure.
	Acre.				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Common Emmer ('Speltz')	1·20	April 18	Sept. 8	143	47	Strong	2	Bearded	3,320	54	40	33¼
Red Emmer	1·40	" 18	" 8	143	49	"	2½	"	6,510	45	30	37
White Spelt	1·40	" 18	" 8	143	51	"	5	Bald	5,620	39	40	28
Black Bearded Spelt	1·40	" 18	" 8	143	50	"	5	Bearded	2,050	26	30	33
Common Emmer	¼	May 5	" 8	126	44	"	2	"	......	42	40	

In estimating the yields of these spelts and emmers, the bushel has been estimated at sixty pounds but no allowance has been made for the husk, which forms about twenty per cent of the total weight.

SUMMER-FALLOWS.

In view of the great importance of properly preparing land for crops, I make no excuse for repeating in this what was stated in last year's report respecting summer-fallows and breaking up and cultivating new prairie land.

While grain on fallows the past year was more or less injured by frost in early September, it must be borne in mind that August last was the worst ripening month in the past 16 years, and that had the last week of that month been at all favourable, the largest crop for years would have been obtained on fallowed land. Another point should be considered. A great many have lately been working their fallows shallow early in the season, and later on ploughing deep, which naturally leaves the soil loose and exposed to drying winds. In a fall like that of 1902, in which no rain fell during the entire season, such cultivation defeats one of the objects of making a fallow at all, namely, conserving moisture.

While Red Fife wheat, on properly fallowed land, in few instances was entirely ripe and cut when frost came, a good deal was nearly so, and suffered only in loss of one or at the most two grades; while all sown on fallows ploughed deep in the fall were greatly injured.

In many cases, the seed, although sown in April, did not germinate until May 20, the dry fall and deep ploughing being the cause.

It is gratifying to know that throughout the Territories, summer-fallowing is rapidly becoming general. No matter where farming is carried on, the farmers realize that to be sure of a crop they must prepare a portion of their land the year before the crop is grown, and apart from the value of the stored moisture, there is the inestimable advantage of keeping weeds from overrunning the farm.

The true worth of properly prepared fallows has been clearly demonstrated in past years in every grain-growing district of Assiniboia.

The work of preparing land for crop by fallowing is carried on in so many ways in different parts of the Territories, that perhaps a few words on some of the methods employed may be of help to at least some of the new settlers.

It has been observed in Alberta and Saskatchewan that the land to be fallowed is not, as a rule, touched until the weeds are full grown, and in many cases bearing fully matured seed. It is then ploughed.

By this method, which no doubt saves work at the time, the very object of a summer-fallow is defeated. In the first place, moisture is not conserved, because the land has been pumped dry by the heavy growth of weeds; and secondly, instead of using the summer-fallow as a means of eradicating weeds, a foundation is laid for years of labour and expense by the myriads of foul seeds turned under.

The endless fields of yellow-flowered weeds, generally Ball Mustard (*Neslia paniculata*), testify to the indifferent work done in many districts, and while no weed is more easily eradicated by a good system of fallows, there is no weed that is more easily propagated or takes greater advantage of poor work on fallows or on fall or spring cultivation.

As has been pointed out in my previous reports, early and thorough work on fallows is absolutely necessary to success, and I here repeat the methods and results of tests carried on for some years past.

First method.—Ploughed deep (6 to 8 inches) before last of June; surface cultivated during the growing season, and just before or immediately after harvest ploughed 5 or 6 inches deep.

Result.—Too much late growth if season was at all wet; grain late in ripening, and a large crop of weeds if grain was in any way injured by winds.

Second method.—Ploughed shallow (3 inches deep) before the last of June; surface cultivated during the growing season, and ploughed shallow (3 to 4 inches deep) in the autumn.

Result.—Poor crop in a dry year; medium crop in a wet year. Not sufficiently stirred to enable soil to retain the moisture.

Third method.—Ploughed shallow (3 inches) before the last of June; surface cultivated during the growing season, and ploughed deep (7 to 8 inches) in the autumn.

Result.—Soil too loose and does not retain moisture. Crop light and weedy in a dry year.

Fourth method.—Ploughed deep (7 to 8 inches) before the last of June; surface cultivated during the growing season.

Result.—Sufficient moisture conserved for a dry year, and not too much for a wet one. Few or no weeds, as all the seeds near the surface have germinated and been killed. Surface soil apt to blow more readily than when either of the other methods is followed. For the past fourteen years the best, safest and cleanest grain has been grown on fallow worked in this way, and the method is therefore recommended.

Fallows that have been ploughed for the first time after the first of July, and especially after July 15, have never given good results; and the plan too frequently followed of waiting till weeds are full grown, and often ripe, and ploughing under with the idea of enriching the soil, is a method that cannot be too earnestly advised against.

In the first place, after the rains are over in June or early in July, as they usually are, no amount of work, whether deep or shallow ploughing, or surface cultivation, can put moisture in the soil. The rain must fall on the first ploughing and be conserved by surface cultivation.

Weeds, when allowed to attain their full growth, take from the soil all the moisture put there by the June rains, and ploughing under weeds with their seeds ripe or nearly so, is adding a thousand-fold to the myriads already in the soil, and does not materially enrich the land.

BREAKING AND BACK-SETTING.

In view of the fact that every year brings to the Territories many new settlers, who are unacquainted with the methods of breaking up and preparing new land for crop, a few suggestions with regard to this very important work may not be amiss.

In all sections where the sod is thick and tough, breaking and back-setting should be done ; while in districts where scrub abounds and the sod is thin, deep breaking is all that is necessary.

The former is generally applicable to Assiniboia, and the latter to Alberta and Saskatchewan, especially to the northern parts of these Territories where the land is more or les scrubby..

SHALLOW BREAKING.

(To be back-set).

The sod should be turned over as thin as possible, and for this purpose a walking plough with a 12 or 14-inch share, is the best. When the breaking is completed (which should not be later than the second week in July), rolling will hasten the rotting process and permit back-setting to commence early in August.

BACK-SETTING.

Back-setting is merely turning the sod back to its original place, and at the same time bringing up two or three inches of fresh soil to cover it. The ploughing should be done in the same direction as the breaking and the same width of furrow turned. Two inches below the breaking is considered deep enough, but three or four inches will give better results.

After back-setting, the soil cannot be made too fine, and the use of disc or Randall harrow to cut up every piece of unrotted sod, will complete the work.

DEEP BREAKING.

Deep breaking, which in many sections of the country is the only practicable way of preparing new land, and which is, unfortunately, done in some instances where breaking and back-setting would give more satisfactory results, consists in the turning over of the sod as deeply as possible; usually from four to five inches.

When the sod has rotted, the top soil should be worked and made as fine as possible. The use of harrow and disc will fill up all irregularities on the surface, and make a fine, even seed-bed.

Whether the land is broken shallow or deep, it is necessary to have the work completed early, so as to take advantage of the rains which usually come during June or early in July. These rains cause the sod to rot, and without them, or if the ploughing is done after they are over, the sod remains in the same condition as when turned, and no amount of work will make up for the loss.

To some districts near the foot-hills of the mountains and in districts where scrub abounds and the sod is thin, these remarks may not apply; but as a rule, throughout the Territories, early breaking, whether deep or shallow is advisable.

WORKING LAND AFTER FIRST CROP.

Inquiries are often made as to what should be done after taking off the first crop on new land, the question being as to whether the land should be ploughed, or cultivated, or sown without any cultivation whatever.

This, however, can only be determined by circumstances. In districts with heavy clay soil, a satisfactory crop may be expected from burning the stubble of the former crop and sowing with or without cultivation; although a shallow cultivation after the stubble is burnt usually gives the best results.

In districts with light soils and especially with gravelly subsoil, cultivation before seeding is necessary.

After taking the second crop from breaking or back-setting, there can be no doubt that the land should be well fallowed to put it in proper condition for succeeding crops. If the fallow is well made and the process repeated every third year, the settler will have started on the right road to future success.

SMUT.

On acount of many new settlers coming into the country each year that can have no idea of the prevalence of smut, especially in the wheat crop, and the serious loss caused by this fungous disease, I submit the results obtained during the past years on this farm for their guidance.

No tests were carried on the past season, as in former years, as it was thought sufficient information had been gained to ensure the safety of all crops, whether wheat, oats or barley, from this dangerous enemy.

Burnt or stinking smut in wheat is a fungous disease that attacks the grain more or less each year, and where at all bad, the crop is rendered unsaleable, and with only a few heads affected, if threshed in damp weather, the grade and price are reduced. No district is proof against smut, and though more prevalent in some seasons than others, it is wise to guard against all danger from this source each year. Three remedies have been tried repeatedly; these are, treating the seed with Bluestone (Copper Sulphate), with Formalin and with Massel powder. Bluestone, from cheapness, ease in application and effectual cure, has proven the best for wheat, while formalin has given the best results with smut in oats and barley. While formalin is not more expensive than bluestone, the application is more difficult in the seed having to be soaked longer.

For wheat apparently free from smut, 1 pound of blustone crushed and dissolved in warm water and mixed with 10 gallons water, and the seed sprinkled with, or dipped in the solution, is sufficient for 10 bushels. For wheat at all affected, 1 pound bluestone to 5 bushels seed is required. The seed can be sprinkled or dipped as is most convenient, but, in sprinkling, care must be taken that every grain is wet with the solution.

For smut in oats or barley, 1 pound of formalin (which is a liquid), is sufficient for 50 bushels seed. If the seed is smutty the solution should be 8 or 9 ounces formalin to 10 gallons of water; if not smutty, 4½ ounces to the same quantity of water.

The seed should be soaked from 5 minutes to 2 hours, according to condition of grain and strength of solution.

EXPERIMENTS WITH OATS.

The oat tests, whether on small or large plots, gave good returns, with samples above the average. The land used in uniform tests and field lots had been fallowed the previous year, the cultivation consisting of one deep ploughing early in the spring, and surface cultivation afterwards. It will be seen that Banner oats gave much the best returns in field lots, and in the uniform test plots as well. This variety has in the past always given good yields, and without a doubt is a safe and satisfactory oat,—for Assiniboia at least.

OATS—FIELD LOTS.

Nine varieties were sown from 22nd to 29th April. Soil clay loam. All varieties, except Waverley, which occupied high land, were badly lodged in spots. Black Beauty was almost entirely down, and had to be cut from one way.

Number.	Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
		Acres				In.		In.		Bush.	Lbs.	Lbs.
1	Banner	5	April 25	Aug. 25	122	54	Strong	9	Branching	119	2	38
2	Abundance	3	" 27	" 29	124	56	"	9	"	106	0	39
3	Wide Awake	4	" 24	" 25	123	50	"	8	"	98	14	40
4	Black Beauty	3	" 29	" 31	124	53	Weak	9	"	97	13	36½
5	Thousand Dollar	2	" 28	" 31	125	56	Strong	9	"	93	8	39
6	Goldfinder	4	" 25	" 31	128	56	"	9	"	91	21	38
7	Improved Ligowo	5	" 25	" 25	122	54	"	8	"	87	0	39½
8	Tartar King	5	" 24	" 22	120	54	"	10	Sided	86	12	41
9	Waverley	5	" 22	" 27	127	53	"	9	Branching	82	3	40

OATS—TEST OF VARIETIES.

Forty-five varieties of oats were sown in this test. The plots were chiefly one-twentieth acre, with a few one-fortieth acre. They were sown on April 25, at the rate of 2 bushels of seed per acre. Nearly all the plots were lodged by rainstorms, but grain was well advanced, and no injury was done so far as the yield was concerned. The soil was a clay loam.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Banner	Aug. 27	124	54	Strong	8	Branching	4,350	136	26	41	Slightly.
2	Wide Awake	" 25	122	53	"	7	"	2,800	134	4	42	"
3	Thousand Dollar	" 25	122	52	"	10	"	3,325	132	27	43	
4	Lincoln	" 25	122	52	"	8	"	4,185	129	29	43	
5	Holstein Prolific	" 26	123	50	"	9	"	3,750	127	32	42	
6	Golden Beauty	" 25	122	52	"	10	"	5,380	127	2	41½	
7	Kendal White	" 29	126	53	"	9	"	4,000	127	2	41	
8	Buckbee's Illinois	" 26	123	50	"	8	"	3,965	126	31	41	
9	Bavarian	" 28	125	50	Weak	8	"	4,870	126	26	40½	"
10	Swedish Select	" 29	126	47	Strong	8	"	5,060	126	16	43½	
11	Improved American	" 25	122	53	"	8	"	4,340	125	10	42	
12	Irish Victor	" 26	123	56	"	9	"	2,225	123	33	42½	
13	American Triumph	" 28	125	51	"	9	"	2,680	123	18	41	
14	Golden Tartarian	" 29	126	50	"	11	Sided	3,180	122	32	41½	
15	Abundance	" 26	123	50	"	9	Branching	4,425	122	27	42½	
16	Black Beauty	" 26	123	47	Weak	8	"	4,180	122	12	37½	
17	Olive Black	" 31	128	57	Strong	11	Sided	4,500	121	26	40	"
18	White Giant	" 25	122	50	"	9	Branching	4,665	121	21	42	
19	Sensation	" 25	122	58	"	9	"	3,070	121	16	43	
20	Golden Fleece	" 31	128	52	"	10	"	5,890	120	30	41	"
21	Early Golden Prolific	" 29	126	56	Medium	8	"	5,280	120	..	42	"
22	Mennonite	" 26	123	51	Weak	10	"	4,730	119	24	42	
23	Milford White	" 29	126	58	Strong	11	Sided	4,580	119	14	41	
24	Golden Giant	" 29	126	48	"	10	"	3,820	118	18	40½	
25	Goldfinder	" 31	128	54	"	9	Branching	2,880	117	22	41	
26	Kendal Black	" 29	126	50	"	10	Sided	4,980	117	2	41	
27	Salines	" 27	124	53	"	11	Branching	3,975	116	1	40	
28	American Beauty	" 26	123	56	"	10	"	5,530	115	20	41	"
29	Pense White	" 29	126	54	"	10	Sided	3,360	115	10	41	"
30	Danish Island	" 25	122	51	"	8	Branching	5,450	115	..	42	
31	Pense Black	" 31	128	60	"	13	Sided	5,810	115	..	42	
32	Milford Black	" 29	126	50	"	11	"	5,100	114	24	41½	"
33	New Zealand	Sept. 5	133	54	Weak	11	"	2,610	112	22	41	
34	Columbus	Aug. 21	126	44	"	9	Branching	2,440	111	26	39	
35	Improved Ligowo	" 25	122	55	Strong	8	"	2,920	111	26	44¼	
36	Twentieth Century	" 25	122	50	"	8	"	2,480	110	20	42½	
37	Olive White	" 29	126	53	"	10	Sided	5,240	109	14	40	
38	Waverley	" 26	123	57	"	10	Branching	3,020	108	28	43½	
39	White Schonen	" 19	116	46	"	9	"	4,160	105	30	41½	
40	Joanette	" 30	127	47	Weak	9	"	5,000	104	19	40	
41	Pioneer	" 26	123	50	Strong	7	"	4,005	100	15	43½	
42	Scotch Potato	" 26	123	57	"	10	"	3,785	100	15	42	"
43	Tartar King	" 25	122	50	"	9	"	2,760	97	22	44½	
44	Wallis	" 28	125	55	"	9	"	4,480	97	22	42	
45	Siberian	Sept. 5	133	59	Weak	12	Sided	2,705	89	9	39	

TOTAL YIELD FROM FIELD CROPS OF OATS.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
					Bush.	Lbs.
Banner	Fallow	5	119	2	595	10
Abundance	"	3	106	..	318	
Wide Awake	"	4	98	14	393	22
Black Beauty	"	3	97	13	292	5
Thousand Dollar	"	2	93	8	186	16
Goldfinder	"	4	91	21	366	16
Improved Ligowo	"	5	87	..	435	
Tartar King	"	5	86	12	431	26
Waverley	"	5	82	3	410	15
		36			3,429	8

An average of 95 bushels 8 pounds per acre.

EXPERIMENTS WITH BARLEY.

The barley tests, whether grown on field lots or on small plots, gave good returns. Repeated rains and heavy dews coloured the grain, but otherwise the sample is good.

FIELD LOTS.

Mensury and Odessa were sown on Brome sod broken and back-set the previous year. The balance of the varieties were on fallowed land, cultivated the same as for wheat. Sidney, in addition to what was sown on fallow, was ploughed in on stubble land, 3 inches deep, for feeding purposes. Odessa came up thin on account of the soil being very dry when sown, which accounts for the yield being small. Soil clay loam.

BARLEY—FIELD LOTS.

Name of Variety	Cultivation.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
		Acres.				Ins.		Inches.		Bush.	Lbs.	Lbs.
Royal	Fallow	2	Ap'l 25	Aug. 10	107	34	Strong	2½	6-rowed.	67	3	51
Claude	"	1	" 29	" 25	118	41	"	2½	"	66		50
Standwell	"	3	" 29	" 25	118	50	Medium	2¾	2-rowed.	63	20	53
Invincible	"	4	" 27	" 28	123	43	"	3¼	"	59	25	53
Mensury	Brome s	5	" 30	" 12	104	45	Strong	3	6-rowed.	56	12	49
Sidney	Fallow	6	" 30	" 21	113	46	"	3½	2-rowed.	54	20	52
Canadian Thorpe	"	4	" 28	" 21	115	50	"	3	"	53	39	52
Mansfield	"	1	" 29	" 25	118	44	"	2¾	6-rowed.	50		52
Odessa	Brome s	4	May 1	" 12	103	42	"	2½	"	48	28	51

BARLEY—UNIFORM TEST PLOTS.

Fifteen varieties of 2-rowed, and twenty varieties of 6-rowed barley were tested on one-twentieth or one-fortieth acre plots. The soil was clay loam. They were all sown on April 29, all the varieties came up evenly and gave large returns.

BARLEY, TWO-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				Ins.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Standwell....	Aug. 22	115	51	Weak..	3	2-rowed..	2,520	80	40	54
2	Invincible..............	" 22	115	50	"	3¼	" ..	4,900	77	14	54
3	French Chevalier	" 24	117	41	Medium	4	" ..	4,930	71	22	53
4	Canadian Thorpe.	" 15	108	53	Strong..	3	" ..	4,150	71	2	51½
5	Danish Chevalier.	" 24	117	40	Weak ..	3	" ..	3,280	66	2	52
6	Gordon	" 14	107	51	Strong..	3	" ..	4,100	64	28	52
7	Sidney..................	" 15	108	46	" ..	3¼	" ..	3,500	62	24	54½
8	Logan....	" 12	105	48	" ..	3	" ..	4,810	62	14	51½
9	Jarvis....	" 15	108	50	" ..	3	" ..	4,430	61	22	50
10	Newton	" 22	115	48	Medium	3	" ..	3,470	61	2	53
11	Fulton..................	" 10	103	55	Strong..	3	" ..	4,050	58	46	51
12	Harvey..................	" 10	103	50	" ..	3¾	" ..	5,200	58	16	51
13	Clifford....	" 12	105	50	" ..	3	" ..	5,250	57	14	51
14	Beaver...	" 19	112	40	Medium	3	" ..	5,460	56	12	52
15	Dunham	" 16	109	44	" ..	3¼	" ..	6,220	52	14	52½

BARLEY, SIX-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head	Weight of Straw.	Yield per Acre.		Weight per Bushel.
1	Odessa....................	Aug. 13	106	42	Strong..	2½	6-rowed...	1,900	71	12	51½
2	Claude....................	" 19	112	39	" ..	3	" ..	3,080	65	40	49
3	Trooper..................	" 17	110	40	" ..	2¾	" ..	3,080	64	8	52
4	Mensury......	" 15	108	41	" ..	3	" ..	3,440	63	36	50½
5	Brome....................	" 20	113	38	" ..	2½	" ..	3,100	63	26	52
6	Mansfield................	" 15	108	41	" ..	2½	" ..	3,130	63	6	52½
7	Summit..................	" 20	113	40	" ..	3	" ..	3,760	61	2	53
8	Common....	" 13	106	37	" ..	2	" ..	2,800	60	20	53
9	Royal....................	" 17	110	38	" ..	2½	" ..	3,720	60	..	53
10	Rennie's Improved.........	" 13	106	37	" ..	2	" .	2,850	57	14	54
11	Empire..................	" 20	113	39	" ..	3	" ..	4,120	56	32	51¼
12	Argyle..................	" 18	111	42	" ..	2½	" ..	3,040	56	32	52
13	Garfield	" 18	111	40	" ..	2½	" ..	3,250	55	30	52
14	Oderbruch...............	" 14	107	39	" ..	2½	" ..	2,270	54	38	54
15	Nugent...	" 19	112	40	" ..	3	" ..	4,260	54	28	
16	Stella............	" 19	112	38	" ..	3	" ..	2,865	54	3	52¼
17	Yale....................	" 19	112	40	" ..	2½	" ..	4,970	53	46	51
18	Albert..................	" 15	108	39	" ..	2¾	" ..	3,030	53	26	53½
19	Baxter.......	" 15	108	42	" ..	2	" ..	3,580	50	20	53
20	Champion...	" 10	103	42	" ..	2½	" ..	3,000	45	20	48

BARLEY CROP AND AVERAGE YIELD.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Royal................................	Fallow	2	67	3	134	6
Claude................................	"	1	66	..	66	..
Standwell.............................	"	3	63	20	190	12
Invincible............................	"	4	59	25	238	4
Mensury...............................	Brome sod....	5	56	12	281	12
Sidney................................	Fallow	6	54	20	326	24
Canadian Thorpe	"	4	53	39	215	12
Mansfield	"	1	50	..	50	..
Odessa................................	Brome sod....	4	48	28	194	16
Total	....	30	....		1,695	38

An average of 56 bushels 25 pounds per acre.

EXPERIMENTS WITH PEASE.

Forty varieties of pease were sown on fallowed land, clay loam on one-twentieth acre plots, on May 5, at the rate of 2 bushels of small, 2½ bushels of medium and 3 bushels of large pease per acre. As will be seen, only four sorts were ripe when frost came. The balance matured afterwards, but were injured more or less.

All varieties were very heavy in straw, and well podded, but the cool, wet weather early in September delayed the ripening.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre		Weight per Bushel.
					In.	In.		Bus.	lbs.	Lbs.
1	Early Britain	Sept. 8..	126	Strong...	53	2½	Medium ..	60	30	60½
2	Paragon	" 12..	130	"	54	3	" ..	60	..	61½
3	Gregory	" 12..	130	"	60	2½	" ..	59	10	62½
4	Mackay	" 14..	132	"	51	3	" ..	57	50	61
5	King	" 13..	131	"	48	2½	" ..	56	30	62
6	English Gray	" 8..	126	"	56	3	" ..	55	50	60
7	Prussian Blue	" 8..	126	"	50	2¾	Small.....	55	50	62
8	Macoun	" 13..	131	"	56	3	Medium ..	55	30	59
9	Wisconsin Blue	" 16..	134	"	60	2¾	Small	55	10	58½
10	Archer	" 10..	128	"	52	3	Medium ..	53	10	61½
11	Pride	" 10..	128	"	57	3	" ..	53	10	62½
12	Bruce	" 10..	128	"	53	2½	" ..	52	50	60
13	Black-eyed Marrowfat	" 10..	128	"	48	2¾	" ..	50	30	62
14	Alma	" 16..	134	"	54	2½	Small	50	10	63½
15	Carleton	" 16..	134	"	65	2½	"	49	50	60
16	Kent	" 14..	132	"	58	3	Medium ..	49	10	62
17	New Potter	" 10..	128	"	52	2¼	" ..	49	10	61
18	German White	" 8..	126	"	48	2½	" ..	49	10	64½
19	Picton	" 6..	124	"	48	2½	" ..	48	30	62½
20	Perth	" 6..	124	"	55	2½	" ..	47	50	61½
21	Agnes	" 6..	121	"	50	2⅓	" ..	46	50	62½
22	Elliot	" 10..	128	"	56	2½	" ..	46	50	61
23	Nelson	" 8..	126	"	50	2½	" ..	45	30	62
24	Pearl	" 8..	126	"	53	2½	" ..	45	30	62
25	Duke	" 15..	133	"	57	3	" ..	45	10	62½
26	Prince	" 8..	126	"	50	2¾	Large	45	10	63½
27	Lanark	" 8..	126	"	50	2½	"	44	50	63
28	Centennial	" 8..	126	"	50	3	Medium ..	44	50	60½
29	Fergus	" 16..	134	"	63	2¼	" ..	44	30	53
30	Large White Marrowfat	" 6..	124	"	57	2¾	Large ..	43	30	62½
31	Arthur	" 6..	124	"	48	2¼	"	42	10	65
32	Daniel O'Rourke	" 3..	121	"	50	2¼	Small	41	10	62
33	Crown	" 3..	121	"	52	2	"	40	50	63
34	Trilby	" 14..	132	"	56	3	Medium ..	39	50	63
35	Golden Vine	" 3..	121	"	47	2	" ..	39	10	64
36	Victoria	" 10..	128	"	60	2½	" ..	38	10	60¼
37	Chancellor	" 6..	124	"	50	2½	" ..	37	30	63
38	Mummy	" 6..	124	"	50	2¼	Small	37	30	62½
39	Prince Albert	" 8..	126	"	60	2½	"	37	30	61
40	White Wonder	Aug. 28..	115	"	46	2¼	Medium ..	31	30	62

ROTATION OF CROPS.

The rotation tests which were commenced in 1899, were continued this year.

All land was ploughed in fall of 1902 that had been in crop that year, and the five half acres of beans, pease, tares and clovers had been ploughed as these crops attained their greatest growth, and all harrowed and put in as good condition as the dry state of the soil would permit.

The grain of the stubble half acres came up very thin, and though the rains in May caused a second germination, the crop was a very light one. Rust also struck the wheat plots, causing a very small yield.

The following rotation has been carried out since 1899.

ROTATION OF CROPS.

No.	1899.	1900.	1901.	1902.	1903.
1	Wheat	Oats	Soja Beans	Wheat	Oats
2	"	Wheat	Pease	"	Wheat
3	"	Oats	Tares	"	Oats
4	"	Wheat	Red Clover	"	Wheat
5	"	Barley	Alsike and Lucerne	"	Barley
6	Pease	Wheat	Wheat	Pease	Wheat
7	Tares	"	Oats	Tares	"
8	Soja Beans	"	"	Soja Beans	"
9	Red Clover	"	Wheat	Red Clover	"
10	Alsike & Lucerne	"	Barley	Alsike & Lucerne	"
11	Rape	"	Summer-fallow	Rape	"
12	Wheat	"	"	Wheat	"
13	"	Oats	"	"	Oats
14	"	Barley	"	"	Barley
15	"	Wheat	Oats	"	Wheat
16	"	Barley	"	"	Barley
17	Oats	Soja Beans	Wheat	Oats	Soja Beans
18	Wheat	Pease	"	Wheat	Pease
19	Oats	Tares	"	Oats	Tares
20	Wheat	Red Clover	"	Wheat	Red Clover
21	Barley	Alsike & Lucerne	"	Barley	Alsike & Lucerne
22	Rye	Summer-fallow	"	Rye	Summer-fallow

ROTATION TEST.—Results obtained in 1903. Plots, ½ acre each. Soil, clay loam.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Rusted.
					In.		In.		Bus.	lbs.	
1	Oats, Banner	April 29	Aug. 20	113	47	Strong	9	Branching	47	12	
2	Wheat, Red Fife	" 15	" 31	138	41	"	3	Bald	16	2	Badly.
3	Oats, Banner	" 29	" 29	122	39	"	9	Branching	43	18	
4	Wheat, Red Fife	" 15	" 31	138	40	"	3½	Bald	15	30	"
5	Barley, Canad'n Thorpe	" 29	" 28	121	39	"	2¾	Two-rowed	20	40	
6	Wheat, Red Fife	" 15	Sept. 8	146	43	"	3¼	Bald	24	8	Considerably.
7	" "	" 15	" 8	146	44	"	3½	"	24	28	"
8	" "	" 15	" 8	146	43	"	3½	"	22	58	"
9	" "	" 15	" 8	146	43	"	3½	"	20	52	"
10	" "	" 15	" 8	146	44	"	3¼	"	23	14	"
11	" "	" 15	" 8	146	43	"	3½	"	20	20	"
12	" "	" 15	Aug. 21	128	45	"	4	"	14	16	Badly.
13	Oats, Banner	" 29	" 20	113	38	"	8	Branching	42	12	
14	Barley, Canad'n Thorpe	" 29	" 18	111	36	"	2⅓	Two-rowed	18	36	
15	Wheat, Red Fife	" 15	" 31	138	45	"	3½	Bald	15	40	Considerably.
16	Barley, Canad'n Thorpe	" 29	" 28	121	37	"	3	Two-rowed	20	..	
17	Soja Beans	May 16	Ploughed under, Aug. 5								
18	Pease	" 21	" July 28								
19	Tares	" 21	" Aug. 5								
20	Red Clover	" 16	" Oct. 21								
21	Alsike and Lucerne	" 16	" " 21								
22	Summer-fallow										

EXPERIMENTS WITH FLAX.

Several tests as to quantity of seed per acre, and different dates of seeding were made, but unfortunately the plots were on low ground, and very heavy rains destroyed the tests.

Two acres of Western Rye Grass sod, ploughed early in May were sown with flax on May 21, and harvested August 20. Yield per acre, 12 bushels.

Three-quarters of an acre of fallowed land was sown with flax on May 5. Ripe September 2. Yield per acre, 10 bushels.

EXPERIMENT WITH CANARY GRASS.

(Phalaris Canariensis).

Sown April 30 on one-twentieth acre plot of fallowed land. Cut September 8. Days to mature, 131 days. Straw, strong; 33 inches long. Weight of straw per acre, 3,960 pounds. Head, 1½ inches. Yield per acre, 29 bushels 20 pounds. Weight per bushel, 48 pounds.

EXPERIMENT WITH SUNFLOWERS.

Russian variety, sown May 22. Produced heads, but no seed had formed when frost came and destroyed the crop.

EXPERIMENT WITH TARES.

One-twentieth acre of fallowed land was sown with tares on May 5; ripe September 10; days to mature, 128; length of straw, 40 inches; pod, 2¼ inches. Yield per acre, 24 bushels 10 pounds. Weight per bushel, 54 pounds.

EXPERIMENTS WITH MILLETS.

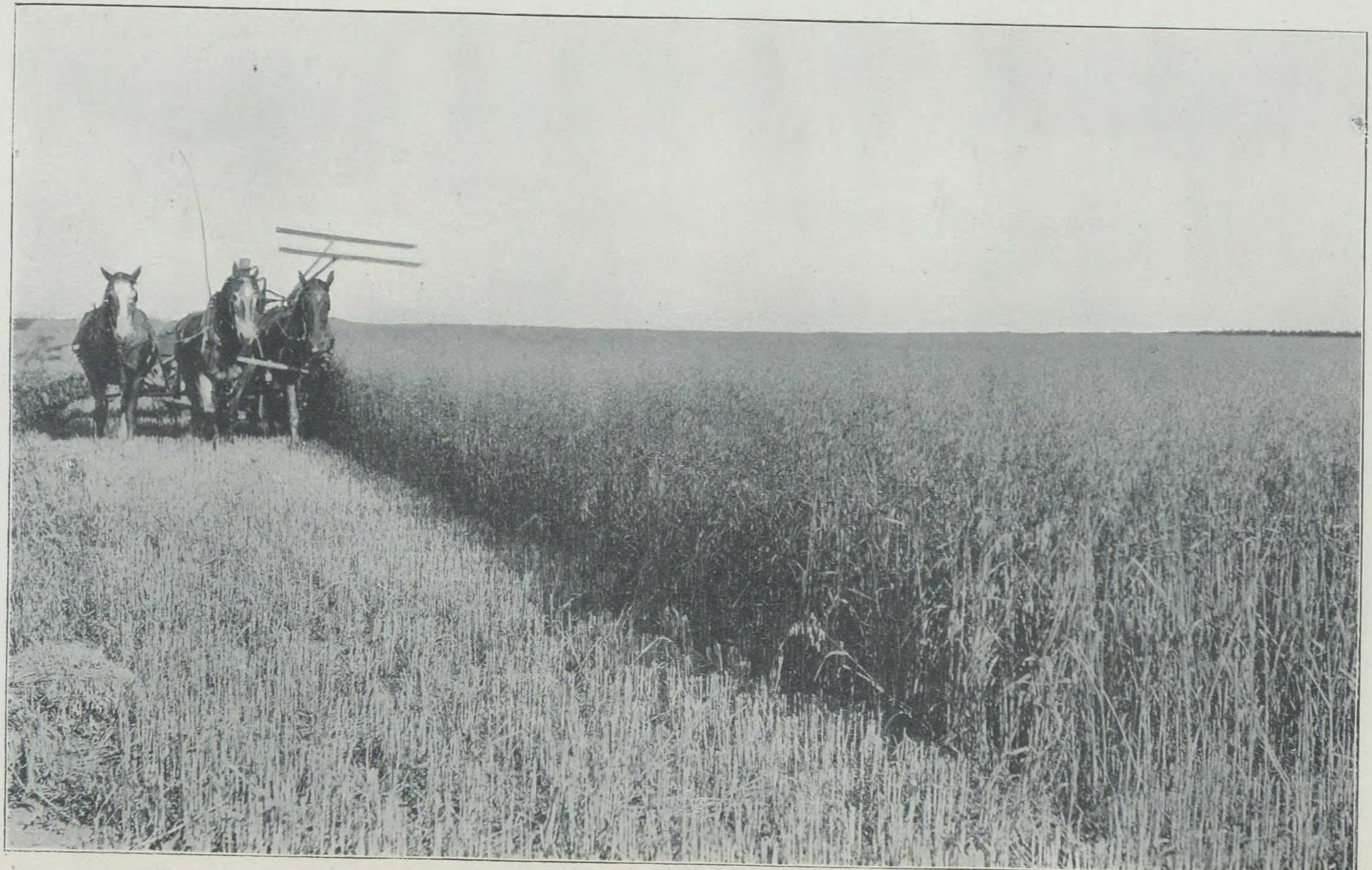
Six varieties were sown on May 16, on one-twentieth or one-fortieth acre plots of fallow. Did not mature. Cut for feed on September 5, on account of frost. Two varieties did not germinate and were ploughed up.

Variety.	Size of Plot.	Height	Yield per Acre.	
	Acre.	Inches.	Tons.	Lbs.
Hungarian	1-20	43	6	...
White Round French	1-40	50	6	...
Italian	1-40	43	4	...
Red Orenburg	1-40	46	3	800
Algerian	1-40	Did not germnate.		
Pearl	1-40			

EXPERIMENTS WITH SOJA BEANS.

Sown May 16, on fallowed land. No pods formed.

Variety.	Rows Distance Apart.	Height.	Yield per Acre. (Green.)	
	Inches.	Inches.	Tons.	Lbs.
Soja beans	21	20	3	1,544
"	28	20	2	1,668
"	35	21	1	1,396



CUTTING BANNER OATS AT INDIAN HEAD.

EXPERIMENTS WITH HORSE BEANS.

Sown in drills on fallowed land on May 16.

Variety.	Rows Distance Apart.	Height.	Yield per Acre. (Green.)	
	Inches.	Inches.	Tons.	Lbs.
Horse beans	21	46	15	176
"	28	46	12	1,496
"	35	44	14	866

EXPERIMENT WITH FALL RYE.

Sown October 7, 1902, on one-twelfth acre plot of fallow. Ripe August 20. Straw, strong; 61 inches long. Head, 4½ inches long. Yield per acre, 46 bushels 20 pounds.

EXPERIMENT WITH SPRING RYE.

Sown April 18, on one-twentieth acre plot of fallow. Ripe August 22. Days to mature, 126. Straw, strong; 50 inches long. Head, 4 inches long. Weight of straw, 4,540 pounds per acre. Yield per acre, 38 bushels. Weight per bushel, 57 pounds.

HAY CROP.

The yield of Brome hay on account of the dry spring was small, but Western Rye Grass, which is later in starting and did not suffer so badly, gave satisfactory returns.

Alfalfa, which gave a small yield in first cutting, improved greatly through the wet weather of August, and the second cutting was better.

Timothy gave a good return.

YIELDS.

Brome Grass (*Bromus inermis*).

Fifteen acres Brome, second year.—Cut July 13 and 15; yield, 1 ton 733 lbs. per acre.

Western Rye Grass (*Agropyrum tenerum*).

Four acres, third year.—Cut July 13; yield, 2 tons 148 lbs. per acre.
Twelve acres, second year.—Cut July 22; yield, 2 tons 166 lbs. per acre.
Three acres, first crop.—Cut July 24; yield, 2 tons 1,530 lbs. per acre.

Alfalfa.

One-half acre.—First cutting, July 13; yield, 1,560 lbs. per acre. Second cutting, September 3; yield, 1 ton 252 lbs. per acre.

Timothy.

One-half acre.—Cut July 13; yield, 2 tons per acre.

Twenty-four acres of Brome Grass, first crop, was pastured.

Thirty acres of Brome Grass, which have been cut for hay from three to six years, were broken up, and a portion back-set and made ready for crop.

EXPERIMENTS WITH INDIAN CORN.

Twenty-four varieties of Indian corn were sown on May 22, in clay loam in drills 36 inches apart, and also in hills three feet apart each way. In addition, three varieties were sown on May 27, in rows at different distances apart. The yield was computed from the weight of two rows, each 66 feet long.

The land was fallowed the previous year and 10 loads of well-rotted manure per acre spread over it after frost came, and cultivated in, as lightly as possible, before seeding.

The corn was cut on September 8 and 9, and cut up and put in silo after wilting two or three days. In addition to the experimental tests, six acres were sown for ensilage.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Date of sowing.	Character of Growth.	Height.	Condition when cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
				In.		Bush.	Lbs.	Bush.	Lbs.
1	Angel of Midnight	May 22.	Very strong.	77	Early milk	25	600	22	
2	Eureka	"	Strong	80	Tassel	20	700	19	1,600
3	Yellow Dakota Flint	"	"	70	Early milk	20	700	17	1,200
4	Longfellow	"	"	72	"	19	1,600	18	1,400
5	North Dakota White	"	"	75	Tassel	19	500	18	1,400
6	Salzer's All Gold	"	"	78	"	19	500	21	1,560
7	Early Mastodon	"	"	77	"	18	300	13	400
8	Mammoth 8-rowed Flint	"	"	75	Early milk	18	300	18	1,400
9	Rural Thoro'bred White Flint	"	"	73	Not in tassel	18	300	22	1,100
10	Compton's Early	"	"	70	Early milk	17	1,200	13	1,500
11	Superior Fodder	"	"	71	Not in tassel	16	1,000	14	1,700
12	Sanford	"	"	70	Early milk	16	560	16	1,000
13	Early Butler	"	"	77	Tassel	15	1,900	15	800
14	King Philip	"	"	70	"	15	1,900	14	600
15	Giant Prolific Ensilage	"	"	74	"	19	800	13	1,400
16	Champion White Pearl	"	"	70	"	14	1,700	13	400
17	White Cap Yellow Dent	"	"	70	Early milk	14	1,700	15	800
18	Mammoth Cuban	"	"	70	Tassel	13	1,500	13	400
19	Pride of the North	"	"	80	"	13	1,500	13	400
20	Selected Leaming	"	"	67	"	13	400	13	400
21	King of the Earliest	"	"	77	Early milk	12	1,300	12	200
22	Evergreen Sugar	"	"	65	Tassel	12	1,300	12	200
23	Cloud's Early Yellow	"	Medium	67	"	11	1,100	11	
24	Red Cob Ensilage	"	"	70	Not in tassel	11	...	14	1,700

INDIAN CORN—TEST OF SEEDING AT DIFFERENT DISTANCES.

Sown in rows by grain seeder May 27; cut September 9. Cultivation of land the same as for preceding test.

Name of Variety.	Character of Soil.	Distance between rows.	Character of Growth.	Height.	Weight per Acre grown in rows.	
		Inches.		Inches.	Tons.	Lbs.
Longfellow	Clay loam	21	Strong	70	24	930
"	"	28	"	68	17	1,425
"	"	35	"	69	12	904
"	"	42	"	68	13	1,347
Champion White Pearl	"	21	"	58	18	1,720
"	"	28	"	57	18	842
"	"	35	"	53	15	564
"	"	42	"	55	13	875
Selected Leaming	"	21	"	50	16	1,005
"	"	28	"	54	20	384
"	"	35	"	51	15	1,696
"	"	42	"	48	11	1,575

EXPERIMENTS WITH FIELD ROOTS.

Fallowed land, with 10 to 12 loads of well-rotted manure per acre, was used for the tests with field roots. The manure was evenly spread on the surface after frost came, and in the spring was lightly ploughed in with three-furrow ploughs. Soil, clay loam.

All varieties of turnips, mangels, beets and carrots came up evenly. The yield was obtained by weighing the roots in two rows 66 feet long and 30 inches apart.

EXPERIMENTS WITH TURNIPS.

Twenty-one varieties were sown on May 14, and again on May 26. Heavy rains soon after the first seeding delayed the second seeding longer than intended.

The Turnip-fly was troublesome, and did injury to the young plants; but the Turnip Moth, after the plants had been thinned out, destroyed great numbers, and retarded the growth greatly.

The turnips on both sets of plots were taken up on October 9.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Hall's Westbury	23	464	774	24	27	1,440	924	..
2	Perfection Swede	22	1,936	765	36	29	80	968	..
3	Jumbo	22	1,540	759	..	15	360	506	..
4	Skirving's	22	1,012	750	12	31	832	1,047	12
5	Mammoth Clyde	21	1,956	732	36	16	1,000	550	..
6	Drummond Purple-top	21	1,956	732	36	18	1,752	629	12
7	Selected Purple-top	20	1,580	693	..	18	488	624	48
8	Carter's Elephant	20	1,316	688	36	21	240	704	..
9	Shamrock Purple-top	19	1,792	663	12	19	1,600	660	..
10	Emperor Swede	19	544	642	24	26	8	866	48
11	Halewood's Bronze-top	19	148	635	48	26	1,328	888	48
12	Bangholm Selected	18	1,884	631	24	21	1,032	717	12
13	Imperial Swede	17	980	583	..	28	288	938	48
14	New Century	17	848	580	48	18	960	616	..
15	East Lothian	15	96	501	36	24	312	805	12
16	Good Luck	14	1,964	499	24	22	880	748	..
17	Magnum Bonum	13	400	440	..	23	1,520	792	..
18	Elephant's Master	12	948	415	48	23	1,520	792	..
19	Kangaroo	10	196	336	36	22	1,808	756	48
20	Hartley's Bronze	*		*		32	152	1,069	12
21	Sutton's Champion	*		*		25	952	849	12

* First seeding destroyed by turnip fly.

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels were sown on May 14 and 28 and taken up October 8. From the start all varieties did well.

MANGELS—TEST OF VARIETIES.

	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant Yellow Intermediate	33	1,716	1,128	36	28	496	941	36
2	Mammoth Yellow Intermediate	32	812	1,080	12	24	840	814	..
3	Lion Yellow Intermediate	32	152	1,069	12	17	1,704	595	4
4	Giant Yellow Globe	29	1,796	996	36	30	720	1,012	..
5	Half-long Sugar White	29	1,796	996	36	17	1,968	597	8
6	Gate Post	29	1,400	990	..	19	1,600	660	..
7	Yellow Globe Selected	29	80	968	..	19	608	643	28
8	Prizewinner Yellow Globe	28	1,948	965	48	18	1,552	025	52
9	Yellow Intermediate	28	892	948	12	26	800	880	..
10	Selected Mammoth Long Red	28	496	941	36	26	1,064	884	24
11	Half-long Sugar Rosy	27	516	908	36	18	1,024	617	4
12	Prize Mammoth Long Red	26	1,592	893	12	25	1,480	858	..
13	Triumph Yellow Globe	26	800	880	..	24	576	809	36
14	Mammoth Long Red	26	536	875	36	29	1,064	994	24
15	Giant Sugar	25	1,480	858	..	24	1,104	818	24
16	Leviathan Long Red	24	1,236	820	36	27	1,176	919	36

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties were tested. The first seeding was made May 15, and the second on May 26, and the roots from both were pulled October 9.

SUGAR BEETS.—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Improved Imperial	26	866	881	6	28	1,024	950	24
2	Royal Giant	26	866	881	6	18	828	613	48
3	Red Top Sugar	25	1,559	859	19	22	1,144	752	24
4	Danish Red Top	24	1,896	831	36	22	1,144	752	24
5	Danish Improved	21	1,956	732	36	23	1,520	792	..
6	French 'Very Rich.'	21	1,243	720	43	14	1,700	495	..
7	Vilmorin's Improved	21	1,005	716	45	29	1,400	990	..
8	Wanzleben	21	886	714	46	21	1,956	732	36

EXPERIMENTS WITH CARROTS.

Eleven varieties were tested. The first seeding was made May 2, and the second May 16 and both were pulled October 12. Although the land was fallowed, manured and cultivated the same as for mangels and other roots, the yield in all varieties was small.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Half-long Chantenay	12	684	411	24	10	1,912	365	12
2	Early Gem	11	1,892	398	12	8	1,160	286	..
3	Ontario Champion	10	64	334	24	9	1,800	330	..
4	Improved Short White	9	1,404	323	24	9	1,800	330	..
5	White Belgian	9	1,140	319	..	10	1,120	352	..
6	Long Yellow Stump-rooted	9	1,140	319	..	8	1,688	294	48
7	Giant White Vosges	9	1,008	316	48	12	1,080	418	..
8	New White Intermediate	9	876	314	36	11	704	378	24
9	Carter's Orange Giant	8	1,820	297	..	9	1,800	330	..
10	Mammoth White Intermediate	8	500	275	..	8	1,160	286	..
11	Half-long White	7	652	244	12	9	1,272	321	12

EXPERIMENTS WITH POTATOES.

Fifty-five varieties of potatoes were tested this year. The land used was fallowed in 1902. It was clay loam and was manured after frost came, the same as for all roots. The sets were dropped in drills 30 inches apart on May 14, and the crop was dug October 5. The yield per acre was obtained by weighing the potatoes from one row 66 feet long.

All the varieties gave large yields, with few or no small tubers.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Average Size.	Total Yield per Acre.		Form and Colour.
				Bush.	Lbs.	
1	Carman No. 1	Strong	Large	711	28	Long, white.
2	Early Sunrise	"	"	649	52	" red.
3	Early St. George	"	"	631	24	" pink.
4	Lee's Favourite	"	Medium	603	40	Oval, red.
5	Holborn Abundance	"	Large	597	31	Round, white.
6	Rose No. 9	"	Medium	597	31	Oval, red.
7	Empire State	"	"	597	31	" white.
8	American Wonder	"	Large	585	12	" "
9	Canadian Beauty	"	Medium	585	12	" pink.
10	Early Andes	"	"	575	57	" red.
11	Everett	"	Large	575	57	Long "
12	Prolific Rose	"	Medium	563	38	" pink.
13	American Giant	"	"	560	33	Oval, white.
14	Uncle Sam	"	Large	554	24	" "
15	Swiss Snowflake	"	"	554	24	Round "
16	Maule's Thoroughbred	"	"	551	19	Long, red.
17	Burnaby Seedling	"	"	548	14	" pink.
18	Burpee's Extra Early	"	"	542	4	Oval "
19	I. X. L	"	Medium	542	4	Long "
20	Rochester Rose	"	Large	542	4	" red.

POTATOES—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Character of Growth.	Average Size.	Total Yield per Acre. Bush.	Lbs.	Form and Colour.
21	Delaware	Strong	Medium	535	55	Oval, white.
22	Penn Manor	"	Large	530	50	Long, red.
23	Seedling No. 7	"	Medium	523	36	Oval "
24	Country Gentleman	"	Large	523	36	Long, pink.
25	Late Puritan	"	Medium	517	26	" white.
26	Vanier	"	Large	514	21	" red.
27	General Gordon	"	"	511	16	Oval "
28	Early Norther	"	"	508	12	" "
29	Sharpe's Seedling	"	"	508	12	Long, pink.
30	Enormous	"	"	508	12	" white.
31	State of Maine	"	"	508	12	Oval "
32	McIntyre	"	Medium	498	57	Long, blue.
33	Troy Seedling	"	Small	492	48	Oval, white.
34	Early Michigan	Medium	Large	489	43	" "
35	Early Rose	"	"	489	43	Long, pink.
36	Irish Daisy	Strong	Medium	483	33	Round, white.
37	Dreer's Standard	"	"	480	28	Long "
38	Vick's Extra Early	"	"	477	24	Oval, pink.
39	Early White Prize	Medium	"	468	9	" white.
40	Sabean's Elephant	Strong	Large	455	50	" "
41	Reeve's Rose	"	Medium	455	50	Long, red.
42	Early Puritan	Medium	"	446	36	Oval, white.
43	Irish Cobbler	Strong	Large	443	31	" "
44	Rawdon Rose	"	"	434	16	" pink.
45	Cambridge Russet	"	"	428	7	Long, red.
46	Carman No. 3	"	"	428	7	" white.
47	Moneymaker	"	"	403	28	Oval "
48	Clay Rose	"	"	391	7	Round, red.
49	Brown's Rot-proof	"	Medium	385	..	Oval, round.
50	Green Mountain	"	Large	369	36	Long, white.
51	Pingree	Medium	Medium	357	16	" "
52	Pearce	"	Large	357	16	" pink.
53	Bovee	Strong	Medium	351	7	Oval "
54	Early Envoy	Medium	Large	326	28	Long, red.
55	Up to Date	Strong	Medium	267	57	Oval, white.

SUMMARY OF CROPS, 1903.

	Bushels.
Wheat:	
9 varieties, 26 acres	931
10 half acres, rotation test	98
62 uniform test plots	90
	1,119
Oats:	
9 varieties, 36 acres	3,429
5 acres Banner, not threshed	500
3 acres mixed feed, not threshed (on stubble)	200
3 half acres, rotation test	66
45 uniform test plots	254
	4,449
Barley:	
9 varieties, 30 acres	1,695
3 acres mixed feed	100
3 half acres, rotation test	34
35 uniform test plots	87
	1,916

	Bushels.	
Pease:		
40 uniform test plots	95	
1 acre	40	
	135	
Flax	28	
Rye	6	
Speltz	10	
	44	
	Tons.	Lbs.
Corn, ensilage	70	
Hay:		
Brome grass	20	
Western Rye grass	41	
Timothy	1	1,612
Alfalfa	2	
Cut in coulees, about	10	
	144	1,612
	Bushels.	
Roots, about	2,000	
Potatoes	100	
	2,100	

VEGETABLE GARDEN.

The vegetables grown in the past season were not satisfactory in all cases. Beans after they were up were injured by frost, and the growth retarded so much that few varieties ripened. Cucumbers, citrons, melons, pumpkins, squash and tomatoes were as unsatisfactory as the beans, from the same cause. Onions continued growing too long, and had not fully matured when they had to be taken up. Corn produced no ears ready for the table before frost came.

The remainder of the vegetables were good.

ASPARAGUS.

Barr's Mammoth, Barr's Elmira and Conover's Colossal were in use from May 17 to July 11. Did not do well at first, but after rains came produced a fair crop.

BEANS.—Sown in open, May 11.

Imported Seed.	In use Green.	Remarks.
Dwarf Black Speckled	....	Killed by frost in June.
Emperor of Russia	....	" "
Dwarf Extra Early	....	" "
Fame of Vitry	....	" "
Golden Skinless	....	" "
Dwarf Inexhaustible	....	" "
Experimental Farm Seed.		
Haricot, Inexhaustible	Aug. 12	Frozen before maturity.
" Matchless	" 3	Matured.
Black Speckled	" 7	Frozen before maturity.
Golden Skinless	" 7	" "
Emperor of Russia	" 3	" "
Early Six Weeks	July 28	Matured.
Valentine Wax	Aug. 7	Frozen before maturity.
Fame of Vitry	" 7	" "
Dwarf Kidney	July 28	Matured.
Golden Wax	Aug. 3	"
Detroit Wax	" 1	"
Extra Early	July 28	"
Early Mohawk	" 30	"
Currie's Rust-proof	" 31	"
Challenge Black Wax	" 30	"

BEETS.

Sown, May 8; in use, August 5; lifted, October 3.
Blood Red Turnip Early, 701 bush. 48 lbs. per acre.
Egyptian Dark Flat Red Early, 810 bush., 42 lbs. per acre.
Nutting's Dwarf Improved Blood Red, 834 bush., 54 lbs. per acre.
Long Smooth Blood Red, 750 bush., 12 lbs. per acre.

BROCOLI.

Sown in hot-house March 30; transplanted, April 13; set out, May 20.
Extra Early White, did not mature.

BRUSSELS SPROUTS.

Dwarf Improved, sown March 30; set out May 20; did not mature.

CELERY.

Sown in hot-house, March 30; transplanted, May 6; set out, June 12; taken up, October 9.

Name of Variety.	In use.	Weight of Single Plants.
		Lbs.
Rose-ribbed Paris	Oct. 1	1¾
Paris Golden Yellow	Sept. 5	1¼
Red Large-ribbed	Oct. 1	2¼
Giant Pascal	" 9	2¾

All varieties did well and produced an excellent crop.

CAULIFLOWER.

Sown in hot-house March 30; transplanted, May 13; set out, May 20.
Half Early Paris.—In use July 8; average weight, 5 lbs.
Extra Early Snowball.—In use June 30; average weight, 6 lbs.
Extra Early Dwarf Erfurt.—In use July 10; average weight, 5 lbs.

CARROTS.

Sown, April 22; lifted, October 8.

Name of Variety.	In use.	Yield per Acre.	
		Bush.	Lbs.
Parisian Forcing Red	Aug. 5	290	24
Half-long Luc Stump-rooted	" 5	302	30
French Horn	" 5	266	12
Long Blood Red	" 5	314	36

Of fair size except French Horn carrots, which were very small.

CABBAGE.

Sown in hot-house, March 30; transplanted to frame, April 13; set out, May 20; taken up, October 13.

Name of Variety.	In use.	Average Weight.	Remarks.
		Lbs.	
Extra Early Express	July 14	8	Good, solid heads.
" Midsummer Savory	Aug. 13	6	" heads.
Winningstadt Early	" 6	10	" solid heads.
Early Jersey Wakefield	July 28	9	Did well.
Paris Market	" 18	8	"
Fottler's Improved Brunswick	" 18	16	Very large heads.
Green Globe Savoy	" 18	10	Good heads.
Red Large Drumhead	" 18	12	"

GARDEN CORN.

Planted May 12. None ready for use before frost came.

Varieties Planted.—Crosby's Early Sweet; the Cory, in use September 12; Mitchell's Extra Early; Ringleader; Early White Cory, in use September 12; Squaw (Indian Head seed), very little germinated; Extra Early Premo. Pop-corn, White Pearl and Amber Rice, did not ripen.

CUCUMBERS.

Planted in hot-house, April 14; set out, May 28; sown in open, May 13; all frozen, September 5.

Varieties Sown.—Cool and Crisp, Everbearing, Improved White Spine.

CITRONS.

Sown in hot-house, April 14; set out, May 28; sown in open, May 13.
Preserving.—Green fruit, July 20; frozen, September 5.

LETTUCE.

Sown, May 17 and June 6.

Name of Variety.	First Seeding. In use	Second Sown.	Second Seeding. In use	Remarks.
Green Paris Cos	July 10	June 6	Aug. 10	Very fine large heads.
White Self-folding Cos	" 10	" 6	" 10	" "
Blonde Stone-head	June 24			Good heads.
Wheeler's Tom Thumb	" 24			"
Trocadero Red-edged	" 24			"
Early Ohio	" 24	June 6	July 28	"
All the Year Round	" 24	" 6	" 28	"
Red-edged Victoria	" 24			"
Neapolitan	" 30	June 6	Aug. 3	"

ONIONS.

Sown in hot-house, March 30; set out, May 28; lifted, September 24. Sown in open, April 22; lifted, September 24. Were not fully matured when taken up.

Name of Variety.	Yield per Acre, Sown in hot-house.		Yield per Acre. Sown in open.	
	Bush.	Lbs.	Bush.	Lbs.
Market Favorite	217	48	217	40
Trebon's Large Yellow	230	24	193	36
Danver's Yellow Globe	242	..	290	24
Large Red Wethersfield	266	12	242	..
Paris Silverskin	...	..	193	36

MELONS.

Sown in hot-house, April 14; set out, May 28; sown in open, May 13; frozen, September 5.

Musk Melons.—Earliest Ripe and Long Island, did not mature.

Water Melon.—Fourth of July did not mature.

PUMPKINS.

Sown in hot-house, April 28; set out, May 28; sown in open, May 13.

Large Yellow Field, New Japanese Pie and Sweet or Sugar did not mature; frozen, September 5.

SQUASH.

Sown in open, May 13.

White Bush Scalloped and Giant Crookneck did not mature; frozen, September 5.

TURNIPS.

Sown, May 13; in use, August 10; lifted, October 8.

Name of Variety.	Weight of Largest.	Yield per Acre.	
	Lbs.	Bush.	Lbs.
Extra Early White Milan	14	738	..
Early White Flat Strap-leaved	10	586	54
Robertson's Golden Ball	7	665	30
Early Stone	8	689	42

PEASE.

Sown, May 14.

Name of Variety.	In use Green.	Ripe.	Size.	Remarks.
Surprise	July 21	Sept. 1	Large	Good crop, early.
Stratagem	Aug. 7	" 1	"	"
Shropshire Hero	" 7	" 10	"	"
C. P. R	July 26	" 2	"	"
Alaska	" 18	Aug. 28	Small	" "
Admiral	" 28	Sept. 10	"	Extra good crop.
Anticipation	" 28	" 9	Large	Good crop.
American Wonder	" 20	" 1	Medium	Fair crop, early.
Burpee's Profusion	Aug. 1	" 10	"	Good crop.
Extra Early	July 18	Aug. 28	Small	Heavy crop, early.
Everbearing	Aug. 7	Sept. 1	Large	Good crop, early.
First of All	July 18	Aug. 28	Medium	" "
First and Best	" 18	" 28	Small	Excellent crop, early.
Champion of England	Aug. 7	Sept. 10	Large	Good crop.
Horsford's Market Garden	July 20	Aug. 28	Medium	" early.
Wm. Hurst	" 25	Sept. 9	Small	"
Gradus	" 18	Aug. 28	Large	" "
Laxton's Charmer	Aug. 3	Sept. 1	Medium	"
Rural New Yorker	July 27	Aug. 30	"	"
Premium Gem	Aug. 1	Sept. 9	"	"
Yorkshire Hero	" 7	" 10	Large	"
Harrison's Glory	" 7	" 10	"	"
Nott's Excelsior	July 22	" 8	Medium	"
Queen	Aug. 7	Aug. 30	"	" "
Daisy	" 7	Sept. 10	Large	"

RADISH.

Sown, May 8; in use, June 20. Second seeding, June 1; in use, July 2.

Early Scarlet Turnip, Forcing Scarlet Turnip, Forcing Deep Scarlet Extra Early, Early Deep Scarlet, French Breakfast, Scarlet White-tipped, Olive-shaped Scarlet.

Winter.—Scarlet China, Black Spanish.

All varieties did well in both seedings.

PARSNIPS.

Sown, May 8; ready for use, September 25; lifted, October 8.

Name of Variety.	Yield per Acre.		Remarks.
	Bush.	Lbs.	
Improved Hollow Crown	338	48	Did well, some fine roots.
The Student	447	42	" " "

TOMATOES.

Sown in hot-house March 30; transplanted to cold frame April 14; set out May 21.

Name of Variety.	In Use Green.	First Ripe.	Remarks.
The Ruby	July 20	Sept. 15	
Earliana	" 20	" 5	
Dominion Day	" 22		Did not ripen.
Earliest of All	" 18	Sept. 7	
New Earliana	" 24		"

PARSLEY.

Sown May 8; Champion Moss-curled; did well.

RHUBARB.

Old beds: Victoria, good crop; Linnaeus, good crop.

Seed sown in cold frame April 24; set out July 10; Victoria or Giant, Myatt's Linnaeus.

Roots from Experimental Farm, Brandon. Set out May 9:—

Early Prince.
Victoria.
Monarch Seedling.
Scarlet Nonpareil.
Royal Linnaeus.
Magnum Bonum.
Early Crimson.
General Taylor.
Fottler's Improved.
Prince Albert.
Paragon.
Brabant's Colossal.
Royal Albert.
Prince of Wales.
Strawberry.
Early Scarlet.
Salt's Perfection.
Tobolsk.

All varieties did well. There were some very fine stalks, some of which seeded.

COMMON SAGE.

Sown May 8; did well.

SUMMER SAVORY.

Sown May 8; did well.

SPINACH.

Large Round Viroflay; sown May 8; in use June 26; good crop.

THE FLOWER GARDEN.

The flower garden was extra good the past season. Pansies were never so fine, and continued in bloom up to November.

ANNUALS.—Propagated in hot-house. Sown March 23.

Variety.	Set out.	Bloom. From	Bloom. To	Remarks.
Abronia Umbellata	June 4	Aug. 5	Sept. 5	Very fine.
Ageratum, Dwarf Imperial Blue	" 4	" 5	" 5	Good border flower.
Agrostemma, Coeli Rosa dwarf	" 4	July 15	" 5	Did well.
Amarantus Superbus	" 4	" 30	" 5	Fine plants.
Alyssum Benthami	May 28	" 15	" 5	Did well.
Antirrhinum, 3 varieties	" 26	" 20	" 5	Very fine.
Adonis Autumnalis	" 26	" 26	" 5	Small deep red flower.
Asters, 15 varieties	" 26	" 20	" 16	Did well. Fine blooms.
Bartonia Aurea	June 4	" —		Did not germinate.
Brachycome iberidifolia	" 4	June 20	Sept. 5	Did well.
Candytuft	May 26	" 20	" 5	Made good show.
Calendula, Royal Marigold	" 26	" 15	" 16	" "
Chrysanthemum, Tricolor	" 26	" 25	" 16	Good show.
" Coronarium	" 26	July 1	" 16	"
Clarkia, 2 varieties	" 26	June 23	" 5	"
Centaurea Margarita	" 26	" 6	" 5	"
Coreopsis Drummondii	" 26	" 11	" 5	"
" tinctoria	" 26	" 15	" 5	"
Celosia, 3 varieties	" 26	" 25	" 5	"
Dianthus, 7 varieties	" 27	July 6	" 16	Some extra fine blooms.
Daisy, double mixed	June 4	" 1	" 5	Bloomed well.
Gypsophila viscosa	May 26	June 20	" 5	Did well.
Godetia, 4 varieties	" 26	Aug. 5	" 5	Did well. Good show.
Gaillardia picta, 2 varieties	" 26	July 11	" 16	Very fine.
Helianthus, 2 varieties	" 27	" 25	" 5	Did well.
Hollyhock, 2 varieties	" 27	" 28	" 5	Some fine plants.
Helichrysum, double dwarf	" 27	" 10	" 5	Fine flowers.
Iberis Gibraltarica	" 28	" —		Did not bloom.
Impatiens Balsamina, double	" 27	" —	Sept. 5	Frozen June 10.
Linum Grandiflorum	" 28	June 20	" 5	Some fine blooms.
Lupins, 5 varieties	" 28	" 20	" 16	All did well.
Larkspur, 4 varieties	" 28	" 24	" 5	"
Mignonette	" 28	" 10	" 5	Did well.
Nasturtium, 3 varieties	28	July 6	" 5	"
Nicotiana, 2 varieties	June 2	" 1	" 5	"
Portulaca, double	May 28	June 26	" 5	"
Petunia, 5 varieties	" 26	" 24	" 16	Fine blooms.
Lobelia, Crystal Palace	" 27	" 15	" 5	Good border flower.
Phlox, 4 varieties	" 28	" 15	" 16	Splendid show of colours.
Pansies, 8 varieties	" 26	" 10	Nov. 6	Good show till November.
Poppies, 9 varieties	June 4	" 10	Sept. 5	Fine show.
Salpiglossis, 2 varieties	May 28	" 26	" 5	Extra fine.
Scabiosa, 3 varieties	" 28	July 15	" 5	Very good show.
Stocks, 3 varieties	" 26	June 16	" 16	" "
Tagetes signata pumila	" 28	" 8	" 5	Good border flower.
Verbena, 2 varieties	" 26	" 24	" 5	Very fine blooms.
Zinnia, 3 varieties	" 26	" 8	" 5	Did well.

ANNUALS.—Sown in the open.

The following annuals were sown in the open on May 9, execpt Sweet Pease, which were sown April 16, and May 10. All varieties bloomed freely, but were from two to four weeks later than the same varieties sown in the hot-house and transplanted.

Abronia umbellata.
Asters.
Ageratum.
Antirrhinum.
Calendula.
Coreopsis.
Centaurea.
Candytuft.
Chrysanthemum.
Clarkia.
Dianthus.
Eschscholtzia.
Gaillardia.
Godetia.
Mignonette.
Nasturtium.
Phlox Drummondii.
Poppies.
Salpiglossis.
Stocks.
Scabiosa.
Sweet Pease, 33 varieties.
Verbena.
Zinnia.

PERENNIALS.

The old beds of perennial flowers wintered well and flowered freely during the summer.

BULBS.

Dahlias.—Set out May 26. In flower July 29. Late on account of being injured by frost in June.

Gladioli.—Set out May 26. In flower August 10. Only a few bloomed.

Tulips.—Bloomed May 12. Were short, but fine blooms.

Cannas.—Bulbs rotted.

Iris.—Planted 1900. Bloomed freely from June 7 to end of July.

PÆONIES.

Planted in 1900. Flowered well, but were a good deal beaten down by heavy rains as buds were opening.

Following will be found a list of the perennial flowers that were living at the end of the past season. The majority of these were sent up from the Central Experimental Farm in 1900, and have proved sufficiently hardy for this climate.

IRIS.

Amœna Crebillon.
" Julia Grisie.
" Maria Theresa.
" Mrs. H. Darwin.
Balkana.
Blondovi.
Chamæriris.
Ensata.
" Biglumis.
" Oxypetala.
Flavescens.
Furcata.
Germanica.
Germanica Verschuur.
Gigantea.
Hungarica.
Neglecta Arlequin Milanais.
" Hericartiana.
Nudicaulis.
Orientalis.
Plicata Gisela.
Prismatica.
Pumila.
" Gracilis.
" Lutea.
Regina.

IRIS—*Concluded.*

Ruthenica.
Sibirica.
" Constantinopolitana.
" Furcata.
" Hæmatophylla.
" Light Blue.
" Lutea.
" Maritima.
" Tenuifolia.
Squalens.
" Bronze Stoffel.
" Hector.
" Lady Seymour.
Squalens La Marmora.
" La Tristesse.
" Minerva.
" Tarquin.
Variegata.
" Arquinto.
" Henry Havard.
" Honorabile.
" pancrace.
" Minos.
" Samson.
Virescens.

PÆONIES.

Pæonia Sinensis—
Souvenir de l'Exposition.
Albiflora Thorbecki.
Festiva.
Prosper d'Aremburg.
Thorbecki.
Officinalis Mutabilis.
De Candolle.
Festiva Maxima.
Rubra plenissima.
Rubicunda Alba Marg.
Duchesse d'Orleans.
Ambroise Verschaffelt.
L'Eclatante.
Tenuifolia fl. pl.

SUNDRY PERENNIALS.

Ajuga genevensis.
Acorus spurius.
Achillea millefolium rubrum.
" ptarmica fl. pl.
Aster Novæ Angliæ roseus.
" Top Sawyer.
Aconitum napellus.
Artemisia stellarianum.
Boltonia latisquama.
Campanula macrantha.
Centaurea macrocephala.
" montana alba.
Clematis recta.
Dictamnus fraxinella.
Delphinium.
Dahlia.
Erigeron macranthus.
Funkia lancifolia.
Grass Pink.
Gladiolus.
Hyacinthus candicans.
Helianthus Maximiliana.
Hemerocallis Kwanso fl. pl.
" Middendorfii.
" fulva.
" disticha fl. pl.
" graminæfolia.
Hemerocallis Dumortieri.
Lupinus.
" Pres. Cleveland.
" polyphyllus.
Lychnis Hybrid.
Lysimachia nummularifolia.
Phalaris arundinacea, fol. var.
Pyrethrum uliginosum.
Rose, Queen of the Prairie.
" Persian Yellow.
" Sweet Briar.
Rosa rugosa alba.
Double Rose.
Rosa Cinnamonea.
" Rugosa.
" Baronne Prevost.
Hyb. P. Rose Clara Cochet.
Rosa Acicularis.
" Lucida.
" Nutkana.
" macrantha.
Rudbeckia Golden glow.
" Laciniata.
Solidago rigida.
" gigantea.
Spiraea Ulmaria.
" filipendula.

SUNDRY PERENNIALS—*Concluded.*

Sidalcea candida.	Veronica spicata.
Symphytum asperrimum.	" salurgoides.
Thermopsis fabacea.	" Virginica.
Veronica elegans carnea.	Viola pedata.

TREES AND SHRUBS.

The trees and shrubs on this farm made rapid growth during the past season. The frequent rains in August and September extended the growing period longer than usual.

Very few seeds formed on the ash-leaved Maple trees, but Caragana, Honeysuckle and other shrubs seeded very heavily.

108,000 seedling maple and a large number of Cottonwood trees, Caragana and other shrubs were taken up this fall for next year's distribution.

The following trees and shrubs have done the best on the Indian Head Farm, and can be recommended for cultivation throughout the Territories:—

Botanical Name—	*Common Name—*
Acer Negundo.	Box Elder.
Acer Tataricum Ginnala.	Ginnalian Maple.
Alnus glutinosa.	Common Alder.
Betula populifolia.	White Birch.
Caragana arborescens.	Siberian Pea Tree.
Cornus stolonifera.	Red Osier Dogwood.
Cotoneaster integerrima.	Common Cotoneaster.
Crataegus chlorosarca.	
" coccinea.	Scarlet Haw.
" Crus galli.	Cockspur Thorn.
Fraxinus americana.	White Ash.
" pennsylvanica lanceolata	Green Ash.
Lonicera Alberti.	Albert Regel's Honeysuckle.
" tatarica.	Tartarian Honeysuckle.
Populus balsamifera.	Balsam Poplar.
" deltoidea.	Cottonwood.
Rhamnus cathartica.	Common Buckthorn.
Rhamnus frangula.	Breaking Buckthorn.
Ribes aureum.	Missouri Currant.
" Sibirica.	Siberian Currant.
Salix pentandra.	Laurel-leaved Willow.
" purpurea pendula.	Pendulous Purple Willow.
" Voronesh.	Voronesh Willow.
Syringa chinensis.	Rouen Lilac.
" Josikea.	Josika's Lilac.
" vulgaris.	Common Lilac.
Ulmus americanus.	American Elm.
Viburnum Opulus.	Highbush Cranberry.

ARBORETUM.

The Arboretum was very attractive during the past season, and proved of interest to visitors at all times from the early spring till late in the fall. On account of the abundant rains, everything made extra strong growth.

(Photo. by C. E. Saunders.)

Crop of Red Fife in Stook at Indian Head.

A list is appended of the species and varieties under observation at present, giving the date planted and particulars as to hardiness. Those which have come through one or more winters without injury, or with very slight injury to the tips only, are marked hardy; where the new wood has been killed back to one-half its growth, the variety has been marked half hardy; and those which have had their wood killed to the ground by winter, have been noted as tender.

No additions were made to the Arboretum last spring.

Botanical Name.	Common Name.	Planted.	Remarks.
Acanthopanax sessiliflorum		1900	Nearly hardy.
Acer dasycarpum	White maple	1896	Half hardy.
" Negundo	Box elder	1895	Hardy.
" platanoides	Norway maple	1896	Half hardy.
" saccharinum	Rock or sugar maple	1899	"
" " Minn. seed No. 1		1897	"
" tataricum	Tartarian maple	1902	Hardy.
" " ginnala	Ginnalian maple	1895	"
Alnus glutinosa	Common alder	1896	"
" " imperialis	Imperial cut-leaved alder	1899	Tender.
" viridis	Green alder	1896	"
Amelanchier alnifolia	Alder-leaved June-berry	1902	Hardy.
Amorpha canescens	Lead plant	1900	Half hardy.
" fruticosa		1902	Tender.
Artemisia abrotanum	Old man	1895	Half hardy.
" " tobolskianum	Siberian Southernwood	1895	"
Berberis amurensis	Amur barberry	1899	Hardy.
" aristata		1896	Half hardy.
" asiatica		1902	"
" canadensis		1902	"
" cerasina		1896	Hardy.
" cretica	Cretan barberry	1899	Nearly hardy.
" Fischeri		1896	Half hardy.
" hybrid No. 2		1899	Hardy.
" ilicifolia	Holly-leaved barberry	1896	Half hardy.
" Sieboldii	Siebold's "	1898	"
" sinensis	Chinese "	1896	"
" Thunbergii	Thunberg's "	1897	"
" vulgaris iberica		1899	Nearly hardy.
" " japonica		1899	Half hardy.
" " foliis purpureis		1896	Tender.
" " violacea		1897	Nearly hardy.
Betula alba	European white birch	1895	Hardy.
" " fastigiata		1899	Tender.
" " laciniata pendula	Cut-leaved birch	1899	Hardy.
" " pendula Youngii	Young's weeping birch	1900	Half hardy.
" " purpurea		1902	"
" davurica		1896	Hardy.
" (from Niemetz)		1898	Half hardy.
" lenta	Sweet birch	1899	Nearly hardy.
" lutea	Yellow birch	1899	Half hardy.
" papyrifera	Paper birch	1896	Nearly hardy.
" populifolia	White birch	1899	Half hardy.
" pumila	Low birch	1899	Hardy.
Caragana arborescens	Siberian Pea-tree	1895	"
" Chamlagu		1900	"
" frutescens	Woody caragana	1895	"
" " mollis glabra		1896	"
" grandiflora	Large-flowered caragana	1896	"
" microphylla		1901	"
" pygmaea	Dwarf caragana	1896	"
" " aurantiaca		1900	"
" Redowskii		1895	"
Celastrus scandens	Climbing bitter-sweet	1898	Half hardy.
Celtis occidentalis	Hackberry	1901	"
Clematis Flammula	Sweet-scented Virgin's bower	1898	"
" ligusticifolia		1898	Hardy.
" recta		1898	Half hardy.
" Viticella		1901	"

Botanical Name.	Common Name.	Planted.	Remarks.
Cornus alba sibirica	Siberian dogwood	1897	Hardy.
" " " variegata	Variegated "	1897	Nearly hardy.
" " " Spaethi	Spath's "	1899	Tender.
" Baileyi		1899	Hardy.
" sanguinea		1897	"
" stolonifera		1896	"
Cotoneaster acutifolia		1899	"
" integerrima	Common Cotoneaster	1896	"
" laxiflora		1899	"
" No. 10 Niemetz		1898	"
Crataegus chlorosarca		1896	"
" coccinea	Scarlet haw	1896	"
" Crus-galli	Cockspur thorn	1896	"
" Douglasii		1902	Tender.
" nigra		1900	"
" No. 9 Niemetz		1898	"
" oxyacantha Sibirica		1897	"
" sanguinea		1897	"
Cytisus biflorus		1899	"
" capitatus		1899	Hardy.
" nigricans		1899	Half hardy.
" " longispicatus		1898	Tender.
" purpureus		1902	"
" sessilifolius		1896	Half hardy.
" triflorus		1902	Tender.
Diervilla lutea		1902	Half hardy.
Elaeagnus angustifolia	Russian olive	1895	Nearly hardy.
" argentea	Wolf willow	1895	Hardy.
" macrophylla		1895	"
Euonymus atropurpureus	Burning bush	1896	Half hardy.
" europaeus	Common spindle-tree	1896	"
" linearis		1902	Hardy.
Fraxinus americana	White ash	1896	Nearly hardy.
" berlandieriana	Berlandier ash	1897	Tender.
" nigra	Black ash	1899	Hardy.
" pennsylvanica	Red ash	1895	"
" quadrangulata	Blue ash	1897	Tender.
Genista tinctoria sibirica		1899	"
Hydrangea paniculata		1896	Tender.
" hortensis		1899	"
Juglans cinerea	Butternut	1898	"
Laburnum alpinum		1898	"
Ligustrum amurensis	Amur privet	1899	Half hardy.
" vulg. fol. aureis var		1899	Tender.
Lonicera Alberti	Albert Regel's honeysuckle	1896	Hardy.
" bella atrorosea		1902	"
" flava		1899	"
" gracilipes		1899	"
" hirsuta	Hairy honeysuckle	1899	"
" Morrowi		1902	"
" notha carnea		1902	Tender.
" " gilva		1902	Hardy.
" punicea		1899	Tender.
" regeliana		1901	"
" ruprechtiana		1901	Hardy.
" Sullivantii		1901	Tender.
" tatarica	Tartarian honeysuckle	1896	Hardy.
" " alba rosea		1902	"
" " elegans		1899	"
" " grandiflora rubra		1899	"
" " splendens		1902	"
" Xylosteum		1899	Half hardy.
Lycium europeum		1902	Tender.
" chinense		1902	Half hardy.
Neillia opulifolia	Ninebark	1900	Nearly hardy.
Ostrya virginica	Ironwood	1899	Hardy.
Philadelphus deutziæflorus		1896	Half hardy.
" grandiflorus		1896	"
" hyb. Lem. Boule d'Argent		1899	Tender.
" Keteleerii flore pleno		1900	"
Photinia variabilis arguta		1899	"

Botanical name.	Common name.	Planted.	Remarks.
Populus alba nivea		1896	Hardy.
" " " pyramidalis	Pyramidal Silver poplar	1896	Nearly hardy.
" balsamifera	Balsam poplar	1895	Hardy.
" berolinensis		1895	"
" certinensis		1896	"
" deltoidea	Cottonwood	1895	"
" nigra	Black poplar	1898	"
" " Nolestii		1896	"
" petrowskyana		1896	"
" sibirica		1895	"
" suaveolens		1898	"
" tremuloides	White poplar	1895	"
" Wobstii		1896	"
Potentilla fruticosa	Shrubby Cinque-foil	1899	"
Prunus Besseyi		1902	Half hardy.
" demissa	Western wild cherry	1895	Hardy.
" grayana, Maxim		1896	"
" Maackii		1896	"
" Maximowiczii		1899	"
" pennsylvanica		1895	"
" pumila	Sand cherry	1895	"
" " (Seedling of Wonder)		1901	Half hardy.
" serotina	Wild black cherry	1899	"
" tomentosa		1902	Tender.
" utahensis		1902	Hardy.
Pyrus americana	American mountain ash	1896	"
" aria flabelliformis		1897	"
" aucuparia	European mountain ash	1896	Half hardy.
" baccata	Siberian crab apple	1896	Hardy.
" betulæfolia		1902	Half hardy.
" Maulei	Maule's Japanese quince	1899	"
" nigra salicifolia		1900	Tender.
" rotundifolia		1900	"
" spuria		1896	Hardy.
" sinensis		1902	Tender.
Quercus coccinea	Scarlet oak	1899	Half hardy.
" (Japanese)		1899	"
" macrocarpa	Mossy-cup oak	1895	Hardy.
" pedunculata fastigiata		1902	Tender.
Rhamnus cathartica	Common buckthorn	1896	Hardy.
" crenata		1900	Tender.
" davurica		1899	Hardy.
" Frangula	Breaking buckthorn	1896	Nearly hardy.
" No. 13 Niemetz		1898	Hardy.
Rhus glabra	Smooth sumach	1896	Nearly hardy.
Ribes alpinum	Mountain currant	1899	Tender.
" " pumilum		1899	Hardy.
" aureum	Missouri currant	1899	"
" " tenuiflorum		1901	Nearly hardy.
" (Cypress Hills)		1900	Hardy.
" robustum		1899	Tender.
" saxatile		1899	Hardy.
" sibirica		1898	"
Rosa blanda	Smooth rose	1898	"
" californica		1899	Half hardy.
" cinnamomea		1902	Hardy.
" ferruginea	Purple-leaved rose	1895	Half hardy.
" rubiginosa		1899	"
" rugosa	Japanese rose	1896	Hardy.
" lucida grandiflora		1902	"
" villosa pomifera		1898	Nearly hardy.
Rubus balfourianus		1900	Hardy.
" caesius		1900	"
Salix alba argentea	Silver-leaved willow	1897	Half hardy.
" " britzensis		1896	Hardy.
Salix aurea pendula		1896	Nearly hardy.
" Bataviae		1898	"
" Caprea	Goat willow	1897	Half hardy.
" daphnoides	Violet willow	1895	Hardy.
" longifolia argyrophylla		1898	Half hardy.

Botanical name.	Common name.	Planted.	Remarks.
Salix Nicholsoni purpurascens		1898	Nearly hardy.
" nigricans	Dark broad-leaved willow	1898	"
" pentandra	Laurel-leaved willow	1896	Hardy.
" purpurea pendula		1896	"
" rubra forbyana		1896	Half hardy.
" Salamoni		1898	"
" triandra		1897	"
" Voronesh		1895	Hardy.
Sambucus (Blue-fruited from B.C.)		1899	Tender.
" canadensis	Common elder	1896	Nearly hardy.
" nigra		1902	Tender.
" " aurea nova		1896	"
" " foliis aureis		1896	"
" " heterophylla		1896	"
" " Swindonensis		1899	"
" " virescens		1899	"
" No. 45 Niemetz		1898	"
Shepherdia argentea	Buffalo berry	1895	Hardy.
Spiraea arguta		1896	"
" chamaedrifolia		1896	"
" discolor	White-beam leaved spiraea	1899	Half hardy.
" japonica	Japanese spiraea	1899	Tender.
" " alba		1899	Half hardy.
" " bumalda		1899	Tender.
" " superba		1896	"
" media		1899	"
" salicifolia	Common Meadow-sweet	1899	Hardy.
" sorbifolia	Sorbus-leaved spiraea	1898	Nearly hardy.
" tomentosa	Hard-hack	1898	Tender.
" Van Houttei	Van Houtte's spiraea	1895	Half hardy.
Symphoricarpus Heyeri		1900	Hardy.
" racemosus	Snow-berry	1895	"
Syringa chinensis	Rouen lilac	1896	"
" Emodi		1901	"
" Josikea	Josika's lilac	1895	Half hardy.
" pekinensis	Pekin lilac	1899	"
" villosa		1895	Hardy.
" vulgaris	Common lilac	1895	"
" " Abel Carriere		1901	"
" " alba	White lilac	1899	"
" " alba grandiflora		1899	"
" " Alphonse Lavallée		1901	"
" " Charles Joly		1901	"
" " Charles X		1899	"
" " Condorcet		1901	"
" " Congo		1901	"
" " de Marley		1901	"
" " Emilie Lemoine		1901	"
" " Francisque Morel		1901	"
" " La Tour d'Auvergne		1901	"
" " Lemoinei		1901	"
" " Mad. Casimir Perier		1901	"
" " Madame Lemoine		1901	"
" " Marie Legraye		1901	"
" " Mathieu de Dombasle		1901	"
" " Maxime Cornu		1901	"
" " Michel Buchner		1901	"
" " President Grevy		1901	"
" " purpurea		1901	Half hardy.
" " rubella		1901	Hardy.
" " Virginité		1901	"
Tilia americana	Basswood	1896	"
Ulmus americanus	American elm	1895	"
Viburnum Lantana	Wayfaring tree	1898	Half hardy.
" molle		1902	Tender.
" Opulus	High-bush Cranberry	1895	Hardy.
" " sterile		1898	Half hardy.
" prunifolium	Nanny-berry	1899	Hardy.

Botanical name.	Common name.	Planted.	Remarks.
Coniferae.			
Abies balsamea	Balsam fir	1896	Hardy.
" " variegata	Variegated fir	1900	Tender.
" lasiocarpa		1898	Half hardy.
Juniperus Sabina	Common Savin	1901	Hardy.
" " variegata	Variegated Savin	1901	"
" Virginiana elegans variegata		1899	"
" " Schotti		1899	"
" " tripartita		1899	Tender.
Larix europea	European Larch	1899	Nearly hardy.
" pendula	Tamarack	1896	Hardy.
Picea alba	White Spruce	1895	"
" " coerulea		1901	Tender.
" " variegata		1899	Hardy.
" alcockiana	Alcock's spruce	1898	Tender.
" Engelmanni		1900	Hardy.
" excelsa	Norway spruce	1895	Nearly hardy.
" " pendula major		1899	Tender.
" " pyramidalis	Pyramidal Norway spruce	1899	Nearly hardy.
" obovata Schrenkiana		1899	Hardy.
" pungens	Rocky Mountain spruce	1895	"
" " glauca		1899	"
Pinus banksiana	Jack pine	1902	"
" Cembra	Stone pine	1895	"
" laricio nigricans	Austrian pine	1899	Tender.
" montana	Mountain pine	1895	Nearly hardy.
" " Mughus	Dwarf mountain pine	1899	Half hardy.
" sylvestris	Scotch pine	1895	Hardy.
Pseudotsuga Douglasii	Douglas spruce	1895	Nearly hardy.
Thuya Occidentalis	White cedar	1895	Hardy.
" " Columbiae		1899	Nearly hardy.
" " Hoveii	Hovey's Arbor-vitae	1900	Half hardy.
" " Meehani	Meehan's Arbor-vitae	1900	Tender.
" " Variegata	Variegated cedar	1899	Hardy.
" " Wareana	Ware's Arbor-vitae	1899	Nearly hardy.

FRUIT TREES AND BUSHES.

The crop of fruit the past season was disappointing. Crab Apples (Pyrus baccata, &c.) and Raspberries alone gave good crops. Late spring frosts killed either the blossoms or the fruit of all other sorts. A few plums escaped, but were not ripe when frost came in September.

SEEDLING APPLES.

Two trees of Tonka (seedling) blossomed, and one produced fruit of a good size. The fruit on the second tree was small, but the tree died before they were fully matured, from rabbits eating the bark away last winter.

PLANTING.

The following seedlings of cross-bred apples were planted in 1902:—

42	seedlings of	Novelty.	20	seedlings of	Charles.
26	"	Progress.	6	"	Pioneer.
18	"	Prairie Gem.	2	"	Olive.
42	"	Aurora.	16	"	Eastman.
13	"	Belmont.	18	"	Eaton.
6	"	Cavan.	1	"	Dean.
1	"	Carleton.	6	"	Parker.

Last spring the following were planted in the same nursery:—

CROSS-BRED APPLES.

4 Northern Queen.
4 Derby.
4 Pioneer.
2 Progress.
4 Ruby.
4 Carleton.
4 Aurora.
4 Charles.

Seedlings from seed of Apples from Thos Frankland, Stonewall, Manitoba:—
1 seedling of Maud.
1 seedling Annie.

APPLE TREES.

3 Hibernal, grafted on Pyrus prunifolia.
3 Wealthy, grafted on Pyrus prunifolia.
2 North-western Greening, grafted on Pyrus baccata.
3 McMahon White, grafted on Pyrus baccata.
3 Yellow Transparent, grafted on Pyrus baccata.
3 Pointed Pipka, grafted on Pyrus prunifolia.
3 Duchess, grafted on Pyrus prunifolia.
3 Scott's Winter, grafted on Martha Crab seedling.
2 McIntosh Red, grafted on Martha Crab seedling.
2 Longfield, grafted on Martha Crab seedling.
3 Russian Seedling, No. 18, grafted on Pyrus prunifolia.
3 Russian Seedling, No. 22, grafted on Pyrus prunifolia.
2 Russian Seedling, No. 7, grafted on Pyrus prunifolia.
1 Russian Seedling, No. 26, grafted on Pyrus prunifolia.

PLUMS.

The following were planted last spring:—

2 Cheney,
1 Bixby.
2 Aitkin.
1 Mankato.

CURRANTS.

The following varieties were planted in 1902 in a new nursery, and are being tested:—

White.—White Cherry, Frauendorfer White, White Grape, Climax, White Kaiser, White Imperial, Large White, White Dutch, White Transparent.

Red.—Victoria, Manitoba Amber, London Red, Early Scarlet, Prince Albert, Wilder, Simcoe King, Large Red, North Star, Red Grape, La Condé, Fay's Prolific, Houghton Castle, Raby Castle, Rankin's Red, Versaillaise, Cherry, Fertile d'Angers.

Black.—Eclipse, Sterling, Black English, Gewonhliche, Stewart, Dominion, Success, Beauty, Clipper, Perry, Ethel, Winona, Star, Ontario, Crandall's Missouri, Ogden, Mattie, Black Grape, Merveille de la Gironde. Bang Up, Standard, Perth, Ismay's Prolific Black, Lewis.

GOOSEBERRIES.

In the same nursery as the currants, the following gooseberries were planted in 1902:—

3 Governess, 2 Smith's Improved, and in 1903—

2 Houghton.
1 Cox's Late Green.
1 Cluster.
2 Downing.
2 Lady Houghton.
1 Carman.

Also Saunders' Cross-breds.

2 Merton.
4 Mabel.
2 Edna.
1 Griffin.
1 York.
2 Sandow.
2 Weir.
1 Troy.
2 Richland.
1 Sussex.
4 Pale Red.
6 Red Jacket.
5 Rideau.
1 Ruth.
2 Saunders.
2 Gibb.

FRUIT CROP.

PYRUS BACCATA AND PRUNIFOLIA.

Many of these Pyrus trees were loaded with fruit, the best of which were ripe before frost came hard enough to injure them.

PLUMS.

The plum crop was a failure. Although some trees had considerable fruit, none of it ripened. The Aitkin plum, which is the earliest variety on the farm, had a little fruit. but it disappeared before it had a chance to mature.

The native varieties were no more fruitful than the improved sorts.

CHERRIES.

All the varieties were more or less killed back, and though blossoms appeared on one variety, no fruit formed.

SMALL FRUITS.

CURRANTS.

Red, White and Black Currants were killed by frost after they were well formed. The varieties set out in the spring of 1902 made good progress this year. The following varieties are under test :—

Black.—Pomona, Stewart, Clipper, Black Victoria, Black Naples, Native Black, Perry, Eagle, Monarch, Charmer, Beauty, Ontario, Stewart, Ethel, Sterling, Standard, Orton, Star, Madoc, Climax, Kerry Eclipse, Oxford, Winona, Lewis, Prince of Wales.

Red.—Fay's Prolific, Wilder, North Star, Raby Castle, Red Dutch, Cherry, Versaillaise, Fertile d'Angers, Prince Albert, Victoria.

White.—White Imperial, White Grape, White Dutch.

RASPBERRIES.

Dr. Reider, Turner, Caroline, Miller, Garfield, Lady Anne, Mary, Marlborough, Kenyon Seedling.

All varieties had a good crop of fruit.

GOOSEBERRIES.

Houghton, Pearl, Golden Prolific, Columbus, Keepsake, Smith's Improved, Lancashire Lad, Governess.

Blossoms were entirely killed by frost.

STRAWBERRIES.

Vines were dead when spring opened.

CATTLE.

The herd of cattle at present consists of 54 head; this includes 18 steers purchased for feeding tests.

The animals raised on the farm are 16 pure-bred Shorthorn cows and heifers, and 19 cross-bred cows, heifers and steers.

The bull 'Arbor,' bred by E. Potter, Lowfield, Kirby Lonsdale, England, imported by the Experimental Farm, Ottawa, and sent up last fall, is at the head of the herd.

The three bulls in use on the farm when my last report was sent in were sold during the fall and early spring.

In December last every animal in the herd was tested for tuberculosis, and I am pleased to report that not one that had been raised on the farm was affected. Fifteen steers had, shortly before that, been purchased for feeding tests. Four of these reacted and were killed. Three were badly affected, while in the fourth the disease was not found, but it had inflammation of the lungs.

The herd was never in better condition than at present.

FEEDING TEST.

Fifteen three-year-old steers were purchased last November for feeding tests. Out of these, four had to be killed, as already stated.

Ten steers out of the 11 left were chosen and divided into two lots of five each.

Both lots received the same ration during the entire time they were being fed, including the preparatory period and after the test was completed.

The test was for 16 weeks, and commenced on December 11.

Lot No. 1 was turned out each day for two hours.

Lot No. 2 was kept continuously in the stable.

The test was carried on to ascertain whether close confinement was a benefit or not in feeding animals.

The meal used consisted of 2 parts barley and 1 part small wheat.

The first month 6 lbs. per day was given to each animal, and increased each month by 2 lbs.

Hay was fed morning and night, and oat or barley straw at noon. Each animal received all the hay and straw it could eat.

Following will be found a statement of the monthly and total weights and gains of each lot during the period of the test; weights and gain made during the whole period from November 4 to May 2; the total amount and estimated value of the feed consumed during the same time; and a summary of the financial results of the transaction.

It will be observed that Lot No. 2, confined in the stable, made a very small total gain over the lot let out for exercise.

MONTHLY and total weights and gains of each lot of steers during the period of test:—

Lot.	Weight at start of test.	1st 4 weeks.		2nd 4 weeks.		3rd 4 weeks.		4th 4 weeks.		Total Gain.
		Weight.	Gain.	Weight.	Gain.	Weight.	Gain.	Weight.	Gain.	
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Lot No. 1.. ...	6,810	7,150	340	7,380	230	7,670	290	7,930	260	1,120
Lot No. 2.....	6,700	7,070	370	7,280	210	7,510	230	7,720	210	1,020

Lot.	Weight when bought, November 4.	Weight when sold, May 2.	Gain.
	Lbs.	Lbs.	Lbs.
Lot No. 1	6,620	8,140	1,520
Lot No. 2.........	6,465	8,080	1,615
	13,085	*16,220	3,135

*Sold less 5 per cent shrinkage, leaving net weight 15,409 lbs.

Total weight and estimated value of feed consumed during the whole period—November 4 to May 2 :—

Preparatory feeding, each lot (five steers), 36 days—

Straw, 3,600 lbs. at $1 per ton......................	$ 1 80
Meal, 720 lbs. at ⅔c. per lb.	4 80
	$ 6 60

Or for both lots, $13.20.

During test* (112 days), each lot—

Hay, 10,656 lbs. at $5 per ton.........................	$26 64
Meal, 5,040 lbs. at ⅔c. per lb.........................	33 60
Ground linseed, 210 lbs. at 2c. per lb.................	4 20
	$64 44

Or for both lots, $128.88.

From end of test till sold (31 days), each lot—

Hay, 2,984 lbs. at $5 per ton..........................	$ 7 46
Meal, 1,860 lbs. at ⅔c. per lb.........................	6 20
Ground linseed, 77½ lbs. at 2c. per lb.................	1 55
	$15 21

Or for both lots, $30.42.

*Record was not kept of the weight of straw consumed during test.

Summary of cost of feeding—

Preparatory feeding..........................	$ 13 20
During test..................................	128 88
Till sold....................................	30 42
	$172 50

Or for each steer, $17.25.

Or for each lot of five steers, $86.25.

SUMMARY of the Financial result of the Transaction.

Lot.	Weight bought.	At	Amount paid.	Add Cost of Feed.	Total Cost.	Weight sold.	At	Amount received.	Gain on each lot.	Gain per head.
	Lbs.	Cts.	$ cts.	$ cts.	$ cts.	Lbs.	Cts.	$ cts.	$ cts.	$ cts.
No. 1......	6,620	3½	231 70	86 25	317 95	7,733	4¼	328 65	10 70	2 14
No. 2......	6,465	3½	226 27	86 25	312 52	7,676	4¼	326 23	13 71	2 74
Total...	13,085	3½	457 97	172 50	630 47	15,409	4¼	654 88	24 41	*

* An average net gain of $2.44 per head.

On account of the price of steers being high when purchased and the export value of cattle having fallen considerably by the time the animals could be sold, the amount realized was very little above their cost and the value of feed consumed.

HORSES.

There are at present 13 horses on the farm. In the spring two young, light horses were exchanged for heavier ones; otherwise the working force remains the same as last year. The health of the horses has been good.

SWINE.

Three breeds, Berkshire, Tamworth and Improved Yorkshire White are kept on the farm at present. Since the last report nine Berkshire boars and five sows, and six Tamworth boars and three sows have been sold to farmers for breeding purposes.

POULTRY.

Three breeds are kept on the farm at present, namely: Black Minorcas, Light Brahmas and Plymouth Rocks. All breeds did well. During the 12 weeks from April 3 to June 20, the eggs laid were kept separate and the number laid by each breed recorded, with the following result:—

Black Minorca.—Sixteen hens laid 496 eggs, an average of 31 each hen.

Plymouth Rock.—Eleven hens laid 275 eggs, an average of 25 for each hen.

Light Brahma.—Twelve hens laid 372 eggs, an average of 31 for each hen.

After June 20, the eggs were not kept separate.

EXHIBITS FOR ST. LOUIS EXHIBITION.

During the past year a large number of exhibits have been prepared and forwarded to Ottawa for the St. Louis Exposition to be held in 1904.

Sixteen large cases of grain and grasses from the crop of 1902 were shipped early in November, and the same number of cases of this year's grain at the end of that month. In addition three cases of fruits and vegetables in bottles, and threshed grain in bags accompanied these shipments.

Fifteen agricultural societies were requested to collect samples from this year's crop from their respective districts. Although all expenses were guaranteed, only one society, Edmonton, sent in anything whatever. A few sheaves were collected by a private party at Moosomin, and I regret that out of the whole of the Territories so little interest has been taken in the matter.

When harvest commenced in 1902, a member of the staff visited the leading grain districts in Assiniboia, Saskatchewan and Alberta, and made arrangements for samples to be sent to the Experimental Farm from the crop then being harvested. I am sorry to say that Pincher Creek alone did anything in the matter.

Samples were collected in the Indian Head district last year of sheaves, and this year of threshed grain by one of the Experimental Farm staff. These have been prepared and sent forward to Ottawa.

GASOLINE ENGINE.

A gasoline engine was obtained after harvest from Goold, Shapley & Muir, Brantford, Ont., and I am pleased to say gave good satisfaction. The engine 'Ideal' is 18-horse power, and ran a 28-inch 'Advance' separator with apparent ease. Some trouble took place at first through want of knowledge in operating the engine, but this was only temporary.

DISTRIBUTION OF SAMPLES.

During the months of March, April and May, the following distribution of samples of products of the farm was made to applicants throughout the Territories of Assiniboia, Alberta and Saskatchewan.

GRAIN.

Wheat	278	bags, 3 lbs. each.
Oats	411	"
Barley	196	"
Pease	232	"
Sundries	41	"
Potatoes	497	"
Tree seeds.—Maple	675	" 1 lb. each.
Grass seed.—Brome	167	"
Western Rye	15	"
Small seeds	326	packages containing 6,155 packets shrub seed, flower seeds, root seeds, garden seeds and corn.
Fruit bushes	163	packages.
Tree and shrub seedlings	452	"

CORRESPONDENCE.

During the twelve months ending October 31, 1903, 4,926 letters were received, and 4,980 mailed from this office. In letters received, circular reports on grain and other samples are not counted, and in letters mailed, circulars of instruction sent with grain and other samples are not included.

METEOROLOGICAL.

Month.	Temperature. Maximum.		Temperature. Minimum.		Snow-fall.	Rain-fall.		Hours of Bright Sunshine.
	Date.	Degrees	Date.	Degrees	Inches.	No. of days.	Inches.	
1902.								
November	2	50	10	—10	6	....	....	48·4
December	17	32	25	—34	13	....	....	43·2
1903.								
January	25	37	12	—31	4	....	....	66·1
February	26	34	15	—42	1	....	....	124·2
March	31	55	19	—25	3½	1	·07	152·3
April	26	75	29	4	1	2	·06	164·3
May	14	92	5	21	....	14	4·08	200·1
June	17	84	10	30	....	8	1·29	228·1
July	23	86	31	35	....	11	4·23	249·4
August	20	83	9	40	....	13	4·16	164·7
September	28	76	27	24	....	10	1·26	121·2
October	13	75	17	11	....	6	·40	172·6
					28½	65	15·55	1,734·6

I have the honour to be, sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

Dr. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to present my report of the progress made and the work done on the Experimental Farm at Agassiz, B.C., for the year 1903. The season was unfavourable in many respects from the early spring until after the crops were secured. The winter was mild and the lowest temperature was 18 above zero on March 11, and there were no very severe wind storms. There was a heavy fall of snow in March, which clung to the branches of the trees as it fell, and many fruit trees were injured, large limbs being split off by the weight of snow. The spring was cold, with frequent showers and with north winds, and the soil remained cold until late in the season, retarding growth in the trees and shrubs, and causing many seeds to fail to germinate, and much of the bloom of the fruit trees to fall off. The weather continued cool throughout, there being only a few days of warm weather during summer. The whole season, and especially during harvest, was cool and showery, which delayed the harvesting and made it more expensive than usual, besides the loss from damaged grain and the shelling of oats and pease in the turnings made necessary by the frequent heavy showers. The crops of grain, roots and hay have been fairly good and prices satisfactory. The fall weather has been mild, with only one fall of snow, and the lowest range of the thermometer up to the present being 22 above zero, enabling farmers to get all roots harvested and other fall work done without delay or injury from frost.

FRUIT CROP.

The fruit crop has been only a very moderate one, but apples have been freer from scab than usual.

HEDGES.

The hedges have made a good growth. There are forty-five of them, and that number gives a fairly wide choice to those desiring to plant an ornamental hedge.

ORNAMENTAL TREES AND SHRUBS.

The shrubs and trees have made a fine growth, especially during the flowering season, were very handsome, and many inquiries are received as to where they can be had the best advantage.

FOREST AND TIMBER PLANTATIONS.

The forest trees planted in the shelter belt continue to grow vigorously, and a considerable number of the timber and nut trees planted on the mountain are making a fair growth, but as these trees have received no care since planting a great growth is not to be expected, at least until they get up above the hazel and other undergrowth.

NUT TREES.

The English and American black walnut trees produced a small crop of nuts, and Japanese and heart-shaped walnut trees a fair crop this season. The chestnut trees bloom late in the spring every year, but this year they were so very late that the nuts did not fill. The walnuts of all sorts are being distributed to farmers throughout the province, as in past years, and many of those who received nuts in previous years report good success in raising trees. The pecan trees are growing into strong trees, but are not large enough yet to bear nuts. All of the filbert bushes have grown splendidly, but as in former years, the crop was light, and the bluejays carry off much of the fruit before it is ripe.

DITCHING.

Owing to the scarcity of labour and the pressure of other work, very little ditching has been done this year.

NEW BREAKING.

Nearly fifteen acres have been ploughed and cropped for the first time this year, and a small area cleared and partly grubbed, and this work will be continued during the winter as the weather and conditions of the ground permits.

LIVE STOCK.

The stock bull mentioned in my last report injured one of his hind legs, and although kept in for some months, never recovered, and was finally slaughtered. Three of the four bull calves then mentioned have been sold at satisfactory prices, and the fourth is still on the farm. A young bull has been received from the Central Experimental Farm, and, as he is from imported stock noted for their superior milking qualities and is a nice, well-formed calf, he is likely to be a valuable acquisition to our stock. The present herd consists of seven registered Shorthorn cows, three heifers, two young bulls, two young bull calves and four heifer calves.

SHEEP.

The flock at present consists of twelve ewes and ewe lambs and two rams, seven head having been sold since my last report. The Dorset Horned breed appears to be well adapted to the damp climate of the coast, and also to make a satisfactory cross with the common sheep.

PIGS.

The stock at present consists of one white Yorkshire boar and two young sows, two Berkshire boars, two sows and four small cross-bred pigs. The Yorkshire pigs and two of the Berkshires were recently received from the Central Experimental Farm, and are very fine animals.

HORSES.

The force of horses consists of five of the original purchase made in 1889, and the two young horses bought one year ago. These latter have proved to be very useful horses, and have given good satisfaction. Another team will be necessary for next season's work, owing to the increasing area under cultivation and the age of the old horses.

BEES.

This has been a poor season for bees, not enough honey having been secured by any one swarm to carry it over. All are being given a little feed now, and we hope thus to carry seven swarms through the winter

FOWLS.

There are on this farm five breeds of fowls—Light Brahmas, Barred Plymouth Rocks, Black Minorcas, Buff Orpingtons and Rhode Island Reds. The two latter are this year's birds—hatched last spring—so have not been tested, except as to weight of cockerels and general thrift.

Of the three first breeds the Black Minorcas are the best layers, and lay large white eggs, but the Barred Plymouth Rocks come very nearly up to them as layers, and far surpass them as table fowls. The Light Brahmas are good layers, but do not come up in this respect to the Black Minorcas or B. P. Rocks. The feathers on their feet and legs are a disadvantage in this climate, as they keep them damp and cold. They are a very fair table fowl, but do not mature quite so early as is desired.

Both the B. P. Rocks and Light Brahmas are good sitters and good mothers, and are profitable up to the age of two and a half years, when they are apt to get too fat and lay few eggs.

The Buff Orpingtons grow large and rapidly, but with us do not mature as early as the B. P. Rocks and the Rhode Island Reds. The latter is a fine blocky bird, and matures early.

The hens are kept in breeding pens with yards attached, from January 1 to July 1; during the rest of the year they are allowed to run at large. They are not troubled by any disease, except sometimes a little rheumatism, caused by the wet weather, but crows and hawks carry off the chickens, even after they are well grown.

We have had an average of 60 per cent of chickens from eggs hatched in the incubator. These chickens were reared in a brooder and have been strong and healthy and have always done well, but have not been any stronger than those hatched and reared by hens.

The weight of cockerels per pair, live weight, at three months old, were respectively: B. P. Rocks, 8 lbs. 2 ozs.; Light Brahmas, 7 lbs. 8 ozs.; Buff Orpingtons, 7 lbs. 5 os.; Rhode Island Reds, 7 lbs. 10 ozs.; Black Minorcas, 6 lbs.

The hens are fed on mixed grain, ⅔ wheat, ⅙ oats and ⅙ peas; sunflower seeds in the autumn, and boiled roots with some chop (whatever is on hand) mixed in, during the coldest weather in winter.

The hen-house is whitewashed several times a year and otherwise kept clean.

The treatment given to the farm fowls is in every way just what every farmer should and can give his hens.

EXPERIMENTS WITH OATS.

Fifty-four varieties of oats were tested this year. The land had been in corn the year previous, was fall ploughed and dressed with stable manure during the winter, and this was well worked in with the spade harrow and drag. The crop was very promising and the yield would have been heavy but a considerable portion was shelled during the process of curing owing to the frequent showers.

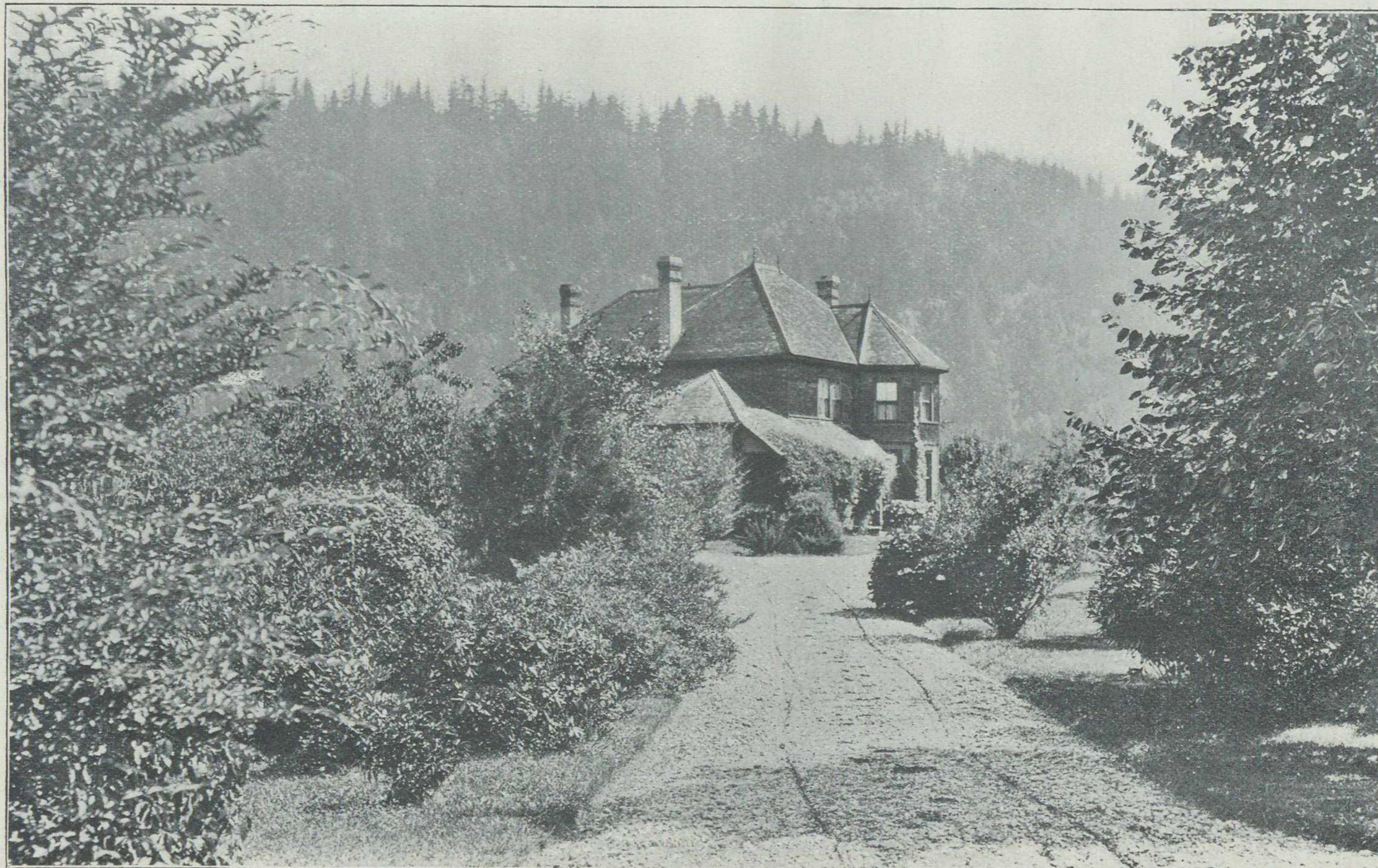
All were sown April 17, at the rate of two and a half bushels per acre. The soil was a sandy loam and the size of the plots one-fortieth of an acre each. There was scarcely any smut, but the rust was very bad, and materially lowered the yield, and by causing weakness in the straw and consequent falling down of the crop increased the cost of harvesting.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
					In.		In.		Bush.	Lbs.	Lbs.	
1	Holland	Aug.	18	123	46	Stiff	10	Sided	83	8	34¼	None.
2	Bavarian	"	13	118	42	Medium	10	Branching	82	32	34¾	"
3	Danish Island	"	19	124	48	Stiff	10	"	82	22	35	"
4	Milford (white)	"	12	117	44	Weak	9	Sided	82	12	34½	Slightly.
5	Sensation	"	11	116	42	Stiff	9	Branching	82	..	34½	"
6	Columbus	"	12	117	44	Weak	9	"	78	28	34	Consid'ably.
7	Tartar King	"	10	115	44	Stiff	9	Sided	77	28	35	None.
8	Abundance	"	17	122	42	Medium	9	Branching	75	30	34	Consid'ably.
9	Olive (white)	"	12	117	46	"	9	Sided	74	4	34¾	Slightly.
10	White Giant	"	17	122	46	Stiff	9	Branching	73	28	34	Consid'ably.
11	Cromwell	"	17	122	44	"	9	"	73	18	34	Slightly.
12	Kendal (white)	"	13	118	44	Medium	8	Half sided	73	8	34	"
13	Waverley	"	11	116	44	Stiff	10	Branching	72	12	34¾	"
14	Irish Victor	"	14	119	40	"	10	Sided	72	2	34½	"
15	Golden Tartarian	"	17	122	44	"	12	"	71	26	34	Badly.
16	Golden Fleece	"	14	119	46	Medium	9	Branching	71	6	34	Slightly.
17	Early Gothland	"	14	119	46	Stiff	9	"	69	14	34½	"
18	Siberian	"	13	118	42	"	10	"	69	4	34	Badly.
19	Improved Ligowo	"	11	116	48	"	10	"	68	28	34½	"
20	American Triumph	"	13	118	46	"	9	"	68	18	34	Consid'ably.
21	Probstey	"	11	116	46	"	10	"	67	8	34	Slightly.
22	Pense (white)	"	13	118	48	"	9	"	66	16	34¼	Consid'ably.
23	Hazlett's Seizure	"	14	119	48	"	10	"	66	6	34	Slightly.
24	Early Blossom	"	12	117	46	"	9	Sided	65	30	34	Badly.
25	Goldfinder	"	15	120	44	"	10	Branching	64	24	34	"
26	Pioneer	"	10	115	44	Medium	9	"	64	14	34½	Slightly.
27	Banner	"	13	118	46	Stiff	11	"	64	4	35	"
28	Olive (black)	"	14	119	44	Medium	8	Sided	63	28	34	Badly.
29	Kendal (black)	"	15	120	44	"	9	"	63	18	34	"
30	Joanette	"	11	115	42	"	10	Branching	63	8	34½	Consid'ably.
31	Abyssinia	"	17	122	46	Stiff	10	"	62	32	34	Slightly.
32	Wide Awake	"	15	120	42	Medium	9	"	62	22	34½	"
33	White Schonen	"	13	118	44	"	9	"	62	12	34¾	Consid'ably.
34	Early Golden Prolific	"	11	116	42	"	9	"	62	2	34	Slightly.
35	Lincoln	"	17	122	48	Stiff	10	"	61	26	34½	"
36	Golden Beauty	"	13	118	48	"	9	"	61	16	34	Consid'ably.
37	Pense (black)	"	19	124	46	"	9	"	61	16	34¾	Slightly.
38	Golden Giant	"	18	123	46	"	9	Sided	61	6	34	Consid'ably.
39	Mennonite	"	12	117	44	"	10	Branching	61	6	34	Badly.
40	Black Beauty	"	11	116	48	Weak	11	"	60	30	34	Slightly.
41	Holstein Prolific	"	15	120	42	Stiff	10	"	60	20	35	"
42	Salines	"	19	124	44	"	9	"	60	10	34½	Badly.
43	New Zealand	"	21	126	42	Medium	9	Sided	59	14	34	Slightly.
44	Swedish Select	"	11	116	48	Weak	9	Branching	59	4	34	"
45	Improved American	"	13	118	46	Stiff	9	"	58	28	34	Badly.
46	Buckbee's Illinois	"	19	124	46	"	9	"	58	28	34½	Slightly.
47	American Beauty	"	15	120	43	Medium	11	"	58	18	34	Badly.
48	Scotch Potato	"	15	120	42	Stiff	10	"	57	32	35	Slightly.
49	Longhoughton	"	17	122	40	Medium	9	"	57	22	34½	"
50	Wallis	"	17	122	46	Stiff	8	"	56	16	34	"
51	Twentieth Century	"	12	117	42	"	11	"	55	20	34	"
52	Milford (black)	"	14	119	39	Weak	8	"	55	10	34	Consid'ably.
53	Salzer's Big Four	"	15	120	38	Medium	9	"	54	10	34	Slightly.
54	Thousand Dollar	"	14	119	44	"	10	"	52	32	34	"

EXPERIMENTS WITH BARLEY.

Thirty-five varieties of barley were tested, fifteen of two-rowed and twenty of six-rowed. The soil chosen for these plots was a rather gravelly loam, with an open gravel bottom. It was fall ploughed and covered with a dressing of farm-yard manure during the winter, and this was well mixed with the soil and the seed sown.



(Photo. by C. E. Saunders.)

ROAD PLANTING AND SUPERINTENDENT'S RESIDENCE AT AGASSIZ.

The yield has been good, but the grain was much discoloured by the weather. All were sown on April 20, on plots of one-fortieth of an acre each, and all the barleys were free from rust and smut.

BARLEY, TWO-ROWED.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days. Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.
				Inches.		In.	Bush.	Lbs.	Lbs.
1	Dunham	Aug. 12	114	42	Stiff & bright	3½	76	32	49
2	Beaver	" 15	117	35	Medium	3½	75	..	49¼
3	Gordon	" 6	108	46	Stiff	3	73	26	48½
4	Sidney	" 15	117	44	Medium	3½	73	16	49
5	French Chevalier	" 15	117	46	Stiff	4	70	40	49
6	Canadian Thorpe	" 12	114	46	Stiff & bright	3	69	28	48½
7	Standwell	" 13	115	44	"	3	67	4	48
8	Invincible	" 13	115	42	"	3	66	12	48½
9	Harvey	" 10	110	40	Stiff	3½	65	40	48
10	Danish Chevalier	" 13	115	40	Medium	3	65	20	48
11	Newton	" 7	109	44	Stiff & bright	3	62	44	48¼
12	Logan	" 10	112	42	Stiff	4	61	12	48½
13	Clifford	" 7	109	46	Stiff & bright	3½	59	28	48½
14	Fulton	" 14	116	40	Medium	3	57	44	48
15	Jarvis	" 7	109	46	Stiff	3½	56	32	48

BARLEY, SIX-ROWED.—TEST OF VARIETIES.

1	Mensury	Aug. 3	105	42	Stiff	3	80	..	49
2	Mansfield	" 7	109	40	Stiff & bright	2½	73	16	48½
3	Stella	" 12	114	36	Weak	3	72	24	48
4	Brome	" 1	103	42	Medium	2½	71	32	48½
5	Oderbruch	" 1	103	40	Stiff	3	71	12	48
6	Royal	July 29	100	42	"	3	68	36	48½
7	Empire	Aug. 7	109	38	Stiff & bright	3	68	36	48½
8	Common	July 30	101	40	Medium	3	67	4	49
9	Argyle	Aug. 6	108	40	Stiff	3	65	40	48¾
10	Trooper	" 7	109	36	Weak	3	65	20	48
11	Rennie's Improved	July 31	102	40	Medium	3	65	20	48½
12	Nugent	Aug. 7	109	44	Stiff & bright	3	65	20	48½
13	Baxter	" 1	103	40	Medium	2½	64	28	48
14	Claude	" 3	105	42	Stiff	3	62	4	48
15	Albert	" 7	109	40	Medium	2½	61	32	48¼
16	Champion	July 28	99	42	Stiff	3	61	32	48
17	Summit	Aug. 7	109	42	Medium	3	60	20	48
18	Odessa	July 29	100	43	"	3	58	16	48
19	Yale	Aug. 7	109	40	Stiff & bright	2½	55	..	48
20	Garfield	" 7	109	42	Medium	3	55	..	48

EXPERIMENTS WITH SPRING WHEAT.

Sixty varieties of spring wheat were tested this year, on plots of one-fortieth of an acre each. The soil was a fairly fertile sandy loam which had produced a heavy crop of corn and clover sod in 1902, and was fall ploughed in fall of 1902 and given a light top dressing of stable manure during the winter, and was well prepared for the seed before sowing. All the varieties were sown on April 15. The crop was handled so much after cutting, on account of the rain, that a good deal of it was shelled. The wheats were sown at the rate of one and a half bushels per acre, and they were not affected either by rust or smut.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
				In.		In.		Bush.	Lbs.	Lbs.
1	Percy	Aug. 10	114	48	Stiff and bright.	3	Beardless.	46	40	60
2	Australian No. 19	" 10	114	48	"	3	"	44	..	60
3	Advance	" 10	114	44	"	3	Bearded	42	40	60¾
4	Plumper	" 11	115	40	"	3	"	42	..	61
5	Hastings	" 8	112	40	Medium	3¼	Beardless.	41	40	60½
6	Bishop	" 11	115	42	"	3	"	41	40	60
7	Monarch	" 17	121	43	Stiff and bright.	3	"	41	20	61
8	Cartier	" 10	114	44	Stiff	3	Bearded	41	20	60
9	White Connell	" 17	121	40	Stiff and bright.	2½	Beardless.	41	10	60½
10	Wellman's Fife	" 19	123	48	Medium	3½	"	41	..	61½
11	Clyde	" 19	123	40	"	3	"	41	..	60½
12	Alpha	" 14	118	46	Stiff and bright.	3	"	40	50	61
13	Laurel	" 17	121	44	"	3½	"	40	40	60¾
14	Australian No. 27	" 17	121	43	"	3	"	40	30	61½
15	Preston	" 15	119	44	Medium	3	"	40	20	61
16	Red Fern	" 17	121	42	"	3½	Bearded	40	20	60½
17	Fraser	" 10	114	44	Stiff and bright.	3	"	40	10	61
18	Benton	" 19	123	44	"	2½	Beardless.	40	10	60
19	White Russian	" 19	123	46	"	4	"	40	..	61
20	Blair	" 20	124	46	Medium	3	"	40	..	60
21	Roumanian	" 15	119	46	"	3	Bearded	39	50	60
22	Countess	" 11	115	42	Stiff and bright.	4	Beardless.	39	40	61
23	Essex	" 16	120	44	" "	4	"	39	30	61
24	Minnesota No. 163	" 18	122	42	"	3½	"	39	20	61
25	Cassel	" 22	126	42	Weak	2½	"	39	20	60
26	Goose	" 10	114	46	Stiff and bright.	3½	Bearded	39	10	60½
27	Crown	" 11	115	46	"	3	"	39	..	61
28	Robin's Rust Proof	" 12	116	40	Weak	3	Beardless.	39	..	60
29	Byron	" 10	114	46	Medium	3	Bearded	38	50	60½
30	Australian No. 25	" 12	116	45	Stiff and bright.	3½	Beardless.	38	40	61
31	Huron	" 11	115	42	"	3½	Bearded	38	..	61
32	Stanley	" 14	118	46	"	3½	Beardless.	37	50	60
33	Australian No. 10	" 18	122	46	"	3	"	37	40	61
34	Crawford	" 8	112	44	Medium	3	"	37	30	60
35	Red Swedish	" 10	114	46	Stiff and bright.	3½	Bearded	37	20	61½
36	Minnesota No. 181	" 21	125	44	"	3½	Beardless.	37	..	60½
37	Minnesota No. 149	" 18	122	41	"	3	"	36	50	61
38	Admiral	" 15	119	46	"	3½	"	36	50	60
39	Early Riga	" 8	112	40	Weak	2¾	"	36	40	60
40	White Fife	" 14	118	46	Stiff and bright.	3	"	36	30	60½
41	Colorado	" 20	124	44	"	3½	Bearded	36	20	60½
42	Hungarian	" 12	116	44	Medium	3½	"	36	..	61½
43	Red Fife	" 17	121	46	"	3	Beardless.	36	..	60½
44	Australian No. 9	" 18	122	46	Stiff and bright.	3	"	35	50	61
45	Pringle's Champlain	" 15	119	40	"	3	"	35	40	60
46	Australian No. 13	" 18	122	44	Medium	3	"	35	30	60
47	Rio Grande	" 18	122	46	Weak	3½	"	35	20	60
48	Progress	" 18	122	40	Medium	3	"	35	20	60
49	Herisson Bearded	" 19	123	40	Weak	3½	Bearded	34	40	60
50	Norval	" 8	112	42	Stiff	3	Beardless.	34	40	60
51	Australian No. 23	" 18	122	46	Stiff and bright.	3½	"	34	30	60
52	Minnesota No. 169	" 20	124	46	"	3½	"	34	20	60½
53	Weldon	" 19	123	44	Medium	3	"	34	20	60
54	Angus	" 12	116	42	"	3	"	33	30	60
55	Chul Bidai	" 6	110	36	Weak	3	Bearded	33	10	60
56	Chester	" 11	115	42	"	2½	Beardless.	33	10	60
57	Vernon	" 11	115	46	Stiff and bright.	3½	Bearded	32	50	60
58	Japanese	" 8	112	40	Medium	2½	"	32	40	60
59	Adjini	" 4	108	38	Weak	2	"	32	40	60
60	Dawn	" 11	115	48	Stiff and bright.	3½	Beardless.	30	40	60

WHEAT.

FALL VERSUS SPRING SOWING.

Two varieties were included in this test, both varieties being sown September 22 for the fall test, and April 25 for the spring test. The land was in fairly fertile condition and was well prepared for the seed in each instance, and the fall sown plots received a light harrowing with the drag, when the spring sowing was made. The fall sown yield was much the heaviest, as will be seen by the accompanying record, and the grain is finer looking.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
				In.		Inches.		Bush.	Lbs.	Lbs.
Oregon Club	Sept. 22	Jul. 29	...	44	Stiff.....	2	Beardless.	49	20	60
" "	Apr. 25	Aug. 20	117	44	Medium..	2	"	37	20	60
Blue Stem	Sept. 22	Jul. 29	....	46	Stiff...	3½	"	46	40	60
"	Apr. 25	Aug. 20	117	46	Medium..	3½	"	38	40	60
Blue Stem from Brandon	Apr. 25	Aug. 20	117	46	Medium..	3½	"	37	20	60

EMMER AND SPELT.

Six varieties of emmer and spelt were sown this year. The land for these plots had produced a crop of potatoes following rape, which had been turned under and which left the land in very good condition. The yields of grain and straw are fairly good, but the straw was of no use for forage, as it was badly discoloured by rain before it was cured.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.
			In.		Inches.		Lbs.	Lbs.
South Dakota No. 3	Aug. 20..	132	42	Medium..	2½	Bearded..	5,100	2,130
South Dakota No. 524	" 20.	132	40	" ..	2½	" ..	4,950	2,040
Red Spelt	" 20..	132	42	" ..	3½	Beardless.	4,600	1,960
Thick Emmer	" 10..	122	40	" ..	2	Bearded..	5,000	1,920
White Bearded Spelt	" 12..	124	44	Stiff......	4	" ..	5,120	1,720
Common Emmer (Speltz)	" 18..	122	40	Weak....	2½	" ..	......	2,190

EXPERIMENTS WITH PEASE.

Forty-two varieties of pease were tested this year on plots of one-fortieth of an acre each. The soil was a fertile clay loam and all the plots were sown on April 21. The vines made a vigorous growth, and were well podded, but a considerable loss was sustained by shelling before they could be properly cured and housed.

PEASE—TEST OF VARIETIES.

Number	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Pod.	Size of Pea.	Weight of Straw per plot.	Yield per Acre Bush.	Yield per Acre Lbs.	Weight per Bushel.
				In.		In.		Lbs.			Lbs.
1	Early Britain	Aug. 15	116	52	Strong	3	Medium	155	46	40	61½
2	Large White Marrowfat	" 21	122	52	"	3	Large	160	46	20	62
3	German White	" 17	118	54	"	3	Medium	163	46	20	62½
4	Carleton	" 17	118	70	"	2½	"	168	45	20	61¾
5	Arthur	" 15	116	50	"	3	Large	165	44	40	62
6	Macoun	. 15	116	56	Medium	2½	..	180	44	20	61½
7	Chancellor	" 20	121	56	Strong	3	Medium	154	44	..	62½
8	Pearl	" 20	121	76	"	3	Large	165	42	40	60¾
9	Lanark	" 15	116	48	"	2½	"	168	42	20	61½
10	Mummy	" 18	119	58	"	3	Medium	148	42	..	62
11	Centennial	" 18	119	64	"	2½	"	170	41	30	61¾
12	Nelson	" 17	118	58	"	3	"	160	40	40	60
13	Paragon	" 22	123	62	"	2½	"	145	40	10	60½
14	White Wonder	" 21	122	61	"	2½	"	160	40	.	61
15	Agnes	" 21	122	62	"	3	"	156	39	20	61¼
16	New Potter	" 21	122	70	"	3	Large	143	39	10	61
17	Wisconsin Blue	" 18	119	64	"	2½	Small	155	39	..	61½
18	Black Eyed Marrowfat	" 22	123	60	"	3	Large	145	38	50	60
19	King	" 20	121	58	"	3	"	130	38	..	60
20	Crown	" 21	122	54	"	2½	Small	140	37	40	61
21	Golden Vine	" 18	119	64	"	2½	"	149	36	40	61¼
22	Pride	" 22	123	58	"	2½	Large	125	36	20	60½
23	Oddfellow	" 18	119	48	Medium	3	Medium	163	36	..	61
24	Canadian Beauty	" 18	119	58	Strong	3	Large	160	35	50	61
25	Prince Albert	" 18	119	56	Medium	2½	Small	138	35	30	61
26	Daniel O'Rourke	" 15	116	36	"	2½	"	140	35	30	61
27	Mackay	" 20	121	58	Strong	3	Medium	140	35	20	60
28	Kent	" 18	119	56	"	3	Large	166	35	10	60
29	Prussian Blue	" 20	121	50	"	3	Medium	125	34	50	61
30	Bruce	" 19	120	52	"	3	Large	165	34	10	60
31	Fergus	" 20	121	52	"	3	Medium	135	33	50	60½
32	Duke	" 19	120	60	"	2½	Large	148	33	40	60
33	English Grey	" 15	116	60	Medium	3	Medium	143	33	30	60
34	Archer	" 21	122	54	Strong	2½	"	135	33	20	60
35	Alma	" 22	123	58	"	2½	Large	125	33	10	60
36	Prince	" 20	121	48	"	3	"	143	33	..	60
37	Perth	" 17	118	52	"	2½	"	125	32	40	60½
38	Elliot	" 22	123	64	"	2½	Medium	125	32	30	60
39	Picton	" 20	121	54	"	2½	"	135	32	20	60
40	Victoria	" 18	119	54	Medium	3	"	130	32	..	60
41	Trilby	" 22	123	62	Strong	2½	"	150	31	40	60
42	Gregory	a 18	119	58	"	3	"	120	31	10	60

EXPERIMENTS WITH INDIAN CORN.

Twenty-three varieties of Indian corn were tested this year. All were planted May 20 and cut October 8 and 9. The land was a clay loam which had been ploughed the fall before, turning under a fine growth of clover. It was well harrowed several times during the spring, to start weed seeds and destroy the weeds. The crop was very late on account of cold and wet weather, but a few of the earlier sorts produced well, the ears being in roasting condition when cut. All the varieties were planted both in drills and hills. The rows were three feet apart and the hills three feet apart each way. The rows were thinned, leaving the plants six inches apart.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	When Tasselled.	In Silk.	Early Milk.	Condition when Cut.	Weight per Acre grown in rows. Tons.	Lbs.	Weight per Acre grown in hills. Tons.	Lbs.
1	Red Cob Ensilage	Aug. 28..	Sept. 2..	Sept. 20..	Late milk...	31	480	22	1,980
2	Angel of Midnight.....	" 28..	" 14..	" 30..	Early milk..	26	580	23	800
3	Pride of the North.	" 31..	" 14..	Oct. 8..	" ..	26	350	22	1,760
4	Superior Fodder......... .. .	Sept. 6..	" 24..	....	Ears formed	25	1,480	23	1,740
5	Early Mastodon.	" 6..	Oct. 3..	....	In silk......	24	1,940	18	1,400
6	Giant Prolific Ensilage. . ..	" 4..	Sept. 26..	....	Ears formed	24	1,720	22	1,430
7	Thoroughbred White Flint...	" 8..	" 30..	....	In silk......	24	1,500	23	860
8	Salzer's All Gold..	" 8..	" 30..	....	"	24	1,280	22	1,430
9	North Dakota White.........	Aug. 28..	" 12..	....	Early milk..	24	400	20	480
10	Mammoth Cuban	" 30..	" 14..	....	" ..	23	1,960	24	620
11	Eureka.....................	" 30..	" 15..	....	" ..	22	1,760	23	420
12	Compton's Early............	" 20..	Aug. 28..	Sept. 24..	Late milk...	22	220	21	1,010
13	Early Butler................	" 28..	Sept. 10..	" 30..	Early milk..	21	1,560	19	280
14	Mammoth 8-rowed Flint......	Sept. 4..	" 15..	Oct. 4..	" ..	21	570	22	220
15	Champion White Pearl	" 6..	" 24..	" 12..	" ..	20	480	21	1,120
16	King Philip........	Aug. 28..	" 20..	....	Ears formed	20	40	18	1,620
17	Selected Leaming.	" 30..	" 28..	....	Early milk..	18	80	17	870
18	Cloud's Early Yellow	" 22..	" 14.	Oct. 4..	" ..	17	1,860	17	430
19	Longfellow	" 24..	" 12..	Sept. 24..	Roasting ...	17	870	17	1,860
20	King of the Earliest..........	Sept. 3..	" 28..	....	Ears formed	17	650	18	80
21	White Cap Yellow Dent......	" 4..	" 16..	Sept. 30..	Early milk..	16	1,220	16	10
22	Evergreen Sugar.......	" 10..	" 28..	....	Ears formed	16	780	15	360
23	Sanford....	" 10..	" 26..	....	"	15	1,46	12	1,740

INDIAN CORN SOWN AT DIFFERENT DISTANCES APART.

The same varieties that were used in this test last year were chosen again this year. They were planted alongside the main crop, both in drills and hills. In the drills the plants were thinned to about six inches and to three plants in the hills.

Three feet apart in drills appears to be the best distance, as that gives room for the best development of the plant, and at the same time no space appears to be wasted. These plots were planted May 20 and cut October 2.

INDIAN CORN.—SOWN AT DIFFERENT DISTANCES APART.

Name of Variety.	Distance in rows. in.	Distance in hills. in.	Condition when Cut.	Weight per Acre—grown in rows. Tons.	Lbs.	Weight per acre—Grown in hills. Tons.	Lbs.
Champion White Pearl	21	21	Early milk.......	17	540	16	340
" "	28	28	"	18	960	17	1,200
" "	35	35	Late milk........	20	1,580	19	1,720
" "	42	42	"	17	1,640	17	980
Selected Leaming..................	21	21	Early milk.....	15	1,240	14	1,360
"	28	28	"	16	1,220	16	780
"	35	35	Late milk.........	20	260	18	1,510
"	42	42	"	18	300	17	430
Longfellow........................	21	21	Early milk.......	13	180	12	860
"	28	28	"	13	1,720	13	510
"	35	35	Late milk	19	1,600	18	1,400
"	42	42	"	18	1,280	18	520

TEST OF SUPERPHOSPHATE OF LIME ON INDIAN CORN.

This test was made on sandy land, which had produced a crop of clover the previous year, and a heavy aftermath was turned under early in September. The corn was planted in hills three feet apart each way, and the fertilizer was applied on the surface about the hills just as the corn was coming up, and worked in lightly with a hoe.

Name of Variety.	Date of Sowing.	When Cut.	Yield per Acre.		Remarks.
			Tons.	Lbs.	
1 Longfellow, superphosphate 100 lbs...	May 20	Oct. 2	18	1,950	Well eared and corn nearly glazed
2 " " 150 " ..	" 20	" 2	19	1,160	" " " "
3 " " 200 " ..	" 20	" 2	21	240	" " " "
4 " no fertilizer............	" 20	" 2	17	430	" but corn in early milk.

EXPERIMENTS WITH TURNIPS.

Twenty-one varieties of turnips were tested under practically the same conditions. The soil was a sandy loam, which was in clover in 1902, and in October of that year the aftermath was ploughed under and the land dressed with farm-yard manure during the winter which in spring was thoroughly worked into the soil with spade harrow and drag. Two sowings of each sort were made, 4 rows 100 feet long of each sort at each sowing. The first series of plots were sown May 13, and the second sowing May 27. The rows or drills were 30 inches apart, and, as in the mangels, the first sown have averaged the best returns. The yield has been calculated from the weight of crop obtained from the two centre rows in each plot.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Emperor Swede........................	47	1,270	1,587	50	38	1,200	1,287	..
2	East Lothian........................	45	1,410	1,519	10	38	1,550	1,292	30
3	Perfection Swede........................	45	1,080	1,518	..	36	930	1,215	30
4	Hall's Westbury........................	42	1,800	1,430	..	36	600	1,210	..
5	Imperial Swede........................	41	1,820	1,397	..	39	1,200	1,320	..
6	Good Luck........................	41	1,490	1,394	50	37	1,240	1,254	..
7	Mammoth Clyde........................	41	1,160	1,386	..	39	540	1,309	..
8	Halewood's Bronze Top........................	40	520	1,342	..	41	500	1,375	40
9	Elephant's Master........................	40	355	1,339	15	36	765	1,212	45
10	New Century........................	39	1,860	1,331	..	39	1,200	1,320	..
11	Bangholm Selected........................	38	1,880	1,298	..	31	1,360	1,056	..
12	Jumbo........................	38	890	1,281	30	38	1,880	1,298	..
13	Skirving........................	37	1,240	1,254	..	35	620	1,177	..
14	Halewood's Bronze Top........................	37	580	1,243	..	40	520	1,342	..
15	Drummond Purple Top........................	36	1,755	1,229	15	33	495	1,108	15
16	Carter's Elephant........................	36	1,260	1,221	..	38	1,220	1,287	..
17	Kangaroo........................	35	1,610	1,193	30	34	1,630	1,160	30
18	Shamrock Purple Top........................	34	1,960	1,166	..	32	680	1,078	..
19	Magnum Bonum........................	33	1,320	1,122	..	36	1,590	1,226	30
20	Sutton's Champion........................	33	660	1,111	..	36	1,920	1,232	..
21	Selected Purple Top........................	31	1,360	1,056	..	37	1,240	1,254	..

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels were sown in two sets of plots, one was sown on April 28, and the second May 12. Early sowing has given the best results. The soil was similar to that on which the turnips were sown, and its preparation and treatment the same. Four drills at thirty inches apart and one hundred feet long were sown in each case, and the yield per acre is computed from the produce of sixty-six feet of the two centre rows of each plot. Both sets of plots were dug October 22.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth Long Red	48	1,185	1,619	45	46	1,555	1,559	15
2	Half Long Sugar Rosy	41	830	1,380	30	38	1,220	1,287	..
3	Half Long Sugar White	40	25	1,333	45	46	1,390	1,556	30
4	Mammoth Yellow Intermediate	39	1,695	1,328	15	34	1,630	1,165	30
5	Selected Yellow Globe	39	1,200	1,320	..	35	1,940	1,199	..
6	Giant Yellow Intermediate	39	1,035	1,317	15	38	560	1,276	..
7	Lion Yellow Intermediate	39	540	1,309	..	33	1,145	1,119	5
8	Selected Mammoth Long Red	37	1,340	1,255	40	34	970	1,149	30
9	Giant Sugar	34	1,300	1,155	..	37	1,340	1,255	40
10	Prize Winner Yellow Globe	34	970	1,149	30	31	1,505	1,091	45
11	Giant Yellow Globe	33	1,980	1,133	..	28	265	937	25
12	Gate Post	33	1,815	1,130	15	36	270	1,204	30
13	Prize Mammoth Long Red	29	1,520	992	..	27	1,440	924	..
14	Triumph Yellow Globe	28	1,460	957	40	26	1,965	899	25
15	Leviathan Long Red	27	120	902	..	31	370	1,039	30
16	Yellow Intermediate	26	1,790	896	30	26	1,470	891	10

EXPERIMENTS WITH CARROTS.

Eleven varieties of carrots were tested. Two sowings were made of each sort, in drills thirty inches apart. The first sowing was made April 27, and the second May 11. All were pulled October 27. Four rows of each sort were put in at each sowing, and the yield was reckoned from the produce of 66 feet of the two centre rows of each plot. The land for these plots was similar to that used for the turnips, and its treatment and preparation was the same.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth White Intermediate	32	1,175	1,086	15	26	1,625	893	45
2	Giant Short White Vosges	31	1,690	1,061	30	28	430	940	30
3	Improved Short White	26	140	869	..	24	1,005	816	45
4	Ontario Champion	25	160	836	..	25	1,480	858	..
5	White Belgian	24	1,830	830	30	22	220	737	..
6	Carter's Orange Giant	23	860	781	..	22	55	734	15
7	Half Long White	21	570	709	30	22	385	739	45
8	Long Yellow Stump Rooted	20	920	682	..	18	1,290	621	30
9	New White Intermediate	19	940	649	..	17	1,640	594	..
10	Half Long Chantenay	19	610	643	30	17	1,310	588	50
11	Early Gem	18	960	616	..	18	630	610	30

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties of sugar beets were tested on a mellow sandy loam that was in clover the previous year, was ploughed in September and disc-harrowed and cultivated in the fall and given a dressing of about twenty loads of barn-yard manure per acre during the winter. This was thoroughly worked into the soil in March and April, and the first series of plots sown in drills 30 inches apart on April 28, and the second sowing on May 12. All were harvested October 23. The yields have been computed from the produce of 66 feet of the two centre rows.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Red Top Sugar	28	1,420	957	..	28	1,750	962	30
2	Danish Red Top	27	120	902	..	25	160	836	.
3	Improved Imperial	26	800	880	..	35	390	1,173	10
4	Danish Improved	26	635	877	15	27	1,440	924	..
5	Royal Giant	26	470	874	30	26	800	880	..
6	Vilmorin's Improved	23	1,190	786	30	22	1,540	759	..
7	French 'Very Rich'	19	280	638	..	22	880	748	..
8	Klein Wanzleben	18	960	616	..	20	590	676	30

POTATOES.

Fifty-six varieties of potatoes were tested. The soil was a clay loam on which oats and pease were grown in 1902, and which had a crop of clover in 1901. Clover was sown again with the oats and pease in 1902, and a splendid catch resulted which gave a fine mat of growth to turn under for the potatoes. Four rows of each sort, one hundred feet long, were planted May 19. All were sprayed July 6 and again two weeks later, except two test plots left unsprayed. When matured the two centre rows in each case were dug, and the yield per acre computed from the weight of crop obtained from these two rows (66 feet). There was little or no blight this season, and in consequence there was no apparent benefit from the spraying.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre of								Form and Colour.
				Sound.		Rotten.		Marketable.		Unmarketable.		
		Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs	Bus.	Lbs.	Bus.	Lbs.	
1	Rochester Rose	466	24	466	24	None	...	373	24	93	..	Long, rose.
2	Cambridge Russet	459	48	459	48	"	...	323	32	136	16	Oblong, russet.
3	Reeve's Rose	400	24	380	24	20	..	340	..	40	24	Long, rose.
4	Country Gentleman	398	12	398	12	None	..	360	..	38	12	" pink and white.
5	Vanier	376	12	376	12	"	...	340	..	36	12	" red.
6	Early Rose	375	40	356	40	19	...	321	..	35	40	Oblong, rose.
7	American Wonder	360	48	342	48	18	...	291	48	51	..	Long flat, white.
8	Early Michigan	360	48	326	..	34	48	361	..	65	..	" white.
9	Rose No. 9	358	36	358	36	None	..	305	36	53	..	" rose.
10	Sharpe's Seedling	356	24	356	24	"	...	285	..	71	24	" round, rose.
11	Seedling No. 7	347	36	330	..	17	36	296	..	34	..	" red.
12	Irish Daisy	344	48	329	..	15	48	263	30	65	30	Round, white.
13	Pearce	344	48	344	48	None	..	274	..	70	48	Long, white and pink.
14	Sutton's Invincible	332	12	316	..	16	12	253	..	65	..	" white.
15	Dreer's Standard	323	24	323	24	None	..	273	24	50	..	Oval, white.
16	Uncle Sam	321	12	304	12	17	..	259	12	45	..	Round, white.
17	Rawdon Rose	316	48	269	18	47	30	221	18	48	..	Long, rose.
18	Brown's Rot-proof	316	48	316	48	None	..	237	48	79	..	" red.
19	Prolific Rose	316	48	284	..	32	48	228	..	56	..	" rose.
20	Maule's Thoroughbred	314	36	302	..	12	36	257	..	45	..	" "
21	Swiss Snowflake	312	24	312	24	None	..	266	24	46	..	" white.
22	Penn. Manor	310	12	294	42	15	30	250	..	44	42	" red.
23	Late Puritan	299	12	299	12	None	..	210	12	89	..	" white.
24	Early St. George	299	12	284	42	14	33	256	12	28	30	" "
25	I.X.L	293	18	263	18	30	..	238	..	25	18	Long, flat, pink.
26	Carman No. 1	292	36	292	36	None	..	234	..	58	36	Round, white.
27	Irish Cobbler	290	24	276	..	14	24	236	..	40	..	" "
28	Bovee	286	..	257	..	29	..	219	..	38	..	Long, rose.
29	Green Mountain	285	54	285	54	None	..	230	54	55	..	" white.
30	Burnaby Seedling	281	36	267	36	14	..	217	36	50	..	" rose.
31	Early Norther	279	24	267	..	12	24	227	30	39	30	" pink.
32	Troy Seedling	277	12	277	12	None	..	251	12	26	..	" red.
33	McIntyre	275	..	275	..	"	...	205	..	76	..	" pink.
34	Early White Prize	268	24	268	24	"	...	214	24	51	..	Oblong, white.
35	Early Puritan	266	12	253	..	13	12	202	30	50	30	Long, white.
36	State of Maine	261	48	261	48	None	..	209	48	52	..	" pink.
37	Holborn Abundance	257	24	257	24	"	..	206	..	51	24	Round, white.
38	Delaware	253	..	253	..	"	..	190	..	63	..	" "
39	Early Sunrise	248	36	224	..	24	36	179	..	45	..	Long, rose.
40	Enormous	244	12	244	12	None	..	194	12	50	..	" white.
41	Vick's Extra Early	242	..	242	..	"	..	181	..	61	..	Round, pale rose.
42	Money Maker	239	48	239	48	"	..	190	..	49	48	Long, white.
43	Everett	236	30	189	30	47	..	141	54	47	18	" round, red.
44	Burpee's Extra Early	234	18	234	18	None	..	175	30	58	48	" rose.
45	Early Andes	233	12	209	12	24	..	177	12	32	..	Round, rose.
46	Clay Rose	232	6	232	6	None	..	185	36	46	30	Long, rose.
47	Canadian Beauty	231	..	231	..	"	..	172	30	58	30	" flat, pink.
48	Sutton's Supreme	228	48	228	48	"	..	171	18	57	30	" white.
49	Early Envoy	226	36	226	36	"	..	181	18	45	18	" pink and white.
50	Sabean's Elephant	211	12	200	42	10	30	166	42	34	..	" flat, white.
51	Lee's Favourite	200	12	200	12	None	..	160	12	40	..	" rose.
52	Carman No. 3	195	48	186	..	9	48	149	30	37	30	Oblong, white.
53	General Gordon	193	36	193	36	None	..	135	36	58	..	Oval, pink.
54	American Giant	189	12	189	12	.	..	161	12	28	..	Long, white.
55	Empire State	183	44	165	14	18	30	132	14	33	..	" pink and white.
56	Up to Date	140	48	140	48	None	..	105	48	35	..	Oval, white.

FERTILIZERS APPLIED TO POTATOES.

The land chosen for these plots was similar to that for the main crop of potatoes, having had clover turned under both of the two preceding years, and consequently the soil was well supplied with nitrogen. Early in the spring it received a dressing of muriate of potash at the rate of 100 lbs. per acre. All the plots were planted the same day and were treated alike in every way. The results show a decided profit in the use of the Thomas' slag.

POTATOES—FERTILIZER TEST.

Name of Variety.	Fertilizer applied.	Planted.	Dug.	Total Yield per Acre.	Yield per Acre of Sound.	Yield per Acre of Rotten.	Yield per Acre of Marketable.	Yield per Acre of Unmarketable.
				Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.
Dakota Red.	Thomas slag, 100 lbs. per acre.	May 19.	Sept. 28.	589 36	589 36	None..	501 ..	88 36
" .	" 150 " ..	" 19.	" 28.	618 12	618 12	" ...	525 30	92 42
" .	" 200 " ..	" 19.	" 28.	686 24	686 24	" ...	584 ..	102 24
" .	Untreated..................	" 19.	" 28.	468 36	468 36	" ...	398 21	70 15

SUMMARY OF CROPS.

The following is a summary of the grain, roots and fodder crops raised on the Experimental Farm at Agassiz this season:—

	Tons.	Lbs.
Hay	53	1,000
Corn for silage and fed green	110	..
Turnips	42	..
Mangels	25	..
Carrots	8	..
Sugar beets	5	..
Oats	11	1,500
Pease	4	1,000
Wheat	2	500
Barley	2	1,700
Potatoes	5	..
Total	269	1,700

FODDER PLANTS.

The following fodder plants were tested this year, all on plots of one-fortieth of an acre each. None of the millets appear to be very successful here, and it is always practicable to get heavier yields of mixed grains, such as oats and pease, or oats and vetches, than of any of the millets, and the mixed grains are eaten as readily as are the millets, and the results of their feeding are more satisfactory.

EXPERIMENTS WITH MILLETS.

Plots 1 to 6 inclusive were sown May 21 and cut September 1.

Plot 1.—White Round Extra French:—

Stalks 30 to 36 inches long and not leafy, heads 2 to 2½ inches long; yield per acre when cut, 3 tons 1,920 lbs.

Plot 2.—Red Orenburg.

A poor uneven crop; stalks 30 to 48 inches long and not leafy; heads 2½ to 3 inches long; weight when cut, 3 tons 960 lbs. per acre.

Plot 3.—Cat-tail Millet:—

Not an even crop; stalks 30 to 36 inches long and moderately leafy; heads 3 to 4 inches; weight when cut, 3 tons 640 lbs. per acre.

Plot 4.—Italian Millet:—

Stalks 32 to 40 inches long; heads 4 to 5 inches long; weight when cut, 3 tons 1,360 lbs. per acre.

Plot 5.—Pearl Millet:—

A poor uneven stand; stalks 36 to 50 inches long and very few leaves; heads 2 to 3 inches long; weight when cut, 3 tons 1,840 lbs. per acre.

Plot 6.—Hungarian Grass:—

A fair even stand and moderately leafy, but short in head and stalk; stalk 24 to 30 inches long and heads 3 to 5 inches; weight when cut, 3 tons 1,280 lbs. per acre.

EXPERIMENTS WITH MIXED GRAIN.

Plot 7.—Oats, Tares and Wheat mixed :—

Sown May 21 and cut September 1; an even luxuriant growth; cut when the oats were in the dough stage; weight when cut, 9 tons 1,460 lbs.

Plots 8 to 15 were sown May 7, and cut September 30.

EXPERIMENTS WITH SOJA BEANS.

Plot 8.—Soja Beans:—

Sown in drills 21 inches apart; an even stand and fairly well podded; pods 1 to 1½ inches long, very leafy; length of stalk, 30 inches; yield per acre weighed when cut, 4 tons 200 lbs. per acre.

Plot 9.—Soja Beans:—

Sown in drills 28 inches apart, well podded, very leafy and well branched; stalks 30 inches long; weight when cut, 4 tons 1,200 lbs. per acre.

Plot 10.—Soja Beans:—

Sown in drills 35 inches apart; very branchy and leafy, pods 1 to 1¼ inches long and fairly plentiful; stalks 28 inches long; weight when cut, 4 tons 400 lbs. per acre.

EXPERIMENTS WITH HORSE BEANS.

Plot 11.—Horse Beans:—

Sown in drills 21 inches apart; a very patchy stand; pods short and few on the stalk; stalks about 24 inches long: weight when cut, 2 tons 1,440 lbs. per acre.

Plot 12.—Horse Beans:—

Sown in drills 28 inches apart; stalks 30 inches long and poorly furnished with pods; weight when cut, 2 tons 1,600 lbs. per acre.

Plot 13.—Horse Beans:—

Sown in drills 35 inches apart; stalks 32 inches long; pods short and not well filled; weight when cut, 2 tons 1,280 lbs. per acre.

Velvet Beans.

Plot 14.—Velvet Beans:—

Sown in drills 18 inches apart; very few of the seeds germinated, and none grew more than 2 inches and shortly died; not hardy enough for this climate.

Cow Peas.

Plot 15.—Whip-poor-will Cow Peas:—

Sown in drills 18 inches apart; made a weak straggling growth of not more than 6 inches; produced no crop worth mentioning.

SUNFLOWERS.

A plot of the Mammoth Russian Sunflowers were sown May 7 in drills three feet apart. They grew very vigorously and made very fine heads. The birds began to eat the seed as soon as it was full grown, and were very destructive. The seed is valuable for poultry.

EXPERIMENTS WITH FLAX.

Two varieties of flax were sown for seed May 7.

Improved Russian. Straw 36 inches long and very branching; yield of clean flax 14 bushels and 23 lbs. per acre. Harvested August 10.

Early Riga. Straw 34 to 38 inches long, not as well branched as Improved Russian and not as good a yield of seed. Ripe August 10; yield, 12 bushels and 8 lbs. per acre.

GARDEN VEGETABLES.

RADISHES.—Sown April 16.

Variety.	Fit for use.	Remarks.
Early Scarlet Turnip	May 10	Crisp, pleasant.
Olive Shaped Scarlet	" 16	Crisp, good.
French Breakfast	" 22	Very sweet and crisp.

LETTUCE.—Sown April 16.

Variety.	Fit for use.	Remarks.
Grand Rapids	May 14	Crisp, tender.
Ohio Cabbage	" 18	Crisp, tender, sweet.
Black Seeded Simpson	" 20	Very crisp and good.
Toronto Gem	" 28	Firm, sweet, crisp.
All The Year Round	" 30	White, solid, sweet.

CARROTS.—Sown April 16.

Variety.	Fit for use.	Remarks.
Parisian Forcing	June 18	Crisp, sweet, good.
French Horn	" 22	Very fine flavoured.
Luc Half Long	July 10	Crisp, sweet, pleasant.
Long Blood Red	" 18	Crisp, very good.
Half Long Danvers	Aug. 8	Very fine.

Table Turnips.—Sown May 1.

Variety.	Fit for use.	Remarks.
Extra Early White Milan	June 16	Very sweet and good.
White Six Weeks	" 20	Sweet, fine flavour.
Red Top Strap Leaf	" 29	Crisp, good.
White Stone	July 8	Very solid, crisp.
Robertson's Golden Ball	" 14	Very fine flavour.
Hazard's Swede	Aug. —	Very sweet, crisp, good.

Onions.—Sown April 17.

Variety.	Remarks.
Early White Welsh	Uniform size, firm, mild, good flavour.
Large Red Wethersfield	Medium, large, solid good.
Danvers Yellow	Flat, medium size, solid.
Market Favourite	An even regular grower, mild, good flavour.
Trebons Large Yellow	Large, handsome, solid, mild.
Paris Silver Skin	Very handsome, fine flavour.

Cabbage.—Sown in hot-bed April 20, and transplanted May 26.

Variety.	Fit for Table	Remarks.
Jersey Wakefield	July 18	Heads solid, crisp, white; a uniform header.
Extra Early Express	" 24	Heads small, firm, good quality, an even header.
Extra Early Midsummer Savoy	" 28	Heads soft but flavour very fine, extra quality.
Paris Market	" 30	Variable in size and firmness, quality good.
Early Winningstadt	Aug. 20	A very nice header; heads uniform in size, firm, white, sweet, quality good.
Drumhead Savoy	" 26	Heads medium size, solid, white, extra fine flavour.
Mammoth Red Rock	" 28	A good header; heads medium size, solid, very red, good.
Green Globe Savoy	Sept. 10	A regular header; heads of medium size, solid, crisp, fine flavour.
Glory of Enkhousen	Oct. —	A regular header, heads large, solid, very crisp and sweet.
Fottler's Drumhead	" —	Heads, large, solid, white, good quality; good keeper.
Fielder Kraut	" —	A fine, medium head, solid, white, sweet.
Lupton	" —	A regular header; heads large, solid, good.
Quintal Drumhead	" —	Heads large, solid, white, fine quality.
Danish Ball Head	" —	Heads medium size, very solid, sweet and of fine flavour; a good keeper.
Zenith	Oct. —	A regular header, head of medium size; solid, tender, fine quality, very good.
Marblehead Mammoth	" —	Heads large, but sometimes soft; quality medium.
Large Red Drumhead	" —	A fairly regular header; heads very solid, deep red, tender, good.

Cauliflower.—Sown April 20 and transplanted May 26.

Extra Early Snowflake	Aug. 4	Heads large, solid, crisp, very white, good.
Extra Early Dwarf	July 28	Heads medium to large, solid, crisp, sweet, very fine.
Half Early Paris	" 24	Heads small, crisp, of good flavour, very fine.

Brocoli.—Sown April 20 and transplanted May 26.

Extra Early White	Aug, 20	Heads firm, of medium size, white, crisp, fine flavour.

Brussels Sprouts.—Sown April 20 and transplanted May 26.

Dwarf Improved	Oct. 24	Sprouts solid, crisp, sweet, very good.

BEETS.—Sown May 1.

Name.	Fit for use.	Remarks.
Egyptian	July 9	Solid, very dark red, sweet.
Nutting's Dark Red	" 18	Good size, very dark red.
Edmands Early Blood Turnip	" 18	Sweet, good, very even sized, good colour, pleasant.
Long Smooth Blood	Aug. 28	Smooth, long, sweet, very dark red, very good.

BEANS.—Planted May 1.

Name.	Fit for use.	Remarks.
Early Mohawk	July 10	Dwarf grower, but very productive; pods 4 to 5 in. long, crisp, pleasant flavour.
Dwarf Golden Skinless	" 13	A dwarf grower, but very productive; pods $2\frac{1}{2}$ to 4 in. long, crisp, stringless and good.
Early China	" 13	A very dwarf grower, productive; pods 4 to 5 in. long, of a pleasant flavour.
Extra Early Edible Podded	" 15	Dwarf grower, productive, good flavour; pods 4 to 5 in. long.
Royal Dwarf Kidney	" 16	A bushy grower, fairly productive and of a pleasant flavour.
Long Yellow Six Weeks	" 18	A bushy grower, productive; pods 3 to 5 in. long, crisp, pleasant, good.
Improved Early Red Valentine	" 19	A strong bushy grower and productive; pods 3 to 5 in. long and of very fine flavour.
Crystal White Wax	" 19	A bushy grower, fairly productive; pods plump, crisp, 4 to 5 in. long with a very pleasant flavour.
Fame of Vitry	" 20	A strong grower, productive; 4 to 6 in. long, crisp, tender, sweet, pleasant, good.
Dwarf, Emperor of Russia	" 20	A bushy strong grower, very productive; pods 4 to 5 in. long, crisp, and of very fine flavour.
Dwarf, Inexhaustable	" 22	Very dwarf, bushy, productive; pods 3 to 5 in. long; crisp very pleasant, good.
Dwarf, Black Speckled	" 24	Dwarf, bushy, productive; pods 4 to 6 in. long; fleshy, crisp, juicy with a very pleasant flavour.

GARDEN PEASE.—Sown April 16.

Name.	Fit for use.	Remarks.
Nott's Excelsior	June 21	Vines 16 in. long, well podded; pods 2 to $2\frac{1}{2}$ in. long and well filled, peas sweet and tender.
Alaska	" 21	Vines 24 in., well podded; pods $2\frac{1}{2}$ to $3\frac{1}{2}$ in. long and well filled with medium sized peas of fine quality.
American Wonder	" 24	Vines 14 to 18 in. long, well podded; pods 2 to 3 in. long and filled with medium sized sweet tender peas.
Premium Gem	" 30	Vines 20 to 24 in. and very well furnished pods 2 to 3 in. long, pea of medium size, sweet and tender with a pleasant flavour.
Sutton's May Queen	July 3	Vines 24 to 30 in., fairly well podded; pods 2 to 3 in. long, well filled, pea of medium size, quality good.
McLean's Advancer	" 5	Vines 26 to 30 in. long and fairly well loaded; pods 3 to $3\frac{1}{2}$ in. long, well filled with medium size peas tender and sweet and of very fine quality.
Heroine	" 8	Vines 20 to 24 in. long, pods 3 in. long well filled, peas large, sweet, tender and of very fine flavour.
Gradus	" 8	Vines 30 to 36 in. long and well podded; pods $3\frac{1}{2}$ to 5 in. long and filled with large peas sweet and of superior flavour.
Sutton's Conqueror	" 9	Vines 2 ft. long, well loaded with pods of 3 to 5 in. long, peas large, sweet and of very fine quality.
Duke of Albany	" 10	Vines 30 to 36 in. long, well furnished with pods $2\frac{1}{2}$ to $3\frac{1}{2}$ in. long containing medium sized very sweet fine flavoured peas.
Admiral	" 11	Vines 3 to $3\frac{1}{2}$ ft. long, very well podded; pods $2\frac{1}{2}$ to $3\frac{1}{2}$ in. long, well filled with large peas of very fine quality.
Rent Payer	" 11	Vines 24 to 30 in. long, well loaded with pods 4 to 5 in. long, pea large, sweet, tender, very good.
New Dwarf Telephone	" 18	Vines 18 in. long, very productive; pods 3 to $3\frac{1}{2}$ in. long, pea large, sweet, tender and of fine flavour.

Garden Peas—Sown April 16.

Name.	Fit for use.	Remarks.
Pride of the Market	July 12	Vines 18 in. to 2 ft. long and fairly productive; pods 2 to 3½ in. long, well filled with medium sized peas of fine quality.
Stratagem	" 13	Vines 18 to 24 in. and well podded, pods 3 to 4 in. long, pea large, sweet and of very fine quality.
Shropshire Hero	" 13	Vines vigorous and 2½ to 3 ft. long, productive, pods 2½ to 4 in. long, well filled with large peas of very superior flavour.
Horsford's Market Garden	" 13	Vines 2 to 2½ ft. long, vigorous and productive, pods 2 to 3 in. long, peas of medium size and very fair quality.
Sutton's Perfection	" 13	Vines stout and 1½ to 2 ft. long, productive, pods long and well filled with 6 to 10 large peas of good quality.
Sutton's Windsor Castle	" 15	Vines 2 to 2½ ft. long, moderately productive, pods 3 to 4½ in. long, peas large, sweet, tender and of very fine flavour.
Sutton's Matchless Marrow	" 15	Vines 1½ ft. to 2 ft. long, well podded, pods 3 to 4 in. long, peas large sweet and of pleasant flavour.
Sutton's Late Queen	" 22	Vines 15 to 18 inches long, well furnished with large pods containing 6 to 10 very large sweet tender peas of first quality.
Telephone	" 22	Vines 2 to 2½ ft. long well podded, pods 2 to 3 in. long and well filled with large sweet peas of very fine flavour.

Kohl Rabi—Sown May 10.

White Goliath	July 22	Crisp, sweet, mild and of pleasant flavour.

Squash—Planted May 2.

Golden Bush	July 29	Productive, sweet and of pleasant flavour.
Bush Fordhook	Aug. 8	A vigorous grower and very productive, fruit small, solid, very thick fleshed and very fine in flavour.
English Vegetable Marrow	July 30	A strong grower and productive, very fine flavour, fit for table July 30.
Delicata	Sept. to Jan.	Vines strong growers and very productive, squash 9 to 11 in. long and 3½ in. in diameter, very thick, flesh of the finest quality.

Name.	Remarks.
Boston Marrow	A vigorous grower and productive. Thick fleshed, sweet, dry, of fine flavour. Fit for table September 4.
Essex Hybrid	Vines vigorous and very productive. Flesh fine grained, sweet and of a fine flavour. Fit for table September 10.
Pike's Peak	A very strong grower and very productive. Very solid, flesh dry, sweet, fine-grained, good. Fit for use September 10.
Golden Bronze	Vine a strong grower and productive. Squash medium size, very thick fleshed. Flesh very sweet, fine-grained, dry and of extra fine flavour. Season September.
Marble-head	Vines vigorous and productive. Squash solid, thick fleshed, sweet, fine-grained and of very fine flavour. Season, September.
Chicago Warted Hubbard	Vines productive. Flesh very thick, sweet, fine-grained and of fine flavour. Season, September.

Sweet Corn.—Planted May 1.

Early Minnesota	Stalks 4½ to 5 feet high, often two good ears on a stalk. Fit for table August 23. Ears 4 to 6 inches long, well filled, corn sweet and fine flavoured.
Early Crosby	Stalks 5 feet high and fairly productive. Fit for table August 26. Ears rather small but very well filled with very sweet, fine flavoured corn.

SAMPLES DISTRIBUTED.

It is gratifying to observe the increase in the interest taken in the work of the farm. This is evident from the increase in the correspondence and the large number of requests for seed grain, nuts and other tree seeds, as well as for scions of fruit trees.

Packages of scions and cuttings	384
3 lb. samples of potatoes	310
3 " oats	163
3 " pease	148
3 " wheat	217
3 " barley	128
Nut and tree seeds, bulbs, &c	213
Total	1,563

CORRESPONDENCE.

Number of letters received, 2,767; number of letters sent out, 2,570.

APPLES.

The season in the spring was unfavourable. The weather was cold and showery, and although the trees were full of bloom, many varieties did not set fruit, and the crop has been light in most cases. The quality, however, was better and the fruit freer from scab than in previous years. The following new varieties fruited for the first time this year :—

1. *James Welch.* Tree a strong grower. Fruit large, oblong, conical. Stalk short, cavity narrow and shallow, calyx small, basin narrow, shallow and ribbed. Skin pale yellowish green, with many grey dots sprinkled over the whole surface. Flesh coarse, white, not juicy, sharply acid. A good cooking apple. Season August.

2. *Summer Rose.*—Tree a slow grower. Fruit small, round. Stalk medium in length, slender. Calyx small, closed. Basin smooth, medium, deep and wide. Skin clear yellow, with a bright red cheek. Flesh white, tender, juicy, sprightly, with a very pleasant flavour. Season August.

3. *Sweet Russet.*—Tree a strong grower. Fruit small, oblate. Stem long and slender. Cavity wide and deep. Calyx closed. Basin wide and shallow. Skin russet, with a russet red cheek. Flesh white, moderately juicy, sweet and pleasant. Season September.

4. *Reine des Pommes.*—Tree a moderate grower. Fruit of medium size, conical. Stalk short, slender. Cavity deep and narrow. Calyx small, closed. Basin narrow and shallow. Skin pale yellow, striped with bright red. Flesh white, crisp, fine-grained, pleasant, sprightly, acid, of good flavour. Season August.

5. *Avista.*—Tree a strong grower. Fruit of medium size, roundish oblate. Stalk medium in length and slender. Cavity round and shallow. Calyx large, closed. Basin wide and shallow. Skin yellowish white, striped and splashed with bright red. Flesh white, firm, crisp, juicy, pleasant and sub-acid. Season early September.

6. *Yorkshire Greening.*—Tree a strong grower. Fruit above medium size, oblate, somewhat ribbed. Stem short. Cavity small. Calyx medium, open. Basin shallow. Skin greenish yellow, with stripes of dull red and small patches of russet. Flesh yellowish white, firm, crisp, moderately juicy, sub-acid. Season early.

7. *Kerry Pippin.*—Tree a vigorous grower. Fruit of medium size, roundish, oblong. Stalk long and slender. Cavity small. Calyx small, closed. Basin small. Skin pale yellow, with sometimes a faint blush in the sun. Flesh yellowish, tender, crisp, moderately juicy, rich, sugary, with a pleasant flavour Season October.

8. *Golden Spire.*—Tree a moderate grower. Fruit of medium size, oblong, conical, somewhat ribbed. Stem short, slender. Cavity deep and narrow. Calyx large, closed. Basin shallow, narrow and ribbed. Skin bright golden yellow, occasionally with a blush on the sunny side. Flesh white, juicy, tender, mild and pleasantly acid. Season September.

9. *Steward.*—Tree a poor grower. Fruit of medium size, globular. Stem short. Cavity very small and shallow. Calyx large and open. Basin wide and deep. Skin greenish yellow, with red stripes on sunny side. Flesh white, crisp juicy, nearly sweet, with a pleasant flavour. Season September.

10. *Gold Ridge Seedling.*—Tree a free grower. Fruit below medium size, roundish, oblate. Stem long, slender. Cavity medium to large. Calyx small, closed. Basin narrow and shallow. Skin dull, greenish yellow, with sometimes a faint blush. Flesh white, crisp, juicy, pleasantly sub-acid. Season September.

11. *Winter Golden.*—Tree a vigorous grower. Fruit medium to small, roundish, oblate. Stem slender. Cavity narrow and deep. Calyx small, closed. Basin narrow and of medium depth. Skin clear golden yellow, with sometimes a faint blush in the sun. Flesh yelowish white, moderately juicy, sweet and of pleasant flavour. Season September.

12. *Northern Dumpling.*—Tree a vigorous grower. Fruit above medium size, conical, ribbed. Stalk short, cavity small, calyx medium and closed. Basin deep and corrugated. Skin yellowish white, nearly overspread with dull red and sprinkled with small russet dots. Flesh white, crisp, juicy, sprightly with a pleasant flavour. Season October.

13. *Looker Winter.*—Tree a vigorous grower. Fruit medium to small, globular. Stalk short and slender. Cavity small. Calyx large, closed. Basin wide, shallow and corrugated. Skin yellow with stripes and splashes of deep red. Flesh yellowish, crisp, mildly sub-acid. Season October.

14. *Brierly Wood.*—Tree a strong grower. Fruit small to medium, globular. Stem short. Cavity deep and narrow. Calyx small, closed. Basin deep and narrow. Skin russet yellow, with a faint reddish blush in the sun and sprinkled with russet dots. Flesh white, tender, a little granular, moderately juicy, mildly sub-acid with a pleasant flavour. Season October.

15. *President de Fays du Monceau.*—Tree a vigorous grower. Fruit large, oblate, a little conic. Stalk short, slender. Cavity small. Calyx closed. Basin narrow and deep. Skin yellow with a little red in the sun. Flesh yellowish white, crisp, tender, mild, nearly sweet. Season October and November.

16. *Imperial.*—Tree a moderate grower. Fruit of medium size, conical. Stalk medium. Cavity shallow and wide. Calyx medium and closed. Basin shallow. Skin greenish yellow, striped with dull red. Flesh white, juicy, tender and pleasantly sub-acid. Season October and November.

17. *Clarke's Pearmain.*—Tree a strong grower. Fruit medium or below, roundish oblate, slightly conical. Stalk short. Cavity small. Calyx small, closed. Basin small. Skin greenish yellow, nearly covered with dull red and many russet dots. Flesh yellow, firm, crisp, sweet and pleasant. Season November.

18. *Calville de Maussion.*—Tree a vigorous grower. Fruit of medium size. Stalk short. Cavity deep and wide. Calyx small, closed. Basin small and corrugated. Skin yellowish with a faint blush on sunny side. Flesh white, crisp, juicy, sprightly, pleasant. Season November.

19. *Hoary Morning.*—Tree a strong grower. Fruit large, flattish, conic. Stalk short. Cavity deep and wide. Calyx small, closed. Basin small. Skin pale yellowish green splashed with red, and with a thin white bloom. Flesh white, firm and briskly sub-acid. Season November.

20. *Friandise.*—Tree a vigorous grower. Fruit of medium size, oblong, oval. Stem short. Cavity small. Calyx small, closed. Basin narrow and shallow. Skin green, nearly covered with stripes and splashes of dull red, and a few small patches of russet. Flesh white, firm, juicy and pleasantly sub-acid. Season November and December.

21. *Cornish Gilliflower.*—Tree a strong grower. Fruit of medium size, roundish, conical. Stalk short. Cavity narrow and shallow. Calyx small, closed. Basin narrow and shallow and plaited. Skin greenish yellow, nearly covered with red. Flesh yellowish, tender, moderately juicy, aromatic and pleasantly sub-acid. Season November.

22. *Ash-leaved Reinette.*—Tree a vigorous grower. Fruit of medium size or below medium, roundish, conical. Stem short, slender. Cavity deep and narrow. Calyx small, closed. Basin small. Skin yellowish, with a bright red cheek in the sun. Flesh yellowish, firm, crisp, moderately juicy, pleasantly sub-acid. Season November.

23. *Forfar Pippin.*—Tree a vigorous grower. Fruit medium to large, roundish, globular, ribbed. Stem long. Cavity deep and wide. Calyx large, with an open basin, wide, shallow and corrugated. Skin dull greenish yellow, liable to be scabby. Flesh yellowish, firm, crisp, sprightly. Season November and December.

24. *De Sermoise.*—Tree a feeble grower. Fruit of medium size, globular, slightly conical. Stem short. Cavity medium. Calyx small, closed. Basin wide and shallow. Skin greenish yellow, striped with deep red. Flesh white, crisp, firm, juicy and of a pleasant flavour, mildly sub-acid. Season December.

25. *Castle Major.*—Tree a slow grower. Fruit of medium size, oblate, conical. Stem short. Cavity medium to small. Calyx small, closed. Basin small. Skin greenish yellow, with a dull red cheek and sprinkled with whitish dots. Flesh firm, juicy and briskly acid. Season December.

26. *Wm. Penn.*—Tree a moderate grower. Fruit small, round, flat. Stem short. Cavity deep and narrow, a little russeted. Calyx small, closed. Basin wide, shallow, corrugated. Skin yellow, with a red cheek. Flesh yellowish, crisp, juicy, sub-acid, with a pleasant flavour. Season December.

27. *Reinette Titus.*—Tree a moderate grower. Fruit above medium size, globular. Stem short. Cavity deep and narrow. Calyx small, closed. Basin narrow. Skin greenish yellow, with considerable russet about the stem, and a bronze red cheek, sprinkled with light dots. Flesh firm, yellowish, juicy, a mild pleasant acid. Season December.

28. *Shackleford.*—Tree a strong grower. Fruit of medium size, conical. Stem of medium length. Cavity moderately deep and wide. Calyx small, open. Basin wide and shallow. Skin yellow, with stripes and splashes of red in two shades. Flesh white, crisp, tender, juicy, mildly sub-acid, with a pleasant flavour. Season December.

29. *Reinette Gris du Portugal.*—Tree a strong grower. Fruit of medium size, oblate. Stalk short. Cavity wide and shallow. Calyx small, closed. Basin narrow and deep. Skin a russet brown, with many dots. Flesh firm, juicy, mildly acid, with a pleasant flavour. Season December.

30. *Reinette de Madère.*—Tree a strong grower. Fruit of medium size, conical. Stalk short. Cavity narrow and shallow. Calyx small, closed. Basin narrow and moderately deep, corrugated. Skin dull russet green, with a little russet about the stalk. Season January.

31. *Green Reinette.*—Tree a strong grower. Fruit below medium size, oblate, flattened at stem. Stem short. Cavity narrow and shallow. Calyx small, closed. Basin shallow and narrow. Skin yellowish with a bronze red cheek and a little ribbed about calyx. Season January.

32. *Duke of York.*—Tree a poor grower. Fruit of medium size, oblate. Stem moderately long. Cavity wide and deep. Calyx large and open. Basin wide and shallow. Skin green, striped and splashed with dull red and a few grey specks. Flesh crisp, white, juicy and pleasantly acid. Season winter.

33. *American Beauty.*—Tree a strong grower. Fruit of medium size, roundish inclining to conic. Stalk of medium length and slender. Cavity medium, with russet. Calyx small, closed. Basin of medium depth. Skin yellow, nearly covered with dark red. Flesh white, juicy, mildly sub-acid, with a pleasant slightly aromatic flavour. Season winter.

34. *Bow Hill Pippin.*—Tree a medium grower. Fruit of medium size, globular, slightly angular. Stem short. Cavity narrow, shallow. Calyx closed. Basin wide and deep. Skin greenish yellow, with a brownish red cheek and a few grey dots. Flesh crisp, white and mildly acid. Season winter.

35. *Calville Rose.*—Tree a strong grower. Fruit of medium size, oblong, conical and ribbed. Stalk short. Cavity deep and wide. Calyx closed. Basin narrow and shallow and deeply corrugated. Skin yellow with a dull red cheek. Season late winter.

36. *Reinette Tardive.*—Tree a strong grower. Fruit of medium size, oblate, conical. Stem short. Cavity small. Calyx small, closed. Basin narrow and flat, slightly corrugated. Skin yellow, with a brownish red cheek and many grey dots. Season late winter.

37. *Reinette de Breda.*—Tree a strong grower. Fruit of medium size, oblate, conical, a little angular. Stem short. Cavity narrow and shallow. Calyx large, open. Basin wide and shallow, somewhat corrugated. Skin greenish yellow, with a red blush and sprinkled freely with grey dots. Season late winter.

38. *Grillot.*—Tree a vigorous grower. Fruit small, oblong, globular. Stem long. Cavity wide and deep. Calyx large, open. Basin wide and deep. Skin golden yellow, with a warm blush. Season late winter.

39. *Grande Breitache.*—Tree a strong grower. Fruit of medium size, oblate. Stem short. Cavity shallow. Calyx closed. Basin wide and shallow. Skin yellow, with pale red streaks and splashes and a few dark brown specks, inclined to be scabby. Season late winter.

40. *Reinette de Willy.*—Tree a strong grower. Fruit above medium size, oblate, a little angular. Stem long. Cavity deep and wide. Calyx large, closed. Basin wide, shallow and corrugated. Skin greenish yellow, with a faint blush on sunny side and sprinkled with white dots. Season late winter.

41. *Reinette de la Rochblin.*—Tree a strong grower. Fruit medium to large, globular. Stem short. Cavity narrow and deep. Calyx small, closed. Basin wide and deep. Skin russet green, with a reddish brown cheek, and a few gray dots. Season late winter.

42. *Bayard.*—Tree a vigorous grower. Fruit large, conical. Stem short. Cavity narrow and deep. Calyx small, closed. Basin deep and narrow. Skin yellow, with a small blush, a little reddish russet about the calyx and a few white dots. Season late winter.

43. *Golden Queen.*—Tree a strong upright grower. Fruit small, conical. Stem short. Cavity small. Calyx small, closed. Basin narrow and shallow. Skin golden yellow, with a red cheek and sprinkled with white dots. Season late winter.

44. *Reinette de Damason.*—Tree a moderate grower. Fruit small, roundish, oblate. Stem long, slender. Cavity small. Calyx small, closed. Basin shallow and narrow. Skin bronze russet, with a red cheek. Season winter.

45. *Oelkofen Pippin.*—Tree a feeble grower. Fruit small, round flat. Stem short. Cavity narrow and deep. Calyx large, open. Basin wide and shallow. Skin golden yellow, nearly overspread with deep red. Season winter.

46. *Ohio Nonpareil.*—Tree a medium grower. Fruit large, roundish, oblate. Stem short. Cavity small. Calyx medium and open. Basin narrow and deep. Skin clear yellow, with a bright, clear red cheek. Season winter.

47. *Greaves' Pippin.*—Tree a feeble grower. Fruit of medium size, roundish, oblate, ribbed, somewhat angular. Stem short. Cavity medium, deep and wide. Calyx medium, closed. Basin wide and shallow. Skin dull yellow, with a few russet dots. Season winter.

48. *Poorhouse.*—Tree a strong grower. Fruit above medium size, roundish, oblate, a little conical. Stem short and stout. Cavity moderately deep and wide. Calyx large, partly open. Basin small. Skin yellow, with a faint blush in the sun and a few russet dots. Season late winter.

49. *Nero.*—Tree a strong upright grower. Fruit below medium size, roundish, oblate. Stalk slender and short. Cavity narrow and shallow. Calyx small, closed. Basin wide, flat and corrugated. Skin yellowish white, nearly covered with bright red russet in cavity about stem, and a few yellowish dots. Season winter.

PEARS.

The pear trees made a strong healthy growth in 1902, and were very full of bloom this spring, but the weather was cold and wet all the time of blossoming, and the fruit failed to set. A few varieties bore good crops, but a few specimens were the rule on most trees and no fruit at all on many varieties. Bartlett, La France, Dr. Jules Guyot, Clairgeau, Bosc and Emile de Heyst gave fair crops. The Emile de Heyst is one of the most satisfactory of the late autumn pears, being a reliable cropper and of very fine quality.

The following new sorts fruited for the first time:—

1 *Hutcherson.*—Tree a strong grower and an early and free producer. Fruit of medium size, broad at calyx and tapering to the stem. Stem one inch long and slender. Skin greenish yellow, with a few small gray dots. Flesh white, juicy, melting, sweet with no pronounced flavour. Season early August.

2. *July Doyenne.*—Tree a medium grower and not productive. Fruit below medium, obovate pyriform tapering to stem which is about an inch long. Calyx small, open. Basin shallow and open. Skin greenish yellow, with a dull reddish cheek. Flesh whitish, sweet, moderately juicy and a little gritty. Season August.

3. *Red Bergamot.*—Tree a poor grower and not productive. Fruit below medium size and nearly round. Stem medium in length. Calyx small, open. Basin wide, shallow. Skin pale yellow, with a dull red over most of the surface. Flesh yellowish, juicy, soft, sweet with a pleasant flavour. Season early September.

4. *Bergamot d'Ete.*—Tree a moderate grower and an early bearer. Fruit of medium size, obtuse, pyriform. Stem short. Cavity moderately deep. Calyx small, open. Basin wide, shallow. Skin yellow, freely sprinkled with gray dots, and with a bronze red cheek. Flesh yellowish, juicy, fine grained, buttery, sweet, with a good flavour. Season September.

5. *Beurre Amande.*—Tree a vigorous grower, but a poor producer. Fruit of medium size, acute, pyriform. Stalk moderately long, slender, curved. Calyx medium and open. Skin russet green. Flesh white, juicy, buttery, sweet with a pleasant flavour. Season September.

6. *Yat.*—Tree a moderate grower, and a poor bearer. Fruit small, obovate, pyriform. Stem short. Calyx large, open. Skin light green, with a few pale greenish spots. Flesh white, juicy, sweet, tender; decays very soon after ripening. Season September.

7. *Honey.*—Tree a vigorous grower. Fruit of medium size, roundish, pyriform. Stalk short and stout. Calyx open. Basin wide and shallow. Skin yellow, with a reddish cheek, and sprinkled with russet dots. Flesh a little coarse, not very juicy, sweet, with a pleasant flavour. Season September.

8. *Sutton's Great Britain.*—Tree a vigorous grower. Fruit large, obtuse, pyriform. Stem medium in length and stout, set in a narrow small cavity. Calyx large, open. Basin shallow. Skin yellow with a small red cheek and patches of russet, with many russet dots. Flesh white, juicy, a little coarse, sweet, with a pleasant flavour. Season September.

9. *Baronne de Mello.*—Tree a moderate grower. Fruit of medium size, acute pyriform, curved. Stem long, curved and fleshy at base. Calyx medium and closed. Skin yellow, with a reddish cheek and many russet dots. Flesh whitish, a little coarse, juicy, sub-acid, vinous, very pleasant; quality good. Season October.

10. *Esperine.*—Tree a vigorous grower. Fruit medium to large, pyriform. Stalk short, stout, with a lip or enlargement on one side. Calyx small, closed. Flesh white, juicy, buttery, sweet, with a very pleasant flavour. Season October.

11. *Kopertscher.*—Tree a strong grower. Fruit of medium size, roundish, oblate, or nearly globular. Stalk short and slender. Calyx large, open. Skin yellowish green, with small patches of russet and many brown dots. Flesh white, juicy, buttery, sweet, with a very pleasant flavour. Season October.

12. *Beurre de Ghelin.*—Tree a vigorous grower. Fruit medium to large, oblong, oval. Stem short, stout. Calyx large, open. Skin yellowish, with a little russet in patches. Flesh yellowish, juicy, fine grained, sweet with a pleasant flavour. Season November.

13. *Duhamel du Monceau.*—Tree vigorous. Fruit of medium size, roundish, pyriform. Stalk long and set at an angle in a slight cavity. Calyx open. Skin

pale greenish yellow, with a bronze cheek in the sun and many brown dots. Flesh whitish, fine-grained, juicy, buttery, sweet, a little vinous, with a very pleasant flavour. Season November.

14. *Beurre Lade.*—Tree a moderate grower. Fruit above medium size, oblong, obtuse, pear-shaped. Stalk long, curved and set in a small depression. Calyx small. Basin shallow, with knobby edges. Skin yellow with a little red in the sun. Flesh white, fine-grained, juicy, very sweet, with a fine aromatic flavour. Season November.

15. *Olivier de Serres.*—Tree a strong grower. Fruit above medium size, with a roundish form. Stem of medium size. Cavity moderately wide, shallow. Calyx large, open. Basin wide and shallow. Skin yellow, with patches of russet and sprinkled with reddish dots. Season winter.

16. *Vauquelin.*—Tree a strong grower. Fruit small, oblong, pyriform. Stem of medium length, stout, enlarged at the base. Calyx large, open. Skin russet yellow, with a dull red cheek. Season winter.

17. *Baronsbirne.*—Tree a vigorous grower. Fruit large, obovate, acute pyriform. Stalk long, curved, in a small cavity with a lip. Calyx large, open. Basin narrow and shallow. Skin pale greenish yellow, with many small reddish brown dots. Season winter.

18. *Colmar Dumortier.*—Tree a slow grower. Fruit of medium size, obtuse, pyriform. Stalk short. Cavity shallow, with a lip. Calyx small, open. Basin wide and shallow. Skin yellowish green, with dots and splashes of russet. Season winter.

19. *Franc-real.*—Tree a medium grower. Fruit small, roundish, pyriform. Stalk one inch long and set even. Calyx large, open. Skin dull yellow, with many brown dots and a bronze red cheek. Season winter.

20. *Charles Cognee.*—Tree a slow feeble grower. Fruit small ovate, obtuse, pyriform. Stalk of medium length, a little angular. Calyx small open. Basin narrow and shallow. Skin pale yellow, with a little russet about the stem and many brown dots. Season winter.

21. *Winter Jonah.*—Tree a medium grower. Fruit of medium size, roundish. Stalk one inch long, stout, and set in a very slight depression. Calyx large, open. Basin narrow and shallow. Skin pale yellow, with a faint blush on the sunny side, a few small dark greenish yellow spots, and many small gray dots. Season winter.

PLUMS.

The season has been a very poor one for this fruit. The spring was unfavourable and bad weather conditions prevailed from the time the trees were in bloom until the crop was ripe. Cold rains in blooming time prevented a free setting of fruit and frequent rains afterwards interfered with effectual spraying to protect the fruit from rot, which was very prevalent again this season. This was especially so on the Experimental Farm orchard, where there are so many varieties, some of which are very susceptible to rot, and these spread the spores to other trees, and cause injury to the fruit of varieties that are, or would be under more favourable conditions, almost, if not quite, free from the disease. Very few of those most recently planted have fruited this year; the trees have in most cases grown well, and many of them bloomed, but the fruit did not set. The most satisfactory sorts which have fruited are listed in the order of their ripening. All are vigorous growers and free producers and desirable fruits.

Clyman,	Cochet Pere,	Diamond,
Angelina,	Blue Apricot,	Bittern,
Burdette,	Belgian Purple.	Grand Duke,
Goliath,	Tragedy Prune,	Monarch,
Lincoln,	Sultan,	Italian Prune.
Mallard,	Mitchelson,	

The following varieties fruited for the first time :—

1. *Blue Rock.*—Tree a vigorous grower. Fruit of medium size, round, slightly flattened at stem. Stem short, inserted in a small cavity. Suture distinct. Skin dark purple, with a heavy whitish bloom and sprinkled with small gray dots. Flesh yellowish, juicy, sweet, with a rich pleasant flavour. Season middle of August.

2. *Reine Claude Davion.*—Tree a strong grower. Fruit below medium in size, globular. Suture short and shallow. Stem short and set in a small depression. Skin pale greenish yellow, with reddish purple spots. Flesh greenish yellow, sweet, juicy, with a pleasant flavour. Season middle of August.

3. *Apple.*—Tree a vigorous grower. Fruit large, round, heart-shaped. Suture deep and terminating in a point one side enlarged. Stem of medium length and set in a shallow depression. Skin deep glossy red with many small white dots. Flesh yellowish, stained with red, sweet, sprightly with a pleasant flavour. Season August.

4. *Late Prolific.*—Tree a strong grower. Fruit below medium size, globular. Suture very shallow and short. Stem medium size and no cavity. Skin dark purple, with a heavy bluish bloom. Flesh greenish yellow, juicy, with a pleasant flavour. Stone small. Season late August.

5. *Guthrie's Green Gage.*—Tree a vigorous grower. Fruit above medium in size. globular, one side enlarged. Skin greenish yellow, with a thin whitish bloom. Stem short. Cavity small and shallow. Flesh greenish yellow, juicy, sweet, with a fine flavour. Season last of August.

6. *Late Orange.*—Tree a strong grower. Fruit large, globular. Suture distinct. Stem short, in a narrow depression, one side enlarged. Skin deep orange, with a reddish cheek. Flesh juicy, tender, sweet, with a pleasant flavour. Season last of August.

7. *Late Black Orleans.*—Tree a vigorous grower. Fruit below medium in size. round. Suture distinct. Stem of medium length, set in small cavity. Skin black, with a thin blue bloom and sprinkled with brown dots. Flesh yellow, juicy, sweet, with a pleasant flavour. Season September.

8. *Kentish Diamond.*—Tree a medium grower. Fruit of medium size, oval, pointed at the apex. Suture distinct, one side enlarged. Stem of medium length. Skin black, with a light blue bloom. Flesh yellowish, rather coarse, not very juicy, sprightly. Season September.

9. *Brahy's Green Gage.*—Tree a strong grower. Fruit medium to large, roundish. Suture wide. Stem short and stout. Cavity wide. Skin greenish yellow, mottled with darker green, and a thick white bloom. Flesh yellowish green, juicy, sweet, with a pleasant flavour. Season September.

10. *Wyedale.*—Tree a strong, upright grower. Fruit of medium size, roundish, oval. Stem short. Cavity small. Suture distinct. Skin dark greenish purple, with a whitish bloom. Flesh greenish, juicy and sprightly. Season October.

CHERRIES.

As in the case of the other fruits, the cold, wet weather prevented the blossoms setting, and the small crop of sweet cherries which some trees produced were cracked and spoiled by the rains when they were maturing.

Very few of the young trees blossomed, and only one or two produced fruit.

1. *Bigarreau Jaboulay.*—Tree a strong grower. Fruit very large, blunt, heart-shaped. Stem long and set in a shallow depression. Skin dark glossy red. Flesh and juice red, tender, sweet, juicy, with a very fine flavour. Last of June.

2. *Amarelle Hative.*—Tree a slender, vigorous grower. Fruit below medium size, roundish. Stem long and set in a narrow depression. Skin deep glossy red. Flesh and juice red, tender, juicy, sprightly, very pleasant. Season last of June.

3. *Brindilles.*—Tree a low slender grower. This variety has blossomed for two years in middle of June, and the fruit ripens late in August. The two trees are healthy and vigorous. Fruit of medium size, round, depressed or oblate. Stem long, set in a narrow depression. Skin light, clear red. Flesh reddish, tender, juicy, sprightly. Ripe last of August.

PEACHES, APRICOTS AND NECTARINES.

The few trees of these fruits which remain have bloomed freely both on the mountain and on the level land, but there was no fruit.

QUINCES.

Portuguese.—This variety makes a vigorous growth, and fruited last year and again this season. It is promising, as the fruit is fine, and having fruited in two unfavourable years in succession, it is likely to be a regular bearer. It is the only one of the quinces tried which has produced fruit, although several varieties were planted in the spring of 1890, and have grown to be fairly large bushes.

MEDLARS.

All varieties of this fruit produced crops again this year.

GRAPES.

The grapes were very late in starting growth this season and late in blossoming. Nearly all the vines produced fruit, but owing to the late spring and cool wet autumn, even the earliest sorts did not ripen.

MULBERRIES.

As usual the mulberry trees were full of fruit, which is very much appreciated by the robins.

MOUNTAIN ORCHARDS.

The fruit trees on the mountains continue to make a strong growth, and a few of the apple trees produced fruit this season, but being so far isolated and unprotected, birds and wild animals destroy much of the fruit. As it has been clearly demonstrated that fruit trees as well as nut trees do well on these lower hills this will be a guide to many who may be able to preserve and protect trees in such situations.

NUT ORCHARDS.

The English and American black walnuts produced a small crop of nuts this year, and the Japanese walnut and the heart-shaped walnut gave fine crops. All of these nuts are being distributed to planters throughout the province, and many report very fair success in growing the young trees.

SMALL FRUITS.

The crop of small fruits was fairly good this year, although a little later than usual.

YELLOW AND RED RASPBERRIES.

There are now under test here seventy-three varieties of red and yellow raspberries. These have all been described in previous reports.

After several years' trial under similar conditions, the following varieties have proved the best: In quality Sarah is superior to all the others, and equal to any in productiveness, although it is not quite so firm as Cuthbert.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Red Phœnix	June 28	Vigorous	Large	Firm, good quality	Productive.
New Fastolf	July 4	"	"	" "	"
Duke of Brabrant	" 4	"	"	" "	"
Northumberland Fill Basket.	" 4	"	Very large	" "	"
Belle de Fontenay	" 5	"	Large medium	" "	"
Sarah	" 6	"	"	Very good quality	"
Lord Beaconsfield	" 7	"	Large	Firm, good quality	"
London	" 7	"	Large medium	" "	"
All Summer	" 9	"	Large	" "	"
Cuthbert	" 9	"	"	" "	"
R. B. Whyte	" 10	"	"	" "	"
French Vice-President	" 10	"	"	" "	"
Shaffers Colossal	" 10	"	"	Purplish red; firm; acid, fair quality.	"
Yellow Golden Queen	" 6	"	"	Firm, good quality	"
Large Yellow	" 7	"	"	" "	"

BLACK CAP RASPBERRIES.

Nineteen varieties of Black Cap raspberries are under test.

Black Caps are rather an uncertain crop. They require very rich ground and moisture, as well as sunshine when the berries are growing and ripening.

The following are the best which have been tried here:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Nemaha	July 10	Vigorous	Large	Good quality	Productive.
Conrath	" 10	"	" medium.	"	"
Older	" 10	"	" "	"	"
Kansas	" 10	"	" "	"	"
Palmer	" 11	"	Medium	"	"
Gregg	" 11	"	Large	"	"
Progress	" 11	"	" medium.	"	"
Mammoth Cluster	" 12	"	"	"	"
Ida	" 12	"	" medium.	"	"

BLACKBERRIES.

The blackberries were a good crop this year. There are twenty-nine varieties of this fruit under trial here; of these the following are the best, named in the order of merit:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Eldorado	July 22	Vigorous	Large	Sweet; melting; no core.	Productive.
Stone's Hardy	" 22	"	"	Very good quality	"
Erie	" 24	"	"	" "	"
Maxwell	" 28	"	"	" "	"
Early King	" 15	"	"	" "	"
Snyder	" 20	"	" medium.	" "	"
Agawam	" 26	"	"	" "	"
Taylor	" 25	"	"	" "	"
Hansel	" 20	"	"	" "	"

The only blackberry fruiting this year for the first time was the Rathburn, July 20. A weak grower. Fruit small to large, of medium quality, sweet, moderately productive.

RED AND WHITE CURRANTS.

The crop of currants as a whole was rather light. Of the forty-two varieties under test, the following are the best:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Red Cherry	July 4.	Vigorous	Large	Very good quality	Productive.
London	" 4.	"	Large medium	Good quality	"
Raby Castle	" 4.	"	"	"	"
Pomona	" 4.	"	"	"	"
La Fertile	" 4.	"	"	"	"
La Conde	" 5.	"	"	"	"
Prince Albert	" 6.	"	"	"	"
White Cherry	" 8.	"	"	"	"
Red Gondoin	" 10.	"	"	"	"
Large, white Brandenburg	" 10.	"	"	"	"
Victoria	" 10.	"	"	"	"
White Pearl	" 10.	"	"	"	"

BLACK CURRANTS.

Fifty-one varieties of black currants are under test here. Of these the following are the best:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Dominion	July 10.	Vigorous	Large medium	Good quality	Productive.
Merveille de la Gironde	" 10.	"	"	"	"
Boskoop Giant	" 10.	"	Very large	Very good quality	"
Prince of Wales	" 10.	"	Large	Good quality	"
Middlesex	" 10.	"	"	"	"
London	" 12.	"	Large medium	"	"
Victoria	" 12.	"	"	"	"
Baldwin	" 12.	"	"	"	"
Black Naples	" 12.	"	"	"	"
Lee's Prolific	" 12.	"	"	"	"
Pearce	" 12.	"	"	"	"
Pomona	" 12.	"	Large	"	"
Climax	" 12.	"	Large medium	"	"

METEOROLOGICAL RECORD.

Date of Highest Temperature.	Temperature.	Date of Lowest Temperature.	Temperature.	Rainfall.	Snowfall.	Sunshine.	
1902.	°		°	Inches.	Inches.	Hours.	Minutes.
December 1	50	December 10	27	6·74	6	17	12
1903.							
January 2	53	January 26	26	4·49	9	41	42
February 19	52	February 2	21	1·04	0	130	18
March 27	62	March 11	18	4·04	20	131	12
April 28	65	April 22	30	5·30		89	30
May 30	76	May 14	36	3·58		128	54
June 9	93	June 6	46	6·00		159	00
July 11	89	July 8	44	2·30		184	18
August 10	85	August 27	44	5·08		132	54
September 18	75	September 30	35	7·30		106	00
October 24	68	October 14 and 15	33	2·71		111	24
November 2	54	November 17	22	3·31	11	32	12
		Totals		51·89	46	1,264	36

Although the season has been so showery during haying and harvest, the rainfall has for the whole year been below the average.

I have the honour to be, sir,

Your obedient servant,

THOMAS A. SHARPE.

STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS FOR THE YEAR ENDING JUNE 30, 1903.

CENTRAL EXPERIMENTAL FARM—EXPENDITURE, 1902-3.

Live stock	$ 1,146 08
Feed for stock, including supplies from experimental plots, $295.50.	1,496 43
Veterinary services and drugs	64 06
Seed grain seeds, trees, &c	446 21
Implements, tools, hardware and supplies	708 67
Drainage and drain tiles	1,958 06
Manure and fertilizers for experimental plots and horticultural department	310 42
Travelling expenses	1,651 66
Exhibition expenses, including value of grain held over for exhibitions	723 33
Blacksmithing, harness supplies and repairs	379 54
Bee department	218 47
Salaries of officers engaged in the general work of the farms, proportion chargeable to the Central Farm	1,792 49
Wages, farm work, including experimental work with grain and other farm crops; also salaries of officers in charge	6,840 84
Wages, care of stock	3,087 45
Chemical division, proportion chargeable to Central Farm	1,412 90
Botanical and Entomological division, proportion chargeable to the Central Farm	1,442 56
Horticultural division, including salary of officer in charge	5,110 92
Poultry division, including all supplies; also salary of officer in charge	1,992 04
Forestry division and care of grounds	1,335 81
Arboretum, including drawing and spreading of 380 loads of gravel on roads	1,892 03
Distribution of trees and tree seeds, including $85.58 value of tree seeds supplied by Brandon and Indian Head Farms	157 74
Office help, correspondence branch and messenger service	4,018 71
Printing of office supplies and stationery	826 68
Seed testing and care of greenhouses	1,019 39
Dairy branch, including wages of dairyman	715 27
Contingencies, including $104 for 197 loads of gravel and work on roads	320 34
Books and newspapers	104 35
Telegrams and telephones	144 06
Steers purchased for feeding experiments	2,787 85
	$ 44,104 36
LESS—Proceeds of sale of steers purchased for feeding experiments	4,082 00
	$ 40,022 36

EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1902-3.

Live stock	$	205 68
Feed for stock		1,816 77
Veterinary services and drugs		26 68
Seed grain, seeds, trees, &c.		27 17
Implements, tools, hardware and supplies		261 57
Manure and fertilizers		70 60
Travelling expenses		168 19
Exhibition expenses		269 90
Blacksmithing, harness supplies and repairs		63 21
Salary of Superintendent, including proportion of salaries for general work, Ottawa		2,545 62
Wages, farm work, including experimental work with farm crops		2,109 48
Wages, care of stock		1,353 08
Chemical division, proportion chargeable to each branch farm		824 19
Botanical and Entomological division, proportion chargeable to each branch farm		586 25
Poultry branch		89 87
Horticultural division, including experimental work with vegetables, fruits, forest and ornamental trees and flowers; also care of grounds and salary of officer in charge		1,408 68
Distribution of seed grain, potatoes, &c		198 14
Contingencies, including postage, $105; mail delivery, $82.50		237 50
Printing and stationery		23 57
Books and newspapers		23 50
Telegrams and telephones		19 05
Drainage and drain tiles		11 25
Steers purchased for feeding experiments		990 00
	$	13,329 95
LESS—Proceeds of sale of steers purchased for feeding experiments		1,830 00
	$	11,499 95

EXPERIMENTAL FARM, BRANDON, MAN.—EXPENDITURE, 1902-3.

Live stock		$	244 67
Feed for stock			182 07
Veterinary services and drugs			21 65
Seed grain, trees, seeds, &c.			33 86
Implements, tools, hardware and supplies			746 49
Travelling expenses			124 26
Exhibition expenses			185 16
Blacksmithing, harness supplies and repairs			218 10
Bee department			13 84
Salary of Superintendent, including proportion of salaries for general work, Ottawa			2,545 62
Wages, farm work, including experimental work, with farm crops, &c.			2,347 91
Wages, care of stock			929 00
Chemical division, proportion chargeable to each branch farm			824 19
Botanical and Entomological division, proportion chargeable to each branch farm			586 25
Horticultural branch, including experiments with vegetables, fruits and flowers; also care of arboretum and grounds			502 64
Forestry branch, including care of hedges			360 50
Poultry branch			62 62
Office help, including delivery of mail, $110			689 99
Distribution of seed grain, potatoes, &c			225 90
Distribution of trees and tree seeds			306 81
Contingencies, including postage, $243.06			268 82
Printing and stationery			37 50
Books and newspapers			18 00
Telegrams and telephones			30 43
Drainage and drain tiles			53 50
Manure and fertilizers			239 25
Steers purchased for feeding experiments			474 17
		$	12,273 20
LESS—Proceeds of sale of steers purchased for feeding experiments	$ 566 05		
Value of grain supplied for seed distribution at Ottawa	125 48		
			691 53
		$	11,581 67

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE, 1902-3.

Live stock		$ 37 16
Feed for stock		39 20
Veterinary services and drugs		45 35
Seed grain, seeds, trees, &c		13 70
Implements, tools, hardware and supplies		919 83
Travelling expenses		143 13
Exhibition expenses		19 83
Blacksmithing, harness supplies and repairs		111 95
Salary of Superintendent, including proportion of salaries for general work, Ottawa		2,545 62
Wages, farm work, including experimental work with farm crops		2,958 99
Wages, care of stock		819 90
Chemical division, proportion chargeable to each branch farm		824 19
Botanical and Entomological division, proportion chargeable to each branch farm		586 25
Horticultural branch		388 53
Poultry branch		67 13
Forestry branch, including hedges		65 00
Office help, including delivery of mail		594 54
Distribution of seed grain, potatoes, &c		596 42
Distribution of trees and tree seeds		101 25
Contingencies, including postage, $378.38		479 98
Printing and stationery		50 79
Telegrams and telephones		37 90
Manure and fertilizers		37 00
Books and newspapers		6 00
Steers purchased for feeding experiments		700 87
		$ 12,190 51
LESS—Proceeds of sale of steers purchased for feeding experiments	$ 909 30	
Value of grain supplied for grain distribution at Ottawa	712 64	
		1,621 94
		$ 10,568 57

EXPERIMENTAL FARM, AGASSIZ, B.C.—EXPENDITURE, 1902-3.

Live stock	926 30
Feed for stock	76 74
Veterinary services and drugs	6 30
Seed grain, seeds, trees, &c	105 19
Implements, tools, hardware and supplies	348 39
Manure and fertilizers	160 06
Travelling expenses	124 29
Exhibition expenses	323 44
Blacksmithing, harness supplies and repairs	80 56
Salary of Superintendent, including proportion of salaries for general work, Ottawa	2,545 61
Wages, farm work, including experimental work with farm crops, vegetables, fruit trees, vines, &c	2,445 23
Wages, care of stock	542 96
Chemical division, proportion chargeable to each branch farm	824 19
Botanical and Entomological division, proportion chargeable to each branch farm	586 25
Poultry branch	70 30
Forestry branch, including care of hedges	134 40
Office help	112 50
Distribution of seed grain, potatoes, &c	160 74
Distribution of trees and tree seeds	2 00
Clearing land	596 40
Contingencies, including postage, $110.22	155 63
Printing and stationery	0 70
Books and newspapers	21 50
Drainage and drain tiles	105 95
	$ 10,455 63

SUMMARY OF EXPENDITURE, 1902-3.

Central Experimental Farm		$ 40,022 36
Nappan "		11,499 95
Brandon "		11,581 67
Indian Head "		10,568 57
Agassiz "		10,455 63
Distribution of seed grain, potatoes, &c., from Central Experimental Farm, including value of grain supplied from Brandon and Indian Head Experimental Farms		5,871 82
Printing bulletins and distribution of bulletins and reports	$ 7,000 00	
Less special sum in estimates for this item	7,000 00	
		$ 90,000 00

SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND DECEMBER 31, 1903.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

19 Horses	$ 3,765 00
13 Ayrshire cattle	1,515 00
12 Guernsey cattle	1,330 00
11 Durham cattle (Shorthorns)	2,705 00
7 Canadian cattle	875 00
34 Grade cattle	875 00
31 Yorkshire swine	840 00
5 Berkshire swine	175 00
7 Tamworth swine	158 00
140 Grade swine	697 19
4 Large black swine	120 00
25 Shropshire sheep	665 00
9 Leicester sheep	245 00
1 Grade sheep	12 00
Farm machinery and implements	2,782 50
Vehicles, including farm wagons and sleighs	1,129 00
Hand tools, hardware and sundries	1,099 65
Harness	553 25
Dairy department, machinery, &c	510 00
Horticultural and forestry departments, implements, tools, &c	606 25
Botanical department, implements, tools, &c	4 95
Poultry department, 222 fowls	218 75
Poultry department, implements, furnishings, &c	113 30
Bees and apiarian supplies	454 78
Chemical department, apparatus and chemicals	1,875 00
Books in several departments	546 55
Greenhouse plants, supplies, &c	2,082 75
Furniture at Director's house	1,100 00
Office furniture and stationery	1,617 25
	$ 28,671 17

EXPERIMENTAL FARM, NAPPAN, N.S.

8 Horses	$ 1,085 00
5 Guernsey cattle	905 00
5 Holstein cattle	325 00
14 Ayrshire cattle	890 00
1 Jersey cow	50 00
48 Grade cattle	1,567 50
5 Yorkshire swine	120 00
3 Berkshire swine	70 00
52 Grade swine	290 00
16 Sheep	245 00
100 Fowls	60 90
Bees and apiarian supplies	10 30
Vehicles, including farm wagons and sleighs	386 50
Farm machinery	517 00
Farm implements	213 00
Hand tools, hardware and sundries	360 45
Harness	185 50
Furniture for reception room and bedroom for visiting officials	154 00
Furniture supplies and books for office	90 00
	$ 7,525 15

EXPERIMENTAL FARM, BRANDON, MAN.

12 Horses	$	1,075 00
3 Ayrshire cattle		150 00
5 Durham cattle		475 00
2 Guernsey cattle		150 00
7 Grade cattle		297 00
1 Tamworth pig		15 00
4 Berkshire swine		40 00
5 Yorkshire swine		50 00
1 Grade pig		5 00
93 Fowls		93 00
Bees and apiarian supplies		101 95
Vehicles, including farm wagons and sleighs		435 00
Farm machinery		2,126 33
Farm implements		654 00
Hand tools, hardware and sundries		643 75
Harness		218 50
Furniture for reception room and bedroom for visiting officials		161 55
Furniture supplies and books for office		286 30
	$	6,977 38

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

13 Horses	$	1,460 00
18 Durham cattle		1,625 00
19 Grade cattle		660 00
3 Berkshire swine		45 00
8 Tamworth swine		85 00
2 Yorkshire White swine		45 00
6 Grade swine		36 00
63 Fowls		63 00
Bees and apiarian supplies		25 75
Vehicles, including farm wagons and sleighs		576 00
Farm machinery		2,213 33
Farm implements		718 00
Hand tools, hardware and sundries		373 55
Harness		185 30
Furniture for reception room and bedroom for visiting officials		217 50
Furniture supplies and books for office		367 50
	$	8,695 93

EXPERIMENTAL FARM, AGASSIZ, B.C.

6 Horses	$	715 00
17 Durham cattle		1,275 00
14 Dorset horned sheep		127 50
8 Berkshire swine		110 00
3 Yorkshire White swine		85 00
76 Fowls		56 00
Bees and apiarian supplies		43 95
Vehicles, including farm wagons		207 50
Farm machinery		508 50
Farm implements		137 50
Hand tools, hardware and sundries		153 50
Harness		91 00
Furniture for reception room and bedroom for visiting officials		165 40
Furniture supplies and books for office		129 00
	$	3,804 85

THOS. M. CRAMP, *Accountant.*

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