APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE.

EXPERIMENTAL FARMS.

REPORTS

OF THE

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do	do	Brandon, Manitoba.	S. A. BEDFORD.
do	do	Indian Head, N.-W.T.	Angus MACKAY.
do	do	Agassiz, B.C.	Thos. A. SHARPE

FOR

1889.

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APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

OTTAWA, 29th January, 1890.

SIR,—I have the honour to submit herewith for your approval the following report relating to the work accomplished at the Central Experimental Farm in Ottawa, as well as that carried on at the Experimental Farms in the Maritime Provinces, Manitoba, the North-West Territories and British Columbia.

Appended you will also find reports from the following officers of the Central Farm: from the Chemist, Mr. Frank T. Shutt: from the Entomologist and Botanist, Mr. James Fletcher; from the late Horticulturist, Mr. W. W. Hilborn; and from the Poultry Manager, Mr. A. G. Gilbert. There are also presented reports of progress from Mr. Wm. M. Blair, Superintendent 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. A. 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 all of these there will, I trust, be found much information which will prove useful to the farmers of the Dominion and helpful to them in the work in which they are engaged, and which will aid in advancing the great agricultural interests of this country, of which you are the honoured head.

I have the honour to be, Sir,

Your most obedient servant,

WM. SAUNDERS.

The Honourable,
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS.

The progress made during the past year at the several Experimental Farms has been such as to attract the general attention of the agricultural community. The Central Experimental Farm, at Ottawa, on which work was begun in the spring of 1887, the farm for the Maritime Provinces, at Nappan, Nova Scotia, and that for the North-West Territories, at Indian Head, both of which were taken possession of in the spring of 1888, the Manitoba farm, at Brandon, on which work commenced during the summer of 1888, and the British Columbia farm at Agassiz, organized in August, 1889, have all been much visited by farmers, who have expressed themselves interested and gratified with what is being accomplished. Many useful experiments have been carried on, especially in those departments of farm work where reliable and positive information is most needed, and these experiments have been watched with much interest, especially by parties residing in the neighbourhood of the farms, many of whom have promptly taken advantage of the information which these tests have afforded.

Correspondence between the farmers of Canada and the Experimental Farms has greatly increased, and as it was intended from the outset to endeavour to make these institutions bureaus of information, where farmers should feel free to seek such advice as would aid them in carrying on their work, this gratifying increase in correspondence has been encouraged and the best efforts of the staff devoted to meet the demands for information. At the Central Experimental Farm alone there has been received during the year 6,864 letters, of which 3,653 have come to the Director, 1,700 to the Entomologist and Botanist, 359 to the Chemist, 247 to the Horticulturist, 195 to the Poultry Manager and 710 to the Accountant. The total number of letters despatched has been 5,428, and of pamphlets including reports and bulletins, 41,584, to which must be added 3,662 packages of grain and seeds, making a formidable total of mail matter. In the letters received, questions of the most varied character have been presented, some of them so difficult as to occupy much time in careful enquiry for their solution.

In addition to the work of organization on the several Experimental Farms, it has been my pleasure to visit many of the more important agricultural districts from the Atlantic to the Pacific for the purpose of ascertaining more fully the needs of farmers everywhere, noting the progress they are making and studying the advantages and disadvantages pertaining to the different climates and varied conditions of soil and situation under which farming operations are conducted in different parts of the Dominion. Invitations also have been freely extended to the officers of the Experimental Farms to attend the meetings of Farmers Institutes in the several Provinces and other gatherings of farmers, for the purpose of addressing them on agricultural topics and giving information regarding the work of the Experimental Farms. While I regret that it has been impossible for the members of the staff to meet all such demands upon their time, as many meetings have been attended in different parts of the country as could be reached in the time available for this purpose. Canadian farmers are making careful enquiries for more full and accurate information regarding the numerous and varied operations pertaining to their calling; they desire to have the mysteries which surround some of the operations of nature explained as far as this is practicable, and it is our object to foster and stimulate such a spirit of enquiry which will, it is believed, result in the speedy advancement of agriculture, and thus in material and lasting benefit to the country.

VISIT TO NEW BRUNSWICK.

In January I visited the Province of New Brunswick, with the object of meeting with some of the more progressive farmers of that Province, assembled under the auspices of the Local Government at the meeting of the "Provincial Farmers Association," held at Fredericton, on the 16th, 17th and 18th of that month. The meeting was attended by representative farmers from almost every county in the Province, nd much interest was taken in the proceedings. It was convened in the City Hall where the visitors were welcomed by the Mayor and aldermen. Lieutenant Governor Tilley was also present with other prominent citizens. During the afternoon, on invitation of the city authorities, a drive was taken to Marysville where an opportunity was afforded of inspecting the large cotton mill of Mr. Gibson and of seeing the town which his industries have built up. On returning to the city the address of the President of the Association, Mr. S. L. Peters, was delivered, which was full of practical suggestions and useful information, after which the Lieutenant-Governor, speaking not only for himself, but on behalf of the Government and citizens, warmly welcomed the visitors.

During the meetings much time was given to the consideration of dairying, sheep husbandry and fruit culture. Many practical papers were read, and the discussions which followed showed the keen interest which New Brunswick farmers are taking in these important subjects, while the facts brought out regarding the resources of the Province and its capabilities plainly indicated that there was plenty of room for extension in almost every department of farm industry. The farmers of that Province are evidently convinced of the fact that their climate and other conditions are such as to favor the production of excellent butter, and that by the introduction of improved dairy stock and the establishment of creameries their hay may be profitably consumed at home, and their lands enriched by the animal manures produced on their farms. Co-operation in the establishment of creameries was urged with much force as the only plan by which butter of uniformly good quality could be produced. The last census credits the Province with 103,965 milch cows, and allowing the average return from a cow to be $20, this produces the sum of $2,079,300. With good breeding and careful management this income might be greatly increased. The farmers were urged to keep more cows, to sell less hay and to combine together to make the best butter, such as would command high prices in the English and American markets. It was remarked that England imports annually more than $40,000,000 worth of butter, of which Canada furnishes about $700,000, while Denmark, with about half the population, supplies more than $13,000,000 worth. If Canadian butter was brought up uniformly to the high standard which has been gained by Canadian cheese, there would be no difficulty in disposing of any quantity of it. The rich pastures and cool moist climate of New Brunswick afford facilities for much progress in this direction.

In fruit growing New Brunswick has made considerable progress, there are many localities where apples can be grown to advantage, while small fruits, especially strawberries, do remarkably well, and on account of the cool summer climate, the later sorts ripen there after the glut of berries coming in from other districts is over, when good prices are usually obtained for them. Considerable quantities of fruit are now sent from this Province to the Boston market. Opportunities were given at the meetings of the Association both to Col. W. M. Blair, superintendent of the Experimental Farm at Nappan and myself, for explaining the objects for which the experimental farms were established and the progress which had been made in the work; a deep interest was manifested in this subject by those present and resolutions were adopted expressing appreciation of the immediate and future benefits which the farmers of Canada are likely to derive from these institutions.

VISIT TO NOVA SCOTIA.

During the following week the farmers of Nova Scotia were met at an Institute meeting, held at Amherst, N. S., where topics similar to those which had been taken

up at Fredericton were discussed with much enthusiasm. Improved dairying is making progress in Nova Scotia, where a Dairymen's Association has been organized and some fine herds of dairy cattle established. In addition to the butter and cheese made in this Province there is a condensed milk factory in Truro, where a large quantity of that useful product is made and canned. Much of it is supplied to sea-going vessels, and a considerable business in this line is carried on with the other Provinces in the Dominion. The trade in fat cattle is also on the increase, a good demand being found both in the local and foreign markets. The farmers here are more than ever awakened to the importance of feeding a large proportion of the hay produced on their fertile marsh lands to stock and with the manure thus obtained fertilizing the uplands, and by this means increasing their crops of grain, roots and fruit. Winter dairying and the subject of winter food for stock was warmly discussed, and the experience of some of the more advanced farmers with ensilage was given. Expensive silos are here no longer considered necessary; one farmer claimed that with forty dollars worth of lumber he could build a silo in his barn, which would hold enough ensilage to feed ten cows during the winter. Here also the importance of experimental farming and the action of the Government in establishing farms for the carrying on of systematic experimental work was warmly endorsed, and the hope expressed that as soon as possible after the farm buildings, then in course of erection at the Experimental Farm at Nappan, were completed, some first-class stock would be sent there, of such a character as would aid in improving the general dairy cattle of the Province.

I next visited the far-famed fruit regions in the Annapolis valley and attended a meeting of the Fruit Growers' Association of Nova Scotia, held in Wolfville, on the 16th, 17th and 18th of January, There was a very good attendance of the fruit growers of the district, and the time was profitably spent in discussing the results of the fruit crop of the past year, the most profitable varieties of fruit to grow in Nova Scotia, the capabilities of the province for the production of fruit, methods of storing, packing and shipping, the best markets for fruit and many other practical topics. The fruit interests in Nova Scotia are yearly becoming more important, and the area devoted to orchard is rapidly increasing, not only in the Annapolis valley but in many other parts of the province; for it is fast being demonstrated that good fruit can be profitably grown over large sections of Nova Scotia, while the facilities for reaching the European and American markets are unsurpassed. The association has done much to encourage fruit growing in the province, and by disseminating useful and reliable information to direct the efforts of those engaged in this work into profitable channels. Fruit growing here will admit of almost indefinite extension, and there seems no reason why apples, pears, plums, cherries and small fruits should not be more generally cultivated.

The relation of the Experimental Farms to horticulture was explained and some details given of the varieties of fruit now undergoing test at the Experimental Farm at Nappan. The importance of this work was promptly recognised and resolutions relating thereto unanimously passed.

MEETINGS ATTENDED IN ONTARIO.

During the first week in February the annual meeting of the Central Farmers Institute of Ontario was attended in Toronto. This is, without doubt, the most important and influential annual gathering of farmers in the province, where a large proportion of the Farmers Institutes scattered over the country are represented by some of their leading men. This meeting was largely attended, was continued for several days and the interest was maintained in the subjects under discussion to the last. A number of practical papers on topics of interest to farmers were read and ably discussed, the speakers generally showing by the way they handled the subjects that they possessed practical knowledge and a keen appreciation for information likely to be useful to them in their calling. An invitation was extended to the writer to explain to the meeting the progress being made in connection with the Canadian Experimental Farms, when some account was given of the work which was listened

to with much attention, and met with the hearty approval and endorsation of those present.

The following week the opportunity was afforded of attending the winter meeting of the Fruit Growers' Association of Ontario, held in Hamilton. The fruit growers of the western part of the Province were well represented and two days were profitably spent in the reading of papers and discussing the subjects provided on the programme, bearing mainly on the fruit industries of Ontario. This association has been largely instrumental in developing fruit growing in Ontario by holding meetings in different parts of the Province to discuss fruit topics, by the publication of lists of such varieties of fruit as are known to be profitable in the thirteen agricultural districts into which the Province has been divided, by encouraging the growing of the best varieties of fruit, so as to gain for Ontario fruit a leading place for quality in the markets of the world, and by distributing among its members every year some promising variety of new fruit for test. It also publishes an excellent monthly periodical, the Canadian Horticulturist, which is sent to its members free of cost. Twenty-one years ago when this association began its work almost every farmer growing fruit in Ontario had what might be called an experimental orchard with a large number of varieties, many of them late summer or autumn apples, which because they would not keep were rushed into the market and sold for what they would bring, no matter how small the price. Now all this is changed, farmers have become careful in planting their orchards and endeavour to so select the varieties as to have the great bulk of them long keepers; fall varieties have been top grafted with winter sorts and now the crop of early apples in a good year is not much in excess of the needs of the community, and if unusually abundant, the excess is readily disposed of in most fruit districts to the manufacturers of evaporated fruit. Much of this change has been wrought through the influence of the Fruit Growers Association of Ontario whose discussions and deliberations have been widely circulated among the people. The association combines with its practical discussions on fruit-growing the consideration of other horticultural topics, the creation of shelter belts and wind breaks for orchards, the cultivation of ornamental trees, shrubs and plants, and the occasional papers presented on the rose, the dahlia, the chrysanthemum, or some other favorite flower or on some group of ornamental shrubs or desirable ornamental trees, and the animated discussions which sometimes follow give a pleasing variety to the meetings and help to encourage and direct that love of the beautiful in nature which is shared to a greater or lesser extent by almost every human mind. At the winter meeting in Hamilton the discussions, while mainly relating to the commercial aspects of fruit-growing, had a pleasing and instructive diversity. The Experimental Farm work there also was awarded a due measure of commendation.

During the subsequent winter and early spring months many meetings of Farmers' Institutes were attended by the officers of the Central Experimental Farm, and in this way all the time which could be spared from other duties was turned to good account.

VISIT TO PRINCE EDWARD ISLAND.

Early in July a visit was paid to Prince Edward Island, at the request of several of the agricultural societies there. During the seven days spent on the island, I had the privilege of addressing five gatherings of farmers, the places of meeting being so distributed as to cover the greater part of the island. Tignish, Summerside, New Glasgow, Charlottetown and Montague Bridge being the points selected. Audiences varying from 150 to 500 were in attendance, and much interest was manifested in the subjects under discussion. The land on the island is generally fertile, but having been under cultivation for a long period, most of it under a system of seven years' rotation, evidences are common of its fertility becoming more or less exhausted, and the farmers are much exercised on this important question. How best to maintain the fertility of the soil, was one of the subjects of discussion at almost every meeting, and the best methods of preserving and storing barn-yard manure so as to prevent any waste of its fertilizing constituents were carefully considered. The seven

years' rotation of crops, which is almost universally followed in Prince Edward Island, is as follows:—The land is well manured previous to a root crop, either potatoes or turnips, following which a crop of wheat is grown, the land at the same time being seeded down to timothy and clover; hay is harvested for two years, then the land left in pasture for two years, when it is broken up and a crop of oats grown on the sod, completes the rotation.

It would appear that manuring once in seven years is not sufficient, and there is good reason to believe that the general adoption of a five years' system of rotation, in place of the seven years' course, would greatly improve the crops, and give the farmer better returns for his labour. It has often been a matter of surprise that the wheat-midge should be found invariably common, and more or less destructive, every year in Prince Edward Island, while in most of the other Provinces its occurrence is only occasional. A portion of this system of rotation has, I believe, much to do with this result. Many of the orange-coloured larvæ of the wheat-midge mature before the grain is harvested, and, escaping, fall to the ground, where they penetrate a short distance below the surface, and change to chrysalids, in which condition they remain during the winter. By the almost universal system of seeding down with wheat, the ground, which has been occupied by wheat this year, is left undisturbed by the plough the following season, thus affording this insect the most favourable opportunity for maturing, and appearing in full force to attack the neighbouring fields the next year. Were the wheat followed by a crop which would necessitate ploughing, a very large proportion of these insects would be buried deep enough to destroy them. By adopting such a course, and also burning the refuse from the threshing-machines, the great bulk of these insects would be destroyed and the annual loss arising from this destructive pest be greatly diminished.

There are not many farmers on the island who keep sufficient stock to produce manure in the quantity required to throughly fertilize their fields, hence substitutes for barn-yard manure are in much demand, and artificial fertilizers are probably more largely used on the island in proportion to the population than in any other part of the Dominion. In some localities there are large deposits of what is called mussel mud, which contains a considerable proportion of ground oyster and other shells, which have been pulverized by the action of water. together with a small proportion of decayed animal matter. A number of samples of this deposit have been analysed by Mr. F. T. Shutt Chemist of the Experimental Farms, who reports that some of them contain a good proportion of fertilizing material. Most of them, however, contain a large proportion of lime, which, when too freely used, unduly stimulates the soil by converting the store of plant food laid up there into available form, which is then rapidly taken up by growing plants; and on this account after realizing a few good crops, the farmer frequently finds that his land is left in a very exhausted condition, and particularly so in the case of light soil. But by using the mussel mud more sparingly in conjunction with swamp muck and barn-yard manure it serves a very useful purpose. With an increase of dairying on the island, the ploughing under of occasional crops of green clover: careful management of barn yard manure and the judicious use of special fertilzers the condition of the land might be greatly improved.

The growing of fruit is not so general on the island as it should be. The orchards found there are fairly successful. The trees are thrifty and promise well and there seems no reason why the farmers of this province should not become exporters of fruit. An enormous business is transacted in eggs, almost every farmer keeping a considerable number of fowls, and the merchants send out teams which go from house to house to collect them, paying cash for the eggs on delivery. They are then packed in cases and shipped to market. The quantity exported during the last year was 1,947,963 dozens which returned to the province in cash $261,845.

EXPERIMENTAL FARM, NAPPAN.

The Experimental Farm for the Maritime Provinces was also visited on this occasion, where the work was found to be progressing satisfactiorily. During the

past year, the farm buildings have been completed, which are conveniently arranged and commodious, a substantial fence has been erected, and a large area of land broken up and brought under cultivation. The hay crop on the marsh land was excellent, but on account of the cold wet spring, the grain crops were not so forward as they usually are in July, but they were thrifty and the subsequent warmer weather brought them along rapidly. The young fruit trees had made excellent growth, and some of the small fruits were bearing well. Particulars of the progress made on this farm, will be found in the Superintendent's annual report appended.

VISIT TO QUEBEC.

Soon after returning from the Maritime Provinces, a visit was made to the Province of Quebec. A few days were spent in the neighbourhood of Les Éboulements and Murray Bay, many farms were visited, as well as several cheese factories in this district. It was a source of much gratification to find the dairy interest so flourishing in that Province, where the exports of cheese are becoming larger from year to year. Most of the factories were small, but well kept; the quality of the product was generally good, and the prices received by the makers encouraging. The milch cows are being improved in some districts by the introduction of new blood, but this is not so general as could be desired. The country in the neighbourhood of Chicoutimi was also visited. Many good crops were seen, but in some localities evidence was apparent of the partial exhaustion of the soil, and the need of more manuring and a proper rotation of crops. The usefulness of the work of the Experimental Farms is also being felt in Quebec; where a considerable distribution has been made of samples of seed grain for test, a special agent employed to visit the farmers and discuss agricultural topics with them, and a large circulation effected of the bulletins and reports of the farm both in French and English.

VISIT TO MANITOBA AND THE NORTH-WEST TERRITORIES.

On the 16th of September I left Ottawa for the West. Many improvements were noticed along the route between Ottawa and Winnipeg; new towns are building up, and in those localities where the land is fit for agricultural purposes many new settlers have located within the past year. Winnipeg itself is making satisfactory and solid progress and the farming lands about the city are being gradually taken up. In the journey from Winnipeg to Brandon the traveller passes through some of the finest wheat lands in the country and although the crops during the past year have in many parts been unusually light the land which has been prepared for next year's sowing seems to much exceed that of any previous year, showing that the settlers themselves have strong faith in the country.

EXPERIMENTAL FARM, BRANDON.

The Experimental Farm at Brandon, which is situated about a mile and a-half from the centre of the town, can be seen from every commanding point in the vicinity. All that part which lies in the valley of the Assiniboine and up its sloping sides being very distinctly in view. The changes which have been effected on this farm in a single season are very manifest. The pasture land adjacent to the river has been cleared of its unsightly scrub of willow, rose, and other bushes, and now appears as a smooth and even meadow, sufficiently capacious to furnish abundant food for a large herd of cattle. The farm has been entirely fenced with a neat and substantial post and wire fence, which extends for about six miles. The old trail which followed a winding course leading to the farms up the valley has disappeared and in its place is a straight and ample roadway, planted on either side with Manitoba maples, the centre of which was being gravelled with good material from a neighbouring hill. A large part of the higher valley land has either been brought under crop or is in summer-fallow, and a large field of about 80 acres lies fallowed on the higher part of the farm beyond the bluffs. The straight lines of stubble with regular divisions between them were all that was left of the experimental plots of grain,

which must have looked very attractive during the summer when their green lines could be seen stretching up the hill slope.

On close examination it was gratifying to find that nearly all the Manitoba maples with which the avenues are planted were doing well, and that most of the young trees which compose the large shelter belt across the west side of the farm are living, notwithstanding the unfavourable conditions to which they have been exposed on account of the very dry season. Only a small percentage of the fruit trees have died even on the open prairie, while in the plantation which has been made in the scrub on the side of one of the bluffs there is not a single failure to record, and most of the trees have made vigorous growth. So encouraging a result is a stimulus to further effort in the same direction; hence other patches of scrub are being cleared so as to make room for several squares of about half an acre each, so arranged as to provide all around them a wide border of this low protecting growth of hazel, oak, &c.

With favourable conditions given, the prospects for fruit-growing in Manitoba are encouraging. The first desire of the new settler who wishes to grow fruit is generally to see about him some of the trees he has been accustomed to grow in less rigorous climates and a supply of these procured at considerable cost frequently constitutes his first experiment which is almost sure to be an entire failure. Too much stress cannot be laid on the importance of procuring hardy trees as one of the conditions necessary, and next a light or gravelly soil, where this is practicable, and some shelter. Fruit trees in a normal condition make what is known as a determinate growth each year of from one to three feet in length, this growth is usually completed early in the season, after which a gradual process of ripening or hardening of the wood takes place, and if these newly made branches can be thoroughly ripened before winter sets in, they are well prepared to endure severe cold. If, as is too often the case, the rich soil of the prairies stimulates the tree so that its growing period is unnaturally protracted, it makes a quantity of vigorous but succulent wood, which is too soft to endure the cold to which it must be exposed, and it frequently happens that in a rich soil, fruit trees start a second growth late in the season when there is not time for the wood to mature before cold weather comes. In most instances trees so situated kill down to the snow line every year. If grown on a comparatively poor soil the production of wood is limited, the growth early completed and the new wood becomes compact and well ripened before the summer is ended.

On the Experimental farm at Brandon, there are locations on the bluffs rising from the river valley which combine to some extent the conditions named. The soil is rather light and gravelly, with sufficient fertility to give reasonable growth. The scrub affords some shelter from prevailing winds and with hardy varieties selected for test the experiment promises well. An inspection of these trees after they have stood the test of a winter will be interesting.

While wheat will probably long continue to be the chief crop on the great western plains of Canada, a large majority of the farmers there are no longer content to depend solely on any one crop for their yearly returns, and mixed farming and the keeping of cattle for dairying and beef-producing is becoming very general. The production of butter is rapidly increasing and a vast number of cattle is now owned by the settlers; hence in any year when there is a partial failure in their grain crops they have something else to depend on for support. With this rapid increase of stock a very important question is looming up, that is the growing of winter food for stock. With a limited number of cattle in the country and an immense area of grass land unoccupied the settlers had fine pasturage for their herds, and at a trifling expense could lay up a store of hay from neighbouring meadow lands with which to to sustain their stock during winter. This condition of things is now rapidly changing and in many localities much of the unoccupied land is taken up and settlers are obliged to drive long distances, often as much as 30 or 40 miles to obtain the hay necessary for the winter sustenance of their cattle. In a very short time in the more thickly settled districts native hay will be no longer available in the quan-

tities required and farmers must then grow on their own land such crops as will sustain the animals they keep. Experiments in growing grasses and clovers for the production of hay have not yet met with much general success, and while these will be continued on the Experimental Farms until all the varieties, both native and foreign, likely to be useful have been thoroughly tested, the main hope for the present is in the cultivation of those annual plants which produce a heavy weight of crop and mature in a short season. Among these are the different varieties of fodder corn, millet, Hungarian grass, and mixed crops of vetches, peas, oats, barley, &c, and cutting these while in a green state and drying them or packing them green into silos where they may be preserved in a succulent condition. A large quantity of such material can be grown on a few acres of land and when supplemented by the oat straw which is usually abundant, and a small quantity of bran or crushed grain, animals may be wintered in good condition at a moderate cost. The results of the past year's experiments with corn and fodder crops will be found in the report of the superintendent of the Brandon farm and although the season has been unfavourable a considerable measure of success has been achieved. The results of similar experiments are given in the report of the superintendent of the Experimental Farm at Indian Head, and it is proposed to continue these on a larger scale on both farms during the coming season.

EXPERIMENTAL FARM, INDIAN HEAD.

On this farm the grain crops have been better than at Brandon, but the forest and fruit trees have not succeeded so well, owing mainly to the very strong drying winds which prevailed during most of the growing period, and the lack of sufficient rain.

Some very instructive experiments have been conducted in order to demonstrate the best methods of treating the soil in preparing for crop. Grain grown on large pieces of summer-fallowed land has been compared with that grown on fall and spring ploughed land, and the results are greatly in favour of the summer-fallow. By this thorough method of preparation the soil is made capable of retaining moisture, and also of absorbing moisture from the air during cool nights, which carries the crop through even in the absence of rain in a remarkable manner. At the time of my visit the grain was all harvested, but the difference in the stubble was most marked, so that one could tell instantly when he stepped off the fallow land, the stubble on the fall and spring-ploughing being so much thinner.

A close examination was made of both fruit and forest trees, especially of those varieties which were planted in the spring of 1888, and hence had stood the test of two summers and one winter. There was obtained from Prof. Budd, of the Agricultural College, of Ames, Iowa, in the spring of 1888, a collection of Russian apple trees, numbering eighty-six in all, of twenty-six varieties, of these fifty-four are alive, and some of them are doing remarkably well, seven have died at the top, but have sent up shoots from near the base, and twenty-five have died entirely. Ten pear trees were obtained of two varieties, these have all died. The collection of plums included thirty-four trees of seven varieties; of these there are eighteen living, seven have died at the top and sent up shoots from the bottom, and ten died outright. Fifteen cherry trees were obtained of three varieties, two died at the top, but sent up shoots from the bottom, while eleven died entirely. These trees were nearly all of Russian origin.

Another collection of Russian trees was purchased from Stone, Wellington & Morris of Fonthill, Ontario, and consisted of 39 trees of 16 varieties; 31 of these are alive and 8 have died. A selection was also made from among the hardiest of the named varieties in general cultivation in the Eastern Provinces as follows: Apples, 65 trees of 18 varieties, of which 41 are alive and 24 dead; crab-apples, 12 trees of 4 varieties, 9 are living and 3 dead; plums, 10 trees of 5 varieties, 1 living and 9 dead; pears, 10 trees of 5 varieties, 1 living and 9 dead; cherries, 14 trees of 4 varieties, 3 living and 11 dead. Hence out of a total of 202 apple trees planted of 64 varieties, 135 are living, 7 have died at the top, and sent up shoots from the bottom and 60 have died outright. Pears, 20 trees of 7 varieties, 1 living, 19 dead; plums, 44 trees

of 12 varieties, 22 living, 7 dead at top with shoots from bottom, while 16 died entirely; cherries, 29 trees of 7 varieties, 3 living and 22 dead. The proportion of deaths among the Russian trees was less than one-third, while among the hardy named sorts grown in the east it was nearly one-half.

Further collections have been secured and planted during the past season, some of which have been grown in Minnesota, some in the Province of Quebec and some at the Central Experimental Farm, these include a number of varieties not before tested.

The gooseberries and currants, numbering between two and three hundred of the planting of 1888, have made fine healthy bushes with vigorous shoots, and plenty of them, from 1 to 2 feet long. The raspberries have also made fair progress. Of the strawberries many have died, but those that have survived look healthy and have made a quantity of runners, but not many of these have rooted on account of the very dry condition of the soil. Of 64 grape vines of 17 of the hardiest varieties, none have survived.

In 1888, nearly twenty thousand young forest trees and shrubs were planted, and during the past season over thirteen thousand more have been sent from the Central Farm at Ottawa, besides which there have been planted a considerable number of seedlings of native trees raised on the spot. Some of the trees have succeeded very well, while others have failed almost entirely. From the experience thus far gained, the following are among the most promising sorts for the Indian Head district. Of deciduous trees, Manitoba maple, American or white elm, rock elm, white ash, green ash, European and American mountain ash, wild black cherry, yellow birch, canoe birch, Russian mulberry European white birch, European alder, Norway maple and black ash. There are also several species of Russian poplars which may be safely added to this list. Of evergreens, Riga pine, Scotch pine, dwarf mountain pine, bull pine and white spruce. There are several ornamental shrubs which have done remarkably well, such as the Siberian pea, *Caragana arborescens*, Russian olive, *Eleagnus angustifolia*, several varieties of lilac, and the barberry. The farm buildings, now nearly completed, will afford excellent accommodation for stock, and it is expected that a sufficient number of animals will be forwarded in the spring to lay the foundation of useful herds of cattle, which will in future prove an important element in the general improvement of stock in the North-West.

VISIT TO BRITISH COLUMBIA.

The Experimental Farm at Agassiz, British Columbia, has also been organized and partially equipped. The work of clearing the brush and breaking up the land is being pushed vigourously forward. Some experimental plots of fall grain have been planted. A large number of different varieties of fruit trees have been secured, part of them from the nurseries in British Columbia and part from Ontario. A large orchard has been planned and partly planted and will be completed as early as practicable in the spring. Many strawberries, raspberries and blackberries have also been forwarded from the Central Experimental Farm, with a collection of grape vines. About 7,000 young forest trees, chiefly of the most valuable hardwoods, of the east have also been forwarded to test their usefulness in that country where hardwoods are almost entirely wanting. There is no reason to doubt that hickory, elm, ash, oak, walnut, cherry and other valuable hardwood timber trees will thrive and make rapid growth in British Columbia, and since there is much land on hill and mountain sides unsuitable for agriculture, but well suited for timber-growing, this line of work will be at once taken up at the Experimental Farm, young plantations made, the relative growth of the different varieties noted so that reliable information may be had as soon as possible for the guidance of those who may desire to engage in such tree planting. A beginning has been made with stock at the Agassiz Farm by the introduction of a well bred Durham bull and an excellent cow, both from good milking strains of that valuable breed of cattle. As soon as suitable buildings can be erected this department of the farm work will be considerably extended. In the

meantime the introduction of a good bull will greatly aid the farmers in that district in their efforts to improve their stock. Several useful breeds of poultry have also been introduced and others will be shortly added.

While in British Columbia the opportunity was afforded of attending the Provincial Exhibition at New Westminster, where a large sum was offered in prizes. The fair was a very successful one and afforded convincing evidence of the progress which has been made during the past few years in that country. The exhibition of stock was much better than I expected to see, and included some excellent animals. Short-horns of milking strains, Holsteins and Jerseys appear to be the favourite breeds. Some very good horses were also shown for heavy draft and carriage purposes.

Some good samples of wheat, barley and oats were exhibited, and an excellent display made of hops, which were of unusually fine quality, large and fragrant.

Among the vegetable products were some very fine roots, enormous mangels and turnips from the delta lands on the Fraser, grown in the rich alluvial soil of that district without fertilizers. There were also very large potatoes, cabbage, cauliflower, squash, carrots, &c., and a fine display of plants and flowers.

The fruit display was perhaps the most attractive feature in the exhibition, although it might have been made much more instructive to the visitors had greater attention been paid to naming the varieties shown. Among the apples specimens of the Gloria Mundi were enormous, Ribston Pippin and Blue Pearmain very large, Gravenstein large and of wonderful colour, Northern Spy of grand size. The Spitzenburg, Fameuse, Golden Russet, Pomme Gris and many other sorts were first-class. Among the pears the Duchesse d'Angouleme, Bartlett and Beurre Diel attracted attention from their size, while Seckel, Beurre Hardy and Winter Nelis were larger than those usually shown at exhibitions in Ontario. The quinces were good, and peaches, although few in number, were very fine. Opportunity was afforded of testing the quality of some of the higher flavoured fruits and they were very good, but whether the flavor was quite as high as it is in Ontario fruit of the same variety could only be determined by careful comparison.

A few days later I had the privilege of visiting the exhibition of the British Columbia Inland Agricultural Association held at Ashcroft on the 10th and 11th of October, this was the first exhibition of agricultural products which had been held within the dry district of the Province east of the coast range of mountains and visitors living within the inland territory flocked to the town from all quarters, some of them from a distance of 200 miles. Here opportunity was given to inspect the products grown with the aid of irrigation. In the absence of a water supply much of the land is occupied largely by sage brush and cactus, with areas here and there of bunch grass and bull pine, (*Pinus ponderosa*), distributed with more or less frequency over the hill sides, but in the vicinity of the mountain streams, which are numerous, the water is ingeniously directed into many channels so distributed over the land as to afford desirable conditions of moisture, and the effect is most striking, the apparent barrenness is transformed into wonderful fertility, and the results as seen in the crops exhibited were quite a revelation.

There was a large assortment of squashes and cucumbers, good celery, very fine Swedish turnips from 26 to 33 inches in circumference and very solid, large cabbages with solid heads weighing from 15 to 25 pounds each, handsome solid white cauliflower from 14 to 15 inches across. Large mangels, long red, and round, excellent carrots in great variety, some specimens of intermediates measured 15 inches around; the parsnips also were unusually fine. Of potatoes, the samples were magnificent. There were tubers of St. Patrick, Early Rose, and several other varieties weighing from 2 to 3 pounds each. A seedling raised in the district by Mr. Walker, of Caché Creek, shown under the name of Blue Bell, attracted special attention on account of its regularity of form and fine appearance, several of these weighed 3 pounds each; there were tomatoes also which weighed from half pound to a pound each.

Of fruit there was a very good display and a few measurements were taken of some varieties. Gloria Mundi measured fifteen inches in circumference, Blue Pear-

main 13 inches. Twenty Ounce 13 inches, Golden Russet, handsome clean specimens 9 inches, Blenheim orange 12½ inches, Greenings 11½ inches, Spitzenburg 11 inches, Weathy 11 inches, Roxbury Russet 12 inches. The examples of Northern Spy were very handsome and highly colored, Vanderere fine. Belle Angevine pears weighed from one to two pounds each, Swans Orange were very large and Vicar of Winkfield measured ten inches around at the widest part. There were fine luscious peaches, some of them 8 inches in circumference; excellent Concord grapes well ripened; also one of Rogers Hybrids, large Yellow Egg plums and some Red currants in good condition.

Excellent field corn was shown of the variety known as Canada Yellow with, ears well ripened and fully eleven inches long, also Horse Tooth corn with ears nine inches long well filled and fairly well ripened. Stalks of fodder corn were also shown measuring from 10 to 12 feet high. Some excellent grain was exhibited of Red Fife and Ladoga wheat grown from seed sent from the Central Experimental Farm also White Russian, Black Bearded and Centennial wheats. Good examples of both six-rowed and two-rowed barleys, the latter specially bright and plump. One of the finest of these was grown by Mr. E. Dougherty, of Clinton B. C., from a chance ear found three years ago growing with other barley, this yielded the second year a "milk-pan-ful" and this season three sacks. Alfalfa has done well in this district; bales of good alfalfa hay were shown by Mr. Pennie, of Savona, who has cut three crops a year, yielding him about 4 tons of dry hay to the acre. He has 22 acres giving this average, and finds the alfalfa to be excellent feed for his stock. Mr. Chas. A. Semlim, of Caché Creek, has 25 acres under the same crop, and has had very similar results.

There were a few entries of stock, but nothing deserving of special mention; a few good horses, and some fine poultry; some excellent butter both in tubs and rolls, and a good show of hops of very fine quality.

FAIR AT MEDICINE HAT.

Returning eastward the fair at Medicine Hat was visited. One of the chief features here was a large display of vegetables from the garden at the Canadian Pacific Railway Station. Among these were some very well grown cabbages weighing from six to ten pounds each; very good potatoes, some of the tubers weighing a pound or more each; Lima beans, and a great variety of other vegetable products. In the general exhibit there were cabbages from 12 to 16 pounds each; mangels, 9 pounds each, solid, well grown specimens; and fair-sized turnips from 6 to 7 pounds each. There were good examples also of carrots, parsnips, vegetable marrow, beets, onions, celery and citrons, with other products of the garden and field. There were samples of Squaw corn, well ripened, excellent peas, both Black-Eyed Marrow-fat and Golden Vine; also, good examples of white beans and flaxseed. Mr. J. H. Hawk, a farmer residing near the town, exhibited a bag of very fine two-rowed barley, of the variety known as "Danish Chevalier," which weighed 56⅓ pounds to the bushel, and was very bright and plump, also one of Carter's Prize Cluster Oats which weighed 46½ pounds to the bushel; both of these were raised from samples of grain which had been sent to Mr. Hawk, for test, from the Central Experimental Farm. These were the finest specimens of grain on exhibition.

Some very good butter was shown, also a fair collection of potatoes and other vegetables of garden and field growth, and a good display of poultry including Plymouth Rocks, Light Brahmas, Buff Cochins and White Leghorns. There was no exhibit of cultivated fruits, but, in their place, samples of the preserved wild fruits of the country, including wild black currant, choke cherry, buffalo berry, and preserved cactus pods; this last makes a very agreeable preserve, reminding one of gooseberry.

FOREST TREES ON THE GREAT WESTERN PLAINS.

A wise policy has recently been adopted by the Canadian Pacific Railway of setting apart, at each of the more important railway stations through the sparsely

settled portions of the western plains, about an acre of land for garden purposes in which are grown a number of different kinds of vegetables, small plots of grain and other products, the whole being brightened by a few flower beds. At the request of the Canadian Pacific Railway officers, a distribution of trees was made from the Central Experimental Farm to 25 of these experimental gardens located at principal points along the line between Moose Jaw and Calgary, a distance of about 440 miles, with the view of testing their relative hardiness and adaptability to this region. Twenty-five bundles were put up and forwarded, each containing 175 trees consisting of the following varieties:

Deciduous Trees.

10 Manitoba Maple.—*Negundo aceroides.*
10 American Elm.—*Ulmus Americana.*
10 Green Ash.—*Fraxinus viridis.*
10 White Ash.—*Fraxinus Americana.*
10 Locust.—*Robinia pseudacacia.*
10 European Larch.—*Larix Europea.*
10 Sugar Maple.—*Acer saccharinum.*
5 Red Maple.—*Acer rubrum.*
5 Soft Maple.—*Acer dasycarpum.*
5 Norway Maple.—*Acer platanoides.*
5 Black Walnut.—*Juglans nigra.*
5 Butternut.—*Juglans cinerea.*
5 American Beech.—*Fagus ferruginea.*
2 Wild Black Cherry.—*Prunus serotina.*
2 American Mountain Ash.—*Pyrus Americana.*
2 European Mountain Ash.—*Pyrus acuparia.*
2 Yellow Birch.—*Betula lutea.*
2 Canoe Birch.—*Betula papyracea.*
2 Rock Elm.—*Ulmus racemosa.*
2 European Alder.—*Alnus glutinosa.*
2 American Sycamore.—*Platanus occidentalis.*
2 Honey Locust.—*Gleditschia triacanthos.*
5 Russian Mulberry.—*Morus hybrida.*
2 Hardy Catalpa.—*Catalpa speciosa.*
2 Horse Chestnut.—*Æsculus hippocastaneum.*
1 Kentucky Coffee tree.—*Gymnocladus Canadensis.*
1 Ailanthus.—*Ailanthus glandulosus.*
1 Yellow Willow.—*Salix.*—?
1 Wisconsin Weeping Willow.—*Salix Wisconsiana.*
1 Tree Cranberry.—*Viburnum opulus.*
4 Barberry.—*Berberis vulgaris.*

Evergreen Trees.

10 Scotch Pine.—*Pinus sylvestris.*
10 Norway Spruce.—*Abies excelsa.*
5 Austrian Pine.—*Pinus Austriaca.*
5 Amer. Arbor Vitæ.—*Thuya occidentalis.*
5 White Spruce.—*Abies alba.*
4 White Pine.—*Pinus strobus.*

To these were added ten currant bushes in five varieties, four raspberry bushes in two varieties, and fifty assorted strawberry plants.

The trees and plants sent were all grown on the Central Farm, they were of medium size, well rooted and carefully packed, and they reached their destination in good order. During my journey, going and returning, I had the opportunity of seeing some of these trees and was gratified to find that in many instances they were doing well. A careful inspection was made of the trees sent to the garden at Medicine

Hat which is cared for under the direction of Mr. J. Niblock, superintendent of the Western Division of the line, who is an enthusiastic lover of trees and has met with encouraging success in his work. Reports are promised as to the results of these tests which will be watched with much interest.

CENTRAL EXPERIMENTAL FARM.

SEED TESTING.

The usefulness of the seed testing department at the Central Farm to the farmers of Canada is indicated by the increasing interest felt in that work, as shown by the number of samples sent for test. During the year, 933 samples have been received for this purpose. The results are given in the following summary.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Average Vitality.
Wheat, sound	320	100	30	89
do frozen	221	99	15	75
do total	541	100	15	83
Oats, sound	153	100	12	83
do frozen	21	94	2	47
do total	174	100	2	79
Barley, sound	98	100	15	86
do frozen	17	99	14	70
do total	115	100	14	84
Rye	5	95	81	85
Corn	3	90	42	73
Peas	9	99	39	67
Grass	23	96	0	40
Onions	3	82	58	69
Carrots	7	67	0	39
Flax	3	84	64	76
Turnips	2	98	80	89
Cabbage	12	84	4	51
Asparagus	6	86	0	39
Thyme	6	42	2	16
Lettuce	3	51	2	20
Radish	2	61	22	42
Tomato	6	63	38	49
Parsnips	1	.....	.....	68
Lentils	1	.....	.....	8
Celery	1	.....	.....	15
Cress	1	.....	.....	80
Egg plant	1	.....	.....	0
Parsley	1	.....	.....	17
Spinach	1	.....	.....	4
Red pepper	1	.....	.....	8
Sage	1	.....	.....	13
Summer savory	1	.....	.....	18
Sweet marjoram	1	.....	.....	10
Beet	1	.....	.....	100
Millet	1	.....	.....	83
Total number of samples of grain tested, highest and lowest percentage and average vitality	933	100	0	78

The tests of frozen grain have been especially useful to the farmers of the North-West and the timely information given has no doubt saved many from the disappointment which would in most cases have resulted from the use of inferior seed. For while occasional instances have been reported of good crops being obtained where frozen grain has been used for seed, the bulk of the evidence appears to be on the

other side and few farmers care to run the risk which always attends the sowing of injured seed. In testing frozen grain not only was the percentage of germinating power returned, but information was also given regarding the vigour or weakness of the growth. It was often observed that where frozen grain had a fair percentage of germinating power its vitality was so far injured that a very weakly growth was made. These weaker plants sometimes gain strength and vigour rapidly in the rich soil of the prairies when the weather is favourable, but if unfavourable conditions prevail, their growth, is usually slow and stunted, and the crop uneven in ripening.

During the season of 1889, rust has prevailed to an alarming extent in Ontario and to some extent iu Quebec and the Maritime Provinces. This parasitic attack has resulted in a shrivelling of the grain and a weakening of its vitality, which is especially the case with oats. The importance of sowing good seed is now generally recognised, and as there is no way short of actual test by which the value of a doubtful sample can be accurately ascertained, farmers should send such as they desire to have tested at an early date so that the needed information may be had in good season. An ounce or two is sufficient for the purpose, unless it is desired that the weight per bushel be ascertained when not less than one pound should be forwarded; packages may be sent to the Experimental Farm free through the mail, the information is given to the sender free of cost, and the time occupied in each test is usually about two weeks. The new building recently completed for this purpose gives almost unlimited capacity for the work, so that none need remain in uncertainty as to the vitality of the seed they are proposing to use.

SEED DISTRIBUTION.

There have been distributed during 1889 for test among the farmersof the Dominion 2,760 three-pound bags of seed grain of the following varieties :—

Wheat Ladoga	1,279
Barleys Two-rowed.	
English Malting	204
Carter's Prize Prolific	230
Beardless	165
Danish Chevalier	178
Danish Printice Chevalier	110
Peerless White	33
Thanet	27
Oats.	
Carter's Prize Cluster	179
Welcome	331
Early Blossom	24
	2,760

LADOGA WHEAT.

One hundred bushels of the Ladoga wheat was sold to the Quebec Government for distribution among the farmers in that Province, forty bushels was sold to farmers in New Brunswick and Nova Scotia, a like quantity to those in Prince Edward Island and sixty bushels to those residing in Manitoba and the North-West Territories.

Up to the time of the date of this report there have been received 142 reports of the results of the tests of this wheat for 1889; of these 117 are favourable and 25 unfavourable. The unfavourable reports are chiefly from Ontario and Quebec, where rust has been very general on all varieties of wheat, and it would appear that in these Provinces the Ladoga has suffered more from this cause than some other sorts. These returns give the average yield from the 3 lbs. samples sent as 46 lbs. The largest

yield yet reported is from M. Saunby of Inderby, British Columbia, in which case 139½ lbs. was harvested. The average weight per bushel of the samples which have been sent of the grain produced is 60½ lbs. per bushel. The heaviest sample comes from Mr. Groat, of Edmonton, North-West Territories, weight 64½ lbs. per bushel. The Ladoga wheat continues to maintain its character for early ripening; the average experience from the returns made gives it 9½ days of an advantage over Red Fife in this respect, and in the Maritime Provinces, where White Russian is principally grown it is reported as being on an average 8 days earlier there than that variety. The following extracts are given as examples from the more favourable reports received from the several Provinces:

Daniel Collins, Mink River Road, Prince Edward Island, harvested 122 lbs. from the 3 lbs. sent him. He says: "The Ladoga is ten to fifteen days earlier than other varieties, and does not require such strong land."

James Corcoran, Piusville, Prince Edward Island, had 74 lbs. from 3 lbs. of seed, and says: "It is twelve days earlier than White Russian sown side by side, and about double the weight of grain, both getting the same chance. My opinion is that this country has been supplied with a long felt want."

Eli Thompson, of Whim Road Cross, Prince Edward Island, got 90 lbs. from 3 lbs. sown; he says there was "no rust, straw bright and clean, about ten days earlier than ordinary wheat; my other wheat showed signs of rust." Weight of grain 61½ lbs. to the bushel.

John Jennings, Newburgh, New Brunswick, had a yield of 102 lbs. from 3 lbs. 2 oz. of seed. He says: "The Ladoga is as early as the earliest grown here, say ten days earlier than the Manitoba Fife. If it does not rust, I think, it is a valuable addition to our wheat."

M. Rideout, of Mount Pleasant, Carleton County, New Brunswick, had 91 lbs. from 3 lbs. of seed, and says: "It was the best wheat I ever sowed. Weight of grain 62½ lbs. to the bushel.

Robert Smith, of Pugwash, Nova Scotia, got 59½ lbs. from 3 lbs., and says: "It is about ten days earlier than other sorts. I am very much pleased with the wheat, it has a good hard appearance." Weight 59½ lbs. to the bushel.

William Andrews, of Stewiacke, Nova Scotia, who got 46 lbs. from 3 lbs. says: "It ripened ten days earlier than White Russian, which was sown on same day and under same conditions. I consider it a valuable wheat."

Joseph Seguin, of Point Fortune, Quebec, had 63 lbs. from 3 lbs. sown, and says: "It ripened about ten days earlier than other varieties; will sow crop next spring; much satisfied."

T. Lyster of Melbourne, Quebec, harvested 60 lbs. from 3 lbs. sown and says "it ripened one week sooner than White Russian."

Lazare Demers, of St. Julie, Megantic County, Quebec, got 40 lbs. of fine wheat which weighed 62½ lbs. to the bushel from 3 lbs. of seed. He says it is "about 10 days earlier than other wheat, the quantity obtained is about 33 per cent. better."

John C. Gurney, of Rockingham, Renfrew, Ontario, got 114 lbs. from 3 lbs. of seed. He says "I believe it to be 10 to 14 days earlier than any other kind that I am acquainted with, and believe the yield would be very large under favourable circumstances; yielded about 40 bushels to the acre, would have yielded 60 bushels if it had not been for rust." Weight 59½ lbs. per bushel.

Henry Jennings, Victoria Square, Markham, Ontario, got 83 lbs. from 3 lbs. of seed and says: "It is a few days earlier than other varieties, no rust, but badly midged."

John Fitzgerald, Mount St. Louis, Simcoe, Ontario, had 61 lbs. from 3 lbs. sown. He says; "It ripened 10 days earlier than Russian or other spring wheats, yields equally as well, but grain is small, a little rusted, spring wheat very much rusted this year."

E. H. Dewart, Milford, Manitoba, got 63 lbs. from 3 lbs. of seed, and says: "It ripens about five days earlier than Red Fife, sown same day and place. I think it stood the test well."

J. R. Patterson, Pilot Mound, Manitoba, who got a yield of 60 lbs. from 3 lbs. says: "It is about eight days earlier than Red Fife. This was a very dry season, but if all grain had done as well as this I should have been well pleased."

Andrew Johnson, of Mowbray, Manitoba, got a sample two years ago from which he has now plenty of seed, he thinks very well of it and says: "I sowed 20 acres in same field as Red Fife."

A. Lennie, of Edmonton, North-West Territories, got 30 lbs. from 3 lbs. sown. He says: "It is 10 days earlier than other sorts."

A very fine sample has also been received from the Rev. A. C. Garrioch, of Dunvegan, Peace River, which weighs 64lbs. to the bushel; in this instance the yield is not given.

M. Saunby, of Inderby, British Columbia, had a sample of 3 lbs. Ladoga sent him in the spring of 1888, from this he got 80 lbs. which he used as seed this year and harvested 3,720 lbs. equal to 139½ lbs., from 3 lbs. He says: "It is one week earlier than other wheats, yield 62 bushels to the acre."

DANISH CHEVALIER BARLEY.

Two sacks of this very fine variety of two-rowed barley were obtained in the spring of 1888 from Copenhagen, Denmark, through the kindness of the president of the Danish Royal Agricultural Society, and was a fine sample of the celebrated barley which commands so ready a market in Great Britain at high prices. It weighed 57 lbs. to the bushel. This barley grown on the Central Farm this season weighs 50½ lbs. to the bushel, but the yield has been over 31 bushels to the acre. The same grain grown on the Experimental Farm at Indian Head, North-West Territories, weighs 55 lbs. to the bushel, and at Brandon, Manitoba, 54 lbs. The number of returns received to date is 19, all of which are favourable. The average yield is 63 lbs.

Fred. R. Mellish, Union Road, Montague Bridge, Prince Edward Island, got 42 lbs. from 3 lbs. sown. He says: "it will compare favourably with any other as to weight of crop, and it ripens in same period as other varieties sown here, am well pleased." The weight of this sample was 49½ lbs. to the bushel.

James Kerr, Summer Hill, Queen's County, New Brunswick, had 130 lbs. from 3 lbs. sown. He says: "The yield is great. I intend sowing all the barley I have next spring." Weight of sample, 47½ lbs. to the bushel.

John Murphy, of Dalling, Quebec, who had 45 lbs. from 3 lbs. sown, says: "The crop was very heavy, but later than the common barley." Weight 48 lbs. per bushel.

Geo. Fisher, Freeman, Ontario, got 125 lbs. from 2 lbs. 13 oz. of seed. He says: "It ripened about ten days later than common six-rowed, and is much heavier." The weight of the sample was 54¼ lbs. to the bushel.

Daniel Baxter, Belmont, Ontario, had 115 lbs. from 3 lbs., and says: "That the straw was bright and of reasonable length, earlier than other barleys and heavier than other sorts."

J. J. Coyne, of Chesterville, Ontario, got 96 lbs. from 3 lbs. sown. He says: "Straw excellent, tall and long headed grain, best I have ever seen in this line. I expect I would have had better grain and more of it but rain and wind destroyed it and left it coloured." Weight, 46½ lbs. per bushel.

A. W. Peart, of Freeman, Ontario, had 94 lbs. from 3 lbs. of seed. He says: "Sown 15th April, harvested 3rd August, no rust whatever, straw long, bright, pliable, tendency to lodge; compared with ordinary six rowed barley the two-rowed ripened two weeks later, compared with Russian a week later. Pound for pound in sowing, the two-rowed gave 31 for 1, the six-rowed 23 for 1. I sowed two-rowed at the rate of 1¼ bushels per acre and six-rowed at 1¾ bushels. As you see by sample the two-rowed is very fine barley, much larger than the six-rowed. The two-rowed was sown side by side with the six-rowed and I noticed it was several days longer in coming up. I am very much pleased with it. My six-rowed barley yielded 41 bushels per acre." The sample sent by Mr. Peart weighed 53 lbs. to the bushel.

Thomas Manderson, of Myrtle, Ontario, who had 75 lbs. from 3 lbs., says: "It ripened about ten days' later than common six-rowed." Sample weighed 53 lbs. per bushel.

J. L. Hawk, of Medicine Hat, North-West Territories, sends in the handsomest sample yet received, very bright and plump, weighing 56⅛ lbs. to the bushel. This barley took first prize at the Medicine Hat Fair. Mr. Hawk got 57 lbs. from 3 lbs. of seed. He says: "Straw a good length and very bright. I had no other barley sown, but think it not quite so early as the old kind."

Reports from the other Provinces are not yet received.

DANISH PRINTICE CHEVALIER.

This variety was also obtained from the Danish Royal Agricultural Society. Grown at the Central Farm this year it yielded 36¼ bushels to the acre and weighed 50 lbs. to the bushel. At Indian Head it weighed 53½ lbs., and at Brandon 53 lbs.

C. Newcomb, Weymouth, Nova Scotia, got 122 lbs. from 3 lbs. of seed. He says: "It is two weeks later than other barley sowed alongside. It took first prize at our County Exhibition."

Thomas Manderson, of Myrtle, Ontario, had 83 lbs. from 3 lbs. of seed. He says: "The straw is weak, rather on the short side; all blew down. Cut same day as other samples; too weak in the straw for this section of country." Weighed 53 lbs. per bushel.

J. Baxter, Pickering, Ontario, had 48 lbs. from 3 lbs. sown. He says: "Straw rather weak; broken down with a rain storm at time of ripening; later than the six-rowed varieties." Weighed 52 lbs. to the bushel.

Other Provinces not yet heard from.

ENGLISH MALTING BARLEY.

This was a very fine and bright sample of barley, which was purchased at the Corn Exchange, London, England, and weighed 54¼ lbs. to the bushel. Grown at the Central Farm this season it has yielded 34¼ bushels to the acre, weighing 50½ lbs. per bushel. The same variety, grown at Indian Head, weighs 53½ lbs., and at Brandon 53 lbs.

John McDonald, St. Peter's Lake, Prince Edward Island, had 50 lbs. from 2¾ lbs. of seed. He says: "No rust; straw fairly good; light growth; no other barley sown." The sample sent by Mr. McDonald is very fine, and weighs 54⅔ lbs. per bushel.

Donald McLennan, Indian Brook, Nova Scotia, who had 3 pecks from 2¾ lbs. sown, sends also a good sample, weighing 52½ lbs. per bushel. He says: "Straw very brittle. I think our ordinary barley does here just as well."

Wallace Oliver, Magog, Quebec, had 45 lbs. from 2¾ lbs. sown. He says: "Straw fair length, soft and limber. I think it is fully ten days later than the six-rowed. Weighed 51 lbs. per bushel.

Joseph Dubrieul, La Patrie, Quebec, harvested 30 lbs. from 2¾ lbs. of seed, and says: "Straw 2½ feet long; grain early and fine."

A. W. Brown, Rebecca, Ontario, had 130 lbs. from 2¾ lbs. sown. He says: "Sown 25th May; harvested 1st August; straw bright and good. I think it is a little later than the four-rowed barley, but think it would beat it in weight per acre. Some of it lodged and injured the sample." Weight 52¼ lbs. per bushel.

Mr. McNaughton, of Gourock, Guelph, had 102 lbs. from 2¾ lbs. of seed, and says: "Sown 18th April; harvested 3rd August. No rust observable; straw good, bright, clean; from ten days to two weeks later in ripening than our Canadian barley. The plot of ground was shaded by trees, and it did not have such a good chance to mature. As far as this sample of two-rowed English is concerned, the only drawback is its lateness of ripening." Weight 53¼ lbs. per bushel.

Major Boulton, of Shellmouth, Manitoba, sends a very good sample of this barley, weighing 52½ lbs. per bushel, grown by Denmark & Martin, of Russell, Manitoba. He says: "Straw short; rather coarse; no rust; about the same as other barley as to ripening; no means of ascertaining weight."

Donald Graham, of Spillamacheen, British Columbia, harvested 174 lbs. from 2¾ lbs. of seed. He says: "Sowed 19th April; harvested 29th July. No rust; straw very fair, but somewhat inclined to lodge. About as early as six-rowed, but yields better."

W. A. Johnson, Quesnelle, British Columbia, had 64 lbs. from 2¾ lbs. sown, and says: "Sown 30th April; harvested 25th August. No rust; straw short and weak; ripens later than other kinds; grain plump, bright and of good weight." Weighed 50¾ lbs. per bushel.

BEARDLESS BARLEY.

The seed of this variety was purchased from Oakshott & Millard, seedsmen, Reading, England. As imported in 1888, it weighed 56 lbs. to the bushel and was handsome and plump. Grown in the field at the Central Farm the past season, it has yielded a little over 50 bushels to the acre, weighing 51¾ lbs. to the bushel. The same grain grown on the Indian Head Farm weighs 55 lbs. per bushel, and at Brandon 52 lbs. This barley cannot correctly be called beardless, as it is bearded like other varieties, but sometimes sheds its beard when mature. The beard drops from it when touched if fully ripe, which is an advantage in threshing; 165 samples were sent out, but only seven reports are yet received, and in most of these the yield is not given.

J. Dearness Granton, Middlesex, Ontario, got 55 lbs. from 3 lbs. of seed. He says: "There is no noticeable difference as to the earliness; sample is unusually large, bright and good."

Joseph Lang, of St. Marys, Ontario, had 50 lbs. from 3 lbs. of seed. It was sown 20th April and harvested 16th July. He says: "It is not so early as the six-rowed."

Peerless White and Thanet barleys are not yet reported on.

CARTER'S PRIZE PROLIFIC BARLEY.

This new strain of two-rowed barley, recently introduced by James Carter & Co., Seedsmen, London, England, is claimed to be the most prolific barley in cultivation and one of the very best for malting. Seed was obtained from Carter & Co. in time for last springs sowing, and the weight of the grain as imported was 54½ lbs. per bushel. From the character of the reports received from all parts of the Dominion where samples were sent for test, and the universal favor in which it is held, it must be regarded as very promising. The crop on the Central Farm was not particularly heavy, 31½ bushels to the acre, but the season was not favorable, and the piece of land on which it was sown not in as good condition for a barley crop as were some other fields. It weighs 50¼ lbs. to the bushel. Through an error in shipping, the bag of Carter's barley, which should have gone to Indian Head for test, was sent to Brandon. On this account there is no report from Indian Head. The crop at Brandon weighed 54 lbs. per bushel.

Benjamin Cole, of Centreville, Prince Edward Island, got 95 lbs. from 3 lbs. seed, which weighed 56 lbs. to the bushel. He says: "Sowed 27th May; harvested 27th August; no rust; straw bright; heads long, but somewhat thin. Was late maturing; will sow earlier next year; am well satisfied with result."

H. T. Hall, Gagetown, Queen's Co., New Brunswick, got 47 lbs. from 3 lbs. of seed. He says: "Sown 21st May; harvested 21st August; no rust; straw not strong enough; lodged badly. Like the grain well; ripens about same time as our other barley; weighs 2½ lbs. more." Sample weighs 48½ lbs. to bushel.

Duncan Stewart, of Iverness, Quebec, who had 60 lbs. from 3 lbs. seed, says: "Sowed 6th May; harvested 2nd September. No rust; straw long and coarse; ripens about same time as other barley, but far heavier crop. If it will turn out as well in future as the sample did, it will be a great boon." Sample weighed 53¼ lbs. per bushel.

Henry Jennings, Victoria Square, Markham, Ontario, harvested 176 lbs. from 3 lbs. seed. He says: "Sowed 12th April; harvested 5th August. No rust or smut; straw heavy, coarse, and lodged badly; grain a great deal heavier than other kinds and 3 or 4 days later. I think this barley will be a great success; the heads were very long.

I have given it a fair trial, without any artificial manures." Sample weighed 53 lbs. per bushel.

Henry R. Wilson, Winona, Ontario, got 147 lbs. from 3 lbs. seed. He states that he "Sowed 15th April; harvested 1st August. No rust or smut; straw clean and bright; ripened about the same time as the six-rowed barley. The principal gain is its great weight, as it over-runs 6 or 7 lbs. to the bushel. The long continued cold rains in the spring and the dry hot weather at time of ripening was unfavorable." This sample was a very fine one, plump and bright, and weighed 55¼ lbs. to the bushel.

Duncan McDonald, of Glen Robertson, Glengarry, Ontario, who had 120 lbs. from 3 lbs. seed, says: "Sowed 2nd May; harvested 8th August. No rust or smut; straw very white. It took from 10 to 14 days longer to ripen than our common barley." Sample weighed 52½ lbs. per bushel.

Colin Phillips, of Brougham, Ontario, had 110 lbs. from 3 lbs. seed and writes as follows: "Sowed 24th April; harvested 8th August; yield 110 lbs. clean, besides part lost in threshing. No rust or smut; straw long, bright, medium stiff; from 10 to 15 days later than other sorts in ripening. I took a sample to Pickering Harbor and had it tested for weight by Mr. Sparks, Inspector of Barley there. He made it 54 lbs. per bushel." The sample received was rather dark in color. The weight as tested by us was 54 lbs. to the bushel.

McKee Bros., of Heaslip, Manitoba, saved 67 lbs. from 3 lbs. seed, but they say "gophers and cattle destroyed about one-third," which would make the yield about 89 lbs. They report as follows: "Sowed 31st April; harvested 20th August. No rust or smut; straw strong, and about 18 inches high. In earliness, is about the same as other barley." Sample weighed 51 lbs. per bushel.

Duncan McCuaig, of Portage la Prairie, Manitoba, got 68 lbs. from 3 lbs. sown, and says: "Sowed 29th April; harvested 21st August. No rust or smut; straw good and long. It was a few days later than other barley, probably on account of its being thinner sown." Sample weighed 52⅔ lbs. per bushel.

L. A. Agassiz, of Agassiz, British Columbia, reports the extraordinary yield of 365 lbs. from 3 lbs. of seed. He says: "Sowed 30th April; harvested 20th August. No rust or smut; straw light medium. Owing to wet weather at harvest it was discolored."

CARTER'S PRIZE CLUSTER OATS.

This new variety of white oat was also sent out by Carter & Co. It is claimed to be the heaviest, earliest and most prolific white oat in cultivation. The seed as received weighed 42 lbs. per bushel, and was very bright and handsome. Grown on the Central Farm it produced 50 bushels to the acre, but the weight, on account of rust, was deficient, being 34¼ lbs. per bushel. At Indian Head the yield was over 34 bushels to the acre, and the weight 45½ lbs. to the bushel. At Brandon the weight was 42 lbs. per bushel. The reports thus far received are very encouraging, and indicate that the introduction of this new oat will be of great advantage to the farmers of the Dominion.

Geo. Baird, of Bairdsville, New Brunswick, harvested 115 lbs. from 2¾ lbs. of seed. He reports: "No rust or smut; straw bright and yellow. It is the heaviest oat I have raised, and as early as any except the White Russian. These oats are going to make a great improvement in regard to change of seed." Sample very fine; weighed 42 lbs. per bushel.

Robert H. Goggin, Elgin, N. B., had 90 lbs. from 2¾ lbs. sown. He says: "Sowed 10th May; harvested 16th August. The straw was tall and stout. This oat compares very favorably with other kinds." Sample weighed 38¾ lbs. per bushel.

H. H. Blois, of Gore, Nova Scotia, got 57 lbs. from 2¾ lbs. seed, and says: "Sowed 4th May; harvested 20th August. No rust to speak of; no smut; straw fairly good; lodged some with rain storms; not stiff enough to stand much top dressing; ripens about the same as our common black oats. The oats throughout this section of country were affected with rust this season—nearly ruined in some instances." Weight, 39 lbs. per bushel.

John Fleetwood, St. Ann's, N.S., had 34 lbs. from 2¾ lbs. sown. He says: "sowed, 25th May; harvested 28th August. There was some rust; no smut; straw was tall and turned of a reddish brown colour. It is a good deal earlier than other sorts, except the Welcome. This year was not favourable for testing any grain in this country, as there was a great failure in all grains." Weight of sample, 35 lbs. per bushel.

John Middleton, Point Fortune, Quebec, got 40 lbs. from 2¾ lbs. seed, and says: Sowed last of April; harvested last of July. No rust; nor smut; straw good; 6 feet long; earlier than other sorts, also a better yielder; was sown in a corner of a field where it was much eaten by squirrels, or would have yielded 5 or 10 lbs. more.

Samuel Lee, of Stoney Creek, Ontario, had 115 lbs. from 2¾ lbs. sown, and says: "Sowed 8th May; harvested 12th August. Some rust; some smut; straw very good, 6 days earlier than the rest of the oats on the farm." Sample weighed 39 lbs. per bushel.

Geo. E. Fisher, of Freeman, Ontario, got 112 lbs. from 2¾ lbs. seed. He says. "sowed 15th April; harvested 5th August. Considerable rust and a little smut; straw remarkably tall and quite soft; much inclined to go down; ripens with Welcome; grain quite as heavy as the Welcome oats." The sample received was very good, and weighed 43 lbs. per bushel.

Thos. Manderson, of Myrtle, Ontario, got 72 lbs. from 2¾ lbs. sown. He says: "Sowed 15th April; harvested 2nd August. No rust or smut; straw very good; stood up fine; they ripened same time as my other white oats. I think these oats will answer this country very well." Weight of sample, 41½ lbs. per bushel.

Duncan McCuaig, Portage la Prairie, had 40 lbs. from 2¾ lbs. seed. He says: "Sowed 29th April; harvested 15th August. Some rust; good straw; has done well. The season being so dry our general oat crop was a failure this year with drought and rust." Weight of sample, 38½ lbs. to the bushel.

A. S. Harding, of Whitewood, North West Territories, had 45 lbs. from 2¾ lbs. sown, and says: "Sowed 9th April; harvested 6th August. No rust or smut; straw tall and strong; valuable for feed purposes. This is evidently a superior kind in early maturing and size of heads and grain; have a very good opinion of it; very dry season here this year." Weight of sample, 33½ lbs. to the bushel.

J. L. Hawk, Medicine Hat, North-West Territories, got 59 lbs. from 2¾ lbs. sown, and says: "Sowed 7th April; harvested 7th August; no rust, but a few heads of smut; straw long and bright; is about two weeks earlier than any other oats, and gives a better yield." This is the heaviest sample yet received. Weight, 46½ lbs. per bushel.

L. A. Agassiz, of Agassiz, British Columbia, had 223 lbs. from 2½ lbs. of seed. He writes: "Sowed 30th April; harvested 13th August; no rust; no smut; straw rather stiff; medium height; grain early and good. Owing to wet weather at harvest a great deal was lost; it was also discolored."

W. A. Johnson, Quesnelle, British Columbia, harvested 87 lbs. from 2¾ lbs. of seed. He reports as follows: "Sowed 30th April; harvested 18th August; no rust; no smut; straw long, apparently of sufficient strength to prevent lodging; compares favourably with other sorts, being ripe ten days earlier than any other oat on the farm." Sample very fine, weighing 43 lbs. to the bushel.

EARLY BLOSSOM OATS.

A few samples of this variety have been distributed, and in some districts it has given good results. On the Central Farm the yield was 30¼ bushels to the acre, but owing to rust the weight of the grain did not exceed 31 lbs. to the bushel. At Indian Head the weight was 42 lbs. to the bushel, and at Brandon 34 lbs.

John Corbett, of Summerhill, New Brunswick, got 41 lbs. from 2¾ lbs. of seed, and says: "Sowed 13th May; harvested 24th August; no rust; no smut; straw coarse, and bright in color. It is two or three days earlier than other oats sown on the same day, and compares very favorably with them." Sample weighed 37½ lbs. per bushel.

E. Frechette, St. Julie, Megantic, Quebec, had 89 lbs. from 2¾ lbs. sown. He says: "There was no rust; no smut; straw stout and long; grain much better than any other varieties on the same ground." Weighs 39½ lbs. per bushel.

John Leader, McIntosh Mills, Ontario, had 74 lbs. from 2¾ lbs. of seed, and says: "No rust; no smut; straw coarse and heavy; ripens six or seven days earlier than other oats. Is superior to any I have grown on my farm; ripens earlier and yields better, and the straw is very good." Weighs 33½ lbs. per bushel.

Adolph Lundgrew, Scandinavia, Manitoba, had 57 lbs. from 2¾ lbs. seed. He says: "Sowed 4th May; harvested 3rd September; no rust; very little smut; straw 3 to 4 feet long, and up to ⅜ inch in diameter; yield nearly double the quantity of other oats sown at the same time. A frost about the end of May, when the grain was 3 inches high, destroyed it. Otherwise, the result would have been better." Weighed 37½ lbs. to the bushel.

A few reports on the test of Welcome oats have been received, some of them quite favourable; but as this is now a well known variety in most districts, it is scarcely necessary to occupy space here with the details.

TREE SEEDS.

A limited number of tree seeds have also been distributed, including many packages of Manitoba maple, or box elder, with some elm and white ash. There were also sent out 440 bags containing from 1 to 2 lbs. each of black walnuts and 117 bags of butternuts. Some interesting reports have already been received regarding these nuts and tree seeds, and many more to whom they were sent will no doubt yet be heard from.

STOCK.

During the months of June and July some purchases of cattle were made for the Experimental Farm of the following breeds: Shorthorns, Ayrshires, Holsteins, Jerseys and Polled Angus. Of the Shorthorns, two bulls, four cows and six heifers of milking strains, and three heifers of special beef strains. Ayrshires, one bull, five cows and one heifer; Holsteins, three bulls, two cows and five heifers; Jerseys, one bull, four cows and one heifer; and Polled Angus, one bull and five heifers-making in all forty-four animals—eight bulls, fifteen cows and twenty-one heifers. In making a purchase of three Holstein bulls these have been bought with the intention of sending two of them to the other Experimental Farms in the spring; the second Durham bull was also bought for a like purpose. Since these were purchased there has been the following increase by births. One Shorthorn bull calf, three Ayrshire bull calves, one Jersey bull calf, one Ayrshire heifer calf, one Shorthorn heifer, and one Jersey heifer. Hence there are in all fifty pure bred animals, to which may be added three grade cows and one grade heifer, making a total of fifty-four. On the other hand we have lost two Jersey cows from acute inflammation of the stomach. Much care has been taken in selecting these animals, and the endeavour made to combine as far as was practicable the most desirable strains in each herd, so that a good foundation might be laid from which surplus animals could be drafted to meet the requirements of the other Experimental Farms. All these animals have been bought within the Dominion, excepting two bulls and five heifers of the Holstein breed, which were selected from the celebrated herd of Smith, Powell & Lamb, of Syracuse, New York. The following particulars relating to the pedigrees of the individual members of the several herds will, it is hoped, be of interest, and enable anyone who desires to pursue the enquiry further to trace back in the several herd books the entire pedigree of each animal:—

SHORTHORN BULLS.

Rosy Prince 8th, No. 9,198, C. H. B. Date of birth 6th November, 1886; colour red, with a little white; bred by Richard Gibson, Delaware, Ontario; sire Wild Eyes Laddie, No. 67,992, E. H. B.; dam Rosy Princess 7th, by 7th Lord of Oxford, No.

17,586, E. H. B; 2nd Dam Rosy Princess 6th, by 22nd Duke of Airdrie, No. 16690, E. H. B.

Duke of Belvoir. Date of birth, 20th April, 1889; colour roan; bred by Gibson & Burch, Delaware, Ontario; sire 8th Duke of Leicester (Imp.), No. 9279, C. H. B; dam Waterloo 48th, by Duke of Oxford, No. 39770, E. H. B; 2nd Dam 43rd Waterloo by Oxfords Baron, No. 32,030, E. H. B.

COWS AND SHORTHORN HEIFERS.

Milking Strains.

Countess of Darlington 12th, No. 14,193, C. H. B. Date of birth, July 19, 1885; colour red and white; bred by Richard Gibson, Delaware, Ontario; sire Marquis of Kirklevington, No. 52,664; Dam Countess of Darlington 8th, No. 14,190; by Oxford Duke, 45,297, E. H. B.; 2nd dam Countess of Darlington, by 14th Duke of Airdrie, 41,348, E. H. B.

Elmwood Garland 3rd, No. 14,327 C. H. B., date of birth, August 1st, 1885, colour red: bred by T. D. Hodgins, London, Ont, sire (Imp.) Belooch; dam Lady Garland 4th, by Earl of Ulster, No. 29,488, E. H. B.: 2nd dam Glosters Garland 2nd, by 17th Duke of Airdrie, No. 6629 E. H. B.

Cherry Constance 3rd, date of birth, 7th November, 1887; colour red and white; bred by Gibson & Burch, Dalaware; sire Wild Eyes Laddie, No. 67992, E. H. B., dam 4th, Constance of Springbrook; 2nd dam, Lady Constance 5th, by Lord Mayor, No. 6969 C. H. B.

Flower of Berkeley, No. 14197; date of birth, 22nd September, 1886; colour roan; bred by Richard Gibson, Delaware, Ont; sire, Lord Kirklevington, of Erie 2nd; dam Fuchsia, by Cambridge Duke; 2nd dam Fidessa, by Red Duke.

Guelder Duchess, No. 14,360; date of birth, 2nd June; 1887, colour roan; bred by T. D. Hodgins, London Ont.; sire, Duke of Guelders, No. 47,740, E. H. B.; dam, Elmwood Duchess, by Buckhurst; 2nd dam Seraphina Duchess 5th; by 7th Lord of Oxford.

Wild Flower No. 14206.—Date of birth, 3rd April, 1886; colour red and white; bred by Richard Gibson, Delaware, Ontario; sire Wild Eyes Laddie No. 9192 C.H.B; dam Hermosa by Prince 3344; 2nd dam Rose by Viceroy of Richmond.

Columbine No. —Date of birth, 24th November, 1888; colour red; with a little white; bred by Richard Gibson, Delaware; sire Duke of Wellington; dam Wild Flower 14206 by Wild Eyes Laddie 9192 C.H.B.; 2nd dam Hermosa by Prince 3344.

Miss Elgins 5th No. 16647.—Date of birth, 23rd April, 1886; colour red; with a little white; bred by James Graham, Port Perry, Ontario; sire Minna Duke No. 2108 C.H.B; dam Miss Elgins 2nd No. 4018 by Royal Buck 2374; 2nd dam Miss Elgins 4017 by Fairfax 1779.

Cowslip 3rd No. 16646.—Date of birth, 13th October, 1886; colour red; bred by James Graham, Port Perry, Ontario; sire Prince Victor 5th; dam Cowslip 2nd, by Royal Buck 2374; 2nd dam Cowslip 797 by Senator 1058.

Wildame 2nd, No. 16648.—Date of birth, 8th November, 1886; colour, red; bred by James Graham, Port Perry, Ontario; sire, Prince Victor 5th; dam, Wildame, 8186, by Oakwood Duke, 3593; 2nd dam Blossom, 2521, by Royal Prince, 1041.

BEEF STRAINS

Maggie Bly 11th, No. 16917.—Date of birth, 28th January, 1887; colour, roan; bred by John Miller & Sons, Brougham, Ontario; sire, Vice Consul (Imp.), 4132; dam, Maggie Bly 5th, 7024, by Young Mayflower, 1197; 2nd dam, Maggie Bly, 7023, by Canadian Prince, 43.

Red Rosebud 2nd, No. 16918.—Date of birth, 14th November, 1887; colour, red and white; bred by John Miller & Sons, Brougham, Ontario; sire, Vice Consul (Imp.), 4132; dam, Rosebud (Imp.), 5205, by Gladstone, 43286; 2nd dam, Rosebud 6th, by Sir Christopher, 22895.

Ury 22nd, No. 16919.—Date of birth, 12th June, 1888; colour, red; bred by John Miller & Sons, Brougham, Ontario; sire, Vice Consul (Imp.), 4132; dam, Ury 20th by Royal Booth, 3817; 2nd dam, Victoria, by High Sheriff 2nd, 702.

HOLSTEIN FRIESIANS—BULLS.

Ruth Artis 2nd Netherland, No. 9451.—Date of birth, 29th July, 1888; colour two-thirds black, strip in face: bred by Smiths, Powell & Lamb, Syracuse, N.Y.; sire, Netherland Statesman, N.H.B. 3280, A.R. 38; dam, Ruth Artis 2nd, N.H.B., 10385, A.R. 487. by Netherland Prince, N.H.B. 716, A.R. 8. This cow has a three year old butter record of 13 lbs. 9½ ozs. in a week, and a milk record of 9,356 lbs. in 11 months and 1 day; 2nd dam Ruth Artis, N.H.B. 4517, A.R. 143; who has a two-year- old milk record of 11,016 lbs. in a year.

Netherland Pythias, No. 9,167.—Date of birth, 11th June, 1888; colour, white predominating, black spots and patches on head and body; bred by Smiths, Powell & Lamb, Syracuse, N.Y; sire, Netherland Prince, N.H.B. 716, A.R. 8; dam, Aaggie Cornelia 4th, N.H.B. 4443, A.R. 43, by Alexander N.H.B. 83. She has a three-year-old milk record of 13,818 lbs. in a year, and a butter record of 19 lbs. ½ oz. in a week; 2nd dam Aaggie Cornelia, N.H.B. 4410, A.R. 40, by Rooker. She gave in Holland 73 lbs. 3 oz. milk in one day, and first year after importation 14,562 lbs. in one year; butter record, 19 lbs. 1 oz. in a week.

"Onnetta's Edgely," No. 11308.—Date of birth, 8th October, 1888; colour, black, with white markings; bred by Smith Bros., Churchville, Ontario; sire, Duke of Edgely, H. F. 552; dam, Onetta, D.F. 1816.

HOLSTEIN FRIESIAN COWS AND HEIFERS.

Netherland Dorinda 2nd, H.F.H.B. 2604, A.R. 489.—Date of birth, 8th August, 1885; colour, two-thirds white, with black markings; bred by Smiths, Powell & Lamb, Syracuse, N.Y.; sire, Sir Henry 2nd of Aaggie N.H.B. 1451, A.R. 5; dam, Netherland Dorinda, H.H.B. 6894, A.R. 199, by Schreuder; milk record, 13,659 lbs. in a year; butter record, 24 lbs. 9 oz. in a week, 96 lbs. 2¼ oz. in thirty days—16$\frac{85}{100}$ lbs. of milk making 1 pound of butter; 2nd dam, Bontje, a very fine cow in Holland.

Netherland Dorinda 3rd, H.F.H.B. 4560.—Date of birth, 21st October, 1886; colour, mostly black, with small star; bred by Smiths, Powell & Lamb, Syracuse, N.Y.; sire, Netherland Prince, H.H.B. 716, A.R. 8; dam, Netherland Dorinda, H.H.B. 6894, A.R. 199; 2nd dam, Bontje. Netherland Dorinda 3rd gave as a two-year-old in 3 months and 17 days to the time of sale, 3,106 lbs. of milk, and made 11 lbs. 12½ oz. butter in a week.

Abi, H.F.H.B. 9831.—Date of birth, 5th July, 1887; colour, black, with white patches; bred by C. F. Sweezey, Marion, N.Y.; sire, Oatka 3rd Neptune, jr., H.H.B. 4531; dam, Snowie, H.F.H.B. 3114, by Empire Boy, H.H.B. 2615; 2nd dam, Rosalind, H.H.B. 577.

Aaggie Cornelia 2nd Netherland, H.F.H.B. 12217.—Date of birth, 4th July 1888; colour, two-thirds black, strip in face; bred by Smiths, Powell & Lamb, Syracuse, NY.; sire, Netherland Prince, H.H.B. 716, A.R. 8; dam, Aaggie Cornelia 2nd, H.H.B. 4341, A.R. 41. Milk record, 14,610 lbs. in a year; butter record, 19 lbs. 6 oz. in a week—21$\frac{79}{100}$ lbs. of milk making 1 lb of butter. She is by Alexander N.H.B. 83, 2nd dam, Aaggie Cornelia, H.H.B. 4410, A.R. 40. She gave in Holland 73 lbs. of milk in one day. In 1885 she gave 16,794 lbs. of milk in one year; butter record, 19 lbs. 1 oz. in a week. She is by Rooker, the sire of Aaggie H.H.B. 901.

Louverse 2nd Clothilde H.F.H.B. 13539.—Date of birth, 29th November, 1888; colour, three-fourths black, strip in face; bred by Smiths, Powell & Lamb, Syracuse, N.Y.; sire, Clothilde 4th Artis, H.F.H.B. 5488; dam, Louverse 2nd, H.F.H.B. 6710, A.R. 510. Butter record as a two-year-old, 11 lbs. 1½ oz. in a week; milk record, 6,381 lbs. in 8 months and 20 days, to 1st September; 2nd dam, Louverse, H.H.B. 6754. Two-year-old milk record, 477 lbs. in 10 days; three-year-old record, 402 lbs. in 7 days, which made 12 lbs. 4 oz. butter.

Bonnie Ethel's Mercedes, H.F.H.B. 11243.—Date of birth, 5th April, 1888; colour, black, with white markings; bred by Thos. E. Wales, jr., Iowa City, Iowa; sire, Mercedes Prince, H.H.B. 2150; dam, Bonnie Ethel, H.H.B. 9510.

Siepkje 3rd Queen.—Date of birth, 11th September, 1888; colour, black, with white markings; bred by W. A. Rowley, Mount Clemens, Mich.; sire, Macomb Boy, H.F.H.B. 8734; dam, Siepkje 3rd, H.F.H.B. 2387.

AYRSHIRE BULL.

MacDuff, No. 479.—Date of birth, 5th October, 1888; colour, red and white; bred by David Nicol, Cataraqui; sire, Norseman, 478; dam, Dora, 244, by Douglas 148; 2nd dam, Moss, 242, by Parker 144.

AYRSHIRE COWS AND HEIFERS.

Clara, No. 3590.—Date of birth, 6th February 1884; colour, red, with white on flank; bred by James Drummond, Petite Côte, Que.; sire, Promotion 3212, imported; dam, Maud 2356, by Sir Roger 2200; 2nd dam, Maggie 3rd, 1332, by Lord Douglas 2nd, 814.

Gipsy, No. 3979.—Date of birth, 15th August, 1886; colour, red, with white spots; bred by James Drummond, Petite Côte, Quebec; sire, Promotion, 3212, imported; dam Victoria, 2931, by Lorne, 2227; 2nd dam Effie 579, by Gordie, 26.

Countess No. 3838.—Date of birth, September 19, 1885; colour, white, spotted red, bred by James Drummond, Petite Côte, Quebec; sire Promotion, 3212, imported; dam Victoria, 2931, by Lorne, 2227; 2nd dam, Effie, 579, by Gordie, 26.

Eva No. 3828.—Date of birth, 15 September, 1884; colour, red, with white spots; bred by James Drummond, Petite Côte, Quebec; sire Promotion, 3213; imported; dam Bell, 3131, by Lorne, 2227; 2nd dam, Juno, 1,214, by Duke of Athole, 575, imported.

May, No. 3633.—Date of birth 25th July, 1883; colour, brown, with white spots; bred by James Drummond, Petite Côte, Quebec; sire Promotion, 3,212, imported; dam Ida, 1181; by Duke of Athole (Imp.) 575; 2nd dam Maggie, 32; by Garibaldi, 25.

Viola, No. 943.—Date of birth, 1st November, 1888; colour, white and red; bred by David Nicol, Cataraqui, Ontario; sire, Norseman, 478; dam, Dido, 942, by General, 155; 2nd dam, Dora, 244, by Douglas, 148.

JERSEY BULL.

Actor of Glen Duart, No. 18033.—Date of birth, 15th November, 1886; colour, solid fawn; from A. McLean Howard, Toronto, Ont.; sire, Actor of Hillhurst, 10454; dam, Rose of Hillhurst, 22806, by Browny; 2nd dam, Lady Mary, imported.

JERSEY COWS AND HEIFERS.

Oriondo's Girl, No. 40376.—Date of birth, 7th May, 1886; colour, mulberry fawn; from A. McLean Howard, Toronto, Ont.; sire, Oriondo, 10791; dam, Judy's Girl, 25189, by Judy's Prince, 5713; 2nd dam, April Girl 3rd, 16141.

Clenna Rex 2nd, No. 38999. Date of birth, 16th April, 1886; colour, dark grey fawn: from A. McLean Howard, Toronto, Ont.; sire, Pride's Orient, 15887; dam, Clenna Rex, 27741, by Queen's Rex, 4943; 2nd dam, Belinda 2nd, 9426.

Clenna Rex of Glen Duart. Date of birth, 11th April 1888; colour, dark grey fawn; bred by A. McLean Howard, Toronto Ont.; sire, Canada's John Morgan No. 16853; dam, Clenna Rex, 2nd 38999 ,by Pride's Orient 15857; 2nd dam Clenna Rex, 27444, by Queen's Rex, 4943.

POLLED ANGUS BULL.

King of Eastview, No. 8780.—Date of birth 3rd January, 1888; colour, black; bred by Late Hon. J. H. Pope, Cookshire, Quebec, sire, Piper of Eastview, 5612; dam, Queen of Eastview 3rd, 5587.

POLLED ANGUS HEIFERS.

Dolly Varden of Eastview, No. 6792.—Date of birth, 11th June, 1886; colour, black; bred by late Hon. J. H. Pope, Cookshire, Quebec; sire, Knight of Canada, 5622; dam, Dolly Varden 3rd, 3458.

Pride of Eastview, No. 6809.—Date of birth, 3rd October, 1886; colour, black, bred by late Hon. J. H. Pope, Cookshire, Quebec; sire, Knight of Canada, 5622: dam, Pride of Montbletton 3rd, 3473.

Stella of Eastview, No. 7638.—date of birth, 14th June, 1887; colour, black; bred by late Hon. J. H. Pope, Cookshire, Quebec; sire, Knight of Canada, 5622; dam, Stella of Ardconnon, 4929.

Gratitude of Eastview 4th, No. 7635.—Date of birth, 25th May, 1887; colour, black; bred by late Hon. J. H. Pope, Cookshire, Quebec; sire, Knight of Canada, 5622; dam, Gratitude, 1824.

Daisy of Eaton 4th, No. 8783.—Date of birth, 8th January, 1888; colour, black; bred by late Hon. J. H. Pope, Cookshire, Quebec; sire, Arminius, 6797; dam, Daisy of Skene, 2258.

The following are the births since the above animals were purchased :—

SHORTHORNS.

Bull calf from Elmwood Garland 3rd, by Rosy Prince 8th.—Date of birth, 30th July, 1889.

Heifer calf from Miss Elgins 5th, by Mazurka Duke 5th.—Date of birth, 31st December, 1889.

AYRSHIRES.

Bull calf from Clara, by Rob Roy 3971. Date of birth, 3rd August, 1889.

Bull calf from May, by Rob Roy 3971. Date of birth, 13th August, 1889.

Bull calf from Countess, by Rob Roy 3971. Date of birth, 23rd December, 1889.

Heifer calf, from Eva, by Rob Roy 3971. Date of birth, 2nd October, 1889.

JERSEYS.

Bull calf from Clenna Rex 2nd, by Canada's John Morgan.—Date of birth, 15th November, 1889.

Heifer calf, from Oriondo's Girl, by Canada's John Morgan, date of birth, 14th June, 1889.

EXPERIMENTS WITH WHEAT.

One hundred and seven varieties of wheat have been tested during the past year, eight of fall or winter wheat and ninety-nine of spring wheat—many of them in small quantities, others in larger plots. The details connected with the special tests made in small plots are too voluminous to permit of their being published in this summary report; hence, the results only of the field tests will be given here, reserving the fuller details for a bulletin.

The following table gives the dates of sowing and harvesting, yield per acre and weight per bushel of each variety.

——	Date of Sowing.	Date of Harvesting.	Yield per Acre.	Weight per Bushel.
Spring Wheat.			Bush.	Lbs.
American, Milwaukee	May 9..	August 20..	10	56½
American Hard, Duluth	do 3..	do 12..	19⅜	56⅜
Blue Stem from Minnesota	do 13..	do 20..	8	55
Banater's Spring	do 13..	do 24..	6	55
Brown's New Wheat	do 17..	do 22..	8	54½
Chilian White	do 9..	do 15..	3	51
Californian White	do 3..	do 11..	7 1/10	50
Defiance	do 3..	do 16..	9½	57½
Early Essex	do 17..	do 24..	7½	54½
Eureka (same as Red Fern)	do 4..	do 13..	21⅜	56
Fife Red	April 19..	do 10..	17	59½
Green Mountain	May 4..	do 14..	17½	55⅜
Hungarian Mountain	do 3..	do 15..	17½	56
Indian Karachi	do 9..	do 11..	4	53½
Indian Club Calcutta	do 9..	do 9..	3½	57½
Indian Hard do	do 9..	do 11..	5	58
Indian Red do	do 3..	do 5..	10⅛	57½
Ladoga	April 19..	do 3..	18	58
Mars	May 3..	do 8..	15	58
Medea	do 3..	do 18..	10	56
Magyar	do 9..	do 18..	3	50
New Zealand Long Berry	do 3..	do 19..	4½	55
Onega	do 3..	do 2..	12	52½
Red Fern	do 3..	do 18..	19	60
Russian Hard Tag	do 4..	do 12..	18	57½
Rio Grande	do 4..	do 20..	17	61½
Saxonka	do 3..	do 8..	8	56½
White Delhi	do 4..	do 6..	13½	57
White Russian	April 20..	do 9..	33	60
Campbells No. 1, Triumph	May 4..	do 12..	13⅜	56½
Campbells No. 2, White Chaff	do 4..	do 12..	36⅜	56
Scotch from Nova Scotia	do 3..	do 17..	14½	55½
Winter Wheat.				
These plots were injured by winter, patches here and there being entirely killed out. Had the ground been uniformly covered they would have yielded nearly, if not quite, 25 bushels to the acre.				
Democrat	Sept. 11..	July 31..	19	59½
Tasmania	do 6..	do 25..	17½	58
Manchester	do 11..	do 25..	17½	58½

The spring wheats referred to as Campbell's No. 1 Triumph and No. 2 were kindly sent for test by David Campbell, Nottawa P. O., Ontario. The Triumph is a short, full, plump berry, rather soft and starchy. Mr. Campbell says: "This was extensively grown in our section last year, turned out much better than the old varieties, some samples weighing 65 lbs. to the bushel. Its only fault is that it shells

from filling so well." No. 2: "A white chaff variety, with a large head, well filled to the top. These wheats both originated on my farm from one variety of seed."

As will be seen from the table, the Triumph did not do very well with us, but No. 2 yielded the largest crop of any variety we have tested this year. It must not be forgotten that the rust, which affected almost all varieties of grain at the Central Farm last season, materially lessened both the quantity and the quality of the crops, and that these field experiments were carried on under ordinary farming conditions.

EXPERIMENTS WITH BARLEY.

The field experiments with barley have been carried on mainly with two-rowed varieties, such as are in favour in Great Britain for malting purposes. Along with these, a few sorts of the six-rowed have been tried:—

	Date of Sowing	Date of Harvesting.	Yield per Acre.	Weight per Bushel.
Two-rowed Barley.			Bush.	Lbs.
Selected Chevalier, O. & M	May 6..	Aug. 5..	31⅛	51
Beardless	April 23..	do 4..	50⅜	51¾
California	May 10..	do 17..	21¼	49¼
Danish Chevalier	do 4..	do 5..	31⅛	50½
Danish Printice Chevalier	do 4..	do 5..	36¼	50
Early Minting	do 6..	do 5..	25¾	50¾
English Malting	April 25..	do 7..	34¼	50½
Golden Melon Improved	May 6..	do 18..	26	48¾
Carter's Prize Prolific	do 3..	do 18..	31½	50¼
New Zealand	do 10..	do 17..	26½	51
Saale	do 17..	do 22..	22	51
Peerless White	April 23..	do 1..	36½	51
Large Two-rowed Hulless	May 9..	do 12..	26	55½
Six-rowed Barley.				
Mensury	May 10..	Aug. 10..	22	46½
Polar	do 10..	do 3..	34½	42
Petschora	do 10..	do 5..	30	43½
Russian	do 10..	do 10..	25¼	48¼

These field crops were grown without special fertilizers. The Beardless, Peerless White and English Malting barleys were sown on clay loam which was in hay in 1888, was ploughed soon after the crop was taken off, and well stirred by the cultivator in the spring, but received no manure. The Selected Chevalier and Early Minting were sown on a sandy loam similarly treated, also without manure. The Danish Chevalier and Danish Printice Chevalier were sown on mixed clay and sandy loam, after a crop of spring wheat, ploughed immediately after harvest, cultivated later in the season, which received a coating of barnyard manure, about 18 tons to the acre, in the spring, the land being lightly ploughed before sowing. The field in which Carter's Prize Prolific and Golden Melon barleys were grown, also had a crop of spring wheat in 1888, was ploughed soon after harvest, and lightly ploughed again in the spring of 1889 before sowing, these also had no manure.

RELATIVE TEST OF TWO-ROWED AND SIX-ROWED BARLEY FOR MALTING PURPOSES.

During the year an important test was made to ascertain the intrinsic value of two-rowed barley of good quality, such as is in demand for malting purposes in Great

Britain, as compared with a good sample of six-rowed barley of Canadian growth, the experiment being undertaken for the purpose of ascertaining how far the peference for two-rowed barley was founded on its actual worth. Five hundred bushels of best malting barley was imported from Scotland and malted; a like quantity of best Canadian barley was similarly treated, and the product in each case brewed. The test was made by a careful and competent maltster and brewer, and the result shows that the preference is well founded, and that the two-rowed barley yielded about 13 per cent. more of extract than the six-rowed. The following report was received:—

"CARLING BREWING AND MALTING COMPANY,
"LONDON, Ont., 14th September, 1888.

"WM. SAUNDERS, Esq.,
"Director Experimental Farms,
"Ottawa.

"DEAR SIR,—In compliance with your request. we beg to enclose statement of results obtained from the two-rowed chevalier barley received from Scotland, and malted by us in April last.

"The extract obtained from it exceeds that of the best Canadian barley grown in this district by 13 per cent., or, in other words. 320 bushels of malt of 36 pounds to the bushel (=11,520 pounds) produced 584 imperial gallons more of ale (say gravity 22) than was made from the same quantity of the best Canadian six-rowed barley

One fault with some of the barley grown here, is the want of allowing it to get fully ripened before harvesting, consequently some of the grain is green when grown on the floor which is detrimental to the keeping quality of beer.

"Yours respectfully,

THOS. M. HEATHORN,

"*Brewer and Maltster for the Carling Brewing and Malting Co.*"

EXPERIMENTS WITH OATS.

Thirty-six varieties of oats have been grown as field crops, and fifty other sorts tested in smaller plots. In field culture the following results have been obtained:—

—	Date of Sowing.	Date of Harvesting.	Yield per Acre.	Weight per Bushel.
			Bush.	Lbs.
Black Tartarian	May 8..	August 20..	51½	29
Black Champion	do 7..	do 22..	39¼	28¾
Carter's Prize Cluster	April 24..	do 4..	50	34½
Canadian Triumph	May 6..	do 14..	19	39
Cream Egyptian	do 6..	do 20..	49	35½
Clydesdale	do 6..	do 26..	18½	31
Canadian White	do 10..	do 26..	15	37½
Egyptian White	do 6..	do 18..	55	37½
Early Calder	do 10..	do 20..	26½	30½
Early Racehorse	do 8..	do 10..	22	37
Early Blossom	do 8..	do 18..	30¼	31
Glen Rothern	do 6..	do 25..	29	25½
Flying Scotchman	do 7..	do 10..	21	34
Georgia Early White	do 10..	do 20..	27	35½
Giant Yellow French	do 13..	do 20..	40	25½
Hungarian White	do 10..	do 26..	39½	32½
Lincolnshire Poland White	do 6..	do 12..	13	40
Longfellow	do 10..	do 14..	.....	34½
Onega Black	do 13..	do 18..	48	26¾
Potato, Scotch	do 3..	do 16..	39	31
do English	do 6..	do 12..	38½	27
Pringle's Progress	do 9..	do 18..	29¼	27½
Rennie's Prize White	do 6..	do 14..	23	35½
Red Oats	do 7..	do 20..	36	30½
Siberian	do 9..	do 24..	44	35½
Small Black Naked	do 9..	do 20..	23	29½
Tartarian White	do 10..	do 20..	33½	28½
Scotch Hopetown	do 13..	do 12..	44	26
Victoria Prize White	do 10..	do 20..	29½	34½
Waterloo	do 6..	do 18..	43	30
Winter Grey	do 9..	do 20..	52	28½
White Bonanza	do 6..	do 12..	22	38
White Wonder	do 13..	do 18..	39¼	33
Welcome	April 22..	July 31..	28¾	35¾
White Russian	May 6..	August 12..	39¾	36
Early English	do 17..	do 20..	18	30

INDIAN CORN.

Much attention has been given to the testing of different varieties of fodder corn now used so extensively for the winter feeding of stock, both cured and in the form of ensilage. Seventy varieties have been tested, and their relative earliness and productiveness, as grown side by side, ascertained; the product has been converted into ensilage. Tests have also been carried on with this important crop at the Experimental Farms in Nova Scotia, Manitoba and the North-West Territories. Some of the particulars will be found in the appended reports from these farms, but fuller details of these experiments will shortly be compiled and given to the farming community in convenient form for comparison and reference in a special bulletin.

ROOTS.

Turnips.

Carter's Elephant Swede.—This fine turnip, first offered by James Carter & Co., of London, England, in the spring of 1888, has yielded a heavier crop than any

other variety tested, exceeding the best of the other sorts by nearly 3 tons per acre. The root is regular in form, projects well above the surface, is of a deep purplish colour outside, with creamy yellow flesh. Grown on sandy loam; sown 29th June; was up 4th July, and harvested 26th October; yield per acre, 16 tons 266 lbs.

Steele Bro.'s New Giant Swede.—On sandy loam; sown 29th June; up 3rd July; harvested 26th October; yield per acre, 13 tons 759 lbs.

The above two plots had no barnyard manure, but a dressing of about 400 lbs. to the acre of a mixture of superphosphate of lime and nitrate of soda.

Steele Bro.'s Purple Top Swede.—Grown on sandy land, to which had been applied barnyard manure in the proportion of about 18 tons to the acre; sown 6th June; up 11th June; harvested 23rd October; yield per acre, 12 tons 1,096 lbs.

A second lot of Steele Bro.'s Purple Top Swede was sown on new land of a peaty character, without manure or other fertilizer. This was sown 14th June; up 18th June, and harvested 25th October; yield, 12½ tons to the acre.

Rennie's Purple Top Swede.—Was grown on similar soil, also without manure; sown 14th June; up 18th June; harvested 24th October; yield per acre, 13 tons 440 lbs.

Skirving's Swede.—Sown on mixed sandy and clay loam, which was dressed with a fertilizing mixture similar in quantity and composition to that used for Carter's Elephant Swede; sown 27th June; up 3rd July; harvested 28th October; yield per acre, 12 tons.

Mangels.

Carter's Golden Intermediate—Sown 16th May; up 22nd May; harvested 13th October; yield per acre, 10 tons 85 lbs.

Carter's Yellow-fleshed New Tankard.—Sown 16th May; up 22nd May; harvested 13th October; yield per acre, 8½ tons.

Pearce's Mammoth Long Red.—Sown 25th May; up 2nd June; harvested 13th October; yield per acre, 14 tons 200 lbs. These were sown on sandy loam, which had received a top dressing of about 18 tons of barnyard manure to the acre.

Carrots.

Steele Bro.'s Improved Short White.—This carrot has succeeded much better on the Central Farm than any other sort exceeding in crop the best of the others tested by 4½ tons per acre. It has proven very regular in form, of good size, and is easily lifted. The seed was sown 15th May; came up 22nd May, and was harvested 18th October. The yield was 20½ tons per acre.

Carter's Orange Giant.—Sown 15th May; up 25th May; harvested 18th October; yield per acre, 16¼ tons.

Carter's Scarlet Perfection.—Sown 15th May; up 24th May; harvested 18th October; yield, 10 tons, 536 lbs. per acre.

Carter's White Belgian Improved.—Sown 15th May; up 25th May; harvested 19th October; yield per acre, 15 tons 1,160 lbs.

Carter's Giant Wiltshire White.—Sown 15th May; up 25th May; harvested 19th October; yield per acre, 12 tons, 1,262 lbs. These were all sown on sandy loam, which had received a dressing of about 18 tons of barn yard manure to the acre.

Sugar Beets.

White Sugar Beet.—Sown 30th May; up 9th June; harvested 14th October; yield per acre, 9 tons 600 lbs.

Vilmorin's Improved.—Sown 30th May; up 9th June; harvested 14th October; yield per acre, 9 tons 240 lbs.

Lane's Sugar Beet.—Sown 20th May; up 7th June; harvested 14th October; yield per acre, 11 tons 660 lbs.

Sugar Beet from Central Germany (seed imported by W. Skaife, Esq., Berthierville, Quebec).—Sown 25th May; up 3rd June; harvested 14th October; yield per acre, 10½ tons.

Bohemian Sugar Beet (seed imported by W. Skaife, Esq., Berthierville, Quebec).—Sown 25th May; up 3rd June; harvested 14th October; yield per acre, 8 tons 856 lbs.

The percentage of sugar contained in these several varieties has been determined by analyses made by the Chemist of the Experimental Farms, full particulars of which will be found in his report.

EXPERIMENTS WITH PEAS.

Golden Vine peas were sown in the proportion of 1 bushel to the acre on 25th April; were up 4th May; harvested 6th August. Total yield of straw and grain, when dry enough to stack, 1,275 lbs. from two-ninths of an acre. When threshed the weight of peas was 480 lbs.; straw 795 lbs.; yield per acre, 36¼ bushels.

Golden Vine peas sown on the same day at the rate of 2 bushels per acre was also harvested 6th August. Total yield of straw and grain, 1,402 lbs. from two-ninths of an acre. When threshed peas weighed 497 lbs., straw 905 lbs.; yield per acre, 37½ bushels.

Golden Vine peas sown on same day, 3 bushels to the acre, harvested also 6th August, gave a total yield of straw and grain, 1,621 lbs. from two-ninths of an acre. When threshed peas weighed 539 lbs., straw 1,082 lbs.; yield per acre, 40¾ bushels.

Golden Vine peas in ordinary field crop, 2½ bushels to the acre, was sown 20th April; harvested 6th August; yield, 30½ bushels to the acre; weight, 63 lbs. per bushel.

Multiplier peas, in field crop, 2½ bushels to the acre; sown 26th April, and harvested 20th August; gave a yield of 50½ bushels to the acre; weight 63½ lbs. per bushel.

Black Eyed Marrowfat Peas.—3 bushels to the acre.—Sown 20th April; harvested 11th August; (the pods were fit for table use 9th July). Weight of peas per bushel, 60¼ lbs.

GRASSES AND CLOVERS FOR PERMANENT PASTURE.

Two plots of about two acres each were sown with the following mixtures of grasses and clovers without any grain or other protecting crop.

Plot No. 1.—6 lbs. Cocksfoot or Orchard Grass, 2lbs. Timothy 4 lbs. Meadow Fescue, 2 lbs. Perennial Rye Grass, 2 lbs. Crested Dogstail, ½ lb. Sweet Vernal, 2½ lbs. Italian Rye Grass, 2 lbs. Kentucky Blue Grass, 2 lbs. Red Top (*Agrostis Vulgaris*), 1 lb. White Clover, 5 lbs. Red Clover, 1 Alsike clover,—total, 30 lbs.

Plot No. 2.—4 lbs. Cocksfoot or Orchard Grass, 3 lbs. Timothy, 2 lbs. Meadow Fescue, 3 lbs. Perennial Rye Grass, 2 lbs. Crested Dogstail, ½ lb. Sweet Vernal, 4 lbs. Meadow Foxtail, 2 lbs. Rough Meadow Grass, 1½ lb. Hard Fescue, 1 lb. Tall Fescue, 1 lb. White Clover, 4 lbs. Red Clover, 2 lbs. Alsike clover—total, 30 lbs.

No. 1 was sown on the 29th of May, on peaty land, and by the 3rd of September, had made a closely matted growth from 2 to 2½ feet high, when it was cut and dried, and weighed 7,430 lbs., which was equal to a little more than 1½ tons to the acre.

No. 2 was sown on the 29th of May, on soil partly peaty and partly sandy loam; by the 31st of August it had reached a height of about 2 feet, and had become thickly matted. It was cut on that date, and when dried weighed 6,590 lbs., equal to nearly 1½ tons per acre.

MIXED CROP.

A mixture of grain, consisting of 1 bushel each of oats, peas and barley per acre was sown for the purpose of furnishing green food for cattle. It was sown on the 27th May, and was fit to cut on the 10th July. The first was cut on this date, and the

cutting lasted twelve days. The yield was 10¼ tons per acre. After this crop was taken off the land was ploughed, and an early maturing variety of white turnip sown, which produced a crop of 7⅞ tons per acre.

SPRING RYE.

This was sown 7th May, was up 12th May; on the 21st of June it was headed out, and from 3 to 3½ feet high, when a part of the field was cut to furnish green food for cattle. From this there was a second growth, which was cut on the 12th August, when it was from 2 to 2½ feet high. Through an omission, these crops were not weighed. The remaining part of the field was allowed to ripen, and yielded 21¾ bushels per acre.

FODDER PLANTS.

Eleven varieties of fodder plants were sown in plots of one-tenth of an acre each, with a view of testing from year to year the yield of green or cured fodder they will give. One cutting was made late in the autumn from several of them, but the result was not weighed.

Trefoil.—Sown 25th May; came up 2nd June. When examined for comparison on the 15th October it was from 3 to 4 inches high.

White Clover.—Sown 25th May; came up 2nd June. Was from 4 to 5 inches high 15th October.

Extra Choice Red Clover.—Sown 25th of May; up 2nd June. By 15th October it had reached a height of from 1 to 2 feet, when it was cut.

Lucerne.—Sown 25th May; came up 2nd June. First crop was cut 15th October, when it was from 1 foot to 18 inches high.

Alsike.—Sown 27th May; came up 2nd June. First crop was cut 15th October, when it was from 1 to 2 feet high.

Scarlet Clover.—Sown 27th May; came up 3rd June. By 15th October, it had reached a height of from 1 to 2 feet when it was cut.

Bokhara Clover.—This was sown 27th May; came up 3rd June. First crop was cut on the 15th of October, when it had reached a height of from 3 to 3½ feet.

Serradella.—Sown 28th May; was up 3rd June; and the first crop was cut 15th October, when it had reached a height of from 1 to 2 feet.

Mammoth Red Clover.—Sown 28th May; up 2nd June. By 15th October it had reached a height of from 1 to 1½ feet, when the first crop was cut.

Broad-leaved Red Clover.—Sown 28th May; came up 2nd June; and the first crop was cut 15th October, when it was from 1 to 2 feet high.

Sainfoin.—This was sown 28th May; came up 5th June, and by the 15th October had reached an average of about 1 foot in height, when it was cut.

POTATOES.

During the season of 1889 a large number of tests were made with the leading varieties of potatoes, both American and European. Many of those grown in 1888 were discarded, either on account of their being poor yielders or for the reason that they have been unsatisfactory as to quality. In this way the 251 varieties in cultivation in 1888 were reduced to 116, to which were added 31 new sorts and a large number of seedlings, which have been raised on the Central Experimental Farm, so that the number of varieties of which records have been kept during the past year is in all 384. Among the newer potatoes the following deserve mention on account of their productiveness, Halton's Seedling, Dakota Red, Stray Beauty, Rosy Morn, Rural Blush, Lee's Favorite, Burpee's Superior, Early Albino and Carter's King of Russetts.

Among the seedlings there are quite a number of very promising sorts, both as to productiveness and quality; but the experience of another season will be needed before any comparative statement as to their relative merits can be given. The exhibits made of the new seedlings at several of the leading exhibitions last autumn

attracted much attention, and numerous applications have been received for samples for test in different parts of the Dominion; but as these seedlings are only two years from seed, the quantity available is not in any instance sufficient yet to admit of any distribution outside of the Experimental Farms. The details relating to these tests will be reserved for a special bulletin, which will be prepared as soon as sufficient facts have been accumulated to make it useful.

SEED GRAIN, &c., FROM INDIA.

In the report for 1888 some particulars were given regarding a variety of cereals and other products which had been received from the Government of India for test on the Experimental Farms in Canada. Most of these products had been grown at considerable altitudes in the Himalayan Mountains, varying from 420 to 11,000 feet. At some of the higher altitudes the climate much resembles that of some portions of the Canadian Dominion, and the results of tests with important agricultural products from similar climates in a country so distant, and which have been so long under cultivation there, are of very great interest. Reference has already been made in Bulletin 6 to some of the results of tests of barley from India, and as the past season has been an unfavourable one, and some of the seeds were not received in time for early seeding—considering, also, that all of them are new to this climate—it has been thought best to have the experience of another year with them before submitting a full report.

FOREST TREES

Many additions have been made during the year to the experimental plots of forest trees. The planting has been continued on the belt across the rear end of the farm, which contains now the following clumps. Beginning on the north side of the central avenue on the farm, known as Elm avenue, they will be found in the following order:—

179 Scotch Pine—*Pinus sylvestris.*
21 Red Oak—*Quercus rubra.*
630 Black Walnut—*Juglans nigra.*
247 Scotch Pine—*Pinus sylvestris.*
288 Butternut—*Juglans cinerea.*
275 European Larch—*Larix Europea.*
38 White Elm from Manitoba—*Ulmus Americana.*
87 Hickory—*Carya alba.*
90 European Alder—*Alnus glutinosa.*
240 Sugar Maple—*Acer saccharinum.*
150 Soft Maple—*Acer dasycarpum.*
90 White Birch (European)—*Betula alba.*
120 Canoe Birch—*Betula papyracea.*
180 White Spruce—*Abies alba.*
150 Yellow Birch—*Betula lutea.*
120 White Oak—*Quercus alba.*
120 Red Elm—*Ulmus fulva.*
150 Rock Elm—*Ulmus racemosa.*
196 White Elm—*Ulmus Americana.*
198 Arbor Vitae—*Thuja occidentalis.*
115 Black Ash—*Fraxinus sambucifolia.*
120 Green Ash—*Fraxinus viridis.*
120 Red Ash—*Fraxinus pubescens.*
266 White Ash—*Fraxinus Americana.*
214 Austrian Pine—*Pinus Austriaca.*
30 Tea's Catalpa—*Catalpa hybrida.*
30 Japan Catalpa—*Catalpa kaempferi.*
158 Hardy Catalpa—*Catalpa speciosa.*

195 Black Walnut—*Juglans nigra.*
300 Norway Spruce—*Abies excelsa.*
83 Russian Mulberry—*Morus hybrida.*
206 Locust—*Robinia pseudacacia.*
219 Wild Black Cherry—*Prunus serotina.*
298 White Pine—*Pinus strobus.*
261 Box Elder—*Negundo aceroides.*

On the south side of Elm avenue the following have been planted:—

170 Red Maple—*Acer rubrum.*
110 Norway Maple—*Acer platanoides.*
100 European Mountain Ash—*Pyrus acuparia.*
50 European Ash—*Fraxinus excelsior.*
30 Hemlock Spruce—*Abies Canadensis.*
50 American Mountain Ash—*Pyrus Americana.*
120 American Sycamore—*Platanus occidentalis.*
150 American Beech—*Fagus ferruginea.*
240 Butternut—*Juglans cinerea.*
30 Riga Pine—*Pinus sylvestris rigensis.*
90 Horse Chestnut—*Æsculus hippocastaneum.*
210 White Ash—*Fraxinus Americana.*
189 Rock Elm—*Ulmus racemosa.*

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Many of these plots are irregular in form, and have been so arranged as to overlap each other, and thus relieve the stiff appearance which a number of square blocks of trees would present. The width of this tree belt is about 150 feet, ten rows of trees at the west end being planted 5 feet apart each way, and at the east end ten rows at a distance of ten feet apart. This has been done to ascertain the relative advantages of planting at different distances. The age of the trees from seed is recorded, the annual growth will be ascertained and other particulars regarding the progress of the different varieties noted, and thus there will be accumulated in a very few years much reliable information, which will be useful to future tree planters.

There has also been planted in mixed clumps, where ten or twelve different sorts of trees are irregularly distributed throughout, about 560 trees. These have been placed along the north boundary of the farm, where they will serve as an excellent wind-break and also afford material for comparing the growth and developement of those in mixed clumps, with trees planted in groups of one sort only.

In addition to the twenty-five bundles of forest trees already referred to as forwarded to the experimental gardens of the Canadian Pacific Railway on the western plains, more than 20,000 were sent from the Central Farm to the other Experimental Farms, besides a considerable number of mail packages of young trees and plants which have been forwarded to farmers, especially in newly settled districts in distant parts of the Dominion, where it has been thought desirable that certain sorts of trees should be introduced for test.

AVENUES AND HEDGES.

The trees on Elm avenue have grown very well, without a single failure, and on the avenue on the road approaching the entrance gate one tree only needs replacing. The other trees have not done so well. Of the sugar maples and soft maples about 15 per cent. have failed to grow, and of the lindens a still larger proportion. The hedges have done remarkably well; scarcely a tree has failed. The spruce hedge on the south boundary has been extended from the public road to the canal, 410 trees having been required for this purpose. Arbor vitae hedges have also been planted around the large poultry runs in front of the poultry building, for which 412 trees

have been used, and some smaller pieces of the same have been planted near some of the other buildings.

Sample hedges in sections of 50 feet in length have also been put out of the following:—

Caragana or Siberian Pea—*Caragana arborescens.*
White Elm—*Ulmus Americana.*
Russian Mulberry—*Morus hybrida.*
Norway Spruce—*Abies excelsa.*
Honey Locust—*Gleditschia triacanthos.*
White Spruce—*Abies alba.*
Common Barberry—*Berberis vulgaris.*
Hemlock Spruce—*Abies Canadensis.*
Purple Barberry—*Berberis vulgaris var. purpurea.*
Prickly Ash—*Zanthoxylum Americanum.*

In addition to the above, it is proposed to test the value of a number of other shrubs and trees for this purpose. These hedges will serve as specimens, and be very useful for comparison.

DRAINING.

During the past year this useful work has been continued, and six and a-quarter miles of tile drains have been laid, the drains varying in depth from 2½ to 5 feet or more. More than two-thirds of this has been laid with 3-inch tiles; the remainder 4 and 6-inch. This, added to the draining previously done, makes a total of 15¾ miles and 235 yards of tile drains and 489 yards, of box and open drains, or 16 miles 284 yards in all. A sufficient fall has been secured in all the drains to allow the surplus water which falls from time to time to find its way promptly off through the five eight-inch drains which form the main outlets. As results of this work, the land will all admit of early planting, and can all be usefully employed; whereas, at the outset much of it was too wet and cold to permit of successful cropping in rainy seasons.

GRADING AND ROAD-MAKING.

Much necessary grading has been done around the office building, seed-testing and propagating houses, poultry house and implement shed, which has greatly improved the appearance of the grounds about these buildings.

The making of roads around and through the farm was continued during the summer, more than four miles having been finished. The roads now completed on the farm afford a drive within the grounds of nearly five miles, and are so arranged as to enable visitors to see from them most of the more interesting features connected with the experimental field work.

BUILDINGS.

The new office building and laboratory mentioned in the report for 1888 as then approaching completion has been finished. The chemical laboratory, as will be seen from the report of the Chemist, is large, commodious and well fitted with such apparatus and appliances as are needed for carrying on the work efficiently. The four offices in the central part form convenient quarters for the other officers, and the museum room, which covers the second flat, is ready to receive the requisite fittings for storing and preserving samples of farm products.

The houses for carrying on the distribution of seeds and for seed testing and propagating are also completed. These have been conveniently arranged and afford ample facilities for seed distribution, for testing the vitality of seed grain, and for propagating trees and plants. Collections of economic plants, the sources of important articles of food and other products useful to man, are being made, to which will be added from time to time other interesting and curious plants, with the view of making this department both attractive and instructive to visitors.

A silo has been built, attached to the west end of the barn, in which was stored in good season about 200 tons of fodder corn, which is now being used as ensilage. A commodious implement house and granary has also been erected, where grain for distribution and farm use can be conveniently stored, and with sufficient space on the ground floor for storing all the farm implements. A work-room has been provided in this part, supplied with a blacksmith's forge and other tools, where needed repairs can be conveniently made. Two lodges have also been erected, one at each of the main gates, for the better protection of the entrances, and also to afford accommodation for those workmen whose duties require their residence on the farm.

A dairy building for experimental work in dairying is urgently needed, and additional accommodation in the poultry department; also, a small engine house near one end of the barn for the steam engine, and necessary shafting through the barn to run the machinery required in connection with threshing, the crushing and cutting of food for stock, &c. A building will also be required for sheep, and another for pigs, as with both these classes of animals there is much experimental work of a useful character which should be undertaken.

EXCHANGES AND DONATIONS.

Exchanges of publications are now effected with the Experiment Stations in the United States, with some of those in Europe, and with the agricultural college at Tokio, Japan. During the year several packages of interesting seeds have been received from the Royal Gardens at Kew. From the Horticultural Division of the United States Department of Agriculture at Washington a number of very useful economic plants have been obtained, through the liberality of the Secretary of Agriculture, the Honorable J. M. Rusk. Further thanks are due to Mr. Chas. Gibb, of Abbottsford, who, in the course of his recent travels through Japan and China, has sent us many seeds and scions of promising vines and fruit trees from both these countries, among which are some which are likely to be both useful and interesting; also to the Fruit Growers Association of Ontario, through their secretary, Mr. L. Woolverton, of Grimsby, from whom we have received young plants of a very promising Russian cherry, known as the "Koslov Bush Morello." This is a new seedling cherry, of which some account is given in the *Canadian Horticulturist* for 1889, page 217. It is very hardy, and is held in high esteem in the colder parts of Russia, and promises to be a valuable acquisition especially for the colder districts of this country.

EXHIBITS OF PRODUCE OF EXPERIMENTAL FARMS.

Large collections of products grown at the Central Experimental Farm were shown at the exhibitions held in Toronto, Ottawa and Belleville, where they attracted much notice. Among the prominent features in these exhibits was a collection of seventy different varieties of Indian corn, grown under the same conditions, showing the different heights of the plants and stages of maturity reached at Ottawa; also, a large collection of seedling potatoes. A display was made of the products of the Experimental Farm of Nappan, Nova Scotia, at the exhibition for the Maritime Provinces held in Moncton, New Brunswick, also at the exhibition held in Amherst, Nova Scotia. Those of the Manitoba Farm of Brandon were shown at the exhibitions held at Virden, Oak Lake, Brandon, Rapid City and Minnedosa, while those of the Experimental Farm for the North-West Territories were displayed at the exhibitions held in Regina, Qu'Appelle, Indian Head and Moosomin. All these exhibits were arranged so as to make them instructive, and they were everywhere much appreciated by visiting farmers.

FRENCH INSTRUCTOR IN QUEBEC.

During the greater part of the year Mr. J. A. Chicoyne, of Sherbrooke, Quebec, has been employed as a special agent to visit different portions of the Province of

Quebec; hold meetings among the farmers, and to deliver lectures to them in the French language on agricultural subjects. This has been done with the view of instructing them in regard to farm work and of encouraging them in the improvement of their farms. From the reports which have been received it would appear that the services rendered have been appreciated by the people.

METEOROLOGICAL OBSERVATIONS.

During the year meteorological stations have been established at each of the Experimental Farms, where careful records are now being taken of temperature, rainfall, &c. The instruments have been supplied by the Meteorological Service of Canada, and the observations are being taken in accordance with instructions received from the Director of that Service, to whom regular returns are made. It is expected that some extension of the work will be made during the coming season in recording the hours of sunshine, and at some points in taking observations with pressure instruments. The question of weather is all-important in its bearing on agricultural operations, and accurate observations are much needed in association with experimental work.

ACKNOWLEDGMENTS.

My sincere thanks are due to the officers of the Central and other Experimental Farms for the zeal manifested in their different departments, and for the efficient discharge of their several duties. The reports herewith submitted bear evidence of the care and attention which has been given to the work undertaken. The foremen and employés are also deserving of eulogy for their faithfulness and prompt attention to the work with which they have been entrusted. Valuable help has been given me in the agricultural department at the Central Farm, by the farm foreman, Mr. John Fixter, whose zeal in the service is deserving of all praise, who has kept accurate accounts of all the work done under his management, and to whose careful observations and records I am indebted for many of the particulars presented in this report. I also desire to acknowledge my obligations to Mr. Wm. T. Macoun, who has had special charge of much of the experimental work during the past year, and who has been unremitting in his attentions, and has proved himself thoroughly reliable in his records and observations.

I desire also to bear testimony to the efficient services rendered by Mr. Wm. Ellis, who has had charge of the seed testing department, where the vitality and germinating power of grain and other agricultural seeds are determined.

W. SAUNDERS,
Director.

REPORT OF THE CHEMIST.

(FRANK T. SHUTT, M.A., F.I.C., F.C.S.)

To WM. SAUNDERS, F.R.S.C., F.L.S., F.C.S.,
Director, Experimental Farms.

SIR,—I have the honour to submit to you herewith the third annual report of the work done in the Chemical Department of the Experimental Farms.

A great part of my time during the early months of the year, was occupied in the personal supervision of the manufacture of the interior fittings, (work-tables, fume cupboards, &c.,) and of the gas and water arrangements for the new Laboratories, the designs for which I drew last year. Though this work was pushed on as rapidly as work of such a nature could be, it was June before the Laboratories were ready for occupation. The room we were using as a temporary laboratory in Ottawa was then vacated and the chemical work transferred to the more commodious accommodation afforded at the Farm. The apparatus previously ordered from Germany having arrived in good order, we have since been able to prosecute the analytical work to a greater advantage than heretofore with our limited space and apparatus.

After having occupied our new Laboratories for six months, I am pleased to be able to report that for convenience of arrangement, light, and all those other accessories necessary to good and quick work, they leave nothing to be desired. Since their completion, many chemists of note who have visited us, have commented highly upon them and their fittings, and already the plans have been copied more than once by those fitting up laboratories. As there have been many inquiries from chemists in the United States and other countries regarding them, I have thought it well to write an outline account of the details of the Laboratories in the accompanying report, trusting at the same time that such may not be altogether uninteresting to the non-professional reader.

During the past year much analytical work has been accomplished, and in the following pages will be found the results of such analyses as have been thought to be of general interest to the agriculturists of the Dominion. Notable among these are the "muds" from Prince Edward Island, of which a comparatively large number of samples have been chemically examined.

As these muds are the chief natural fertilizers available to the farmer of that island, the benefit to be derived from a correct knowledge of their composition, their value, use and mode of action in the soil will at once be obvious. Other analyses comprise those of wood ashes,—the worth of which as a fertilizer can hardly be said to be realized in this country as yet—swamp and black mucks, marls, soils, superphosphates, and other artificial fertilizers, potable waters, etc.

Among agricultural products analysed has been a number of samples of sugar-beets grown in various parts of the Province of Ontario. These analyses were made with a view of ascertaining the richness of the beet in saccharine matter when grown here from imported seed. A series of analyses of native grasses grown at the Central Farm and in the North-West has been commenced Samples, at the Central Farm, were taken at two stages in their growth. The results of this work, when finished, will be published in Bulletin form, and it is confidently hoped that from them we shall be able to point out the more nutritious of our Canadian grasses, as well as to indicate the best time for cutting them. Analyses are also in progress of Indian corns, grown for

ensilage at the Central Experimental Farm. The composition of the ensilage will also be ascertained.

Explanatory notes of the analyses are given to afford further information regarding the materials examined.

I have the honour to be, Sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist to the Dominion Experimental Farms.

SOILS.

The composition of three samples of soil, analysed during the past year, is given in the following table. All of them are clay loams. No. 1 is from lot 39, 5th range, tp. of Ditton, Province of Quebec. Nos. 2 and 3 from the south-east quarter and the south-east half, respectively, of section 16, tp. 11, range 26, west 3rd, North-West Territories:—

ANALYSES OF SOILS.

——	No. 1.	No. 2.	No. 3.
Moisture	8·85	6·80	8·72
Organic matter	1·86	5·16	5·57
Clay and sand	76·43	73·65	72·52
Oxide of iron and alumina	8·46	9·75	9·02
Lime	1·69	·99	·37
Magnesia	·55	1·48	1·82
Potash	·25	·28	·39
Phosphoric acid	·14	·06	·13
Soluble silica	·48	·12	·14
Carbonic acid	1·33	·95	1·01
	100·04	99.24	99.79
Nitrogen in organic matter	·048	·125	·114

No. 1, forwarded through J. H. Chicoyne, Esq., Sherbrooke, Province of Quebec, was supposed to be a marl, and hence valuable as a fertilizer. Marls contain between 60 and 80 per cent of carbonate of lime; this sample contains but 3·02 per cent. It is a clay loam, of average quality as regards its inorganic constituents, but low in its percentage of organic matter and nitrogen. This would probably be most benefited by deep fall ploughing, in order to render it more friable, and a plentiful application of barn-yard manure to supply nitrogen. It would then, I consider, make a strong soil for the growth of cereals.

Nos. 2 and 3 were sent at the instance of Wm. Pearce, Esq., Superintendent of Mines, North-West Territories, by Dixon Bros., Maple Creek, North-West Territories. As might be expected from the proximity of the localities from which the samples are taken, they are very similar in composition. So close are the figures in many instances, that these soils may practically be considered as one sample. Comparing their analyses with that of No. 1, a great difference is at once seen in the amount of nitrogen they contain—the percentage in No. 1 being about one-third of that in Nos. 2 and 3. The nitrogen in the clay loam from Lake Temiscamingue, analysed last year, was ·087 per cent., about two-thirds the quantity possessed by the North-West soils. It is believed that these comparisons are being drawn between analyses of unmanured soils. If, therefore, future analyses bear out that there exists this difference, generally speaking, between virgin soils of the North-West and those of the eastern portion of Canada, we shall have scientific data to support the statements regarding the great fertility of North-West soils, and their peculiar suitableness for the growth of the cereals.

FERTILIZERS—NATURAL AND ARTIFICIAL.

THE MUDS OF PRINCE EDWARD ISLAND.

Continuing the work begun last year, several specimens of these materials have been analysed since the issue of the last annual report, in which, on pages 32 and 33, will be found remarks upon the chief uses of such substances as fertilizers and the best mode of their application. They are known as swamp, river, marsh and oyster muds, according to their source or the locality whence obtained, and are found to differ materially in their composition.

The swamp muds are essentially nitrogenous manures, holding the greater part of their nitrogen in a form not immediately available to plants, but rendered so by composting with some substance that assists the decomposition of their humus by setting up a process analogous to fermentation. Of these substances barnyard manure, wood ashes and lime stand out as the most easily obtainable and the cheapest. The continued use of these muds, without previous composting, cannot be of great value except to lands well manured otherwise, excepting, of course, their well-known mechanical effect on heavy clay and sandy soils. The river muds, as a rule, do not contain as much organic matter and nitrogen as the swamp muds. The marsh muds are very variable in their composition, sometimes approaching swamp muds in the amount of nitrogen they contain, and at other times largely composed of oyster and other shells mixed with greater or less quantities of clay, sand and organic matter. The chief fertilizing constituent of the oyster muds is lime, present chiefly in the form of carbonate. Several specimens received consist almost entirely of oyster shells in an almost unbroken condition. Unless such were broken fine or the mud composted, many years of exposure to atmospheric agencies would be necessary to make it valuable as a manure. By these means the notable quantity of phosphoric acid these shells contain would be rendered assimilable by plants. The debris of marine plants and the remains of marine animals supply the nitrogen-holding organic matter of these muds.

Analyses of Muds from Prince Edward Island.

Number.	Sender.	Address.	Nitrogen.	Water.	Organic Matter.	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Phosphoric Acid.	Soluble Silica.	Carbonic Acid, &c. (undetermined.)	Chlorine.	Soda.	Total.
1	Artimas Boulter	Little Pierre Jacques	·245	6·30	10·90	71·43	7·00	0·66	1·31	0·49	0·12	0·09	0·41	0·52	0·77	100·00
2	Michael Dillon	Kildare Capes	·30													
3	do	do	·539													
4	George Compton	St. Eleanors	·047	22·23	5·99	19·10	7·11	23·53	1·58	0·67	0·22	0·94	18·59			100·00
5	Richard Hunt	do	·480	55·17	18·05	21·56	3·63	0·64	0·30	0·16	0·27	0·07	0·15			100·00
6	do	Miminigash	·153	73·99	5·25	17·76	2·52	0·06	0·39	0·02	0·04					100·03
7	Curtis Lord	Bedeque		14·03	4·43	34·52	4·91	21·93	0·90	0·25	0·19	0·95	17·89			100·00
8	do	do	·88	5·80	31·81	53·02	7·40	0·11	0·49	0·14	0.36	0·40				100·80
9	W. A. Brennan	Summerside	·242	71·55	8·81	13·70	3·36	0·18	0·55	0·01	0·05	0.47	1·32			100·00
10	do	do	·245	72·23	9·37	12·52	3·07	0·16	0·55	0·01	0·09	0·38	1·62			100·00

No. 1 is a sample of river mud from Lot 8, Prince Edward Island, received May 10th, 1889. Although it contains a large amount of clay and sand, the percentage of nitrogen it possesses renders it of great agricultural value.

No. 2 is also a sample of river mud. Its percentage of nitrogen is very close to that of No. 1, and the value of both these samples may be considered about equal.

No. 3 is from a fresh water pond and corresponds to a swamp mud. As a supplier of nitrogen it is worth twice as much as No. 2. Mr. Dillon, who sent samples 2 and 3, asked which would be the better of the two for composting purposes. An estimation of their nitrogen was sufficient to answer this important question.

No. 4 is a specimen of oyster mud, and consists largely of the undecomposed shells of these and other bivalves in a matrix of clay. Its value as a fertilizer depends almost entirely upon the lime it contains. As nearly all the shells were entire, exposure to air, or, as it contains but little nitrogen, burning, would improve it. In its present condition it is of little value as a supplier of plant food.

No. 5 is a swamp mud, of which it is an excellent sample. Its value closely approximates that of No. 3.

No. 6, from Lot 3, Prince Edward Island, is a marsh mud, and we accordingly find it low in nitrogen compared with No. 5, also sent by Mr. Hunt.

No. 7 is described as burnt swamp mud. It is only valuable for its inorganic constituents, the nitrogen being destroyed in the process of burning. Its insoluble matter (clay and sand) amounts to one-third of the whole, and as potash and phosphoric acid are not present in large quantities, its principal value is as an agent for the supply of lime. This analysis goes far to prove what has already been said, that burning swamp mud is not an economical process.

No. 8, a swamp mud very rich in nitrogen, and hence exceedingly valuable as a nitrogenous manure. Burning this mud would have the effect of destroying almost its whole value.

Nos. 9 and 10, are marsh muds, between which the analyses show there is no practical difference in value. Mr. Brennan reports them as "doing good work in the raw state, but they are specially productive when composted." This is owing to the nitrogen during composting being converted into forms assimilable by vegetation.

BLACK MUCKS OF ONTARIO.

These are very rich in organic matter, containing a comparatively large percentage of nitrogen, which constitutes their principal value as a manure. To a great extent they are similar in their composition to the swamp muds of Prince Edward Island, and what has already been stated with regard to the benefit to be derived from composting them is specially applicable to these mucks. Several correspondents have lately asked for advice as to the treatment of land covered to a depth of a foot or more with peat or black muck, for crops on such soils make a good start but seldom attain to mature growth. It has been the practice with some farmers to burn off the peat for several inches, the result being that the small amount of ashes formed supplies mineral constituents for a year or two, when burning is again resorted to. Where the muck or peat exists for a depth of several feet this may be the only practicable method for increasing the productiveness of the land, at the same time it must be remembered that such a process is a wasteful one, as the nitrogen—the valuable ingredient of these materials—is entirely lost without a permanent advantage being effected. The great difficulty in putting out the fire when once it has got a headway in dry peat, and hence the danger accompanying this mode of treatment, render this plan, in addition to the reasons just urged, one that cannot be recommended and which should only be resorted to with the greatest caution. The more rational mode of treatment appears to be one by which the value of the muck would be retained. This might be effected by deep subsoil ploughing, especially if it is underlaid by clay, or by spreading a heavy dressing of lime or wood ashes. By these means a manure is formed in the soil capable of furnishing to the growing crops the food they require, while the tilth of the soil will be much improved. Peat soils are often too sour for

vegetation, from the presence of humic and other acids; this sourness is corrected by the lime or wood ashes.

Mr. David Gascho, of Musselburg, Ont., forwarded three samples of black muck for analysis and report as to their relative value for agricultural purposes. Their composition is shown in the following table:—

ANALYSES OF BLACK MUCKS FROM MUSSELBURG, ONT.

—	No. 1.	No. 2.	No. 3.
Water, dried at 212° Fah.	30·60	10·77	15·66
Volatile and organic matter	42·20	48·10	62·08
Mineral matter (inorganic)	27·20	41·13	12·26
	100·00	100·00	100·00
Nitrogen	1·56	1·11	2·07
Phosphoric acid	·13	·58	·42
Potash	·73	·50	·40
Mineral matter insoluble in acids	16·14	28·00	16·70
" soluble "	11·06	13·13	5·56
Nitrogen calculated on dry substance	2·25	1·24	2·45

Regarding nitrogen, the most important fertilizing ingredient of these mucks, No. 3 is the richest, while No. 2 is the poorest. As, however, Mr. Gascho had No. 1 on his own farm, and as this sample closely approximates in value No. 3, which had to be bought and teamed three miles, I concluded that No. 1 would be quite as valuable, if not more so, to him for composting purposes.

Of the following samples of black muck, No. 1 is from Mr. H. R. Macdonald, Alexandria, Glengarry County, Ont., and No. 2 from Geo. H. Cornell, Carleton Place, Ont.

ANALYSES OF BLACK MUCKS FROM ALEXANDRIA AND CARLETON PLACE, ONT.

—	No. 1.	No. 2.
Water, dried at 212° F.	69·20	72·10
Volatile and organic matter	21·78	23·90
Clay and sand, insoluble in acids	3·29	·47
Oxide of iron and alumina	1·52	·56
Lime	2·27	1·68
Magnesia	·13	·16
Potash (K_2O)	·15	.....
Soluble silica	.....	·08
Phosphoric acid (P_2O_5)	·07	·03
Carbonic acid	1·81	1·12
	100·22	100·10
Nitrogen in organic matter	·689	·457
" " calculated on dry substance	2·266	1·638

Both of these are excellent for compost, No. 1 being the better of the two.

MARLS.

Three samples of this natural fertilizer have been received for analysis. Their composition is tabulated in the following table:—

ANALYSES of MARLS.

——	No. 1.	No. 2.	No. 3.
Moisture	·70	·42	17·51
Organic matter	7·93	10·33	3·11
Clay and sand	4·94	·62	·25
Oxide of iron and alumina (Al_2O_3,Fe_2O_3)	·85	·45	·50
Lime (CaO)	45·45	47·70	43·61
Magnesia (MgO)	1·30	1·46	·23
Soda (Na_2O)	·37	·57	·39
Potash (K_2O)	Traces.	...	·06
Soluble silica (SiO_2)	·81	·58	·04
Carbonic acid (CO_2)	37·22	38·01	33·73
Phosphoric acid (P_2O_5)	Traces.	·15	·03
	99·57	100·29	99·46
Carbonate of lime, corresponding to lime	81·16	85·18	77·89

No. 1 is a specimen of shell marl from Mr. Aylsmith, Dorchester, Ont., 5th May 1889.

No. 2 is from John Lennox, Boucesville P. O., Ont.

No. 3 is from the farm of J. D. Edgar, Esq., M.P., at Etobicoke, where it occurs in large quantities.

Nos. 1 and 2 are almost equal in value, and worth slightly more than No. 3. The texture of all was good, being such as to allow them to easily disintegrate on exposure to atmospheric agencies.

The application of marl supplies lime to the soil, and its value as a fertilizer depends principally upon the quantity of this element—which is present as carbonate of lime—that it contains. All plants require lime, and hence many clay, sandy and peaty soils are benefited by a liberal dressing of marl. Besides supplying lime and some other ingredients of plant food in small quantities, marl acts beneficially both chemically and mechanically, on many soils, liberating the locked-up store of plant food and effecting a better tilth or condition of the land for the spread of the plant roots and the retention of moisture.

Its use after burning is strongly recommended on peaty soils. The acid of the humus by this treatment is neutralized and the nitrogen of the decayed vegetable matter set free in a form available for crops; while at the same time, lime and other inorganic constituents, in which such soils are generally lacking, are supplied. Burned lime must, however, be sparingly used on ordinary soils, as it is much more powerful than marl. Its excessive use may destroy much valuable nitrogen-holding material.

The effect of marl on soils and its best mode of application have been treated at length in previous reports. It will therefore be unnecessary to repeat *in extenso* what has already been said on this subject.

FLUE DUST OR ASHES.

This sample was forwarded by Mr. John Croil, of Aultsville, who writes that "it is gathered in considerable quantities behind the furnace of a factory where

hard and soft coal is used, being the lighter particles but too heavy to be carried up the chimney. Please say of what value, if any, you consider it for agricultural purposes."

ANALYSIS OF FLUE DUST.

Soluble in water,	2·77
Soluble in acid,	10·74
Residue insoluble in acid,	86·49
	100·00
Potash. (K_2O)	·16
Phosphoric acid. (P_2O_5)	·76

Only traces of the phosphoric acid are soluble in water.

This sample may be considered one of coal ashes in a very fine state of division. In potash and phosphoric acid it is scarcely richer than many good loams. As a fertilizer, therefore, it cannot have any commercial value. From its mechanical condition, however, good results are often obtained upon its application to stiff clay and peaty soils.

WOOD-ASHES.

Of the three materials indispensable for plant growth—nitrogen, phosphoric acid and potash—Canada finds within her own bounds ample supplies of the two latter in the vast phosphatic deposits of Ontario and Quebec, and in the wood-ashes produced in the clearing up of new country, while nitrogen is supplied by the swamp and marsh mucks already referred to.

Wood-ashes are the mineral or inorganic constituents of plants which they, during their growth, have absorbed from the earth. If, therefore, we return to the soil such ashes, we are supplying future crops with the mineral food necessary for their development in the proportions that they require for the building up of their tissues.

The essential fertilizing ingredient of wood-ashes is potash—the secondary elements of value being lime and phosphoric acid. The crops specially benefitted by an application of potash, are clover, peas and other leguminous plants, potatoes, cabbages, beets and other leafy plants. Hence it is that wood-ashes are strongly recommended for these crops.

On account of the alkalinity of wood-ashes their use is also recommended for making composts with black muck and such like substances, for by this treatment the nitrogen of the latter is set free in a form readily assimilable by plants. Thus it is that wood-ashes act both directly and indirectly as a fertilizer. By their use the tilth of sandy soils may be much improved, for by virtue of their contained potash the particles of the soil be come more closely cemented, thus ensuring a greater retention of moisture.

As a potash fertilizer, wood-ashes in Canada take a front rank, yet it seems necessary to impress the value of their use for home consumption upon our agriculturists. Canadian ashes are sold and eagerly bought in the New England States for three times the price they can be purchased for in the home market. Notwithstanding this fact, the sale of ashes for agricultural purposes in Canada is very limited. It is to the lighter soils, in the older sections of this country, where cultivation for many years has exhausted considerably the original store of potash, that the benefit from a dressing of wood-ashes will be reaped.

Through the courtesy of the Honourable the Minister of Public Works, the Central Farm has the privilege of drawing the wood-ashes from the furnaces of the Parliament buildings. In order to arrive at a knowledge of their composition, samples for analysis were taken at different dates and submitted to chemical examination. As the woods from which they are produced are the ordinary hardwoods of this country, and as these ashes must represent a fair average of those made in

Canada, it is deemed that the publication of the results of these analyses, though primarily intended for our own guidance in experiment, will be of value to Canadian agriculturists.

ANALYSES OF CANADIAN WOOD-ASHES.

No.	Date.	Source.	Moisture.	Potash (K_2O).	Phosphoric Acid (P_2O_5).	Residue insoluble in Acids.	Residue insoluble in Acids after ignition.
	1888.						
No. 1..	February 15.....	Maple and birch	1·08	6·35	2·09	6·85	5·29
2..	do 16.....	do	·52	7·35	2·42	5·66	4·94
3..	do 17.....	do	1·11	8·89	2·08	5·06	3·31
4..	do 29.....	do	·96	4·47	2·15	6·69	5·03
5..	do 15.....	Maple, birch, beech, ash and elm	1·29	8·41	1·96	5.76	3·31
6..	do 29.....	Maple and birch	·97	4·87	2·06	6.46	5·52
Average		.....	·99	6·72	2·12	6.08	4·57

POUDRETTE.

This material was forwarded from Toronto, where it was produced as a bye-product in a system of sewage purification by precipitation then under examination. An analysis was asked for to determine its value, if any, as a fertilizer. It is a brown or brownish-black powder, and emits no offensive smell. The analysis afforded the following figures:—

Moisture	3·94
Organic matter	40·91
Residue insoluble in acids	34·05
Oxide of iron and alumina (Fe_2O_3, Al_2O_3)	13·65
Lime (CaO)	2·07
Magnesia (MgO)	0·33
Potash (K_2O)	0·21
Soda (Na_2O)	0·34
Phosphoric acid (P_2O_5)	1·24
Soluble silica (SO_2)	0·82
Chlorine	0·19
Sulphuric acid (SO_3)	1·53
Carbonic acid, &c (CO_2)	0·72
	100·00
Nitrogen in organic matter	2·04
Phosphoric acid soluble in water	0·08
Poudrette soluble in water	9·68

The chief value of this material would be as a supplier of nitrogen, of which it contains a notable quantity. A large percentage of this nitrogen no doubt exists in a condition easily assimilable by vegetable life. The phosphoric acid (1·24 per cent.) is also an ingredient of value. Its mechanical condition is in its favour—being capable of ready application as a top dressing. Poudrette usually contains germs of the nitric ferment, which are necessary for the nitrification of the nitrogen of the soil, and it is probable that some part of the good results attendant upon its use are produced by this agency. Judging from the analysis, the fertilizing value of this poudrette is about equal to that of a good sample of black muck.

FISH WASTE OR REFUSE.

In June last C. F. Green, Esq., Fishery Guardian of Ladner's Landing, British Columbia, forwarded for analysis a sample of fish manure made from the refuse of the salmon canneries of that place. With regard to its manufacture, Mr. Green writes: "As soon as the oil is boiled out of the offal the residue is simply put into heaps for a few days to allow it to heat and sweat; after that it is spread out and allowed to dry in the sun, being turned over, but nothing is added to it." He also adds that several people in that locality have used it, and report it as a strong manure:

Water	5·19
Organic matter	46·99
Ash or mineral matter	47·82
	100·00
Nitrogen in organic matter	3·47
Potash (K_2O)	·69
Phosphoric acid, soluble in water (P_2O_5)	·12
Phosphoric acid, reverted (P_2O_5)	9·29
Phosphoric acid, insoluble (P_2O_5)	8·19
Total phosphoric acid	17·60
Mineral matter, soluble in water	1·14
Mineral matter, soluble in acids	40·98
Clay, sand, &c.	5·70

These figures show most conclusively that in this material we have a most valuable fertilizer, as a supplier of both phosphoric acid and nitrogen. The addition of wood-ashes or some other form of potash would make this a complete manure.

The process of fermentation to which it has been subjected in its preparation has converted to a large extent its fertilizing ingredients into forms readily available for plant nutrition. Further fermentation would no doubt improve it in this respect, and in order to affect this, moisture, warmth and air are required. Its most economical use would be as a manure for light, warm soils, where it might be harrowed in either alone, with barn-yard manure or wood-ashes.

GAS LIME.

A sample of this material was sent by Mr. John Croil, Aultsville, Ont., in November last. He writes: "Be kind enough to let me know of what value it is for manuring purposes, and if of any value, how much may be advantageously applied." On submitting it to analysis its composition was found to be as follows:—

ANALYSIS OF GAS LIME.

Moisture	35·20
Volatile and tarry matter	3·37
Insoluble matter in acids	1·24
Caustic, and carbonate of, lime	54·21
Sulphate of lime	·56
Sulphide and sulphite of lime	2·59
Oxide of iron and alumina	2·04
Magnesia	·79
	100·00

Gas-lime is a bye-product in the purification of illuminating gas. The gas in passing through or over beds of slaked lime loses the greater quantity of its sulphur,

converting the lime into sulphide of lime. This sulphide, although a good insecticide and destroyer of fungi, is in quantities deleterious to vegetation. If, however, fresh gas lime is exposed to the air this sulphide becomes oxidized into sulphite, and finally into sulphate of lime, or gypsum. The latter is valuable as plant food, as affording both sulphuric acid and lime—two essentials for plants, and especially those of clover and turnips. While, therefore, the application of fresh gas-lime to active vegetation is harmful, and should be only resorted to as an insecticide—when care should be taken that it does not come into actual contact with the living plants—the use of it after a lengthy exposure to air will be attended in most instances—and especially upon the crops above named and upon land destitute of lime—with beneficial results. To this end, therefore, it is advised that it be spread upon the fields in the autumn to the amount of two or more tons per acre and ploughed in the following spring, when it will have lost the greater portion of its water and the sulphur compounds will be converted into sulphate. The exact amount to be applied per acre must vary according to the circumstances. To land naturally deficient in lime five tons is not considered too much, but on ordinary soils, a dressing of two tons per acre may be used as above recommended, with perfect safety. Owing to the variation in the composition of different samples of this material, as produced at the gas works, more definite instructions as to the quantity to be applied cannot be given. For ameliorating the condition of stiff clays and liberating as plant food their inorganic constituents ; for rendering more compact the texture of sandy loams and for rendering available the nitrogen of peaty soils gas-lime does good service, both chemically and mechanically.

SUPERPHOSPHATES.

Two samples of this fertilizer have been received for analysis this year:—

Shirley's soluble Phosphate.

	Per cent.
Moisture	1·20
Residue insoluble in acid (rock matter)	1·80
Calcium sulphate (gypsum)	21·60
Soluble phosphoric acid	9·59
Total phosphoric acid	20·95

The percentages of both soluble and total phosphoric acid are above the average, and show this to be a valuable fertilizer where phosphoric acid is required.

Plain Superphosphate.

This sample was sent for examination by E.A. Barnard, Esq., Secretary, Council of Agriculture, Quebec, who reports that excellent results have been obtained from its use:—

Moisture	9·13
Residue insoluble in acid	6·12
Calcium sulphate (gypsum)	47·27
Soluble phosphoric acid	7·72
Reverted phosphoric acid	1·62
Total phosphoric acid	12·34

This is also a good sample of superphosphate.

The function of superphosphate as a fertilizer is to furnish phosphoric acid. All virgin soils, or nearly all, contain a greater or less amount of phosphoric acid, since the rocks from which they are primarily formed, possessed a certain, though it may be small, percentage of calcium phosphate. Since, however, all plants need this material in order to come to mature growth, successive croppings, where the product is sold, have the effect of exhausting the land of its valuable plant food, without returning to the soil phosphoric acid in quantities concomitant to the extent to which it has been consumed. Such has been the practice in many parts of the older Provinces of the Dominion, and

as a result we find to-day a very marked decrease in the yield, compared with that of the land when but newly cleared up.

The statement has been made before, that of all the constituents of plant food, it has been found necessary as a rule to supply but three—nitrogen, phosphoric acid and potash. As a result of experiment, it has been discovered that certain crops are more benfited by the application of one of these substances than by that of either or both of the other two forms of plant food. Thus, although clover, peas and other members of the leguminosæ contain a large percentage of nitrogen, their growth is not increased to any great extent by nitrogenous fertilizers, while the application of potash benefits such plants most characteristically. Again, the cereals (wheat, barley &c.), though absorbing but little nitrogen from the soil, find in nitrogenous manures that element which they need in order to produce remunerative crops. In like manner phosphates are found to be of special value for root crops, *e.g.* turnips beets, &c. Sometimes, however, as in the case of the more or less complete exhaustion of the land, exceedingly sandy soils, &c., a fertilizer containing all three is required. Hence, in the judicious use of fertilizers a knowlege of their composition is not only necessary, but also a history of the soil (its nature and previous croppings), and of the character of the crop which it is sought to benefit.

Plants absorb their food in a soluble form. Superphosphate contains a considerable amount of its phosphoric acid in a form soluble in water. This has been brought about by treating bones—or as is more commonly the case now, apatite (a mineral phosphate of lime) with sulphuric acid—the result being known as superphosphate. It is used most advantageously as a top dressing for turnips and other roots, and usually applied in quantities from 150 ℔ to 300 ℔ per acre. By such an application the development of the young plant is so stimulated that it is able to withstand the attack of the turnip-fly to a great extent, and the subsequent yield is largely augmented. In connection with nitrogenous fertilizers, superphosphate has also been found to benefit the cereals.

SUGAR BEETS.

The examination into the value of sugar beets as grown in Canada has been continued this year. To this end the amount of saccharine matter has been determined in samples of beets grown in various parts of the Province of Ontario from seed imported from Germany and Bohemia by Wilfred J. Skaife, Esq., President and manager of the Berthier beet sugar factory, Berthierville, Que. Most of these specimens were collected and forwarded by Robert H. Lawder, of Toronto, who is amassing data regarding the yield per acre &c. of the sugar beet as grown on different soils and in different localities. The series also contains samples of the sugar beet grown at the Central Experimental Farm.

The table subjoined shows that the samples analysed are for the most part rich in saccharine matter. They compare most favorably in the quantity of sugar-yield with those grown in France and Germany, where for many years the manufacture of beet-root sugar has been a staple industry, and where, by careful selection and breeding of the beets, the percentage of sugar has been so greatly increased.

In a few instances the beets arrived slightly withered. This would probably have the effect of concentrating the juice, and so increasing the percentage of sugar. Such increase, however, would not exceed .1 per cent. to .2 per cent. of the total percentage.

Analyses of Sugar Beets.

Letter or No.	Name of Grower.	Locality where Grown.	Per-centage of Sugar in Juice.	Specific Gravity of Juice.	Source of Seed.	Soil.	Remarks.
A	W. Martin	Whitby	13·05	1075·4	Imported by W. Skaife		Grown in garden.
B	Jas. Reid	Lot 13, con. 1, Whitby	11·81	1068·0	"		
C	Thos. Pindar	Lot 14, B. F. con., Whitby	12·18	1075·2	"		
D	Chas. Bateman	Lot 13, con, 1 "	13·84	1077·5	"		
E	Jeremiah Sick	Lot 15, con, 1 "	9·47	1056·7	Central Germany		
F	"	" "	14·90	1077·5	Hungary		
G	Wm. Sinclair	Lot 17, B. F. con. "	15·69	1083·0			
H	Daniel Walker	Lot 17, con. 1 "	17·08	1088·5			
K	Geo. Lang	Lot 21, con. 1, Pickering	14·44	1080·0	Central Germany	Clay	12 roots weighed 32 lbs.
L	Wm. Trebell	Lot 18, con. 9, Reach	12·55	1066·1	California	Sandy loam	18 " 40 lbs. Had not been properly thinned out.
M	Thos. Forman	Lot 12, con. 4 "	14·40	1081·9	Bohemian seed	Clay, not stiff	14 " 32 lbs.
N	"	" "	15·65	1084·5	Central Germany		15 " 34 "
O	John Whitfield	Lot 16, con. 6 "	16·27	1083·0	"	Strong clay	18 " 20 " Never thinned out or weeded.
P	W. & G. Steele	Lot 26, con. 2 "	10·17	1060·3	Bought in Port Perry	Sandy loam	15 " 62 lbs.
Q	Jas. Graham	Scugog Island	12·35	1071·9	"		12 " 35 "
R	Bernard Earls	Town of Peterborough	14·29	1082·8	Imported by W. Skaife	Loam, with limestone	12 " 34 "
S	Wm. Graham	Lot 6, con. 4, Smith	16·87	1087·7	"	Clay loam	6 " 18 "
T	John Bowman	Lot 18, con. 6, Hamilton	14·78	1078·8	Central Germany	Sandy loam	13 " 37 " Unmanured.
U	John Russell	Lot 21, con. 1 "	16·18	1084·4	Bohemia	Heavy clay	13 " 37 "
W	John Wright	Lot 5, con. 3, Hope	15·99	1083·1		Stiff clay	15 " 14 "
Y	W. Smith	Lot 6, con. 7, East Whitby	13·51	1070·2		Clay, not heavy	
Z	J. & J. Wilson	Lot 23, con. C., Scarboro	16·51	1085·3		Clay	
P H	John Hume	Port Hope	13·30	1073·0			
	E. Holmes	St. Catherines	16·89	1085·1		Stiff clay	
1	Central Experimental Farm	Ottawa	14·91	1078·9	Imported by W. Skaife from Central Germany	Sandy loam	5 roots weighed 5 lbs. 7 ozs.
2	"	"	16·38	1083·3	"	"	4 " 6 lbs. 4 ozs.
3	"	"	13·79	1072·2	Bohemian	"	4 " 7 lbs. 8 ozs.
4	"	"	13·70	1072·7	White Sugar Beet	"	3 " 5 lbs. 14 ozs.
5	"	"	12·95	1069·9	Vilmorin's Improved	"	3 " 8 lbs.
6	"	"	12·12	1065·8	Lane's Sugar	"	5 " 7 lbs. 6 ozs.

In all the above, the specific gravity or density of the expressed juice was determined by the Westphal balance; the percentage of sugar in the juice was obtained by mean of a Schmidt and Haench Polariscope.

The average percentage of sugar in juice of beets sent by Mr. Lawder is 14·25, that of those grown at Ottawa being 13·97. Both these figures approximate closely the average percentage of sugar obtained in Europe from beet roots of the best varieties grown for the factory.

At the request of Mr. Robt. H. Lawder the following analyses were made on beets sent by him in September, 1889 :—

No. 1.—Grown by Mr. Whitfield, Port Perry, Ontario, without phosphate.

Water	81·92
Organic matter	16·87
Ash	1·21
	100·00
Percentage of sugar in beet root	13·30
Percentage of sugar in juice, calculated	14·15

No. 2.—Grown by Mr. Forman, Manchester Ont., fertilized by phosphate.

Water	81·04
Organic matter	17·86
Ash	1·10
	100.00
Percentage of sugar in beet root	12·00
Percentage of sugar in juice, calculated	12.77

The results of these two latter examinations must not in any way be interpreted as proving that fertilizing by phoshate has the effect of lowering the percentage of sugar in the beet root. Before any deductions on such an important matter could be made, tests, extending over several seasons, must be carried on, in which all the factors, *e. g.*, seed (variety), soil (nature and previous history), treatment or cultivation of the root, amount and composition of fertilizer, are known. It is more than probable that at the date when these two samples were pulled—the middle of September—they were immature. This may account for the rather low percentage of sugar, as it is well known that there is a rapid increase of sugar as the beet approaches maturity.

WATER ANALYSES.

OTTAWA WATER SUPPLY.

An analysis of this water in December, 1888, gave the following results :—

	Parts per Million.
Free ammonia	·02428
Albuminoid ammonia	·1881
Chlorine	1·0
Oxygen absorbed in 15 minutes, at 80° Fah.	3·164
" " 4 hours, at 80° Fah.	6·986

In my report for 1887 is contained a full account of the chemical and biological examination of this water, made a year previous. Comparing the above with the results then obtained, we find that the water has by no means improved during the year, yet the variation is not so great but what the same general characteristics

may be traced. The figures point now, as they did then, to a large excess of dissolved vegetable matter.

The amount of "oxygen absorbed" during a stated interval at a stated temperature from a given amount of an acid solution of potassium permanganate gives a measure of the organic matter present. The more oxygen absorbed the greater the quantity of the decomposing organic matter. This test of the presence of organic matter was therefore used in order to ascertain the efficacy of Dr. Albert R. Leed's method of purification of water by alum. Dr. Leeds advised the use of ½ grain of alum per gallon to peaty waters, which he held should precipitate all the peaty matter, together with the alumina, leaving the water brilliant, clear and limpid. With a view of trying this process on the Ottawa water the above directions were carried out and the water allowed to settle for three hours. At the end of this time there was a brownish-white flocculent precipitate at the bottom of the vessel, while the supernatant water was clear and free from all yellow color. The water was then submitted to analysis, with the following result:—

	Parts per million.
Oxygen absorbed in 15 minutes, at 80° Fah.	·732
Oxygen absorbed in 4 hours, at 80° Fah.	1·440

Comparing these figures with those obtained from the untreated water, the fact is made clear that over three-fourths (¾) of the organic matter was precipitated and rendered insoluble by the alum. This result seems to point to a probable means for the purification of the water supply.

WELL WATER FROM WM. BROWN, RICHMOND, ONT.

This sample had a bad smell, and contained much floating vegetable *debris*.

	Parts per million.
Free ammonia	·753
Albuminoid ammonia	·16
Chlorine	50.00

This analysis was made on 7th January 1889. The quantity of water forwarded was not sufficient for a complete analysis. On 27th February another sample of the same water was received from Mr. Brown, and was submitted to chemical examination with the following result:—

	Parts per million.
Free ammonia	·59
Albuminoid ammonia	·08
Chlorine	48·00
Total solids	390·00
Loss on ignition of total solids	50·00
Oxygen absorbed in 15 minutes, at 80° Fah.	·772
" " 4 hours, at 80° Fah.	1·296
Nitrogen in nitrites and nitrates	·24

This water evidently varies in its quality, and the analysis shows that an improvement had taken place between the two dates above mentioned. I condemned this water on account of the large quantities of free and albuminoid ammonia associated with an excess of chlorine, which point unmistakably to contamination by sewage. To use such a water as this, either for the family or live stock, must be attended with a tremendous risk. The well acts, no doubt, to some extent, as a cess-pool for the barnyard or outbuildings. The importance of pure water for man and stock has been dwelt upon in a previous report. It is, therefore, only necessary for me to reiterate that great care should be exercised when deciding upon the location of a well, in order that no risk may be incurred from the drainage of barnyard,

stables, privies, &c. Besides this, the condition of the well itself and its surroundings should be examined from time to time, and if any doubt be entertained as to the quality of the water a chemical analysis of it should be made. The latter must be insisted upon as the means for ascertaining the relative purity of a water. Sight, taste and smell are only of value in a confirmatory sense when pronouncing upon the quality of a drinking water. Farmers desiring an analysis of their well water should write for directions as to its collection, &c.

WELL WATER FROM TORONTO ISLAND.

(*Forwarded 6th July*, 1889.)

Appearance through 2-ft. tube.—Clear; very pale greenish yellow. Smell at 100° Fah., not marked.

	Parts per million.
Chlorine	7·00
Phosphoric acid—very slight traces	
Free ammonia	·03
Albuminoid ammonia	·042
Nitrogen in Nitrates and Nitrites	·235
Oxygen absorbed in 15 minutes at 80° Fah.	·168
" " 4 hours, at 80° Fah	·280
Total solid matter	295·00
" " after ignition	220·00

Judging by the standards laid down by water analysts, this water is one of great purity, and one which can be strongly recommended as a drinking water. The amounts of free and albuminoid ammonia, and of the oxygen absorbed in fifteen minutes and four hours, all fall within the limits of a first-class water.

Compared with the water of Lake Ontario, however, this water takes a second place, though the quantity of organic matter is yet very small. The total solid matter and chlorine exceed largely those present in the lake water. This points to a larger quantity of inorganic matter, which, however, is not present in such an amount as to detract from the purity of the water for drinking purposes.

THE NEW CHEMICAL LABORATORIES.

The laboratories occupy the eastern half of the main building, the suite consisting of three rooms. The western half comprises offices for the Director, Entomologist, Horticulturist and Accountant, with a museum above for agricultural products. Admittance is gained to the main building by a central door, opening into a spacious hall, on the left hand of which are the double doors of the principal laboratory. This is 36 feet long and 24 feet wide, and amply lighted on the north and east sides by five large windows. Work-benches are arranged along the two walls under the windows, while two double work-tables occupy the central space. The southern wall divides the principal laboratory from the balance room (which also serves as the office for the Chemist) and the private laboratory. Along this wall are arranged the blast and blow-pipe table, the fume cupboard, and the large sink.

By a door on the right of the main laboratory the balance room and office is entered. This room is 12 feet wide and 16 feet long, and lighted by two windows from the south. Perfect rigidity is secured for the balances by the bench which supports them being fixed to the wall. Glass cases and shelving for specimens and instruments find a place here.

Passing from this room we find the private laboratory, which also has an entrance from the principal room. Here also are work-benches arranged along two sides under the windows. Its fume-cupboard is connected with a companion flue to that of the large one—thus the fume-cupboards stand back to back on either side of the

partition wall. The dimensions of this room are as follows: 12 feet wide by 20 feet long.

The height of the suite is 11 feet 6 inches. The floors are of maple, the walls and ceilings of matched pine—the latter being worked out in panels.

WORK-BENCHES AND TABLES.

These are throughout of pine, with cherry tops, and stand at the uniform height of 3 feet from the floor. The width of the work-benches is 2 feet 6 inches, that of the central tables being 5 feet. The lower part of both consist of cupboards, above which, and projecting some 3 inches, are drawers of various depths, the table top surmounting these and projecting 2 inches. By this arrangement the unsightly toe-space has been rendered unnecessary. At intervals in the work-benches and tables are knee-spaces, the arched tops of which support the gas and water taps.

FUME-CUPBOARDS.

These are 8 feet long, 8 feet high and 2 feet deep. The lower portions are enclosed by cupboards and drawers, which support the base of the fume-cupboard proper, the latter lined with lead. Sliding glass doors with panels of glass above form the front and sides. The gas and water supplies are regulated by taps outside.

GAS SUPPLY.

The expense incumbent upon bringing the gas supply from the city of Ottawa would have been so great that it was deemed expedient to manufacture it upon the premises from gasolene. For this purpose a Springfield machine was put in, which furnishes illuminating gas for the whole building, as well as for heating purposes in connection with laboratory work. As this gas is very rich in hydro-carbons it does not draw in sufficient air when using the Bunsen burner to produce complete combustion, a *sine qua non* in chemical operations. A blast of air, blown by the same machine, and conducted to the tables, where it connects with the gas-pipes about 6 inches from the nozzles, was therefore devised. The nozzles issue from the table tops at the back, the supplies both of gas and air being regulated by taps in front immediately over the knee-spaces mentioned before. By this system perfect combustion has been obtained, while it allows the gas to be turned off and on without disturbing apparatus already set up.

WATER SUPPLY.

Water is supplied to the work-benches along the sides of the laboratory by goose-necks set on the table tops at the back opposite the knee-spaces—the water being turned off and on in front, as in the case of the gas. These work-benches have no sinks, but the waste water is carried off by means of waste pipes immediately beneath the goose-necks (the waters supplied being used only for distillation and the like purposes). The central tables have sinks at both ends, half their width being let into the tables. Over the large sink adjoining the fume-cupboard are arranged the following pieces of apparatus: an automatic still and condenser for making distilled water, a hot water generator and a blast and exhaust pump. A vacuum for rapid filtration is procured on the end table by means of a pipe carried from this pump, while a tube conducting a blast of air produced by the same machine is taken to the blast table. All three pieces of apparatus are connected directly with the water supply.

REPORT OF THE ENTOMOLOGIST AND BOTANIST.

(James Fletcher, F.R.S.C., F.L.S.)

To Wm. Saunders, Esq., F.R.S.C., F.L.S., F.C.S.
Director, Experimental Farms.

Sir,—I have the honour to submit herewith a report upon the work carried on in the Department of Entomology and Botany during the past season. In the division of Entomology this has consisted chiefly of field investigation of such pests as have occurred upon the Experimental Farm, including the trial of various insecticides and methods of agricultural treatment with a view of controlling insect ravages; of delivering addresses at Farmers' Institute meetings; of writing articles for the local press in such districts as any particular outbreak of injurious insects may have rendered it advisable; of naming specimens and of answering correspondence concerning insect injuries and advising remedies. In the division of Botany there has been a considerable amount of correspondence concerning fodder plants, particularly our native grasses. Much interest is shown in this subject by settlers in the North-West Territories and various species have been sent in for identification and report as to their probable value.

The experimental grass plots laid out by yourself previous to my appointment have been carefully watched and notes have been taken of the behaviour of various species under cultivation. There are in this collection, which has been very much increased during the past season, many species of promising appearance which have been grown at Ottawa from seed procured in different parts of the world, but particularly from our own North-West Territories. Several species not yet in cultivation as farm crops, give evidence of being worthy of that attention. In the Arboretum and Botanic Garden, work has been begun by locating and grouping some of the more important natural orders. About 200 species of trees and shrubs, two specimens of each, have been set out where they are intended to be grown. These are made up as follows:—

	Species.
Coniferæ	19
Rosaceæ	79
Oleaceæ	23
Juglandaceæ	3
Cupuliferæ	7
Urticaceæ	2
Caprifoliaceæ	22
Leguminosæ	14
Cornaceæ	8
Saxifragaceæ	15
Berberidaceæ	11
Elæagnaceæ	7

Next spring this number will be largely increased from stock already in hand, either in the nursery rows or in the botanical seed beds, which have been grown from seed procured from various sources.

Since I took possession of my office in the new Museum building, my own *hortus siccus* presented to the farm two years ago, has been unpacked and is now accessible to any students who may wish to consult it. This collection contains a complete representation of the phanerogamic flora of the Ottawa District and a large proportion of the wild plants of the rest of the Dominion. Valuable additions have been

made to the collection during the past autumn, through the courtesy of the Director of the Geological Survey and by the kindness of Prof. Macoun, the Naturalist of the Geological Survey. A collection of the seeds of the wild plants and agricultural seeds of the Dominion has been begun, which will be preserved in small glass phials and placed in the Museum for reference.

Collections of seeds and living plants have been received from the following:—

Dr. G. M. Dawson, Ottawa.—A collection of seeds and roots of rare western plants from the Rocky Mountains and British Columbia.

Prof. John Macoun.—Seed of *Ferula dissoluta* from British Columbia.

Rev. C. J. Young, Lansdowne, Ont.—Living roots of the fern *Asplenium ebeneum.*

Mr. James Goldie, Guelph.—Seed and living roots of *Lithospermum canescens* and *Asclepias tuberosa.*

Mrs. Chamberlin, Ottawa.—Seed of English and Canadian plants.

Mr. L. A. Woolverton, Grimsby.—Roots of *Hamamelis virginica.*

Mr. Donald Kennedy, Bird's Hill, Man.—Seed of Muhlenberg grass (*Muhlenbergia glomerata*).

Miss Alice Williams and Miss Woods, Victoria, V.I.—A collection of British Columbian bulbs and seeds from the interior of British Columbia.

In the month of July last with the consent of the Hon. Minister of Agriculture I visited Washington for the purpose of examining the apparatus and collections in the Division of Entomology of the United States Department of Agriculture. In this Division, under the direction of the eminent United States Entomologist, Prof. C. V. Riley, particular attention has been given for many years towards the development and improvement of apparatus and methods for the successful treatment of injurious insects. The continuous study of these important subjects has resulted in the invention of many useful and simple machines for counteracting the attacks of our insect enemies. Prof. Riley was himself absent from Washington, attending the Paris Exposition; but I was most courteously received by Mr. L. O. Howard, the Assistant United States Entomologist and by the rest of the staff of the Division, who showed me every kindness and attention in exhibiting the machinery and explaining the uses thereof, as well as in throwing open for my examination the magnificent collections which have been brought together in the National Museum.

Nor was less courtesy shown me by the officers of the Division of Botany, and by request of the Hon. Edwin Willits, Assistant Secretary of Agriculture, arrangements were entered into during my visit for the mutual exchange of seeds of native grasses and fibre plants.

In conclusion, I beg gratefully to acknowledge the great assistance I have received in my work from Prof. Riley, the United States Entomologist, and his able staff at Washington. My thanks are specially due for specimens and identifications of insects, a set of three samples of the Riley cyclone nozzle and a Kutzner New Zealand triplet nozzle, which the United States Entomologist was good enough to present me with; from Miss E. A. Ormerod, Entomologist of the Royal Agricultural Society of England, for valuable advice, and from my many correspondents in all parts of Canada, who are too numerous to mention by name.

The subjects treated of in the following pages, are those which have been most prominently brought before my notice during the past season, or concerning which information has been specially requested. A great many subjects which have been dealt with in the large correspondence of the office are held over for future use in bulletins, or when the occasion may be more opportune.

For the use of some of the excellent figures which add materially to the value of this report, my thanks are especially due. For Nos. 1, 2 and 3, I am indebted to the kindness of Miss E. A. Ormerod; for Nos. 8 and 9 to Prof. Riley; and for No. 10 to Messrs. Blackie & Son, of Edinburgh.

I have the honour to be, Sir,

Yours obediently,

JAMES FLETCHER,

Entomologist and Botanist.

THE HESSIAN FLY.

(*Cecidomyia destructor*, Say.)

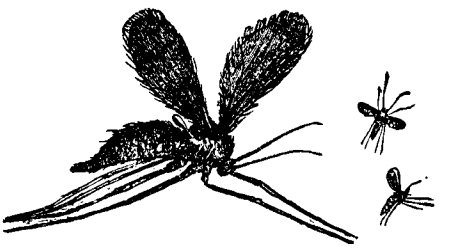

Fig. 1.—The Hessian Fly enlarged and natural size.

Attack.—In autumn two or three small whitish maggots, generally showing a green strip in the centre, may be found embedded in the crown of the root-shoots of winter wheat, or in summer just above the first or second joint of the stems of barley, rye and wheat, where they lie beneath the sheath of the leaf, but outside the stem from which they suck the sap, causing it to become weak and fall over (Fig. 3). When full grown these maggots harden and turn brown, when they resemble small flax-seeds (Fig. 2). They eventually turn to small blackish midges, with smoky wings, which appear in Canada in April and May, and again in August and the beginning of September. The females lay small scarlet eggs upon the inside crease of the leaves of barley, rye, and wheat plants.

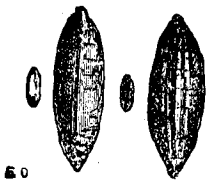

Fig. 2.—Hessian Fly puparia or "flax seeds," natural size and enlarged.

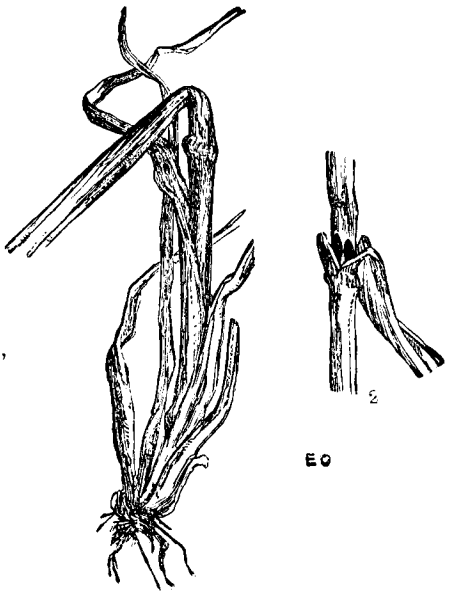

Fig. 3.—Attacked barley stem. 1, elbowed down; 2, showing "flax seeds."

It is many years since the Hessian Fly committed serious injuries in our Canadian wheat and barley fields, a fact largely due to farmers having become acquainted with the life-history of this pest, and in consequence taking the necessary precautions to avoid its attacks. During the past summer, however, specimens and enquiries

have been sent in from different districts, which indicate that it has increased considerably in some places. In the neighbourhood of Ottawa it was noticed in a few fields, and it is mentioned as troublesome in some parts of the counties of Grey and Simcoe. Two of the packets of specimens which have been sent to me, are worthy of attention, on account of their containing large numbers of parasites. On 11th August Mr. G. F. Marsh writes from Thornbury, Ontario: "I send you some specimens of barley injured by a small brown maggot. From the description given in your reports, I would suppose that it is the larva of the Hessian Fly in the flax-seed stage, but I did not know that it ever attacked barley. I do not know of its having caused any damage to crops here before; but this year I should think that 1 or 2 per cent. of the barley crop is destroyed, and wheat to a less extent. Are they likely to increase next year, and what meaus would you advise for destroying them?" Mr. Marsh was written to, that the specimens sent were the true Hessian Fly, and he was requested to send a further supply of injured straws, so that parasites might be bred. The usual remedies of late sowing of winter-wheat, the destruction of rubbish and tailings at the time of threshing, the use of plenty of manure, and, if practicable, the burning of stubble, were suggested. The cultivation of certain varieties of wheat, such as Lancaster, Fultz, Clawson, Diehl and Underhill Mediterranean, which are reported to be less attacked than others, was also recommended.

On 3rd September Mr. Marsh writes further: "I have been making enquiries amongst the farmers of this neighbourhood, and find the extent of the injuries of the Hessian Fly much larger than I expected. Some say the wheat is almost a total loss; others not so much, and a few I have spoken to say that a great deal is lying down, but they do not know the reason. Most likely it is the same cause—the Hessian Fly. With regard to what you say about some of the varieties of wheat being more liable to attack than others, I may mention that the sample of Ladoga wheat received from the Experimental Farm, seemed nearly free from the Hessian Fly, while a small patch of Magyar wheat was nearly all destroyed. I send, as desired, a number of injured straws. I am a farmer and fruit grower, and wish to make a collection of insects for study, especially those injurious to orchard and farm produce. Will you kindly advise me what I need to begin, or recommend me some book on the subject."

In reply to the above, the following letter was sent: "I am very much obliged to you for sending the infested straws, and am pleased to tell you that I have bred from them, already, a large number of beneficial parasites. The presence of these parasites is a most important matter, as the diminution in the numbers of this pest from what they were some years ago is supposed to be due, for the most part, to these beneficial parasites. I am much pleased to hear of your determination to make a collection of injurious and beneficial insects, for I am confident that this is the only way to learn about them. The large amount of injury which can be prevented by even an elementary knowledge of economic entomology makes it most important that farmers should know something of the lives of the insects from the depredations of which they annually suffer so much. I shall always be glad to help you in any way in my power. There is an excellent small work lately published, which I think will give you all the information you ask for, about farm insects and the best way to collect and study them. It is 'Packard's Entomology for Beginners,' New York, 1888, published by Henry Holt & Co." The other parcel referred to above as having contained parasites came from Prince Edward Island, from the office of the *Pioneer and Island Farmer*, with the following letter: "Herewith I enclose you the joints of some wheat stalks. You will find on opening them that there is the larva of some insect which has destroyed many fields of wheat in the vicinity of Summerside. Would you kindly let us know what insect it is, and what means might be adopted to prevent its ravages. The gentleman from whose fields thes talks were taken, says that the stalks which missed being punctured by the fly came to maturity all right, but with the others—about three-fourths of the field—all vitality was destroyed. The joint where the larva mostly is, is the first from the ground, although sometimes they are found in the second as well."

The stems sent from Prince Edward Island produced only a few parasites; but these were sufficient to indicate that these valuable allies were present. The straws sent from Thornbury, however, produced large numbers. In fact, it is probable that not a single Hessian Fly larva was left unmolested in the straws sent. The contents of some of the "flax-seeds" have not yet emerged; but so far nothing but parasites have appeared. These have been kindly identified by Prof. Riley as *Merisus destructor*, and a winged form of *M. subapterus*.

The life-history of this pest has been studied very carefully by many observers, but particularly by Dr. Packard, Prof. Forbes and Prof. Webster in America, and by Miss Ormerod in Europe, all of whom have published valuable articles upon its habits.

In reply to the letter sent by the *Island Farmer* the following answer was sent and was published in their issue of 26th September:—

"I beg to inform you that the wheat stalks enclosed in your letter have been injured by the Hessian Fly, a very injurious insect which some years ago committed enormous ravages upon the wheat crops of North America. Of late years, however, although reports come in annually of its depredations in some parts of Canada, the injury to the wheat crop of the Dominion from this cause is comparatively small. This diminution in the numbers of this pest, is due mainly to the operations of minute parasitic insects which destroy the insect before it reaches the mature state. I am glad to inform you that in the small packet of infested straw forwarded by you I have found several of these beneficial parasites. This, however, only shows that the parasites are present in the field from which the straw was taken, and it is very desirable that farmers should take the usual precautions to prevent the spread and increase of this dangerous insect. The life history is briefly as follows: The perfect insect appears in the spring and autumn, the exact time varying in different localities; but it is usually in the months of April and May in the spring, and August and September in the autumn. It is a small black gnat, about one-third the size of the ordinary mosquito The body is black and the wings are smoky. Each female lays about twenty eggs.. The eggs are laid in the crease of a leaf of the young wheat plant. They hatch in a few days into small maggots, which work their way down into the sheathing base of the leaf and remain between the base of the leaf and the stem, causing the stem to swell and become weak, so that it breaks very easily (Fig. 3). The spring brood from eggs laid in April and May, comes to maturity and a large proportion of the flies appear in August, although a few of them may not come out until the following spring. The brood which appears in August and September lays eggs upon volunteer wheat, young fall wheat and perhaps some grasses. When the maggots hatch they work their way down to the bases of the leaves and feed upon the juices of the plant. They become full grown before the winter sets in, and pass the winter either in the state of a naked larva or in the 'flax-seed' state, in which they may be found on removing the lower leaves, as little brown, smooth, oval and pointed bodies, somewhat resembling the seeds of flax. Inside these "flax-seeds" the larvæ remain unchanged until the following spring; on the return of warm weather they change to chrysalides, and the perfect flies appear in April, May and June."

In reference to the above, Prof. S. A. Forbes writes—Bulletin 3: "The Hessian Fly," 1887. "It was especially to test, for the latitude of southern Illinois, the details of the current biography of the Hessian Fly in America, that I commenced observations on the subject in southern Illinois in 1883. The results thus far established show that in that latitude a large percentage, at least, of the flies emerge as imagos before wheat harvest or immediately thereafter (28th May to 28th June); that, if opportunity offers, the fly will breed freely in volunteer wheat at a date earlier than its usual breeding season in wheat of the regular sowing; and that the greater part of this midsummer generation emerge as winged flies before winter and lay their eggs immediately, thus giving origin to a third brood which hibernates chiefly in the puparium."

The usual life history of the Hessian Fly in Canada is, I think, that which I sent to the *Island Farmer*, for I have never been able, so far, to find the larvæ or "flax-seeds" in volunteer wheat or barley. There is, however, a possibility of its occurring in Canada, for where the Hessian Fly and the Wheat-stem Maggot (*Meromyza Americana*) occur together, the life histories of the two insects agree closely.

If it were found to be the case here with the Hessian Fly, as it has with the Wheat-stem Maggot, that there is an intermediate brood which matures in volunteer wheat, which springs up in the stubble after the grain is cut, it would give a further opportunity of keeping this pest in check by treating the stubble, first by harrowing it directly the grain was cut to make the volunteer crop start, and then by ploughing this in before the larvæ were mature. With regard to the general impression current amongst farmers of infested wheat turning yellow, this is probably a mistake. Prof Webster, who has studied the matter carefully, writes: "Infested wheat does not turn yellow in the fall, but the leaves are darker in colour than those of a healthy plant, and proportionately broader. The central spindle-shaped leaf is missing, and the whole plant is only a bunch of rank-growing leaves. Dr. Lindeman, of Moscow, Russia, in his recent work on the Hessian Fly, uses this language: 'All the leaves of the plant wither at the same time, commonly changing but little of their green colour.' So you see that a yellow colour is a poor indication of fly, even in Russia. I am confident that 50 per cent. of what is known here as winter-killed grain is due to the attack of the fly. I am certain of this. Wheat will go into winter looking thrifty and even rank, though seriously infested, but so far as I have observed it is killed before spring. By explaining the difference between healthy and injured plants I hope to enable our farmers to detect the injury, possibly in time to re-sow, if the first sowing was done quite early."

Remedies.—The remedies for the Hessian fly are the following:—

1. Late sowing.—The postponement of sowing winter wheat until after the third week in September usually has the effect of delaying the appearance of the young wheat plant above the ground until after the Hessian Fly is flying.

2. Burning refuse.—Of great importance is the burning of all rubbish and "tailings" or fine screenings from the threshing mill, wherever barley or wheat have been known to be infested. A proportion, sometimes large, of the "flax-seeds" is carried with the grain, and in the threshing they are thrown down amongst the rubbish and broken straw beneath the machine. By burning this, not only will the Hessian Fly "flax-seeds" or puparia be destroyed, but also the seeds of many injurious weeds.

3. Treatment of stubbles.—As soon as the crop is cut, a harrow may be run over the surface of the fields, so as to make the volunteer crop, from grain which has dropped in harvesting, begin to grow quickly. If there be an intermediate brood of the Hessian Fly this will be easily destroyed by ploughing in the volunteer crop before the insects are full grown, and at any rate will attract the early flies of the autumn brood to lay their eggs, and will also be very beneficial in destroying the summer brood of the Wheat-stem Maggot. Another adaptation of this remedy is the sowing of a strip of wheat in August, which will attract the females to lay their eggs, and which can afterwards be ploughed under. The burning of stubble has sometimes been practised with good results. If fields are conveniently situated, away from barns, houses and stacks, stubble can be easily burnt over, in summer, as it stands in the fields, if a day be chosen when there is a gentle breeze. This should of course be done as soon after the crop is carried as possible. The "flax-seeds" being situated as a rule in the first or second joint of the stem, are all destroyed by this burning process.

4. Rotation of crops.—Neither wheat, barley, nor rye should be sown again the next season in fields where the crop has been infested this year.

A point of great interest in the life-history of this insect is the discovery made by Dr. C. Lindeman, of Moscow, of two of the varieties of grass which are sometimes attacked by the Hessian Fly. Miss Ormerod records (Rep. XII, p. 51): "Observa-

tions with which I have been favoured by Dr. C. Lindeman, of Moscow, during the past season, point to the importance of clearing the surface rubbish of infested fields as thoroughly as can be done. There has been doubt and difference of opinion as to the kinds of wild grasses which were liable to infestation by Hessian Fly, but during the past season Dr. C. Lindeman has been good enough to send me information of "Timothy Grass," *Phleum pratense*, having been found during 1887, in one of the Russian Governments (that of Tambor) to be severely attacked by Hessian Fly, in corroboration of which many specimens of Hessian Fly puparia were sent to him. In 1887 also, Dr. Lindeman received specimens of stems of Couch grass, *Triticum repens*, sent from the Government of Tambor and that of Woronetz, which were elbowed down by and infested by puparia of the Hessian Fly; and communication was made to him at the same time that the couch grass was so severely attacked that in whole districts covered with this grass it was destroyed."

When winter wheat is found to have been only moderately attacked by the autumn brood of the Hessian Fly, good results have still been secured by the use of special fertilisers in the spring, by which weak plants and uninjured shoots, even on infested plants, were strengthened sufficiently to give a fair crop.

THE GRAIN APHIS—(*Siphonophora avenæ*. Fab.)

Attack.—Green, yellow, red or black, plant lice with the antennæ, or horn-like feelers in front of the head, the knees and the tips of the shanks, as well as the feet, black. These insects may be found in clusters upon oats, wheat, barley and rye, and probably also upon some grasses—in the spring, upon the leaves, which turn first red and then yellow around and above where the clusters are situated—later in the summer they crawl up the stems and attack the flowers and forming grain, sucking out the juices by means of their beaks. They leave the fields of grain about harvest time and are not again found until September, in which month a few were found on volunteer barley at Ottawa this season. Dr. Thomas found an aphis on wheat in the winter of 1875, which he had no doubt was this species. Speaking of their autumn operations he says: "They work upon the leaves and stalks singly, while the weather is not too cold, but when winter appears they move downwards towards the ground, some of them entering the soil and feeding on the sap of the roots."

The life-history of this insect is not yet completely worked out. The usual cycle of life in this order is for them to pass the winter as eggs, from which wingless viviparous females hatch in the spring; these by a process of budding and without the sexes pairing (there are no males at this season) give birth to fully-formed young, which in a few days mature and themselves bear young plant lice. There are several successive broods of females, until a certain time in the year (varying slightly in different species), when perfect females and also males are produced. This is the only time of the year when males appear. Some species of plant lice migrate at certain times of their development to some other plant than that upon which they had passed the summer months. Pairing now takes place, and as a result eggs are laid, which remain unhatched until the following spring. This is a general statement, only, of the life-history of plant lice, to which there are exceptions—a notable one of these being the Hop-Aphis (*Phorodon humuli*), the remarkable life-history of which has been so carefully worked out by Prof. Riley and recorded in his report of 1888 as follows: Of this species the winter eggs are laid by the perfect female upon plum trees in autumn; from these hatch the next spring wingless females, which have been 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 has been free from attack up to this time. A number of generations of wingless females are produced upon the hop, until in autumn winged females, known as the "return migrants," again appear. These return to the plum and produce some three or more young. These have no wings, but are

true sexual females. Somewhat later upon the hop the true winged males, the only males of the whole series, are developed. These fly to the plum, and towards the end of the season may be found pairing with the wingless females, which afterwards stock the twigs with winter eggs. The above life-history will show how complex and difficult to understand are the habits of some of our injurious insects. The importance, however, of this knowledge, cannot be over-estimated. By the treatment of plum trees near hop gardens, with a kerosene emulsion late in the winter or very early in spring, one of the most injurious insects which harass the English farmer can now, to a large measure, be kept in check. As stated above, there are still gaps in the life-history of the Grain Aphis; the male and egg-laying female are as yet unknown, as also the exact knowledge of how the species passes the winter in Canada.

It is recognised as being one of the most prolific of plant-lice, and although always present every year, to a greater or less degree, it seldom increases to such an extent as to cause an appreciable diminution in the cereal crops. Occasionally, however, this is the case, and last season was one of these exceptions, more particularly in the United States than in the Dominion, but still in some parts of Canada considerable alarm was caused by its appearance in vast numbers. Enquiries as to the habits and probable extent of the injury were received during July and August from many parts of Ontario and from the Hon. Col. Rhodes, Minister of Agriculture for the Province of Quebec. In the United States tales of its injuries went the rounds of the press, which were copied and exaggerated, until neither the insect nor the injury were recognizable. Its abundance demanded the attention of official entomologists in most of the Northern States.

Quite as frequent as enquiries concerning the habits of the Grain Aphis were others with regard to insects which were found associated with them; these were parasitic species, which were performing the useful work of destroying the injurious plant lice, but whose good offices were, without exception, misunderstood. These beneficial insects were in most of the instances reported: the larvæ or perfect beetles of lady-bird beetles (*Coccinellidæ*), of which *Hippodamia convergens* was the one most frequently sent in, the larvæ of the Syrphus flies and minute parasitic four-winged flies belonging to the genus *Aphidius*. Although least often noticed, owing to their small size, these last named are perhaps the most efficient helpers the farmer has, in ridding his crop of these insects. The egg is laid by the female in the body of the young plant-louse, and the grub grows to maturity inside its body, entirely consuming the liquid contents, and leaving it as a dry shell, which serves the pupa of the parasite as a cocoon. When mature the perfect insect, a small four-winged, dark-bodied fly, eats its way out of its host through a round hole in the back. The flies of this genus are all parasitic upon plant lice, and although so small, $\frac{1}{10}$ of an inch in length, are frequently the most important factor in reducing the numbers of these prolific plant-lice, which attack almost every crop that is grown. As yet no practical artificial remedy has been discovered for the grain plant-louse, a fact which makes it important that its full life-history should be worked out as soon as possible.

THE WHEAT-STEM MAGGOT.

"Wheat Bulb Worm," "Silver-top of Wheat." (*Meromyza Americana.* Fitch.)

Attack.—Some time before wheat, barley and some grasses should be ripe, the ear and top portion of the stem turn white. Upon examination the stem will be found to be severed and consumed just above the top joint, by a slender transparent green maggot, $\frac{1}{4}$ of an inch in length, pointed at one end and having black, horny mouth-parts. When full-fed it works up to the upper portion of the sheath and turns to a slightly flattened green pupa, from which the fly emerges about the end of July and during August. The perfect insects are active little greenish-yellow flies, $\frac{1}{5}$ of an inch in length, with shining green eyes, and three dark stripes extending down the back. The hind thighs are much thickened, and when the fly is at rest the fore part of the body is raised. Very soon after emerging the sexes pair and the eggs for a second brood are laid upon volunteer grain growing on stubble and in the root-

shoots of various grasses. The flies of this second brood emerge late in September, and the eggs of an autumn or third brood are laid on young winter wheat and on the shoots of grasses. The flies from this brood do not appear until the end of May and in June of the next year.

Close observation of the operations of this insect during the past season settled conclusively, for this district, one or two questions concerning which there was previously some doubt. The three broods were plainly traced. Perfect flies of the first brood, in considerable numbers, being taken in the beginning of June; of the second brood at the end of July, and of the third brood at the end of September. They were found in small numbers of the first brood until the end of June, and of the second, flies continued emerging in the breeding cages from infested straws almost to the end of August. The larvæ from this brood were also found half grown, in large numbers, in the bases of volunteer barley, on the 10th of September. The empty egg shells from which the larvæ had hatched were also found adhering to the first leaf of the infested plants and the central leaf was dead, making it an easy matter to detect the injured plants. Larvæ were also at this time found in the root shoots of several grasses on the experimental grass plots, and upon some fine days at the end of September the flies were taken in large numbers upon the same grass plots.

Notes were taken of the varieties of wheat which were most attacked, and it will be seen from the appended list, that there was a decided preference shown for some of the varieties, whilst others were almost unmolested. This was also the case with the different species of grasses which were attacked. In addition to wheat, some varieties of barley also suffered, and a single instance only of attack on Welcome oats was observed. Prof. A. J. Cook, of Michigan, however, informs me that in his State oats of several varieties are severely attacked. With regard to the attacks of this insect upon grasses, it was found that while early flowering species, as *Poa serotina*, *Agropyrum caninum*, *A. glaucum*, &c., were injured in the flowering stems, in the same manner as wheat and barley, the late flowering species or perennial grasses of the first year's growth, which had no flowering stems, were injured in the root-shoots, after the same fashion as the attack of the later broods upon volunteer and winter wheat. The injuries to grasses were also largely augmented by another minute black species of fly belonging to the same family (*Oscinidæ*) as yet unidentified. This was not detected until the flies had nearly all emerged, when the empty brown puparia were found in large numbers in the dead shoots and between the sheaths of the grasses.

Remedies.—The discovery of the freedom with which this insect breeds in grasses which occur everywhere, complicates very much the problem of securing a satisfactory remedy. Those which should be tried, however, are the following:—

1. The collection (hand-picking) of the conspicuous "silver-tops" or injured stems in the beginning of July.

2. For the second brood, which attacks volunteer wheat and grasses, a strip of wheat or barley sown near infested fields early in July, will act as a bait to attract the females, to lay their eggs, as soon as they emerge. These succulent young plants would probably be more attractive than grasses at that time, and would also be in advance of the volunteer crop. This strip should be ploughed under in August to destroy the half-grown larvæ.

3. Late Sowing.—From what I have seen of this insect, winter wheat sown late, after 25th September, would, I believe, be free from attack. The remarkable similarity between the habits of the Wheat-stem Maggot and the Hessian Fly render the same remedies applicable for both. The following dates may be of interest, and will perhaps explain some points in the foregoing: "Spearing" of grain is the term used to indicate the time the flowering head appears above the sheath. Winter wheat is generally sown in this section about the first week of September—the third week of September is considered late sowing. Winter wheat sown 11th September, 1888, appeared above the ground 21st September. Winter wheat at Ottawa this year speared 17th June and was ripe on 21st July. Volunteer wheat was up on the stubble by 3rd

August. Spring wheat sown on 1st May speared 1st July, and was harvested from 2nd to 30th August. Barley sown 19th April speared 3rd July, and was cut 1st August. Volunteer crop on stubble was well up on 15th August.

Parasites.—In my last report I mentioned breeding large numbers of a *Cœlinius*, a small four-winged parasite of the Wheat-stem maggot. This year the same insect, which is probably a local variety of *Cœlinius meromyzæ*, Forbes, was particularly abundant, and destroyed large numbers of the larvæ. It differs from the type in having the head and shoulders (prothorax) reddish yellow. It attacks all the broods of the Wheat-stem maggot.

The following is a list of the different varieties of grain and grasses attacked by the Wheat Bulb Worm. Records were taken of the large fields on the farm, and the varieties grown were found to be attacked in the same ratio as in some plots of which the following is a record.

These plots were sown from the crop of fifty grains of each variety of wheat, sown separately, 1 foot apart, in the season of 1888, and the average size of each plot was about 22⅔ feet wide by 36 feet in length. In addition to these plots there was one of Ladoga wheat, 195 feet by 22⅔, and one of Judket wheat, 411 feet by 22⅔. All of these varieties were grown together upon similar soil, and were only separated from each other by a 3-foot path.

LIST A.—Varieties of Wheat which were decidedly more severely attacked than the varieties mentioned in List B.

Wheat.	Speared.	Attacked.
		Per Cent.
Judket	July 1	¼ of 1
Indian Club, Calcutta	June 18	⅓ of 1
Pringle's Champlain	July 1	½ of 1
Bearded, from Peace River	do 2	1
Bearded Summer	do 6	1
Red and White (Campbell's)	do 1	1
White Tuscan	do 5	1
Indian Red, Calcutta	June 18	1½
Naples	July 6	1½
White Chaff	June 30	1½
French Imperial	July 3	2
Greek Summer from Andros	June 29	2
do from Russia	July 1	2
Indian Hard, Karachi	June 22	2
Indian Red do	do 20	2
Bearded March	July 1	2½
Russian Hard Tag	do 2	2½
Beardless, from Peace River	do 2	3
Californian March	June 30	3
do White	do 30	3
Indian Hard, Calcutta	do 20	3
Medea	do 27	3
Victoria de Mars	July 2	3
White Delhi	June 21	3
Algiers Summer	July 4	4
Torentino	do 1	4
Bearded Trimenia Sicilian	do 4	5
Greek Summer, from Atalanta	June 29	5
do from Missogen	do 30	5
do from Paros	July 3	5
Polonian	do 8	5

LIST B.—Varieties of Wheat which were very little injured, only showing a few heads of "Silver-top."

Wheat.	Speared.	Wheat.	Speared.
Australian	July 4	Heaney's Spring	July 5
Bearded Red	do 1	Herison's Bearded	do 3
Beardless March	do 8	do Beardless	do 6
Blue Stem (or Velvet Chaff)	do 5	Improved Summer Cob	do 2
Brown's New Wheat	do 2	Ladoga	June 29
Canada Club	do 2	Large-leaved from Cap	July 4
Chilian White	do 4	New Zealand Long-berried	do 6
Club	June 30	Noe	do 10
Eureka	do 30	Red Fern	do 3
Farrell's Early Sonora	do 30	Rousselin	do 7
Fife, American hard, Duluth	July 2	Russian, White	do 2
do do Milwaukee	do 2	Rye Wheat	do 17
do Red	do 2	Saxonka	do 1
do Saskatchewan	do 2	Scotch	do 1
do Scotch	do 1	Sicilian	do 4
do White	do 1	Summer Mars	do 6
do Wellman's	do 2	Triumph	June 29
Galician Summer	do 4		

The question as to what varieties of grain are least attacked is one of importance, and the records of last season, and of 1888, as far as they were taken, show an advantage in favour of the varieties mentioned in list A. Last season, however, was cool and damp, which would probably have the effect of lengthening the time of appearance of the perfect insect. It has been pointed out to me by Mr. William T. Macoun, who assisted me in taking the above record, that the varieties of wheat most attacked are of the character known as "ricey," and so little esteemed by millers in this country. The different varieties of barley were much less attacked than the wheats by the first brood of the Wheat-stem Maggot. Of these, however, three of the best varieties were chosen, viz., Peerless, Beardless and English Malting barley. The injury to these was not general nor widespread; but upon a clay knoll a few injured stems were observed constituting perhaps $\frac{1}{20}$ of 1 per cent.

The attack upon grasses grown in the experimental plots, was upon some species serious. The grasses most injured were the following, in the order they are mentioned:

In the flowering stem,—*Poa serotina*, 5 per cent.; *Agropyrum caninum*, 4 per cent; *Agropyrum glaucum* var *occidentale*, 2 per cent.; *Poa pratensis*, two or three stems only; *Poa cæsia*, two stems; *Panicum capillare*, one stem: *Setaria viridis*, two stems.

In the root-shoots during the summer, *Elymus Canadensis*, this plot was nearly destroyed, few plants throwing up more than one or two stems, and the same was the case with *Agropyrum tenerum* and a new bed of *A. caninum*. *Deschampsia cæspitosa* lost perhaps 10 per cent. of the root-shoots. *Deyeuxia neglecta* and *Elymus Americanus* about 5 per cent.

The mature flies in the seasons of their appearance could always be swept in considerable numbers from the beds of *Agropyrum glaucum* var *occidentale* and *Koeleria cristata*, but no injury could be detected in the root-shoots, either in the summer or autumn.

CUT-WORMS.

Fig. 4.

The W marked Cut-worm.

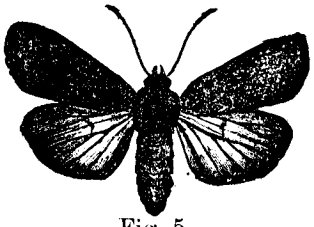

Fig. 5.

Agrotis Clandestina, Harr. the moth of the W marked Cut worm.

The attacks of these injurious caterpillars were very severe in many parts of the Dominion. Most of the complaints were received from central Ontario. From British Columbia only three reports have come in, all recording a diminution in the amount of injury. Mr. G. A. Knight, of the Mount Tolmie Nurseries, writes: "Taking it all through, we have been freer this year from cut-worms than we have been before for ten years past."

In the vicinity of Arnprior, Ont., some species were extremely abundant and destructive, the worst depredators being the Dingy Cut-worm (*Agrotis subgothica*, Haw.), and a grey cut-worm with a brown stripe down the back, from which *Agrotis campestris* was bred. Upon the farm of Mr. Charles Mohr, of Mohr's Corners, I was shown, in the beginning of July, a field of 15 acres, which was planted with corn, potatoes and turnips. Along the side of the field was a strip of wheat. The appearance of the field was remarkable. The corn was untouched, as also was the wheat, with the exception of the lower leaves on the outside edge of the plot which was towards the centre of the field. The potatoes showed an occasional stem cut off, but no serious injury. The turnips, however, except in one corner of the field, where there was a patch of about 50 feet square, were so entirely consumed as not to show a vestige of green foliage all over the rest of the field. Cut-worms were found in countless numbers. The ground was a rich, well-manured sandy loam, and had always required considerable labour to keep down the weeds. This year, however, Mr. Mohr assured me that not a weed had been touched. All through the corn and potatoes and all over the turnip field every weed had been eaten off directly it appeared above the ground. In the strip of wheat, likewise, the weeds were all destroyed on the side nearest the infested field for a distance of 12 or 14 feet from the outside. There is no doubt that this clearance of the weeds was done by the cut-worms which, luckily for Mr. Mohr, did not happen to be cereal-feeding species. At the time of my visit the turnips had been sown the third time, and were just beginning in places to appear above the ground. The poisoned trap remedy was recommended, and about 20 loose bundles were made of pepper-grass (*Lepidium virginicum*) and other weeds, by tying together some of these plants from a neighbouring field. After dripping them in a strong mixture of Paris green they were laid along the rows of turnips about 20 feet apart. Upon visiting the field the next morning an average of about 80 cut-worms was found under or near each trap. Most of these caterpillars were alive at the time; but from the intensity of the green colour of Paris green, its presence inside the alimentary canal was easily perceptible through the delicate skins. The specimens were put inside a large bottle and exhibited at the meeting of the Fitzroy Agricultural Society later in the day, when they were all found to be dead. Mr. Mohr afterwards made several more of these traps, and placed them at

intervals along the rows of his turnip field. Mr. Mohr wrote to me on July 29th: "The turnips are all right now and look remarkably well. In the portion of the field which I sowed without disturbing the drills there has never been the slightest sign of vegetation, except the turnips, but in all the rest of the field the weeds have grown where I upset the drills. The corn is as high as my head now, but no weeds ever started. I put out a good number of traps and they did well." The reason the weeds did not grow where the ground was not disturbed, was probably due to the fact that all the seeds of weeds which were near enough to the surface to germinate, had grown at first and had been destroyed by the cutworms. Those brought to the surface later, in hoeing or cultivating the turnips, would be destroyed by the repetition of those operations. After very careful trial of this remedy during the past season, I consider it one of the most satisfactory for these injurious caterpillars, where the nature of the crop is such as will allow of easy access to all parts of the field. Almost any succulent plant answers for the traps, and the one mentioned above was only used because it was the easiest obtained. I would suggest the advisability of always placing a few poisoned bundles in gardens in the spring, a day or two before sowing seeds and after the ground is cleared. The labour is very small, and the benefits derived are decidedly great.

Cut-worms very similar to those found in Mr. Mohr's fields were sent to me by Mr. J. Armour, of Victoria Road, Ontario, who reported that the ground was literally alive with them, and that they were doing a great deal of harm to garden vegetables.

All efforts to breed the perfect insects from these caterpillars failed owing to the attacks of parasites; the caterpillars resembled closely those from which I have bred *Agrotis turris* Grote.

The Glassy Cut-worm, Fig. 6, the caterpillar of the Devastating Dart moth, *Hadena devastatrix*, Brace, Fig. 7 proved to be very destructive, and particularly so

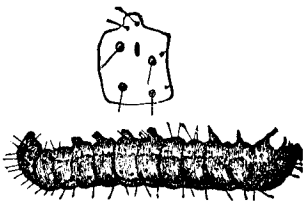

Fig. 6.

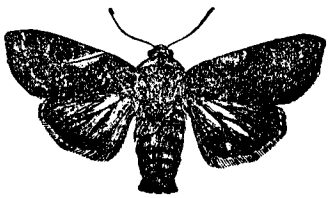

Fig. 7.

to fall wheat in some localities, notably in the Ottawa district and near Creemore, Ontario. Early in June Mr. J. B. Spurr, the editor of the Creemore *Star*, sent me specimens of the caterpillar, from which the moths were afterwards bred. He described their injuries as so severe that it had been necessary to plough up several fields of winter wheat. An article descriptive of the habits of the insect, and the best remedies, was sent, which appeared in the issues of 13th and 20th June, with some additions by the editor.

This species frequently attacks plants of different natural orders: but from what I have seen of its habits, I think it should be considered as being normally a grass-feeding species. The caterpillar is white, with a reddish head, and the body has several small bristle-bearing warts arranged over the surface in the position usually found in this family of insects. It is a subterranean feeder, sometimes doing much harm by lying at the heart of clumps of grasses and destroying the bases of the stems. The moth is extremely common, and but for the abundance of grasses of all kinds and their rapid growth, would be one of our most injurious insect enemies. The season of the appearance of this insect in the perfect state was last summer very prolonged. The first moths were taken on 27th June, and they in company with *Agrotis clandestina*, flew to the light in my study in large numbers until the middle of September.

THE TURNIP FLEA BEETLE, "Turnip Fly" (*Phyllotreta vittata*, Fab.)

Attack.--Small active, shining black beetles, with yellow marking on the wing covers, which eat the seed-leaves of turnips and all other cruciferous plants directly they appear above the ground. When disturbed they hop to some distance.

For the treatment of field crops of turnips I have nothing of importance to add to what I said in my last report. The application of Paris green in land plaster in the proportion of 1 to 50 or in flour 1 to 20 by weight, gives perfect satisfaction. The only precautions necessary are that the powder must be perfectly dry, so as to be easily distributed in an even manner and to throw it upon the turnips when the dew is on them.

The most difficult attacks to meet, of this insect, are those upon such vegetables as are to be eaten at once, as the radish, or of which the foliage is the part for which the plant is cultivated, as garden cress of several varieties. For radishes air-slacked lime, or road-dust or ashes, give a partial immunity; but these were never quite satisfactory. For garden cress the most successful treatment tried was covering the rows with strips of fine gauze stretched on light frames. This, however, is a somewhat clumsy remedy, and requires a good deal of attention. However, I have grown very superior cress in this way, but the plants were uncovered about 6 o'clock in the evening and left uncovered until 8 o'clock the next morning. Frequent watering and good soil of course help by producing a strong growth. The attacks, too, of the insects, are not equally severe all through the season. There will be times between the broods when the frames can be left off altogether.

A remedy which I have not tested, but which is well attested, is that mentioned by Prof. Cook on p. 32, Rep. X, Society for Promotion of Agricultural Science. It is a decoction of tobacco. He says: "The past season we tried ten different insecticides, both on the Striated or Radish Flea Beetle and on the Cucumber Flea Beetle (*C. cucumeris*), We found two remedies which seemed effective. The first is ashes. We tried these with and without London purple, and could not see that the poison was of any value. The ashes seemed to drive the beetles away. Yet to secure satisfactory results we had to fairly cover the plants. In some cases it seemed that the ashes did considerable injury to the vegetables. The other remedy, and a better one, was a strong decoction of tobacco. We took tobacco dust, which we got at a factory for little more than the expense of the sack and labour in filling it up. The decoction was made by pouring two gallons of hot water on a pound of the dust. This was applied to the plants with a force pump. In every case the beetles were driven off and we could see no harm to the plants. Indeed, from the dispersion of the beetles the plants at once put on new vigor. We used this on cabbages and radishes for the Striated beetle, and on potatoes for the Cucumber Flea Beetle, and with like favourable results in both cases."

If this remedy should prove, generally, as satisfactory as this first trial of Prof. Cook's, it will be a most useful addition to our knowledge of simple remedies, and will be very applicable for such plants as cress, of which the leaves are eaten. All taste, of the tobacco would, of course, be easily removed by a good washing in water.

THE MEDITERRANEAN FLOUR-MOTH (*Ephestia kühniella*, Zeller).

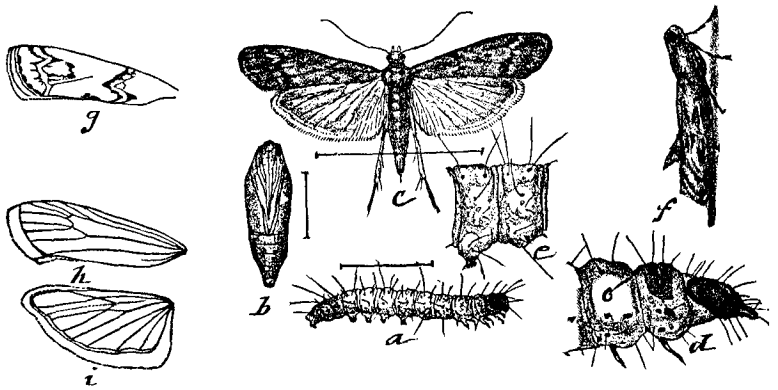

Fig. 8.—The Mediterranean Flour-Moth (*Ephestia kühniella*): *a*, larva; *b*, pupa; *c*, adult enlarged; *d*, head and thoracic joints of larva; *e*, abdominal joints of same—still more enlarged; *f*, moth from side, resting; *g*, front wing, showing more important marking; *h*, venation of fore-wing; *i*, venation of hind wing—somewhat enlarged (*a. b. c.* and *c.* (Riley) *d. f. g. h. i.* (Snellen).

Attack.—Slender white or pinkish, cylindrical, caterpillars. When full-grown, from ½ to ¾ of an inch in length, with reddish-brown heads, and having four conspicuous, and two smaller, dark bristle-bearing dots on each side of every segment. These caterpillars are found feeding in flour and manufactured foods prepared from wheat, rice, and Indian corn, through which they burrow, spinning silken tunnels and threads wherever they go. They also infest the mills where these grains are ground, doing much harm by clogging the apparatus and by destroying the fine silk gauze of the machines. When full-grown, the caterpillars spin close silken cocoons, about half an inch in length, inside which they turn to honey-yellow chrysalises, and from these again, in about three weeks' time, the perfect moths emerge. They are long, narrow moths, about half an inch in length, of a leaden-grey colour. When at rest they raise the front part of the body, and draw the wings close in to the sides. They are rather sluggish insects, and will remain still in the above position for hours. Sometimes the females assume a position something like that in which the moth of the Meal Worm (*Asopia farinalis*) may generally be observed when at rest (Fig—f). The wings are slightly parted, and the abdomen is bent backwards, so as to point upwards between them. The antennæ are folded back and, as a rule, crossed over the thorax, the first pair of legs being generally at the same time folded to the breast, and not used. The upper wings are deep grey, more or less sprinkled with black scales, and are crossed near the tip by a couple of waved angular blackish lines; about one-third of the way from the base there is another W-shaped transverse line. In the centre of the upper wings there is a black dot, which is sometimes double, as in (Fig.—c). The under wings are large and semi-transparent, of a pale drab colour, bordered by a dark line. All the wings are heavily fringed.

During the past summer a serious outbreak of this insect, which has been described as "the scourge of the Mediterranean ports," has occurred in one of our Canadian cities. On 7th August I received from the owners of a large mill some specimens of caterpillars and moths which were stated to be at that time in vast numbers upon their premises. Directly my attention was called to the matter, I feared that it might be the Mediterranean Flour Moth, and upon forwarding specimens to Prof. C. H. Fernald my suspicions were confirmed. Through the kindness of Miss E. A. Ormerod and Mr. O. E. Janson, of London, England, I have lately received typical specimens of *E. kühniella* from Germany, which Mr. Janson had carefully compared with Zeller's types in the British Museum, and these I find are identical with our Canadian-bred specimens. Immediately I received the first specimens I notified the owners of the mill of the serious nature of the visitation, and urged them to adopt extreme measures for the extermination of the pest. Later in the

month the manager wrote to me as follows: "I send you some more specimens of the flies and worms. They have conquered us, and we have shut down. It is a great loss to us."

The matter was then brought officially before the notice of the Ontario Government, and under instructions from the Hon. Charles Drury, the Provincial Minister of Agriculture, prompt and vigorous steps were taken for the extermination of the pest. The investigation was placed in the hands of Dr. P. H. Bryce, Secretary of the Provincial Board of Health of Ontario, who made careful enquiries as to the introduction and possible spread of the insects from the infested mill to other similar establishments in the neighbourhood. Dr. Bryce subsequently published the results of these investigations and enquiries in a Bulletin, which was issued by the Provincial Board of Health on 19th October. This pamphlet, which is written in a clear, intelligible manner, and illustrated with figures of the insect in its various stages, will certainly be of great use to the miller, for whose use it was prepared. The history of the habits and extent of the depredations of this insect in the past are given, as to its European occurrence, from Miss Ormerod's Twelfth Report (1888), and in this country from statements made by the manager of the mill above referred to. A detailed account is then given of the habits and appearance of the insect in the different stages of caterpillar, chrysalis and moth, and of the steps which were taken to destroy the pest in the infested mill. Further measures, preventive and remedial, are suggested in case the moths should at any time appear again in other mills or feed stores.

During part of this investigation I accompanied Dr. Bryce to the infested district, and together we visited several mills and feed stores, as it was important to find out whether the insects had spread from the first mill, either by flying from the open windows or by being sent out in produce sold from the mill. We were pleased to find that it had not appeared in any of the other large mills, and that the smaller firms appreciated keenly the necessity of not keeping a large stock of farinaceous goods, and of not keeping on hand that which they handled for any length of time. It was only in one of these smaller businesses that we found any trace of the moth, and here the principal of the firm assured us that he only kept in stock such quantities of farinaceous foods as would be sold out week by week to consumers.

There was a general opinion amongst all those we visited that this insect was only the ordinary Meal-Worm (*Asopia farinalis*, L.) which may generally be found in small numbers in neglected meal or flour barrels, but which seldom does sufficient harm to be classed as an injurious insect. The present species, however, is a much more formidable enemy, and if, by the negligence of millers, it should be allowed to multiply and spread through our large American flour mills, it will be a calamity of enormous magnitude. The very facts connected with the single case which has occurred this year should be sufficient to put on their guard, all who are concerned in the milling industry. I sincerely trust that the prompt and highly commendable action taken by the Ontario Government may be attended with the success it deserves. That it may be fully understood how necessary these decisive steps were in the interests of the whole country, I give below some of the salient facts concerning this outbreak. Towards the end of August and in September I visited the mill four or five times and found the state of affairs very serious. Work had been stopped and the machines were being pulled to pieces and cleaned. The whole building, a large warehouse 25 feet wide by 75 feet deep, and four stories high, was completely overrun by the insects. Myriads of the cocoons were found adhering to the walls, joists, shelves and ceilings. Every nail-hole, crack or crevice of the woodwork, machinery and furniture throughout the whole building was found to contain one or more of the cocoons or caterpillars, and the moths were flying about in thousands. All the flour and prepared food in the establishment was found to be injured, being clotted and matted together by the webs of the caterpillars.

The following statement made by the manager of the mill, and taken from Dr. Bryce's pamphlet, gives a concise history of this outbreak, and is materially the same as was reported to me from time to time in correspondence:.–

"The first appearance of the *Ephestia kühniella*, or Flour Moth, that we remember seeing was during the month of March last, 1889. The moth was seen flying about near a steam pipe in the basement of the mill and near the w. c. Little attention was paid to it, as from appearance it did not indicate any danger. In April there was an appearance of a few moths on the different floors of the mill, even at the top, but still there was nothing suspicious. In the month of May we were troubled with a few worms in some of our goods, and in June more of them appeared. In July they increased rapidly, and then we began to suspect they were from the fly which we had seen in the mill during the previous months, and which was steadily increasing in numbers. About the middle of July we shut down for a day or so, took the clothing from our bolting reels and cleaned it, and washed the inside thoroughly with soft lye soap and lime. We did the same with the elevators. When we started up again every corner and part of the mill had been thoroughly cleaned, as we supposed, and we commenced to work again; but after about four days we found our bolting reels, elevators, etc., worse than before. They were literally swarming with webs, moths and worms, even inside the dark chambers of the reels. We shut down again and made a more thorough cleaning by washing, etc. While this was going on we found there was no use to try and clear ourselves of the pest as the mill, walls, ceilings, cracks, crevices and every machine was completely infested with moths, cocoons and caterpillars, and there was no use going on. It then occurred to us that a plague like one of the plagues of Egypt was upon us. The moth was different to any of which we had had any knowledge or experience, and we decided to apply to the Dominion Government for relief and assistance. We addressed the Government Entomologist, Mr. Fletcher, and sent him samples of the moth, caterpillars, webs, etc., and received a prompt answer, which considerably alarmed us. This letter was followed by others almost daily from Mr. Fletcher and a visit from Prof. Saunders on the 17th of August. Mr. Fletcher visited us also on the 27th of August; but in the meantime Mr. Blue, the Assistant Minister of Agriculture for Ontario, visited us and took in the whole situation. It was explained to Mr. Blue that the Dominion Government had been appealed to by us, through Mr. Fletcher, the Dominion Government Entomologist, for assistance and remuneration for the loss we had sustained. Mr. Blue, considering it to be a matter with which the Local Government had to do, brought Dr. Bryce, the Provincial Medical Inspector, and submitted the matter to the Government for action. Afterwards Dr. Bryce and Mr. Fletcher came together, and finally the whole matter was left in charge of Dr. Bryce and the Provincial Board of Health.

"In the mean time we took down our machinery and subjected it to steaming. Every part was thoroughly steamed. The mill was swept down, and subjected to sulphur fumes. The walls, ceilings, etc., were cleaned, and elevator spouts and loose wooden work burnt up. Paper bags and hundreds of dollars worth of goods were burnt in the furnace, while the other bags, clevator belts and cups were boiled for hours in a cauldron of water. The machines and all parts that were not destroyed were then burnt by means of a kerosene torch, which flamed and smoked through and around every part of them until we considered we had everything clean and ready for putting together again.

"But on the 19th of September the Local Government passed an Order in Council compelling us to take more stringent steps, and on the 20th September we received an order from Dr. Bryce, which stated that before placing our machinery in position we should subject it to a thorough disinfecting process in a strong room, so arranged that steam under pressure might be drawn or driven into it.

"In compliance with this order we at once constructed a tight steam box 6 feet wide, 6 feet high and 12 feet long, and attached a steam pipe to it from the boiler. In this box we put every machine, and even our mill stones and iron rollers. This process was very expensive, and took up considerable time, as we were over a week at the process and were delayed in the placing of our machinery. The Board of Health visited us in a body during the time this process was going on and pronounced it a success. This was all done, not only in our own interests, as was pointed out in the

letter of the 20th September from Dr. Bryce, but in the interests of the public health and commerce of the country.

"Having now got to the position which enables us to go to work again after two months loss of time and the loss of machinery, fixtures, stock and expense, we have arranged for remedial measures to prevent the reappearance or destruction of the pest should we ever be again attacked. We have erected a steam stand-pipe with hose or other connection on each flat of the mill building. By shutting up all doors and windows of each flat and turning on the steam simultaneously to each floor the whole building can be filled with hot live steam sufficient to kill anything. This will rust all bright parts of the machinery, but to remedy this we intend using oil on them, should we ever be under the necessity of resorting to the measure.

"Another purpose of this steam stand-pipe will be in cold weather to let on sufficient steam to moisten everything and part of the building at night, and then throw open the windows for the night and let the frost penetrate so as to kill any eggs or insects that may have become lodged in unseen parts.

"By these measures, with plenty of light, thorough cleanliness, a cold mill, and caution in taking in stock and old bags, we hope to keep free of a pest which has given us so much trouble and loss."

On the 11th December the manager of this mill writes: "I would say that we are absolutely clear of the moth, but cannot tell what the spring may reveal."

Notwithstanding all that has been done, as above mentioned, and the probable success in the mill treated, great vigilance must still be maintained, in case the pest should again start operations from another centre. Although the moths were only noticed six months before the time that they had increased in such numbers as to necessitate the closing down of the mill, there is, I think, no doubt but that they had been in the mill, but unnoticed, for some time previously. There seems to be some doubt as to the date and place whence the first specimens were introduced into Canada; but evidence seems to point strongly to a consignment of goods imported into Canada from Mediterranean ports, in 1887, consisting of "Indian cassava," "Italian semolina," Brazilian farina," tapioca and rice.

Upon enquiring if any particular kind of flour were more attacked than others, the manager of the mill writes: "If this insect strikes a mill where there is a variety of cereal products manufactured, it will work its way into every cereal product, though it likes glutenous substances best. It attacked everything we made, from pot-barley to fine farina, and milk food in tins. You ask about semolina, it is a product of Russian wheat, and is a very choice article, full of gluten."

The question as to the true origin of a new insect pest is one of some importance, because if an indigenous species which has suddenly increased in undue numbers; it is probable that this increase is due to some unusual cause, the removal of which will again bring the numbers down to the usual occurrence. If, however, the intruder be a foreign species, which has increased in numbers after introduction, owing to suitable environment, it is frequently more difficult to eradicate; but, at the same time, there is the satisfactory feature about such a visitation, that if the first occurrence be stamped out before it spreads, the injury ceases there.

Upon the appearance of Dr. Bryce's pamphlet a copy was forwarded to Washington, and the United States Entomologist was requested to insert a warning to American millers in the organ of his Department, "Insect Life." This he has done, and has published (Vol. II., p. 166) some interesting additions to the history of the insect in question. At the time of the outbreak of *Ephestia kühniella* in Canada, the only available literature of a practical nature was Miss Ormerod's excellent article in her Twelfth Report, 1888. Perhaps half a dozen articles had appeared in different publications, mostly, like the original description, in German. In publishing the note as requested in "Insect Life," Prof. Riley has added a valuable article of his own, "bringing together, in condensed form, a summary of the known facts concerning this pest," and a few points suggested by his notes and collections. With regard to its previous occurrence in America, he continues: "We had had in the National Museum collection, for some time, specimens of a moth indistinguishable from this

species, from A. W. Latimer, of Eufaula, Alabama. On referring to our notes we find also that we had seen specimens from North Carolina in the collection of M. Ragonot, in Paris. These facts undoubtedly prove the occurrence of the insect in North America for at least some years back. Up to the present time the species seems to have been rare here, for every case of serious damage to grain by Lepidopterous larvæ, which has been carefully investigated, has shown that the author of the damage was either the Angoumois Moth (*Gelechia cerealella*), the Grain Moth (*Tinea granella*), or *Ephestia interpunctella* (= *zeæ*. Fitch), a congeneric insect, which was treated by Dr. Fitch under the common name of the 'Indian Meal Moth.'"

The Mediterranean Flour Moth seems not to have been known previous to the year 1877, when specimens were sent to Dr. Kühn, Director of the Agricultural Institute of the University of Halle, Germany, with the complaint that they had been very troublesome in the bolting cloths during the grinding of a quantity of American flour. These specimens were sent to Prof. P. C. Zeller, of Grunhof, and found to belong to an undescribed species of *Ephestia*, which was then named *kühniella* after its observer, Dr. Kühn.

In February, 1883, Prof. Zeller wrote to Dr. Riley: "This predaceous domestic insect appears to have died out here at Grünhof."

In 1884 and 1885 *E. kühniella* attracted much attention in Europe, and several papers were written concerning its ravages. There were five articles published in English periodicals in 1887. In one of these, by Mr. Sydney Klein, whose observations were made from May to September, 1887, on an immense colony of larvæ which had overrun some large warehouses in London, and of which fumigating with sulphur, and hot-liming the floors, did not prevent the spread—the interesting information is given that "a small ichneumom fly destroyed the pest by September." In speaking of the source whence the English outbreak was introduced into the London warehouses, Mr. Klein writes in the *Mark Lane Express*, 14th November, 1887: "Now, with regard to the origin of *E. kühniella*, I found that the larvæ originated in some meal shipped from Fiume, on the Adriatic, over two years ago"—that is in 1885.

At the end of his article Prof. Riley gives a list of the materials from which he has bred *Ephestia interpunctella* (Fig. 9), a species which might be confounded with *kühniella*, and which, indeed, was found in small numbers with it in the infested Canadian mill. To show the omnivorous nature of this insect I give Prof. Riley's list of substances from which it has been reared: Wheat, meal, corn, dandelion roots, chicka-saw plums, sugar, dry opuntia, old books, pecan nuts, cinnamon bark, English walnuts. Prof. A. J. Cook also mentions it as a pest in bee-hives, and I have myself bred it in numbers from European almonds, of which the larvæ had eaten both the soft shells and the kernels. With regard to the life-history of *E. kühniella*, although the perfect insects might probably be found at any time of the year in heated mills, most authorities speak of two broods—one in spring, the other in autumn. This would probably be the case in mills and warehouses not artificially heated. Judging from caterpillars collected in September, which were then full grown, this insect hibernates as a caterpillar and turns to a chrysalis about three weeks before the moths emerge the following spring. Of a large number of caterpillars collected in the beginning of September nearly all spun cocoons at once; but although most of the specimens have pupated and given the moths, a few are still caterpillars and seem to be in a semi-torpid condition. Miss Ormerod writes, Rep. XII, p. 69: "The attack may be considered as going on constantly where temperature is suitable, for we have notes of appearance of the moths in May, June, July, November and December; and intermediate observations of larval or pupal presence point to this, which, when once established, is indeed a mill or flour *scourge* as being a year-round pest." And later on the same lady writes: "In answer to your enquiry regarding winter condition and number of broods, I should say that I gather

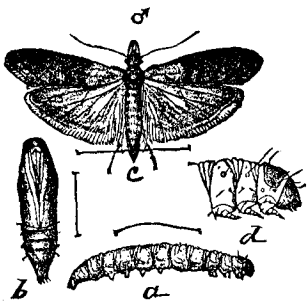

Fig. 9.

from reports sent in that where there is warmth (as inside a mill) that there is no definite succession of broods, but that the pests are present constantly in all stages."

In the month of September last, moths were found flying in large numbers in the infested mill, as well as caterpillars of all sizes, and in my study moths have continued to emerge and lay eggs until the present time (December 15).* The eggs are very small, $\frac{1}{40}$ of an inch in length, twice as long as broad, elongated and somewhat kidney-shaped; when first laid of a semi-translucent greenish white tint, which changes to a pinkish hue as the young caterpillar takes form within. The caterpillars emerge (at this time of the year and in a warm office) about 19 days after the eggs are laid, and are very slender, active little creatures, not more than $\frac{1}{16}$ of an inch in length, when first hatched of a pinkish brown colour, with dark heads, and are covered with long, slender hairs. The eggs are laid singly or in strings of from 3 to 15. They are supposed to be laid on the outside of sacks, through the meshes of which the young larvæ work their way as soon as hatched. They crawl about quickly until they find a place in their food which suits them. They then spin a few silken threads round them, and begin their life of destruction. The general appearance of the full-grown larva is given above, at the head of this article. Its habit of spinning a silken thread wherever it goes, and also of spinning silken tunnels to live in are characters which make this insect even more obnoxious than the injury it does by destroying produce. By these webs the grain-products are rendered unfit for sale, and the machinery of the mills is clogged up so as to cause a constant loss of time as well as a direct expense in cleaning the different apparatus. Prof. Riley in his paper in "Insect Life," already referred to, figures the stages of *E. interpunctella* in comparison with those of *E. kühniella* in order that both may be recognized. The excellent figures (No. 8 and 9), used herewith, have been lent to me by Prof. Riley for the illustration of this article. Speaking of the similarity of these insects, he says: "The early stages are rather similar, but the larvæ may be distinguished by the following characters: the larvæ of *kühniella* are more slender and of a more uniform diameter than those of the other species; the abdominal legs are longer, cylindrical, with a circular fringe of hooklets at the crown; in *interpunctella* the legs are short, conical, with the fringe of hooklets at the crown oval. All piliferous warts in *kühniella*, most of which are rather minute, are still rather prominent, readily observed, and of a black or brown colour; those most conspicuous are, the lateral ones each side in front of the first spiracle, the sub-dorsal one each side of the meso-thorax, almost completely encircled by a narrow black ring, interrupted only at its upper margin. In *interpunctella* all the warts while present, are con-colorous with the rest of the body, and can be distinguished only with great difficulty. The surface of the body of *kühniella* is almost perfectly smooth, while that of *interpunctella* is somewhat granulate."

The moths of the two species are quite different, *interpunctella* being slightly smaller, but having the wings yellowish fawn colour at the base and red mottled with purple at the tips, the two colours being separated by an abrupt line across the wings. (Fig. 9).

Remedies.—The remedies which were adopted in the outbreak recorded above have already been given. In addition to these some others were tried. Spraying gasoline was not found to be practicable. Fumigating with sulphur, to be successful, requires to be very thorough and often repeated. Bisulphide of Carbon was suggested, but was not tried. A kerosene emulsion was recommended, and would probably have been useful; but it does not appear to have been tested. The experience and final conclusion of all who have had the misfortune of being visited by this pest is, that, the only safeguard is scrupulous cleanliness. In Canada, where we have severel months consecutively of winter weather, when no insects breed, there should not be much difficulty in keeping this pest down, if millers will only recognise the danger of being indifferent. I do not think that any degree of cold will kill the insects if left undisturbed in their silken tunnels, but if by constant sweeping these

* Larvæ from these eggs are now (Mar 21) full grown.

are broken and the caterpillars left exposed, cold will certainly injure them. Four full-grown caterpillars were taken from their silken galleries and placed out of doors in a small phial when the thermometer was standing at 5 degrees above zero (Fah.), they were left there for half an hour, and when taken in again rattled like glass beads against the sides of the bottle. Of these, two never recovered at all, and the other two, although they retained their natural appearance for about a fortnight and moved their bodies a little, they never recovered.

The great difficulty, as shown above, of eradicating this moth when once it establishes itself, will, I trust, induce millers to pay attention to this matter and put a stop to its operations, before it becomes too numerous to manage. From the mill manager's report on the results of the above treatment, I believe it is not too much to say that the prompt and thorough measures undertaken by the Ontario Government and the owners of the mills which were infested by *Ephestia kühniella*, have succeeded in exterminating what threatened to be a national calamity.

Scrupulous cleanliness in every way seems to be most important, the moths preferring old, stale flour to lay their eggs upon. This, of course, will sift and blow into all cracks and corners, but every effort should be made to keep mills clean.

Miss Ormerod, upon being informed of the state of affairs in our Canadian mill, very kindly sent all recent information at her disposal concerning remedies which had been tried in England, and has sent a letter from the owner of mills in England, which were badly infested in 1888. Her correspondent writes: "Unfortunately, they are still here, but as I took measures in the spring, and in fact all along, to keep them under, I have not been troubled this year anything like what I was last. The measures I adopted were: in the spring, just before the moths begin to appear in any quantity, to have the mill and all machines thoroughly cleaned, and have since made it a rule to stove the place every Saturday night, or as often as necessary, with sulphur, burning 1 cwt. each time. This kills all the moths and acts as a great check on them, so much so that I am again hoping to get clear of them, by carefully watching for their appearance next spring and stoving them as they come out. I have not been troubled with the grubs this year, and were it not that I know from sad experience the damage they do, should not now trouble about them." Miss Ormerod, commenting on this, says: "I think, on the whole, you will consider the letter satisfactory. When the attack first came under my notice the caterpillars were absolutely clogging the machinery, and the steady improvement in the state of affairs also points to the benefit of great cleanliness."

GRANARY WEEVILS.

(*Calandra* (Sitophilus) *granaria*, L. and *C. oryzæ*, L.)

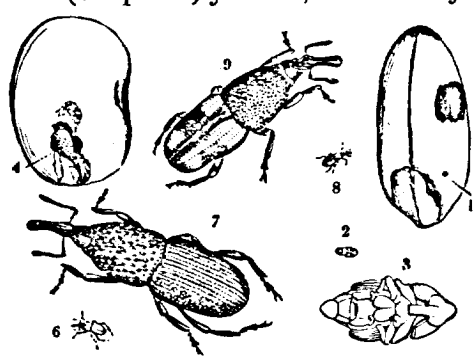

Fig. 10. The Common Granary Weevil, 6 natural size, 7 enlarged. The Rice or Spotted Granary Weevil 8, 9.

Attack.—Small, dark-coloured, narrow beetles, rather more than $\frac{1}{8}$ of an inch in length, with their heads prolonged into a slender snout. These insects, both in the

grub state and as perfect beetles, sometimes destroy large quantities of grain when stored in granaries.

Several enquiries are received every year concerning the habits of the "grain weevil". Many of these do not refer to the true granary weevil, the word "weevil being as a rule very inaccurately applied to almost any insect which attacks crops. Its use, should properly be limited to a class of beetles which have their heads elongated into a snout, at the end of which the mouth parts are situated. This inaccurate use of terms is frequently the cause of much loss of time. Information is asked concerning insects of which no description is given, except perhaps the name of the crop it feeds upon. The following are specimens of some of the descriptions which have been sent in to me: "A loathsome bug on my grapes;" "a nasty insect on my turnip crop, of a greenish colour;" "like the common slug, which hangs on a thread from shade trees." Now, such descriptions as the above simply mean that great loss of time is necessitated. First of all, a fuller description has to be written for, and then by the time this is received, the injurious insect is identified, and the proper remedy sent off, it is more than probable that it will be too late to save the injured crop. Above all things, it is necessary, when asking for information and remedies for injurious insects, to send specimens whenever possible.

The power of the granary weevils to destroy grain, when held for any length of time in warehouses, is enormous. These insects are not natives of North America, nor is it at all likely that that they will ever increase sufficiently in Canada, where we have such cold winters, to be rated higher than third-class pests. It is true they occasionally destroy samples or small quantities of grain kept in heated offices or stores, but this injury cannot compare with their ravages in hot climates. In the Southern States and in South America they have occasionally done considerable harm, but their ravages are most serious in India and the south of Europe. In the old times of long passages from the East the injuries to cargoes of grain were much heavier than at present, but even now care is necessary in the grain warehouses of England, lest stored grain should be destroyed by weevils introduced from an infested cargo.

The most extensive article upon these weevils, has lately been published by the Government of India, as "Notes on Economic Entomology." No. 1, "A Preliminary Account of the Wheat and Rice Weevil in India," by E. C. Cotes, in 1888. In this pamphlet not only is much valuable information given concerning the occurrence of the Rice Weevil in India, but full notes and extracts are given from the literature of the two species in all parts of the world. Mr. Cotes says: "The amount of loss occasioned by weevil (in India) every year is estimated by Messrs. Rallie Bros. at an average of 2½ per cent., the maximum being 5 per cent., and the minimum 1 per cent. Taking the value of wheat exported at £6,000,000 sterling, the annual loss occasioned by weevil in exported wheat alone is £150,000 sterling. This sum, however, in reality represents but a fraction of the real loss, as it does not take into account the damage done to wheat consumed in the country, or any of the loss occasioned to rice, which is also attacked by the same weevil, besides the loss indirectly occasioned owing to the difficulty of storing the grain."

"In the Transactions of the Entomological Society, London, 1870, Proceedings, p. 15, is an account of Spanish wheat attacked by *C. oryzæ*; also of American maize attacked by the same insect. From 74 tons of the former 10 cwt. of weevils had been screened; from 145 tons of the latter 6 cwt. and afterwards 79 cwt. of weevils were screened." (*Cotes, Indian Wheat and Rice Weevil.* P. 23.)

The insects which caused the loss above referred to, belong to two distinct species. In general appearance, size and habits they are very similar, but may always be easily separated. *Calandra granaria*, the common "Granary Weevil," is slightly the larger of the two, the whole body is of a deep brown, sometimes almost black, and it has no wings beneath the hard wing-cases; while *C. oryzæ*, the Rice Weevil is paler in colour, has two yellowish blotches on each wing-case, and also possesses well developed wings.

Although their legs are short, they are very active little creatures, especially in warm weather or when the grain which they are infesting is disturbed. They will then come to the surface and run rapidly about in all directions. They seem very fond of warmth, and a high temperature is necessary for them to breed freely.

"As warmth is requisite to their breeding freely, everything which will keep down the temperature of the infested corn is useful, more particularly as where they are in great numbers, considerable heat is engendered (as is well known in the case of infested corn-ships), by the results of their accumulations of frass or workings. This is so well known that I have received enquiries from shippers as to whether the heat generated the beetles. This is certainly not the case. It is the beetles and maggots which generate the heat; but at the same time, the heat is so favourable to their reproduction that under such circumstances they multiply the quickest. In Germany "air-drains" are used to cool the heaps, and this is considered the surest way to prevent damage. Drain pipes are laid in various directions through the heaps, and the temperature of the heaps and the surrounding atmosphere is thus considerably lowered. (*Ormerod, E. A. Rep. XI., p.* 74.)

Samples of wheat, barley, pot-barley, malt and maize have been sent to me which had been injured by these insects, and in most cases contained the perfect beetles. The life-history is as follows: The eggs are laid by the females inside minute holes which she drills into stored grain of various kinds. This, however, always takes place inside granaries or storehouses, and never in this country, as has been supposed by some of my correspondents, in the grain as it stands in the fields. Even in India, where the Rice Weevil is indigenous, all the evidence is in favour of the view that it only attacks dry stored grain. As a rule, there is only one egg deposited in each kernel; this soon hatches into a fleshy, white, legless grub, with a brown head, which feeds upon the inside of the grain, and by the time it is full grown has usually reduced the seed to a mere shell. It passes through all its stages, from the egg to the grub, and from the grub to the chrysalis, and from the chrysalis to the perfect beetle, inside the grain in which it hatched. The minute holes which the female bores for the reception of the eggs are generally on the concave side of the grain, at the end occupied by the germ, where the outside is softest. In a colony of *C. oryzæ*, however, which I have now before me in a glass jar and which was imported from India last spring, I find that a few grains of American maize which were placed in the jar about September have been punctured indiscriminately all over the surface, but most of the grains are only bored at the soft germ-end. With regard to the deposition of the eggs, Prof. Riley as quoted by Miss Ormerod. (The Entomologist XII, page 207, 1879), says: The puncture is somewhat curved, rather less than $\frac{1}{16}$ inch deep, and rather narrower at the bottom than at the opening; the egg, which is 0. 5. mm. long, elongate, ovoid, and translucent, is pushed to the bottom, and the whole space above it is then filled in with particles of grain gnawed into fine powder-like flour, the orifice being pasted over with a little saliva."

As stated above, I do not think that we shall ever be seriously troubled in Canada by the attacks of granary weevils. This is mainly owing to our cold winters, for I have found that these insects, which are in other ways possessed of a most marvellous tenacity of life, are very susceptible to cold. With regard to their powers of vitality, I have now before me some specimens of both *granaria* and *oryzæ* which were taken out for examination and comparison. They were placed in methylated alcohol and left for two hours; I then took them out, dried them and mounted them, by sticking them with shellac varnish to slips of card-board. In an hour's time time they were all seen to be moving their legs. They were then placed for two hours in an exceptionally strong cyanide of potassium bottle prepared in the ordinary way for killing insects, and which killed specimens of the Mediterranean Flour Moth in 30 seconds. They were left in this bottle for two hours and then removed to a cabinet. An hour afterwards, to my amazement, they were again moving their legs about, as if nothing had happened to them. Low temperature, however, seems not only to prevent their breeding but actually to kill them. Of the two species, the Rice Weevil appears to be the more sensitive to cold. Miss Ormerod records (Rep. XI, 1887) that even in the cli-

mate of England, and in the temperature of a living room constantly used, very few specimens came to maturity, and of those which did, after fourteen months there had been only one small brood, of which many were dwarfed or imperfect. In cold climates, therefore, it would seem that there should be no great difficulty in keeping these weevils in check; but in India, from data given by Mr. Cotes, it seems almost an impossibility to keep grain for any length of time unless it be buried beneath the ground.

Remedies.—Owing to the fact that the granary weevils hibernate in the perfect state, and that they are easily killed by intense cold, the only remedies which need be considered in this country are those by which infested granaries are well ventilated, and thrown open to the frosts of winter.

Miss Ormerod quotes a correspondent as follows: "We unfortunately have had a great deal of experience of the mischief done by these animals. They breed very rapidly, we find, in warm weather, particularly in wheat from Russia, but can usually be got rid of by turning the wheat in frosty weather, if the warehouse is in an open situation with a good through draught. Sometimes during a mild winter it is impossible to get rid of them. This was the case in the winter of 1884-85; we lost between £1,000 and £2,000 on a single cargo of Russian wheat from this cause. As a rule, weevils are imported every year in Russian and Indian wheats, and do more or less harm in the autumn, but are got rid of in the first severe frost."

Last spring a consignment of various kinds of Indian grain was received at the Experimental Farm direct from India. Upon opening the samples many of them were found to be swarming with the two kinds of granary weevils. The parcels were exposed in an open barn for a week or two, during which time the thermometer several times went below zero (Fahrenheit). When the samples were afterwards examined every beetle was dead. For fear, however, that there might be eggs or larvæ in the grain, the samples were placed in large glass jars and subjected to the vapour of bisulphide of carbon. Not a weevil has been seen in samples of these grains which have been kept for the Museum.

The bisulphide of carbon treatment of seed grain of various kinds is now largely used by seed merchants on this continent, and with decidedly good results. It is probably due to the careful treatment of seed peas, more than any other cause, that the ravages of the Pea Weevil (*Bruchus pisi, L.*) have been brought down to almost nothing within the past few years.

The following is from Mr. Cotes's pamphlet: "Professor Church, in a memorandum issued by the Revenue and Agricultural Department, recommends the use of bisulphide of carbon. This would appear to be deserving of careful experiment, bisulphide of carbon having been utilized in a somewhat similar way against the Grain Moth (*Gelechia cerealella*) in America. He writes: 'The only cheap and perfect application for the prevention of the attack of weevil upon corn and grain consists in the employment of bisulphide of carbon. The quantity required, provided the grain is kept in closed vessels, is very minute, not more than 1½ lbs. to each ton of grain, so that 8d. is the cost of preserving a ton of wheat. The bisulphide leaves no disagreeable taste or smell behind, but the quality of the grain remains unimpaired.'"

A letter is also published from Mr. L. O. Howard, Assistant United States Entomologist, which gives the best method of using this substance:—

"In the absence of Prof. Riley, I beg to acknowledge the receipt of your letter transmitting specimens of ...—— *C. oryzæ*. Clearing up and disinfecting granaries, filling up cracks and crannies, and trapping the beetles in rags and wool, are all very well as methods of ridding the granary from these creatures. It is, however, considered a very good idea here, in America, to establish a large quarantine bin, into which all grain is put after receipt, and disinfected by means of a little bisulphide of carbon. It is then removed and stored away. The bin in question must be made as tight as is possible, and the method of using the bisulphide is to place a pound or so in a shallow vessel on top of the grain. The vapour of this rapidly volatilizing substance is heavier than air, and sinks through the mass, destroying all contained insects. Care should be taken in its use, on account of its extreme inflammability.

The airing which the grain will get in removing it from the bin will probably be sufficiently to rid it of the odour. This remedy was first proposed by Prof. Riley in 1879."

For the treatment of infested peas, large sheet-iron cylinders are specially made for the purpose, with close-fitting caps.

SPRAYING WITH ARSENITES.

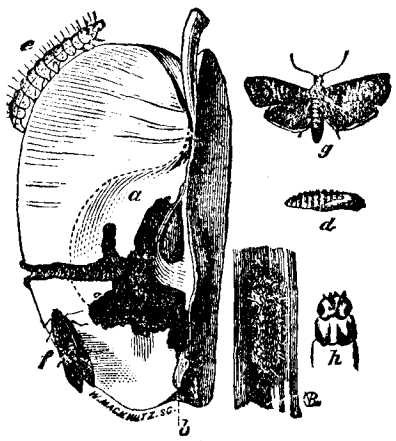

Fig. 11. The Codling Moth.

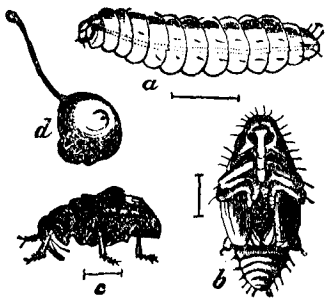

Fig. 12. The Plum Curculio.

The Codling Moth (*Carpocapsa pomonella*, L.) Fig. 11.

Attack. — A white or pinkish caterpillar, about $\frac{3}{4}$ of an inch in length, boring into the centres of apples, and injuring them considerably. These worms spin up and change to chrysalises inside close cocoons, in the crevices of bark, or when barrelled with the apples, in any crack or crevice of the barrel. The moth is a beautiful little insect, easily distinguished by a bronze mark towards the end of each of its upper wings.

The Plum Curculio (*Conotrachelus nenuphar*, Herbst.) Fig. 12.

Attack.—A small crescent-shaped mark, with a single hole in the centre, upon the sides of plums, apples, cherries and peaches. This injury is caused by the female beetle (Fig. 12 c), which makes these marks in the operation of egg-laying. An egg is laid in the central spot, from which hatches a white grub (Fig. 12 a). This soon destroys the fruit. Plums drop very soon, apples become distorted, and peaches either drop or become distorted and disfigured by large blotches of gum.

The injuries by the two above-named insects (Figs. 11 and 12) are amongst the most serious from which the fruit grower has to suffer. The remedies which are most satisfactory come under the head of "Spraying with Arsenites."

Undoubtedly one of the most important discoveries which has ever been made in economic entomology is that of the utility of the arsenites as insecticides. Although, of course, it is perfectly true that materials containing arsenic must necessarily be, not only poisonous to all animals which may eat them, but also, if unskilfully used, injurious to vegetation as well, these points cannot be, I think, successfully urged against their use when we consider the great benefits which are to be derived by the farmer and fruit grower, when he uses them with due care and in accordance with the instructions given by entomologists who have tried them. There is much available literature upon this subject. No one will to-day question the efficacy of Paris green as a useful remedy for the attacks of the Colorado Potato Beetle —and it has been lately proved that spraying the arsenites upon apple trees for the Codling Moth larva, which is commonly called the "Apple-Worm," and upon plum and cherry trees for the Plum Curculio, are practical and satisfactory remedies. My own opportunities for extensive experimenting with these substances have been somewhat limited. Although our orchard at the Central Experimental Farm contains

now 1,300 trees, none of these are old enough as yet to bear fruit, but the subject is one of such importance, and such good results have attended my own and the careful experiments of other entomologists who have studied the matter, that I consider it my duty to draw the attention of our Canadian fruit growers to the subject: The advantage of spraying plum trees, &c., for the Curculio is not so pronounced as it is with the Codling Moth, for which insect I consider it the best remedy. In the report of the United States Entomologist for 1888 is a full article upon the Plum Curculio by Prof. Riley and Mr. Howard. In this report we find the following:—

"There can be no doubt but practical use has demonstrated that the jarring method is the most effective way yet proposed for destroying these insects (Plum Curculios)."

"*Spraying with Arsenical Mixtures.*—Testimony as to the efficacy of this remedy is variable, but theoretically it is a sound one, and such experiments as have been made indicate that it will pay to spray trees for this purpose.

"The testimony which we have so far given is all favourable, in a greater or less degree, to the use of the arsenical sprays against the curculio. The remedy has had to make its way to popular favour against great odds, and so many people have taken part in placing it before the public that it is useless to attempt to give any one individual particular credit. The successful use of arsenical mixtures against the Canker Worm and the Codling Moth has done away with a great part of whatever fear of the poisonous nature of these substances existed, and the objectors to its use have been, for the most part, those who were more or less familiar with the habits of the insects, and who decried the use of this remedy as inconsistent with what they knew of their habits.

"On the whole, the remedy is one which is a desirable addition to our list, although it will never become so great a success as the application of these poisons for the Codling Moth."

Since the above was written, several careful experiments have been made by leading entomologists, and the conclusions they have come to are all in favour of the treatment. Prof. A. J. Cook, of Michigan, has published a paper in the Proceedings of the Society for the Promotion of Agricultural Science (Meeting X), held at Toronto, August, 1889, in which he says: "I believe I am warranted in the following conclusions: The arsenites and carbolized plaster will protect against the Plum Curculio, if they can be kept on the tree or fruit; but in case of very frequent rains the jarring method will not only be cheaper, but much more effective. Again, as our wild fruits are more cleared away we must have plums in our orchards to protect the apples from the Curculio. When apples are seriously stung they become so gnarled and deformed as to be worthless. It will pay then to set plum trees near by or among the apple trees. Then we shall escape mischief among our apples from the Curculio, and shall only need to spray our apples once to destroy the Codling Moth, and can treat the plum trees three or four times with Paris green or carbolated lime in case we have only occasional showers, or can jar the trees when the rains are very frequent. For the apples, we can use London purple, 1 lb. to 200 gallons of water. For the plums we must use Paris green, 1 lb. to 200 or 300 gallons of water. If the carbolated plaster is preferred, we use 1 pint of crude carbolic acid to 50 lbs. of land plaster. This is thrown freely over the trees, so as to strike every plum on the tree which is being treated." "London purple is more injurious to foliage than Paris green. This is doubtless owing to the soluble arsenic which is quite abundant in London purple, and almost absent in Paris green. The coloured water after London purple fully settles is very destructive to foliage." London purple may be used on apple, plum, cherry, pear and most ornamental trees, but on these should never be stronger than 1 lb. to 200 gallons of water. If the application is to be repeated, as it must be for the Curculio, to prove effective, or if it is to be used in June or July, Paris green should be used in the same proportion as above, or else we should only use 1 lb. of London purple to 300 gallons of water. If the arsenites are to be used on the peach for the curculio, Paris green only should be used, and that not stronger than 1 lb. to 300 gallons of water."

In the same number of the Proceedings of the Society for the Promotion of Agricultural Science is a paper detailing some very careful experiments made by Prof. Clarence M. Weed, Entomologist and Botanist to the Ohio Agricultural Experiment Station. The following are his conclusions: "This series of experiments, carried on through two seasons upon two varieties of cherries and four varieties of plum trees, during which a grand total of 65,500 have been individully examined, seems to me to confirm the conclusions provisionally announced one year ago, which may now be put in the following form:—

"1. That about three-fourths of the cherries liable to injury by the plum curculio can be saved by two or three applications of London purple in a water spray, in the proportion of 1 oz. to 10 gallons of water.

"2. That a sufficiently large proportion of the plum crop can be saved by the same treatment to insure a good yield when a fair amount of fruit is set.

"3. That if an interval of a month or more occur between the last application and the ripening of the fruit, no danger to health need be apprehended from its use.

"4. That spraying with the arsenites is cheaper and more practical than any other known method of preventing the injuries of this insect."

In Bulletin 7, of the Iowa Agricultural Experiment Station, (Nov., 1889), Mr. C. P. Gillette gives an account of careful experiments carried on during the past season for making tests and comparisons of remedies for the destruction of the larvæ of the Codling Moth. Trees were treated with carbolized plaster, 1 pint of crude carbolic acid mixed thoroughly with 100 lbs. of land plaster. The application was made by throwing the powder over the trees early in the morning, when the dew was on the leaves. This treatment was the least successful, and the author wisely remarks: "This remedy could hardly be recommended, even if very good results were obtained, as it does not kill the insects in any of its stages, but simply repels the moths, which seek the fruit of neighboring trees on which to lay their eggs."

One tree which was treated with London purple, 1 lb. in 100 gallons, sprayed on it once upon 14th June, the time that the young worms hatched in Iowa, was about as well protected as any of those experimented with.

The experiment with Paris green and plaster proved very successful. Two trees were used (numbered 12 and 13). "Number 13, which was treated once, and which having a smaller number of apples is less valuable in the experiment, had ·02 of its fruit wormy, or an apparent saving of ·62 of would-be wormy fruit; while tree 12, which was well loaded and which received three applications, had but ·00½ of its fruit infested, an apparent saving of ·94 of fruit that without treatment would have been wormy. I think that in the above case two applications would have done nearly or quite as well as the three. Poisons cannot be applied by this method as rapidly or easily as by means of a force pump, but it has the advantage of costing nothing for apparatus, and the trees can be dusted quite rapidly from a waggon by driving on the windward side of a row. This method of applying the poisons would be specially useful where only a few trees were to be treated, and when it is thought that a pump cannot be afforded."

In addition to the above, I have received several letters from fruit growers in different parts of Canada, who have sprayed their trees to protect them from insect enemies. Mr. Alex. McD. Allan, President of the Fruit Growers' Association of Ontario, wrote to me on 12th January, 1889: "My experience has been most undoubtedly that judicious spraying with Paris green saved the plum crop from the Curculio. For some time I was strongly under the impression that the remedy did not kill the insect, but that possibly there was some odour which was so obnoxious that it left without further trouble. Lately, however, after closer observation, I am more inclined to think that the poison applied in proper season destroys the insect, which, I feel satisfied, feeds liberally upon the fruit, not of the plum alone, but other fruits as well, notably the cherry and apple. I know there are those who say they have no faith in the remedy, but I cannot help this. It is possible such are merely assertions based on some theory; but when we have practical results from practical experience we are apt to abide by the results rather than trust to theory." And later, on 17th

December, 1889, Mr. Allan writes: "I prefer Paris green to London purple, as it is generally more reliable in quality. I would specially urge growers never to use the poison when the bloom is on the trees, as it then accomplishes little if anything, and injures our interests by destroying our good friends, the bees. It should be used as soon as the fruit is fairly formed. The quantity to use depends on the quality. If good, I use a teaspoonful—not heaped—to a common patent pail of water."

Mr. Linus Woolverton, Secretary of the Fruit Growers' Association of Ontario, writes: "Spraying with Paris green is more or less done by all our best orchardists in an irregular manner, but not with the regularity and system which its importance demands. London purple is used very little indeed. I have used it for experiment in my orchard, but see no special advantage in it over Paris green. With regard to spraying with Paris green for Curculio, I am a strong advocate for it, both from my own experience and that of my neighbours. But to be effective it must be done very early, as it is the parent beetles we have to poison before eggs are laid. I have succeeded in growing fine crops of plums where the poison is applied immediately after the petals fall, but when neglected longer I have little success. I find that much caution is necessary in making the mixture, as the plum will not stand as much poison as the apple, and very often both plums and foliage will fall, as the result of spraying with a little too strong a mixture. One ounce of green to twelve gallons of water is strong enough for the plum foliage. The application will have to be repeated if followed very soon by a rain storm. I have hesitated about applying Paris green to my peach trees, for the foliage is still more tender than that of the plum, and is very easily affected. I would not like to apply more than 1 ounce in 20 gallons of water, but have no experince to offer. Even with the apple and plum I have caused all the fruit and foliage to fall when more than 1 ounce to 10 gallons of water was applied."

On the 5th July, 1888, Mr. Woolverton sent me some apples badly infested by the larvæ of the Codling Moth. "These," he said, "are from trees not sprayed; from those sprayed I cannot get any with worms, but those left without are worse than usual. Notice that the worm has not entered the calyx end, but on the side. I think this is the case in at least half the apples affected. I also send you samples of peaches, showing the alarming condition of the crop just now, a very large percentage being stung (by the Curculio), and dropping off."

Mr. W. H. Moore, of Peterborough, also writes: "Spraying plum trees with Paris green for killing the Curculio pest answered well on the trees upon which I tried it."

Mr. E. D. Arnaud, of Annapolis, Nova Scotia, found that one spraying was not sufficient, as, late in the season he found plums under his trees containing the grubs of the beetle. This is in accord with the usual experience of other observers. It is necessary to spray at least twice, owing to the known lengthened period during which the Curculio lays its eggs.

From the foregoing it can be plainly seen, that it decidedly pays to spray fruit trees as a protection against the various enemies which attack them. This should be done as soon as the petals have dropped, which in most varieties will be before there is a very large surface of foliage. This will not only destroy the young caterpillars of the Codling Moth but the larvæ of many other leaf-feeding insects, as the Canker Worm and the Leaf Rollers, although it is true these last are protected for some time by being supplied with food inside the leaves they have curled up before the spraying; but when these are consumed, fresh leaves, which have been poisoned, will have to be consumed. The Lesser Apple-leaf Folder, *Teras minuta*, Robs. (*Teras malivorana*, Le Baron) was sent to me from Abbotsford Que., by Mr. W. M. Fisk, where it was stated to have done "considerable damage in orchards for three years past. In some orchards they are so bad as to completely defoliate the trees, which now (28th May) have the appearance of having been badly scorched. This is particularly the case in a neighbour's orchard, where the trees have not been sprayed with London purple. They are most difficult to reach with poison, as they are so well protected by being rolled up in the leaf, that they feed for some time without coming to grief;

still, where prevalent, trees that have been sprayed are much freer from them than those which have not." For spraying the arsenites over trees some kind of force pump and spray-nozzle is necessary; but the saving in the crops saved in anything but a very small garden will much more than pay for the original cost in a single season. It is necessary that these arsenical mixtures should be thrown on to the trees in a fine spray, and only sufficient of the mixture to thoroughly dampen the leaves. As soon as the liquid begins to drip from the leaves the spraying must be stopped. If the operator does not possess a proper spraying-nozzle, for a small number of trees or for a short time, a spray may be made by holding the thumb or a finger over the outlet, this however soon becomes very tiresome, and is at best a clumsy substitute for a cheap instrument.

Of the materials mentioned, I think there is no doubt that the best results will be secured by using Paris green, and I do not think that it ever need be used stronger than 1 lb. to 200 gallons of water. I have used it much weaker than this with good results. It must not be forgotten that this material is very heavy, and must be constantly stirred to keep the particles in suspension when mixed with water.

"BLACK KNOT" OF THE GRAPE.

In May, 1888, I received from Mr. L. A. Woolverton the following letter and the specimen mentioned therein, which he considered the work of some parasitic fungus: "Find enclosed a small portion of diseased bark from one of my Salem grape vines. It first made its appearance last spring. I cut it off, and thought nothing more of it. Last fall when I was covering my grapes I found that it had spread on the two branches of the vine to the extent of 16 or 18 inches. It peals off with the old bark, and leaves the wood quite healthy. The vine is otherwise in good condition, and I would like to know what this is.—*T. Neelam, Port Hope, Ont.*"

The specimen enclosed was a solid soft excrescence, about an inch long by half an inch high. The tissues of the bark seemed to be torn asunder and the spaces filled up with a powdery corky growth. Being unable to detect any fungous cause for this injury I forwarded it to Prof. W. G. Farlow, of Harvard University, for an authoritative opinion. His answer was as follows. "The trouble is not due to a fungus. This peculiar kind of excrescence has in Germany generally been attributed to cold and severe weather in winter. How well that may apply to your case I do not know. The trouble, however, is climatic rather than fungous."

During the past autumn further specimens of this same disease have been received from Mr. G. E. Fisher of Freeman, Ont. who had found it in some abundance upon his Champion grape vines. He writes: "The Champion is the only variety I found it upon. It extends along the whole of the old wood from about four inches above the ground; the roots are quite clean, at all events I could not discover any traces of it on them. My Champion suffered more than any other variety from the late frost last spring, and had very little fruit."

This disease has been studied both in Europe and in this country. In Bulletin 8 of the Botanical Division of the United States Department of Agriculture, Mr. B. T. Galloway gives a concise account of the disease, which is known by the French under the name of *Broussins* and by the Germans as *Krebs* or *Schorf*. Mr. Galloway says under the action of the frosts of autumn and winter, and especially those of spring, peculiar malformations are developed upon the roots, the root-crown, the side branches and the shoots left after pruning."

The appearance and nature of the galls is then described and as a remedy cutting off the branches down to the healthy part is advised, which is the only means of arresting the growth of unhealthy tissue.

THE LARGE RED-HEADED FLEA-BEETLE, (*Systena frontalis* Fab.)

A very troublesome pest in the shrubbery and on the seed beds of the Botanic Garden, at the Experimental Farm during the past summer, was the Large Red-headed Flea-Beetle. Young plants and low shrubs of a great many orders were attacked.

Their ravages were particularly noticeable upon some species of *Althea*, *Hibiscus* and *Weigelia*, and upon some young grape vines. Few plants, however, seemed to come amiss to them. This injury was all done by the perfect beetles, which are black, with a red patch on the top of the head in front. The body is slender and elongated, about $\frac{1}{6}$ of an inch in length by $\frac{1}{16}$ in width at the widest part. The jumping legs are well developed, and when at rest stick out conspicuously from the sides. This beetle belongs to the *Chrysomelidæ* a large family of injurious beetles, including also the much smaller Cucumber and Turnip Flea Beetles.

THE MARGINED FLEA-BEETLE, (*Systena marginalis*, Ill.)

In the month of August the leaves of the Service Berry (*Amelanchier Canadensis*, T. and G.) upon the Experimental Farm were badly attacked by the above named species, the parenchyma being eaten and the ribs only left, giving the bushes a rusty and seared appearance. Oaks, and to a less degree, elms and hickories, also showed their ravages. This species is smaller than the last mentioned, and not so slender. Specimens varied from $\frac{1}{8}$ to $\frac{3}{16}$ of an inch in length. The mature beetle is honey-yellow in color, with a narrow black stripe running down the outside edges of the thorax and wing-cases.

Dusting the foliage with a mixture of 1 part of Paris green to 20 of flour was found to be a successful remedy.

FULLER'S ROSE-BEETLE, (*Aramigus Fulleri*, Horn.)

Attack.—Larva—A thick white legless grub, when full grown $\frac{1}{4}$ of an inch in length, the body curved, wrinkled above and flattened below, covered with short tawny bristles. Head yellow with dark, black-tipped, sharp mandibles, with which it consumes the young rootlets of various greenhouse plants.

Beetle—The perfect beetle is a brown weevil, a little more that $\frac{1}{4}$ of an inch in length, with a short thick snout, and long slender antennæ or feelers, bent abruptly in the middle. The wing-cases are indistinctly striate, and bear rows of large punctures and minute hairs. A whitish stripe runs along the sides of the thorax and half way down the sides where it terminates as an oblique white dash, reaching to the middle of each wing-case. These beetles lie hid during the daytime, but come out at night and feed upon the foliage of various plants.

On 12th December I received word from Alderman Charles Scrim, florist, of Ottawa, that he had discovered this insect in his extensive greenhouses at Stewarton. I immediately went to investigate the matter and found that in a large house, 150 feet long by 20 feet wide, where plants of various kinds were grown for winter flowers, the foliage of a great many species had been very much disfigured and eaten. There was in this house a collection of 1,700 rose bushes. These had been imported from a florist in the United States. Ever since they had been in Mr. Scrim's hands they had been sickly looking, and had never thriven as they ought to have for the attention they had received. The beetles had not been noticed until the present autumn, when their attacks upon the rose bushes as well as upon the foliage of some lilies which were being grown in pots attracted Mr. Scrim's attention. About the same time he discovered that the roots of the roses before mentioned and of some Begonias which had been planted in soil from which some roses had been removed, were being destroyed by large numbers of the larvæ.

Previous to my visit, a large quantity of white hellebore had been sprinkled over the plants in the house. This had been partly effective only, for of the perfect beetles which were found hidden only about 10 per cent. were dead. The beetles had been very destructive to a collection of lilies, as many as three or four being sometimes found in the heart of the terminal cluster of leaves. The roses in this house are planted in long wooden beds, and the soil is about 6 inches deep. An experiment was tried with bisulphide of carbon for the destruction of the larvæ, but owing possibly to the small depth of earth and openings for drainage in the bottom of the beds, this was found to be quite useless. The only

remedy then was to remove entirely the soil from the infested beds, and re-plant in fresh soil such of the plants as were found to be sufficiently uninjured to make this worth while. At the same time, the plants frequented by the mature beetles for feeding were syringed with a weak mixture of Paris green. The beetle is nocturnal in its habits and hides during the day. Several were found hidden beneath leaves or against the sticks to which the stems of the roses were tied. The sticks were the small bamboos used for this purpose by florists. The open top joints of these bamboos proved convenient traps for catching the beetles, for in each of them there were usually from one to five specimens. As yet this troublesome insect only infests one of Mr. Scrim's greenhouses, but there are traces of its presence in one end of another. There is no doubt that it must have been present and gradually increasing for some time, although unobserved. It is a troublesome insect to eradicate, but if the above treatment of regularly poisoning the mature beetles is persevered in, so as to prevent eggs being laid, it must succumb before long.

This insect has been treated at some length in the report of the United States Entomologist for 1878, and by the State Entomologist of New York in 1885. Its history is an interesting one. It was brought to the notice of entomologists about 1874, when it was found by Mr. A. S. Fuller and others in the State of New Jersey, where it was injuring the foliage of Camellias and other plants in conservatories. In 1876 it was decided by Dr. Horn that it was a new species, and was named after the gentleman, who had first brought it to his notice. Since that time it has been found to occur in greenhouses from the Atlantic to the Pacific. Prof. Lintner says: (Rep. 2, p. 143): "Its greatest injury is committed upon roses grown under glass, by the larvæ feeding upon the tender rootlets, at first merely checking their growth, but finally, when their numbers have increased, destroying the plant. It has also been observed upon the roots of *Geranium* and *Hibiscus*, and in California, is reported as "very destructive to *Dracœnas* (and palms lightly), oranges, Cape Jessamine (*Gardenia*) and *Achyranthus*, in the order named. In Brantford, Canada, it has been found upon *Abutilon* and *Plumbago* in hot houses. From Massachusetts, it is reported upon the Azalea, "Cissus," and "Inch-plant." The best method by which to meet the depredations of this insect, so far as known at the present, is to hunt for the beetles upon their food plants and to destroy them. If this be persistently done the evil can be arrested." Until quite lately the only mention of this insect in entomological literature, has been as a greenhouse pest; but in "Insect Life" (Vol. 2, p. 90, Sept., 1889) there is a note of its having been found to be very destructive in the vicinity of Los Angeles, California, to the leaves of evergreen oaks, camellias, palms (*Washingtonia filifera*), *Canna indica* and several other plants growing out of doors. The experience of all those who have suffered from this pest, seems to be that destroying the mature beetles is the surest way of stopping its ravages. Prof. Riley quotes in his 1878 report from an account written by Mr. Peter Henderson, of New York, of the work of this beetle. After stating his belief that the failure of so many to grow roses is due to the unknown presence of the larvæ at the roots, he says as follows:—"Mr. John May, the gardener in charge of Mr. Slaughter's rose-growing establishment at Madison, New Jersey, which is probably the largest in the vicinity of New York, has given great attention to the rose bug, his roses for four or five years being much injured by it, but by persistent efforts in destroying the perfect insect, he has now got entirely clear of it. The symptoms of the grub being at the roots are a partial stagnation of growth, weak, pale shoots, and generally barrenness of flower-buds."

In the greenhouses where this insect has appeared at Ottawa, the plants in the house are of such a nature that Paris green can be used without injury or danger. The plants most resorted to for food appear to be some lilies which are just throwing up their stems, and some rose bushes which have no buds upon them. The use of only a very weak mixture ($\frac{1}{2}$ oz. to 3 gallons of water) has been advised, but every beetle that eats leaves sprayed with it must soon die.

Prof. Riley discovered that the eggs were laid close to the ground, at the collar of the rose bushes, and were secreted beneath any roughness in the bark, or other

material placed there. He therefore suggested the value of placing traps, composed of rags, tape or paper, tied either round the stem or around pieces of stick, and placed close to the roots. In these the females would lay their eggs, which he describes as laid in flattened batches, consisting of several contiguous rows, and each batch containing from ten to sixty. The individual egg is smooth, yellow, ovoid, and about one millimetre in length. The female shows a confirmed habit of secreting her eggs. The eggs take about a month from the time they are laid until they hatch, so that if these traps are taken up every three weeks, and thrown into boiling water, all the eggs must be destroyed. If the plan of tying rags to sticks be adopted these need not be untied each time, but after being scalded can at once be placed back again at the roots of the plants.

INSECTS INJURING A WOODEN WATER-PIPE (*Macronychus glabratus?*)

In the autumn of 1889 it was discovered that a large wooden pipe which was used to bring water from the Ottawa River to the Ottawa water-works was full of large holes. Upon examination it was found that there were innumerable larvæ of various kinds upon the surface of the pipe, and it became necessary to consider whether it would not be advisable to go to the great expense of laying a metal pipe in lieu of this wooden one, which was found to have been rendered useless, in a much shorter time than was anticipated. Specimens of the injured wood were submitted to me by the City Council, and I also visited the water works and consulted with the engineer. After careful examination, the following letter was written, which explains itself:—

"CENTRAL EXPERIMENTAL FARM.
"OTTAWA, 18th December, 1889.

"R. SURTEES, Esq.,
Engineer, City Water Works,
Ottawa, Ont.

SIR,—I beg to report that I have carefully examined the specimens submitted to me by you—1. Pine staves taken from the clear-water pipe of the Ottawa water works system.

2. Samples of oak slats taken from a rack through which the water passes before entering the water turbines.

The condition of these specimens is, briefly, as follows:—

1. The wood of the pine staves is almost uniformly $1\frac{1}{2}$ inch in thickness, in a few places possibly $\frac{1}{8}$ of an inch less, and perhaps a little thicker where knots occur. At the original point of contact, where the staves touched on each side those next to them, the edges, particularly of the inner surface of the pipe (but also to a much less extent of the outside as well), are much eroded between the staves for some distance towards the exterior of the pipe, causing a deep groove, varying between $\frac{1}{4}$ and $\frac{3}{4}$ of an inch across at its greatest width. In depth this groove varies in most places between $\frac{1}{4}$ of an inch and 1 inch; but at many points it has extended right through the wood to the outside, causing large holes from 4 to 6 inches in length, by 1 wide, thus entirely defeating the ends for which this pipe was originally intended.

If these staves were as stated, 2 inches in thickness when put down, it is evident that by some means about half an inch of the wood has been removed during the fifteen years which have elapsed since the pipe was laid down in the aqueduct.

In answer to your enquiry as to the probable cause of this diminution in the substance of the pipe and the probability of its being due to the operations of aquatic insects, I take the liberty of drawing your attention to the following points:—The condition of the wood of the staves is as follows:—The wood itself below the surface, and between the staves where these were in close contact, is perfectly sound, of good colour, and not injured in any way. On the other hand, all surfaces which have been exposed to the action of water, whether inside or outside the pipe, or in the grooves eroded between the staves, are discoloured and in a semi-decayed condition, *i.e.*, the wood is so soft and rotten that it can be easily removed with the finger-nail to a depth

of at least $\frac{1}{16}$ of an inch. In and upon this thin layer of half-decayed wood the larvæ of various kinds of aquatic insects have taken up their abode, and some have made use of it as food, as is plainly seen by the numerous tracks which have been eaten out all over the surface. These tracks are irregular and winding in their course, going in all directions, as often across the grain of the wood as with it. They do not penetrate the solid wood but frequently reach down to it and run along on the surface. The same track sometimes runs in one direction for some distance and then doubles back on itself and runs the other way, a fact which entirely disproves the suggestions which have been offered by some that the whole of the injuries to the pipe, as well as these tracks, are the effects of friction, current or suction. One particular track was observed to start on the inside of the waterpipe and work its way through one of the large holes out onto the outside surface. It is a notable fact that these tracks run over the whole surface of the wood, even to the bottom of every little depression.

I believe that the softened condition of the surface of the wood is due to the action of the river water, and I find that in some places, where the eroded groove stretches out in points from the inside towards the outer surface of the pipe, there is generally a discolouration of the wood beyond the point where the surface is actually eaten away, as if decay had already begun, although the tissues of the wood are still unbroken, but showing plainly that the water had effected an entrance between these discoloured surfaces. It is generally perceptible that there is in such spots a slight inequality of the exposed surfaces of the two contiguous staves, which may have been caused either by some slight unevenness in the planing of the wood at the time of building the pipe, or possibly from the wood having swollen unequally when it was placed in the water.

I am informed that at the time the pipe was constructed the edges of the staves were flush both inside and outside this pipe, which was built like a barrel, with the staves slightly bevelled at the edges, so as to procure the tubular shape, and that the whole was held together by iron hoops. This being the case, I can only suggest as a reason for the eroded groove being so much wider and deeper on the inside of the pipe, that unless the angles of the bevelling were perfectly true the outer edges of the staves would be much more tightly clamped together than the inner by reason of the iron hoops outside.

I would suggest then, as the cause of the destruction of the clear-water pipe—first of all—the decaying of a very thin layer of the surface of the wood through the chemical action of the river water; and, secondly, the breaking up and removal of this decayed surface by aquatic insects, so as to constantly expose a new surface of the wood to the action of the water.

It is probable that both of these operations were assisted by the strong current in which the pipe was situated—in the first place, by forcing the water into every minute crack or crevice, and then by carrying away fragments of the surface loosened or undermined by insects.

I am aware that it is held by many that sound pine wood, kept constantly submerged beneath the surface of water, is practically indestructible; and I have no doubt that under some circumstances, and for some purposes, this might be the case. It must, however, be remembered that more or less air, varying with the circumstances, is always dissolved in water. I am under the impression that water containing a large quantity of air, as the water of the Ottawa River necessarily does, after passing down the Deschenes Rapids, would be more destructive to wood submerged in it than water containing less oxygen.

With regard to the insects found upon the staves submitted to me, they were for the most part predaceous larvæ of Beetles and Dragon Flies or allied insects. Many of these live in silken cases, which they spin upon the surface of objects in the water, but into which they also weave fragments of the substance upon which their cases are fixed—as small pieces of stone, sand or wood. Upon portions of the wood submitted to me were vast numbers of these cases, which, when placed under the microscope, showed plainly that they contained fragments of coniferous wood. The time of year is not opportune for the exact identification of the many larvæ which

occurred upon the injured wood, nor am I able to say with certainty which is the species that has eaten the tortuous tracks in the decayed surface of the pipe. This, however, is a point of no practical importance; but I think it probable that it belongs to the *Parnidæ*, a family of aquatic beetles of which very little is known of the life-history. To this family belong some small beetles, of which several were found on the injured wood, belonging to the closely allied genera *Dryops* and *Macronychus*, as well as some larvæ which I refer provisionally to these beetles.

As to the wood-eating habits of these beetles which live exclusively in water, Prof. Westwood, in his "Modern Classification of Insects," says of the genus *Macronychus*, as follows: "They are found in running water, appearing to prefer the under sides of stones, and especially on floating wood, burrowing beneath the bark. Their movements are very slow. When taken out of the water they do not survive more than two or three hours." I might mention that none of these insects have ever been known to bore into sound wood, but feed exclusively upon decaying vegetable tissues in water, and their appearing in large numbers upon the clear-water pipe may possibly be due to the unusual quantity of decaying bark which, I am informed, lies in the Ottawa River, near the inlet of this pipe, and which would attract these insects as a suitable breeding ground. They are in no way related to the ordinary timber-boring beetles which are so destructive to standing timber and manufactured lumber in all parts of the world.

I shall endeavour to breed those I have to maturity, so as to settle this question of identity, but there is great difficulty in breeding in confinement those insects which live in running water, on account of it being almost impossible to give them the same conditions as they have in nature.

2. The oak slats taken from the rack near the pump house, and which had only been in the rack for ten years, were proportionately much more destroyed than the pine staves. The slats were ½ an inch in thickness by 4 inches in width when put in the rack; but many of them are now so seriously injured that it is necessary to replace them. In most of the slats the greater part of the wood has been entirely consumed."

REPORT OF THE HORTICULTURIST.

(W. W. HILBORN.)

WM. SAUNDERS, F.R.S.C., F.L.S., F.C.S.,
Director Experimental Farms.

SIR,—I have the honour to submit herewith a report on the progress made in the Horticultural Department of the Central Experimental Farm, Ottawa, during the year 1889. The winter of 1888-89 was unusually mild, which was favourable to the orchards, the greater portion of the trees coming through in good condition and making a satisfactory growth during the summer. Small fruits, with few exceptions, wintered well, grew strong and vigorous in the spring, and produced abundant crops.

APPLES.

The trees in the apple orchards passed through the winter with but little injury to most sorts. Many trees were added to the orchards, some of them of the same varieties as those already planted, but grown farther north, so that their relative hardiness might be tested. Some of the older sorts not already in the collection, together with some new varieties, have also been added, most of which have made good growth and promise well for the future.

PEARS.

A number of pear trees were injured by the winter, some of them either killed outright or down to the snow line. A few of the standard sorts survived, and may recover sufficiently to form good trees. The Russian varieties escaped with but little injury and give evidence of being hardy. These have made a good growth, but more experience is required with them before a list of hardy kinds could be given that would be valuable to the planter in northern localities. Some pear trees were obtained that had been grown in northern districts with the hope that they would possess greater hardiness. A collection was also planted that had been grown from scions kindly donated by Chas. Gibb, Esq., of Abbottsford, Que., selected from his most promising hardy Russian sorts. These have made a satisfactory growth, and the outlook for establishing a pear orchard in Ottawa is more favourable than at first.

PLUMS.

Plum trees have suffered more from the winter than most other fruits, a large percentage of the trees being killed. A portion of this injury was probably due to the fact that the trees were transplanted from the nursery rows to the orchard rather late the preceding spring, and did not get sufficiently well established to withstand the winter. The vacancies have been filled in this orchard also by trees grown farther north, with the hope that they may prove more hardy.

CHERRIES.

Very few of the cherry trees were injured by the winter; most of them came through in excellent condition. They have made a good growth, and strong hopes are entertained for their future success.

GRAPES.

Grape vines succeed well in this locality when proper protection is given to them during the winter. All varieties require to be laid down and covered with earth before the ground freezes in the autumn. Care must be taken not to remove the covering too early in the spring. They will be better to remain covered until the buds begin to swell.

In the spring of 1887, 320 vines were planted on what may be called the "French system," in rows 4 feet apart, and 2 feet apart in the rows. These were trained to short stakes and pruned closely. They made strong, healthy plants, and some fine fruit was produced the past season. This plantation consists of the following varieties: Bacchus, Brighton, Concord, Clinton, Champion, Delaware, Early Victor, Niagara and Wilder. All the vines have succeeded nicely. Present indications would warrant further experiments in this direction, especially in the colder localities.

CURRANTS.

This plantation has not been out a sufficient length of time to produce much fruit. A slight frost which occurred at the time they were in bloom did some injury to the red and white sorts. Black varieties were but little hurt by the frost and produced a fair crop. Lee's Prolific, Black Champion, Black English and Prince Albert were nearly equal in productiveness. Black Naples was not nearly so productive as the others. Black Champion gave the largest fruit, and appears to be a desirable variety in every respect. Some of Mr. Saunders' seedling black currants proved quite productive, of good size, and are well worthy of a more extended trial.

RASPBERRIES.

The past season was a favorable one for the raspberry crop. The first plantation was put out in the spring of 1887, and consisted of the following varieties: *Black Caps*—Tyler, Souhegan, Chapman, Doolittle, Hilborn, Johnson's Sweet, Ohio, Centennial, Mammoth Cluster, Nemaha and Gregg; Shaffer's, a purple cap, and Caroline, a yellow cap. *Red Raspberries*—Rancocas, Hansell, Highland Hardy, Reider, Marlboro', Turner, Clarke, Herstine, Parnell, Hudson River Antwerp, Niagara, Cuthbert, Brandywine and Golden Queen. These ripen about in the order named. In making a selection of Black Caps, either for home use or market, the following will ripen at intervals during the season and give very satisfactory results: Tyler for first early, Hilborn for medium and late crop. Gregg is a fine, large, late sort, not as hardy as the others, but where it succeeds it is a valuable market berry, on account of its large size and firmness for shipping. Shaffer's is very much prized for home use, being of a dark purple colour, but they are not regarded as very attractive for market. Where they can be grown near the market in which they are to be sold, so as to reach the consumer in good condition, little difficulty will arise on account of colour. On the Ottawa market they were much sought after, and by many were preferrd to any other variety. Among the red raspberries there is more difficulty in making a selection. None of the early sorts fully meet the requirements either, for market or home use. Rancocas is the earliest, but no larger than Highland Hardy or Hansell. Marlboro' is large and quite early, but does not succeed in all localities. Turner is of first quality, but too soft, and not productive enough for market; but it is the hardiest variety yet tested. Cuthbert is the best late-ripening sort, either for home use or market. Golden Queen, the best yellow, somewhat hardier than Cuthbert which it much resembles, except in colour.

SEEDLING RASPBERRIES.

Among the seedling raspberries of the Director, Mr. Saunders, which were referred to in my last report, there are some very fine Black Caps of large size, good quality and very productive, worthy of further trial. But probably the most valuable berries in the collection were a number of red sorts. Some of these gave

promise of being early, larger and more productive than any of the early standard sorts. These will be propagated and further tested at the several Experimental Farms. From present indications it is likely that some of them will be an improvement on any of the varieties now in cultivation.

BLACKBERRIES.

This fruit has succeeded well on the Central Experimental Farm. The hardy sorts passed through the winter in good condition and produced a fine crop of fruit. Snyder is perhaps the most hardy and reliable—strong, vigorous and very productive, with fruit of medium size and good quality. It ripens early and is valuable for market or home use. Agawam is larger than Snyder, of better quality, very productive, and worthy of more general cultivation for both home use and market. Taylor's Prolific, Gainor, Minnewaski, Western Triumph, Stone's Hardy and Wachusetts Thornless all came through the winter in comparatively good condition. Stone's Hardy and Western Triumph are productive, but too small in size for profitable culture; Wachusetts Thornless is not productive enough to be of value; Gainor and Minnewaski are large and productive, but not sufficiently hardy for this vicinity; Erie, Early Harvest, Early Cluster, Wilson Jr., and Knox, were all killed back nearly or quite to the ground.

STRAWBERRIES.

About 115 named varieties were in full fruiting this season, and the weather being favourable a large crop was gathered. All came through the winter in good condition, except a few which were planted in low places, where ice was formed on the plants. Most of these were killed, but the area thus destroyed was not large. All of the leading varieties were described in Bulletin No. 5 of the Central Experimental Farm, with methods of culture, &c.

SEEDLING VARIETIES.

A large number of seedlings were in bearing. Some of those brought to the farm by the Director, which were mentioned in my last report, produced fruit which was large and proved productive. Most of them were not firm enough for market, but a few were thought to be valuable for that purpose, and of these a number of young plants were put out for further trial.

VEGETABLES.

Some experiments were made in vegetables, principally with radish, lettuce, asparagus, and rhubarb.

RADISH.

Sutton's Rosy Gem, a round turnip radish, was the best of its class in the collection tested on the farm. It is very early tender, crisp, and seldom becomes hollow or pithy, as many varieties do when left standing a short time after they have become large enough for use. Early Oval, Dark Red and Early Scarlet Short Top, with the above, will give, perhaps, the best satisfaction of any of the earlier varieties. In addition to the above, the following sorts were tested:—Early Carmine Short Top, Arlington Early Long Scarlet, Improved Chartier, Wood's Early Frame, Market Gardeners' Early Long Scarlet, French Breakfast, New Early Oval Dark Red, Red Rocket and Garnet Turnip.

LETTUCE.

The following sorts were grown for trial:—Boston Market, Black Seeded Simpson, Black Seeded Tennis Ball, Boston Fine Curled, Buttercup, Burpee's Hard Head, Grand Rapids Forcing, Gold Nugget, Henderson's New York, Large Hanson, Landreth's Forcing, Marble Head Mammoth, New Premium, Gem and Salamander. Where it is desired to grow only one variety for family use, Black Seeded Simpson

will give good satisfaction. It is of fine flavour, and remains a long time fit for use. Grand Rapids Forcing, Landreth's Forcing and Boston Fine Curled are valuable for early forcing. Buttercup and Salamander are good in quality and fine for summer use, as they withstand the hot sun at that season better than most kinds. Henderson's New York, forms the largest heads, but is rather too dark a green to sell well in the markets.

ASPARAGUS.

In the spring of 1888 strong two-year old plants of Conover's Colossal, Palmetto, Le Normandy and Early Purple Argenteuil, were obtained and planted in a rich sandy loam. They made a very strong growth the season they were planted, and little difference could be detected in the varieties. The past spring they were tested on the table, and the difference between them was so slight that there seems to be but little choice, they are all much alike.

RHUBARB.

Seven varieties were planted in the spring of 1888 in rich, sandy loam, in rows 6 feet apart and 4 feet apart in the rows, and good cultivation given them. In the past spring they made such a growth that the ground was nearly covered with their foliage. This plot consisted of the following sorts:—Egyptian Queen, Carleton Club, Linnæus, Paragon, Stott's Mammoth, St. Martin and Victoria. Carleton Club is the largest kind, producing very long and large stalks of good quality. Stott's Mammoth is equally large, but much shorter in length of stalk. A single leaf of this variety measured 31 by 38 inches. The quality is not of the best, and as it is one of the latest to start in the spring it would not be a profitable market sort. Egyptian Queen is of the finest flavor, stalks of medium size and freely produced; good for home use or market. Linnæus is one of the best for market or home use. It is of good quality, a strong grower, and remains fit for use a long time. Paragon starts into growth later than Linnæus, is not as good in quality, and the foliage sunburns badly during early summer. St. Martin is a very strong, rank grower, but the quality is poor, and hence not desirable.

All of which is respectfully submitted.

W. W. HILBORN,

Horticulturist, Central Experimental Farm.

REPORT

OF THE

POULTRY MANAGER.

(A. G. GILBERT.)

To WILLIAM SAUNDERS, F.R.S.C., F.L.S., F.C.S.,
Director Experimental Farms.

SIR,—I have the honour to submit to you the second annual report of the Poultry Department of the Central Experimental Farm. My first report included operations to the 20th of January last, at which date winter laying was going on satisfactorily, and so continued until such time as it was necessary to give the laying stock a rest, prior to making up the breeding pens. It is desirable, when practicable, to keep the breeding stock, male and female, apart, in compartments away from those containing the layers, and treated in such a manner that, while robust health is secured, the hens are not stimulated to lay until mated at the proper season. Chickens from hens which have been actively laying all winter, are not likely to be possessed of that vitality so necessary to vigorous growth. Again, the shells of the eggs from winter layers are apt to be so thin by springtime as to be unfit to put under early sitters. When the winter laying stock have to be used as breeders, they should be given a rest and run outside, if the weather permits, before the eggs to be used for hatching are laid. As the poultry building did not afford space for separate pens of breeders and layers, the hens were given the necessary rest, and in all cases the breeders were mated with a male bird of a different strain. It may be mentioned that it is, I believe, intended to provide such addition to the present poultry house as to allow of the laying and breeding stock being kept in different compartments. The male birds were not placed with the hens during the winter season, and should under no circumstances be permitted in their company. Apart from the fact that impregnated eggs lose their finer flavour, the male birds will not be in the desired condition when mated in early spring, besides the risk that no breeder would care to run of having fertilized eggs, from his best birds, sold promiscuously at the price of eggs for eating.

THE BENEFIT OF NEW BLOOD.

The benefit of having, at the first establishment of the poultry department, procured eggs from different strains with a view to future breeding, was particularly instanced in the case of the Buff Cochins, which, after laying during the winter months, were only eleven months old when mated, after a short rest and run, to a cockerel of the same breed and age, but of a different strain. The result was patent in a large percentage of the eggs producing hardy chickens of large size.

BREEDING PENS MADE UP.

Breeding pens were made up of the descriptions, numbers and at dates as follows:—

Breed.	Numbers.	Date when Mated.
Plymouth Rocks	1 cockerel and 9 hens	February 15.
Buff Cochins	1 do 6 pullets	do 18.
Brahmas	1 do 7 hens	March 15.
White Leghorns	1 do 11 do	do 15.
Houdans	1 do 11 pullets	do 15.
Black Minorcas	1 cock and 10 pullets	do 25.
do Hamburgs	1 cockerel and 6 pullets	April 6.
White Leghorns	1 do 5 hens	do 6.
Dirigos	1 do 6 do	do 17.
S. P. Hamburgs	1 do 2 do	do 13.
Crosses.		
B. B. R. G. {W. Leghorns.. / B. Minorcas...}	1 cockerel and 7 hens	April 17.
P. Rock.... {Brahmas..... / W. Leghorns.. / Wyandottes...}	1 do 7 do	March 30.
Brahma .... {P. Rocks..... / W. Leghorns..}	1 cock and 7 hens	April 15.

In all cases, when possible, a yearling cock was mated with two year old hens, and males of two years of age with pullets. A few days after being placed with the hens the Silver Pencilled Hamburg Cockerel died suddenly and the pen was broken up. The Dirigo Cockerel became ill a week after being mated and continued so until late in the season. Few eggs were, in consequence, used.

SITTING HENS AND THEIR MANAGEMENT.

The first two hens to become broody were Wyandottes. One was set as early as the 2nd March, but the egg shells being thin broke frequently, and although the remaining eggs were carefully washed in lukewarm water and reset, only one chicken was hatched. The other Wyandotte was given eight Plymouth Rock eggs on the 17th of the same month (March) and the result was fairly satisfactory in the shape of four fine chickens, the remarkable progress of which is noted elsewhere. As other hens became broody they were given eggs as soon as possible. Every effort was made to rid the broody hens of any vermin that might be on their bodies before putting them on eggs. To effect this the nest, which was made of straw, in boxes specially arranged, was well dusted with carbolic powder. China eggs were placed in the nests and the sitter put on them for 24 or 36 hours. The china eggs were then taken away and the real eggs substituted for them. All lice meanwhile were most probably driven from the hen and she could then sit in ease for the remaining period of incubation. The nest boxes were made without bottoms so as to be placed on the floor of the building in early spring, or on the ground in the warmer weather. At another season it is intended to set a number of hens on the dry floor and others in nests on the damp ground in order to thoroughly test both methods, each of which have their enthusiastic advocates. In the early season it is beyond question that the dry floor is preferable to the cold ground. As the weather becomes warmer the cooler earth may be best. In order to arrive at a satisfactory conclusion, the eggs must be thoroughly tested and the unfertile ones removed. Unless the eggs are so tested, no definite result can possibly be arrived at, for some nests will be sure to con-

tain a greater number of fertile eggs than others. The conditions must be the same in both cases. We have no statement from the advocates of either of the methods mentioned to show that any conclusive trials were even attempted. Corn in a trough, water and a dust-bath were always kept near the sitters. Some of the hens were confined to their nests and allowed out at a certain hour every morning to feed, drink and enjoy a dust bath. Others were kept in open nests and allowed to come off and return at pleasure. The former is the better way in the early season when the weather is cold and it is an object to get the hen on the eggs again before the latter are chilled. In the dust bath a small quantity of sulphur was mixed to aid in the prevention of lice. As previously stated, when eggs were broken under a sitter the remaining ones were carefully washed in lukewarm water and replaced in the nest.

The following table will show the number of eggs put under hens and the results therefrom.

EGGS set and chickens hatched.

Date when Eggs were Set.	No of Eggs Set.	Description of Eggs.	No. of Chickens Hatched.	Date when Chickens were Hatched.
1889.				1889.
Mar. 17..	8	Plymouth Rock	4	April 7
April 10..	9	5 White Leghorns, 4 Houdans	4	May 1
do 11..	11	Brahmas (from London, Ont)	4	do 2
do 30..	11	Houdans	5	do 21
do 30..	11	Brahmas	2	do 21
do 30..	9	White Leghorns (hen got sick on nest)	1	do 21
do 30..	11	5 Wyandottes, 6 Buff Cochins	6	do 21
May 1..	9	Game-Cross	4	do 22
do 2..	11	7 Plymouth Rocks, 4 Buffs	5	do 23
do 7..	11	6 Game-Cross, 5 Buffs	6	do 28
do 9..	11	Plymouth Rocks	5	do 30
do 9..	13	7 Buffs, 6 Game-Cross	8	do 30
do 15..	11	Black Hamburgs	7	June 7
do 15..	13	do Minorcas	9	do 7
do 17..	13	Redcaps (from London, Ont)	4	do 9
do 17..	11	Andalusians	5	do 9
do 20..	11	Houdans	9	do 12
do 23..	9	Wyandottes (purchased in Ottawa)	4	do 15
do 28..	11	6 Houdans, 5 Mixed	7	do 20
June 3..	11	Black Hamburgs	5	do 24
do 4..	9	Mixed	4	do 25
do 8..	11	9 Andalusians, 2 White Leghorns	7	do 29
do 11..	11	7 Plymouth Rocks, 4 White Leghorns	6	July 1
do 22..	13	Wyandottes (purchased in Ottawa)	11	do 13
do 26..	11	6 Leghorns, 5 Black Hamburgs	5	do 17
July 6..	11	Pekin Bantams (purchased in Ottawa)	3	do 27
May 26..	.....	Incubator Chickens	6	June 6
			146	

With the exception of the eggs obtained from outside sources as stated above, all were furnished by the farm stock. A feature of the early breeding season was the scarcity of sitters, as much as one dollar being offered on the market for a sitting hen.

DEMAND FOR STOCK AND EGGS.

As spring advanced the demand for stock and eggs became brisk. It was decided after due consideration to sell eggs to farmers for hatching at a reasonable price, also spare cockerels for breeding purposes. This is done with the view of inducing them

to cultivate a better class of poultry for eggs and sale on the market, care being taken that the interests of regular poultry breeders were not interfered with. In several cases thoroughbred cockerels were exchanged with farmers, in order to afford them opportunity to introduce new and better blood into their much inbred stock. A taste for a superior class of poultry once disseminated, it must result in a greater demand for thoroughbred stock, and the business of the high class poultry breeder cannot fail to be correspondingly enhanced.

EGGS SENT TO DIFFERENT POINTS.

Eggs and stock were shipped to different places in the Provinces of Ontario, Quebec, Nova Scotia, New Brunswick, the North-West and British Columbia, and the branch experimental farms at Indian Head, N. W. T., and British Columbia. It is to be regretted that in some cases the eggs sent to a distance did not hatch well, although packed according to the most approved method. There is always a certain amount of risk and disappointment attending the despatch or reception of eggs for hatching. So much so, indeed, that several breeders of note prefer to send live stock rather than eggs to their customers. The whole matter of egg carriage is likely to receive the serious consideration of the American Poultry Association at its next annual meeting. It may be remembered that in June of last year, eggs received from England, for the poultry department of this Central Farm hatched out fifty per cent., and the eggs sent by express to the branch experimental farm at Indian Head, in May last, did very well. In many cases eggs are not fertile when sent, and the carriage is blamed for disastrous results that would have been the same at home. All that can be done is to use every means to have the eggs fertile; pack according to best plan in a light basket with handle; apprise the carriers by conspicuous letters on package of the care required in handling and give the consignee to understand that he is to share a certain amount of the risk.

THE CHICKENS, THEIR GROWTH AND TREATMENT.

On the chickens hatching, they were allowed to remain for 24 or 26 hours under the hen until they were completely "nest-ripe." With the mother they were then placed in coops of improved pattern specially designed for the poultry department. The mothers were confined to the coops, but the chickens could run at large or return to brood at pleasure. The coops became the homes of the chickens until they were removed in the fall to winter quarters. On the chickens feathering sufficiently to keep themselves warm by nestling together at night (generally at the age of four or five weeks), the mother was removed to her quarters in the poultry house to resume laying, and each colony of chicks returned to their own coop without hesitation. The coops were so arranged that on being closed for the night the inmates were secure against all enemies in the shape of rats, weasels, skunks, &c., while proper ventilation was not lost sight of. In rainy weather a double roof on each coop was drawn forward and made an excellent shelter. It could also be used as a shade in the hot season. Care was taken to prevent lice on the chickens. These pests are insidious and deadly foes to the young chicks and cannot be too energetically guarded against. A great deal of this precaution can be well observed at the time of setting the hen, by ridding her body of all such tenants. (See setting hens, above). In the early summer of the year 1888, two methods of feeding newly hatched chickens were tried, viz., the dry (hard boiled eggs and bread crumbs) and the wet (bread and milk), but with one or two exceptions in the past year the bread and milk system was adopted, and with excellent results. This method is particularly adapted to farms where large quantities of butter are made and there is plenty of curdled milk to feed. The bread was put into milk, squeezed nearly dry and so fed. It contained moisture enough to do for drink, and in consequence, water was not given to the chicks until they were several days old. Sour milk was left for them to take when desired and was always enjoyed with great relish. Feed was given as frequently as

they would eat and as much as they would take. Too much importance cannot be attached to the fact that the first few weeks of the chicken make the future fowl. A chicken half starved, or stinted from any cause in the first five weeks of its existence never regains the loss afterwards. Chickens for table use should be pushed from the first day they are able to eat. As the chickens grew up the last feed in the evening was gradually changed to wheat and crushed corn, and pains were taken to see that every chicken went to its coop with a crop full. The bread and milk gave way to shorts, cornmeal, ground oats, bran, and other suitable materials mixed in boiling water with a handful or two of ground meat to the chickens which could not get grasshoppers or other form of insect life. The mortality among the earlier chickens did not reach beyond 5 per cent.

The growth made by the chickens of the different breeds is shown by the following table:

WEIGHT OF CHICKENS.

Plymouth Rocks—A cockerel hatched on 7th April, weighed, on 7th May (one month afterwards), 1 lb. 6 ozs.; on 7th June, 2 lbs. 15 ozs.; on 12th July, 4 lbs. 12 ozs. (making 4¾ lbs. in 3 months). On 24th of the same month (July) the same bird weighed 5 lbs. 8 ozs.; on 15th August, 7 lbs. 1 oz., and on 18th October, 8¾ lbs. Another Plymouth Rock, hatched on 30th May, made equally rapid growth, showing a weight of 8 lbs. 4 ozs. on the 30th October (5 months from date of hatching), thus making weight of nearly one and three quarter pounds per month.

Brahmas—Four chickens, hatched on 2nd May, from a setting of eggs from London, Ont., turned out pullets, so in this case we have to take the female; one, grew at the rate of 1 lb. 2 ozs. per month, weighing at the end of October, 7 lbs.; another, at same date, weighed 6 lbs. 8 ozs. A Brahma cockerel, hatched on 21st May, weighed, on 21st August (3 months later) 2 lbs. 15 ozs., showing a gain of a little over 15 ozs. per month.

Buff Cochins—Two cockerels, hatched on 21st May, weighed, on 21st August (3 months afterwards) 3 lbs. 6 ozs. and 3 lbs. 4 ozs., making progress at rate of 1 lb. 2 ozs. per month.

Wyandottes—Chickens hatched on 21st May, weighed 3 lbs. 7 ozs., on 21st August, (three months later), gaining a little over 1 lb. 2 ozs. per month. A White Wyandotte made the same gain during the same period. Eleven Wyandottes hatched on 13th July, did not make quite such rapid progress during the hot term, showing, on 20th August following, only 13 ozs., but on 23rd September, cooler weather, reaching 1 lb. 5 ozs., and, on 23rd October, 2 lbs. 14 ozs.

Houdans—Hatched on the 1st May, showed a gain of 1 lb. per month.

Game-Cross—Two cockerels of a cross between a Black Breasted Red Game male and Black Minorca hen, and hatched on the 22nd and 28th of May respectively, weighed, on 22nd August (three months), 3 lbs. 7 ozs. and 3 lbs. 4 ozs., making almost 1 lb. 3 ozs. per month.

Incubator Chickens—The chickens hatched in incubator on 16th June, and reared in the brooder made 1 lb. and 1 lb. 2 ozs. per month. The majority of these chickens were crosses between the Plymouth Rock and Wyandotte, except one, a White Plymouth Rock, which made 1 lb. 6 ozs. per month.

From the above it will be seen that the Plymouth Rocks made the greatest headway, reaching a development, in some instances of nearly one and three-quarter pounds per month, far distancing all others. The difference in progress made can be more easily seen by the following figures:—

COMPARATIVE RATE OF PROGRESS PER MONTH.

Breed.	Lbs.	Ozs.
Plymouth Rocks	1	12
Brahma Pullet	1	02
do Cockerel	1	00
Wyandottes (laced and white)	1	02
Buff Cochins	1	02
Houdans	1	00
Game-Minorca Cross	1	03
Incubator Hatched Chickens	1	04
	1	02

EARLY LAYERS.

Of the four Plymouth Rock chickens hatched on the 7th April last three were pullets. The early development and laying of these pulletts are worthy of note, as showing what care and good feeding will do to bring about desired results. One of the pullets began to lay on the 28th of August, four months and twenty-one days from date of hatching. The second pullet laid three days after the first and the third a short time after. A number of pullets of the same precocity would give a supply of eggs when the older stock are moulting and eggs are becoming scarce and dear in consequence.

NUMBER OF EGGS LAID BY CERTAIN BREEDS.

The following will show the number of eggs laid in twelve months by nine of the best known of the standard breeds. It must be borne in mind that the majority of the layers were pullets, and that none of the laying stock were forced as much as they might have been, for the reason that the greater number were to be used as breeders in spring. As the sitters became broody they were given eggs, and the number of layers were correspondingly reduced. Twice during the later portion of the winter the Buff Cochins, Leghorns, Minorcas and Houdans were stopped laying on account of eating eggs. A certain number of hens were sick, some died, and some were sold. In the months of August, September, October and part of November few eggs were laid, because the hens were in full moult:—

Breed.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
15 White Leghorns	99	40	210	162	166	56	40	71	10	14	18	9	895
10 Plymouth Rocks	24	44	67	95	54	26	33	37	31	12	15	29	467
8 Brahmas	27	7	39	70	66	9	19	17	1	1	15	7	278
8 Black Minorcas	47	10	51	51	52	8	10	27	29	2	12	5	304
5 Black Hamburgs	53	31	59	16	39	9	45	65	12	1	17	12	358
5 Buff Cochins	8	10	36	49	25	.....	5	36	17	7	5	13	211
10 Houdans	43	6	56	77	92	.....	.....	15	2	3	.....	.....	294
2 Wyandottes	22	12	13	10	24	5	2	2	3	.....	3	9	111
5 Dirigos	43	21	28	41	87	14	8	12	.....	11	10	.....	281
Total	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,199

The result aimed at was to have the hens lay when eggs were high in price and the sitting breeds hatch chickens when the price was below eighteen cents per dozen. The early pullets should begin to lay when the older hens are in moult and new laid eggs are becoming scarce and high in price, as was done in the case of the three Plymouth Rock pullets hatched on the 7th April, 1889. (See sub-head Early Layers.) A point to be considered is, that all the laying stock had limited runs compared with what one or two breeds could enjoy on a farm where a poultry department is made a source of revenue.

WEIGHT OF EGGS.

From time to time the eggs laid by the different breeds were weighed singly and in dozens, as follows:—

——	Single Egg.	Per Dozen.
	ozs.	lb. ozs.
Plymouth Rock hens	2¼	1 11
do pullets	.....	1 09
Wyandottes, hens	.....	1 09
do pullets	2	1 07
White Leghorns, hens	2¼	1 10
do pullets	.....	1 08
Brahmas, hens	2¼	1 11
do pullets	.....	1 09
Buff Cochins, hens	2¼	1 11
do pullets	2	1 08
Black Minorcas, hens	2¼	1 11
do pullets	2	1 09
Black Hamburghs, hens	.....	1 06
do pullets	.....	1 04
Dirigos, hens	.....	1 10
do pullets	.....	1 08
Brahma-Minorcas, hens (not laying yet)	.....	.....
do pullets	.....	1 14

It will be noticed from the above that the pullets of the Brahma-Minorca cross laid exceptionally large eggs. The hens have turned out larger than either the average Brahma or Minorca hen. The eggs were mostly weighed in February and March of last year (1889). Some of the eggs from White Leghorn hens, laid in the beginning of March, were remarkably large, as those who saw them on exhibition in the poultry house may remember. Taking two of the largest of these Leghorn eggs, one weighed 2½ ozs. and the other 2¼. The lesser weight has been put down, as best representing the weight of the majority.

MISHAP TO INCUBATOR.

On the 26th May last one hundred eggs were put into the Bessey Incubator. The hatching went on successfully until the sixth day when the lamp of the incubator burst into flames and was injured beyond immediate repair. The eggs were removed to another machine operated on the hot water principle without lamp, but in so doing several hours' delay unavoidably occurred and what eggs were not spoiled before were chilled by the long waiting. The machine was, however, attended to for the full period but only ten chickens came out. Four died within a week and the remainder were placed in the brooder where they grew rapidly. Examination of the unhatched eggs showed chickens in the first stages of development in most of the eggs, thus proving that the mishap to the incubator at the end of the first week had been fatal to the *embryo* chick. As enquiries by letter, and from visitors, are becoming more and more frequent, I would recommend more extended experiments in the way of arriving at the simplest and safest manner of artificial incubation. From what has been attempted in this way in the past two years, the hot water incubator without a lamp has been found the

most reliable. If the eggs are properly tested at the proper time and the unfertile ones removed there can be no doubt, with proper attention, the incubator will hatch as great a percentage of chickens as hens set on the same number of eggs. Beyond doubt the chickens grow as well in the brooder as those brought up by hens.

HOW THE CROSSES DID.

Several crosses were tried with gratifying success in most cases. A cockerel of a cross, between a Black-breasted Red Game cock and Brahma hen, made a very handsome large bird. Hatched on the 30th May it weighed, when killed on the 19th December, 7¼ lbs. The cross between the same Black-breasted Red Game cock and Black Minorca and White Leghorn hens resulted in plump birds, game-shaped, and showing the markings and many of the characteristics of the male parent. One cockerel is so well marked as to be easily mistaken for a brown red. Several of the pullets of the White Leghorn cross, with same male bird, are very little different from the pure Black-breasted Red Game. All the Game cross pullets ought to make excellent layers, and when they begin to lay their record will be carefully noted. The cross between a Plymouth Rock male and Wyandotte and Houdan hens did not make as large birds as anticipated. The four Plymouth Rock Brahma crosses (males) of the year before, (May, 1888), turned out suitable market fowls, weighing, when killed, 8 lbs. 7 oz., 8 lbs. 3 oz., 7 lbs. 15 oz., and 7 lbs. 6 oz., respectively. The females of this cross matured into goodly proportioned fowls, laying large eggs. In the experiments made so far (two seasons) no cross has rivalled the pure Plymouth Rock, the nearest approach being the Plymouth Rock-Brahma cross of 8 lbs. 7 oz. and the Game-Brahma cross of 7 lbs. 4 oz. It is important that experiments in the way of crossing different varieties, calculated to make superior market fowls, should continue. The results cannot fail to be of interest to all who are desirous of having fowls of larger size and better quality of flesh placed on the market.

LIST OF POULTRY.

The number of fowls of both sexes on hand at present is as per list:—

	Males.	Females.
Plymouth Rocks	6	18
Brahmas	2	10
White Leghorns	11	23
Houdans	6	15
Wyandottes	9	9
Andalusians	6	6
Buff Cochins	6	9
Crosses	9	21
White Plymouth Rocks	1	6
Black Hamburghs	4	15
do Minorcas	4	12
do Russians	...	2
do Spanish	...	1
do Javas	1	1
Coloured Dorkings	...	2
G. B. Polands	1	2
Redcaps	1	2
B. B. R. Game	...	1
Silver Pencilled Hamburghs	...	1
Brown Leghorns	1	
Wild Geese	3	2
	71	161
		71
		232

A DISEASE WHICH WAS GENERAL IN THE CITY AND VICINITY.

Fowls in the city and vicinity were attacked during the summer months by a disease which appears to have been general in the locality, and which was the cause of many losses. A dairy farmer in the neighborhood reported the loss of forty fowls in a short period. Not far distant from him a farmer stated his loss at thirty-five, and many others were losers to an equal or less extent. Enquiries as to the nature of the disease and for treatment were frequent. Fifteen fatal cases occurred among the farm fowls. As soon as the first cases were noticed, and others in the neighbourhood were reported, particular attention was given to the phases presented by the disease. The fowls affected did not show any outward difference from the others, until they were noticed slow in coming to feed or refusing to eat and then it was too late to save them. On handling the ailing ones they were found to be mere skeletons, the breastbone sticking out with the sharpness of a knife. As quickly as noticed the sick fowl were separated from the others and given bread and milk with a few drops of Pain Killer in the drinking water. In some cases a condition pill was given, but despite every effort the invalids wilted away as in a rapid decline until death, generally attended by convulsions, followed. There was no discharge as in cholera, nor was the ailment caused by lice. The fowls had a fair run, and the premises and grounds were quite new. In two cases the fowls had become so weak from emaciation as to choke to death from inability to swallow the bread and milk they attempted to eat. One gentleman, well known in the city, besides writing for information, brought two of his sick fowls to the poultry house to show the condition they were in after being ill for some days. They were too far gone to benefit from the stimulating treatment given and died during the night. The whole of the farm poultry, although in the month of July, were at once given a generous allowance of soft feed—seasoned with cayenne pepper or ground ginger—in the morning in lieu of grain. A small quantity of tincture of iron was put in the water for drink. While this treatment did not cure any of the sick it certainly seemed to prevent others from being attacked. It may be stated that at first cholera was suspected, but in no case were there any symptoms to prove a case, nor was there any cause in the case of the farm fowls for an outbreak, the premises being new and the runs used for the first time. Any information from any quarter near or at a distance (not heard from) with an experience of this disease, will be gladly received with a view to further investigation.

BEGINNING OF WINTER LAYING.

Winter laying commenced about the 10th of December. One or two hens began to lay earlier, having got over their moult. The Plymouth Rock pullets, as already mentioned, laid through the fall, with a short stoppage, from time of first laying on 28th August. Other pullets laid as follows:—

Brahma,	hatched	2nd May,	laid first egg	22nd December,	1889.
Game Cross	do	30th do	do	23rd	do
Buff Cochin	do	21st do	do	26th	do
White Leghorn	do	21st do	do	18th	do
Black Hamburgh	do	24th June	do	31st	do

Other pullets are expected to lay soon.

THE WILD GEESE.

The wild geese have grown to large size in captivity. They did not breed last season, but will probably do so next season, when they will be in their third year. In October last the largest gander weighed 15½ lbs., and the next in size was within short weight of being as heavy. During the hot weather water tanks were provided for them, and added much to their good condition.

ORDERS FOR EGGS.

During the exhibition of the Central Canada Association in September, 1889, among the farmer visitors to the city many seized the opportunity to visit the Cen-

tral Farm, and while in the poultry department left orders for eggs for hatching, to be forwarded in early spring.

LETTERS OF ENQUIRY.

Numerous letters have been received since last report from different parts of the Dominion, enquiring as to the best breeds of fowls for egg-production and market, incubators, diseases of poultry, &c., &c. All the desired information was given in reply.

PACKING EGGS.

Several enquiries have been made as to the best manner for packing away eggs, in summer, when the price is cheap, and keeping them until the winter season. I would suggest, in view of the importance of the matter, that experiments should be made of certain well recommended methods, in order to ascertain the best and simplest.

ENQUIRING FARMERS—INFORMATION THAT WILL BE USEFUL TO THEM AND OTHERS.

During the past year numerous farmers from the locality and a greater distance, have visited the poultry department, with evident desire to gain all the information possible as to the most profitable sorts of poultry and the best methods of caring for them. It afforded me great pleasure to impart all the information in my power, and the interest displayed in the different points of merit in each breed was a source of great gratification. From the tenor of the questions asked on the occasion of such visits the following general information may be found of service and anticipate many questions others are desirous of having answered. As preliminary, I may state that the best authorities hold that the poultry department of the farm ought to be one of the best paying. The same authorities state that a hen will yield a profit of one dollar per annum. This result, however, cannot be obtained without a thorough knowledge of the best methods. A farmer can no more receive a return from neglected hens than he can from neglected fields. It is not a whit more unreasonable for him to expect paying crops from frozen ground than it is to anticipate a crop of eggs at winter prices from frozen hens. A profit from his fields can only be derived by the systematic, intelligent and industrious manipulation of the soil. So it is with poultry. He must understand what he is about. He knows that his fields must be properly fed to ensure a paying return. The laying stock must be as equally well fed. They must be comfortably housed in the cold season. They must be given food best calculated to furnish egg-forming material and to gently stimulate; material to furnish lime for the shell, meat to make blood. There is a constant drain on the resources of the regnlarly laying hen as there is on the fields from which successive crops are reaped. The farmer supplies the drain on his fields by a liberal supply of manure. He must supply the drain on the resources of the laying hen by similar generous treatment in food. In summer, when the hen can roam at large, she supplies herself with all the necessary egg-making material. But when she is confined to limited space, in winter, she must be furnished with all she has been accustomed to help herself to when abroad. And this is the whole basis of winter laying. Let the hens be supplied in the house as nearly as possible with what they can pick up outside, and what is it? We will speak about it directly. First, it is absolutely necessary that the laying stock should have good winter quarters.

A GOOD HOUSE NEEDED.

A comfortable fowl house can be cheaply and expeditiously made in the corner of a barn, shed or any outbuilding. It should be cheerfully lighted and face the south or west if convenient. Tarred felt paper makes a good lining and is obnoxious to vermin. The house should be divided into pens, lage enough to hold 20 fowls, and no more. Fowls do better in small colonies. The laying stock must not be crowded or they will not be layers long. The temperature in the coldest weather should be high enough to keep the water from freezing—at any rate, warm enough to prevent

the combs of the layers from freezing. A wooden floor is better than any other kind. In the cold weather the best earthen floors will get damp, and keep so, and damp is disease and death to poultry.

WHAT SHOULD BE IN THE HOUSE.

The best roost is a 2 by 4 inch scantling, put broadside over two 12-inch boards, forming a platform to catch the droppings, which as manure is worth 75 cents to $1 per barrel. Heavy fowls should not have to jump more than 18 inches. Each pen should contain a dust bath, so that the fowls can roll in the dry dust and keep down lice. A small box to hold broken oyster shells, old mortar, gravel, crockery broken into small pieces, &c., &c. Some of these substances are absolutely necessary to furnish grit to grind up the food. They are the hen's teeth. A certain amount goes to furnish lime for the egg shell, but much of the lime for this purpose can be given in the shape of proper food.

TREATMENT OF LAYING STOCK.

The hens shold be kept in constant activity. A lazy hen is never a laying one. Cut-straw, hay, chaff or dry leaves should be scattered liberally on the floor of each compartment, and in this all grain fed should be thrown, so that the hens will be kept scratching for it. A cabbage suspended from the roof or ceiling high enough to make the hens jump at it is a capital way of keeping them busy. Occasionally substitute a piece of cow's liver, lights or any tough sort of meat for the cabbage. In very cold weather the chill should be taken off the water for drink. Laying fowls require plenty of fresh water, hence the importance of having the house warm enough to prevent water freezing. Take away all the male birds from the laying hens. The cock bird is a nuisance in the pen of layers. He not only monopolises the most of the food, but teaches the hens to break eggs, and so learn to eat them. Besides, the stimulating diet is too fattening for him, and will ruin him as a breeder.

THE PROPER FOOD FOR LAYING STOCK.

In the cold weather of winter a warm meal in the morning is necessery to start and keep up a steady supply of eggs. A good plan is to throw all the waste of the kitchen, in the shape of meat scraps, pieces of bread, uneaten vegetables, &c., into a pot; heat up in the morning till nearly boiling, and then mix bran, provender, shorts, or whatever is most abundant or cheap on the farm, into the hot mess, dusting in a small quantity of red pepper before mixing. Let the mixture stand for a few minutes until the meal is nearly cooked; then feed in a clean trough, with laths over it, to keep the hens from jumping in and fouling or wasting the feed in their eager anxiety. Feed only enough of this soft stuff to barely satisfy, never enough to gorge. When a hen has had so much food that she will go into a corner and mope, she has had too much, and if the overfeeding is continued will soon cease to lay. The laying hens are the active ones. If food is given at noon, it should be oats, and scattered among the litter on the floor. This meal should be light. The last feed in the afternoon should be generous. Each hen should be sent to roost with a full crop to carry her over the long night. Green food, in the shape of vegetables, usually grown on every farm, will be relished by the layers. Cabbages, turnips, carrots are generally the most convenient. Small potatoes boiled and mixed with provender or bran is a good change for the morning meal. Some of the above-named vegetables should always be in the pens of the layers. There is no danger of their eating too much. Red clover hay steamed, chopped and mixed with bran, and given while hot, is one of the healthiest foods for the morning meal. Meat in some shape must be given at least twice a week, to furnish blood-making material. Hens fed on meat lay well. If given no meat the hens will eat their eggs and pick feathers frem one another. In cold weather warm the grain feed.

WHAT QUANTITY TO FEED.

Experience will teach the "happy medium" in feeding. It is desirable to feed well, but not so much as to make the hens too fat. And here the advantage of having small colonies of fowls, where different breeds are kept, will be evident, for what would be generous and stimulating diet for Leghorns, Minorcas and others of the Spanish family, would be too fattening for Plymouth Rocks or Brahmas. As before stated, give enough to keep the hens active. When meat is given, it is not necessary to give so much grain. For instance, if meat is fed at noon it will be only necessary to scatter a few handsfull of oats in each pen to keep the inmates at work. When a hen becomes too fat she will lay soft-shelled eggs. Where plenty of meat is to be had as one of the cheapest articles of food a greater quantity of oats may be given. Wheat is the best all-round food. The waste of the farm in conjunction with meat and the hot morning meal and exercise will bring plenty of eggs.

WHAT SORT OF FOWLS TO HAVE.

Beyond question, the best all-round fowl for the farmer is the Plymouth Rock. The best two breeds are the Plymouth Rock and the White Leghorn, for the reason, as the tables published in a preceding part of the report prove, that the Plymouth Rock puts on flesh more rapidly, and the White Leghorn lays more eggs than any other of the standard breeds. Closely following come the Wyandottes as an early flesh producer and layer. Then follow the Brahmas, but they are slower in development. Another advantage in keeping Plymouth Rocks and Leghorns is, that while the Plymouth Rock hens are hatching chickens, after laying all winter, the Leghorns (being non-sitters) will go on laying, and pay the expense incurred while the other breed is sitting. The common barn door fowl is a good winter layer, when not too old nor too inbred. Where a farmer has a large number of mixed fowls, and he does not care to get rid of them, he can do a great deal to improve the state of things by procuring a thoroughbred cock or cockerel, and breeding from him.

HOW TO BREED.

If his fowls are large he should get hold of a Leghorn, Minorca or Andalusian male; if small he should place a Plymouth Rock, Brahma or Wyandotte male among his fowls. It is best to breed from a certain number of his best fowls. By observation he will soon find out which are his best layers, and those he should breed from, and so a flock of good layers will be produced. A hen is at her best at two years of age. She does not lay so many eggs in her third year, and after that should be disposed of, unless of extraordinary worth as a breeder. One of the greatest drawbacks to a farmer keeping poultry successfully is that he allows his fowls to inbreed from year to year, until they are so reduced in size as to be unfit for table use, and their laying qualities are things of the past.

VICES.

Two of the worst vices which fowls in confinement are given to are egg eating and feather pulling. The first is caused by being kept in too great numbers in limited quarters; a craving for animal food; the nests not being dark enough, and the eggs exposed to view in consequence; the male bird being among the layers, and breaking an egg; hens laying soft-shelled eggs. The second vice is caused by the absence of blood food, such as meat; fowls being in too great numbers, and not kept busy enough. Both faults, once acquired, are very difficult to stop. Prevention in both cases is far better than any cure. The nests for the layers should be as retired as possible, and a little difficult to approach. Eggs should be gathered as soon as laid. If the habit becomes general, stop the hens from laying, by ceasing the soft food, and give nothing but oats. If convenient, move the hens to a strange pen, and that will aid in stopping the egg-production. If there is an incorrigible egg-eater in the pen she should be killed, or she will teach every companion to be as vicious as

herself. In feather-pulling a "bit" is sold by dealers in poultry supplies to go into the mouth; another plan is to feed the pullers nothing but feathers, and separate them from one another. With care to have the layers kept in small numbers, with the proper variety of diet, neither of these habits should be acquired.

SITTING HENS, CHICKENS, &c., &c.

All information necessary for the proper management of sitting hens and tbe rearing of chickens will be found under their proper sub-headings in preceding pages of this report. The benefit of hatching chickens early will also be evident. The pullets hatched in April and early May should begin to lay when the older stock are in heavy moult and eggs are becoming scarce and dear. Early hatched Plymouth Rock cockerels will weigh 8 and 9 lbs. by the fall months.

POINTS TO REMEMBER.

A few points to remember are:—

1. Make hens lay when eggs are dearest.
2. Breed stock when eggs are cheap.
3. Keep a non-sitting breed to lay when sitters are hatching, and pay expenses of latter.
4. Breed as many chickens as possible and as early as possible. They all represent so much money.
5. Keep all the pullets. They are worth $2 each as prospective early winter layers.
6. Kill, or otherwise dispose of, all hens after three years of age.
7. Breed the best flesh-formers for market. Feed them up to as great weight as possible.
8. Well-fattened, well-dressed poultry will bring the best prices from the best customers.
9. If not accustomed to poultry, begin with a small number. Learn to make a success of the few, then go on with a larger number.
10. Do not neglect the little essentials to success, such as lime, gravel, meat, plenty of clean water, green food, dust bath, &c., &c., regularly supplied to layers.
11. Keep strict account of every cent of expenditure and receipts. Charge the poultry with all expenses and credit them with all receipts. The droppings at 75 cents. per barrel will go a long way to pay feed.
12. Market gardeners and dairymen are particularly well situated to permit of their dealing profitably in poultry. The former has spare time in winter; the latter is among the best customers in the city every day.

CHARACTERISTICS OF DIFFERENT BREEDS.

Some of the leading features of the best known breeds, as follows, may be interesting, viz.:—

Plymouth Rocks.—A hardy, vigorous breed, growing rapidly to large size. Small bones, great and rapid flesh-formers. Male birds go up to 10 and 12 lbs.; cockerels reach 8 lbs. in early fall. Females good layers, good sitters, good mothers. A breed well suited to climate. Chickens hardy. The best all-round fowl for farmers. Pullets lay from 4½ to 6 months of age.

Wyandottes.—A comparative new breed, of great merit. Cross of dark Brahma and Silver Spangled Hamburg. Matures rapidly, having small bones and putting on flesh easily. Males go up to 7, 8 and 9 lbs. Females are good layers, good sitters, good mothers; apt to become broody, but easily broken up and lay soon after. Chickens hardy. A good fowl for farmers. Pullets lay when 5 months old.

Brahmas.—A well-known and old-established breed, with many friends and admirers. Grow to large size and heavy weight, but take time to do so. Have large frames, and a good deal of feed is required to put flesh on them. Are very hardy, both as chickens and fowls. Are quiet, and bear confinement well. Females are fair layers of eggs of good size, but rather heavy for early sitters (when egg-shells are likely to be thin), and apt to be clumsy as mothers. After 7 or 8 months of age males make good table fowls. Pullets lay at 7 months of age.

Buff Cochins.—Another of the Asiatic family that has many friends. Like the Brahma, they grow to large size, but take time to do so. Are very quiet, and stand limited quarters well. The females are good sitters and careful mothers, fair layers of a large egg (when hens) of rich colour. Pullets lay when 7 months old; males grow to heavy weight; chickens and fowls hardy.

Houdans.—A breed of French fowls of some merit as layers, but do not grow to the same weight in this as they do in the country of their origin. Are non-sitters, and lay a white egg of rather more than average size. Chickens are hardy, mature rapidly and are great foragers. Are not so suitable to farmers as either Plymouth Rocks or White Leghorns. Owing to heavy crest on top of head are apt to fall easy prey to hawks and other enemies of the poultry yard. Crest will freeze and become solid with ice where water is not kept from freezing or fountain with narrow lip is not used. A good table fowl.

White Leghorns.—One of the best layers at all seasons, when properly handled and cared for, as all fowls should be. Are non-sitters, hardy, and mature rapidly. Will lay well in winter, in a moderately comfortable house. Chickens thrive well and feather quickly. Hens lay a white egg of large size (see table of weight of eggs). Pullets lay at 5 or 6 months, sooner if hatched early. The Brown and Black Leghorns are also great layers. They are good fowls for farmers when kept with a breed of sitters. Great flyers, like all the Spanish family.

Black Minorcas—An old English breed, comparatively new to this country, and fast taking the place of the Black Spanish. They are as good layers as the Black Spanish, and grow to much heavier weight, the males making fair table fowls. They are given weight allowance in the new standard of excellence (American). They lay well in winter, properly housed. Both fowl and chickens are hardy; the latter grow rapidly. The males have large and high combs, which must be kept from freezing. Pullets lay at 5 or 6 months of age.

Andalusians.—Another comparatively new-comer—to this side of the water—of the Spanish type, and as a breed of layers rivalling the Leghorns. They are likely to occupy a high position among poultry fanciers on their superior laying merits. They lay well in winter, when looked after, and are hardy, quick-growing chickens. They do not breed true to colour or markings in every case; but that is a matter of secondary importance to those who wish to keep them for their laying properties. Like the Black Spanish, they are not heavy-weights, and in consequence are not so good for table use as the heavier breeds. Pullets lay when 6 months old. Hens lay large white eggs.

Black Hamburghs.—Small tightly-feathered fowls. They lay small eggs, but a great many of them. Chickens grow fairly well, but all the family seem liable to cold and roup in the fall. There are other breeds of greater merit for farmers to choose from.

Silver-Pencilled Hamburghs.—Beautifully marked small fowls. Lay a large number of small eggs. Require great care, as they are subject to roup in rainy, cold weather.

Dorkings.—A breed very much prized in England for its table qualities. In this country they are sensitive, when chickens, to the fall weather, and are harder

to rear than Plymouth Rocks or White Leghorns. The coloured are the best suited to this part of the Dominion. While a breed of great merit, they are not hardy enough for the farmers to take hold of. Crossed with the Plymouth Rock, an excellent result is attained.

Black Javas.—Grow to large size when in second year. They are not remarkable as layers, but are good table fowls. The eggs are large and of a rich colour. If better known would perhaps be better appreciated. They are fairly hardy as chickens and fowls.

Black Russians.—Have not been found to possess the hardiness nor winter-laying qualities claimed for them. They are predisposed to colds and roup in the cold wet weather of the fall months. The females make good, kind mothers. They do not possess the merits that other breeds do to make them suitable to farmers.

Games.—Are of many varieties. Some are more suited to the cold winter of this country than others. Black-breasted Red Games have been found rather hard to get over the first year, but are hardy and vigorous afterwards. As table fowls their reputation is world wide. Hens are fair layers. They are tight-feathered and weigh much more *than they look.*

There are several new breeds yet on their trial, and nothing decided can yet be said for or against them. A breed may have a reputation for laying qualities in a mild climate which on removal to a colder one they may not be found to display. Several crosses have been found to result satisfactorily, such as the Plymouth Rock male and White Leghorn female and *vice versa;* Brahma and Black Minorca hen; White Leghorn male and Brahma female.

DISEASES.

Poultry like all other animals are subject to disease. But with a run such as they should have on a farm, and proper care in the cold, wet weather, of a certain portion of the fall, disease should be rare. The disease most common to poultry in this portion of Canada is roup in its different phases of cold, catarrh and throat affections. The first symptoms are running at the nostrils and sneezing. In its more virulent form it is attended with swollen head and closed eyes, and a most offensive discharge. It is better on detecting a case to kill the bird at once and burn it. If neglected it will contaminate all the others in the pen by dipping its nostrils into the drink water, and so disseminate the virus. It is very contagious. A simple cold if neglected will develop into roup. Treatment for a cold is to inject with a syringe a small quantity of coal oil, and if handy a few drops (5 or 6) of carbolic acid added. Two or three injections ought to effect a cure. Isolate the fowl from the others. The most frequent causes of disease are keeping too many fowls together and filthy quarters.

The foregoing information on the most important points in poultry management can only be briefly given in the limits of a report. It is to be hoped all who have the opportunity will visit the Experimental Farm and see the methods and appliances in operation. There is no food given that the farmer has not in abundance, no treatment adopted nor appliances used that is not within his easy reach.

I have the honour to be, Sir,

Your obedient servant,

A. G. GILBERT,
Manager Poultry Department.

CENTRAL EXPERIMENTAL FARM,
OTTAWA, 3rd January, 1890.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF W. M. BLAIR, SUPERINTENDENT.

To Prof. WILLIAM SAUNDERS, F.R.S.C., F.L.S., F.C.S.,
Director Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces at Nappan, N.S., during the year 1889.

WEATHER.

The year has been a fine one for farm work. We had a very mild winter, with much rain and sleighing only for 15 days. The spring was early. Farm work commenced on 6th May. Until 12th June the weather was dry and warm, with occasional showers, that made vegetation very rapid, after which there was 10 days of cold, damp weather. During this period much of the grain, especially that sown late, turned yellow, but whether this was caused by the weather or due to the presence of the grain Aphis that infested the grain in great numbers, more particularly the late sown, I am unable to determine. However, as soon as the weather became warmer the grain partially recovered from its sickly appearance and made as fair a growth as could be expected after being so seriously checked.

I may here say that the "Lady Bug" rendered valuable assistance in destroying the Aphis.

During the months of August and September the weather was unusually warm, the thermometer ranging for several days from 85° to 88° in the shade at 1 o'clock. The root crops suffered severely from drought during this period.

The autumn was fine and dry, with occasional showers. The first frost to interfere with farm work was on the 27th November, with 2 inches of snow on the 28th, which soon melted away with a south wind.

MANURE.

Owing to the scarcity of snow last winter we only succeeded in hauling 450 loads of marsh mud. This was put on four and a-half acres of sod land that had been previously drained and ploughed in the fall, and as soon as the first frost left the land in the spring, was evenly spread and well worked in with a two horse cultivator or grubber and a disc harrow, until it was thoroughly mixed with the top soil, and a good seed bed thus made. It was then sown to wheat with a seed drill. This wheat made rapid growth; the straw was free from rust and the grain well filled.

The manure from the cattle and horse stables was drawn to the fields every week during winter, and was well mixed together in a pile, and frequently turned over for a few weeks and then spread on the fields from a cart or sled. By this mode we succeeded in giving ten acres a fair dressing.

MARSH LANDS.

The high tides of December last that broke the dykes and flooded the marsh were a benefit to those parts of the marsh that were well drained, as the salt water ran off quickly but left a deposit of new mud and, as a consequence, a large crop of hay was cut this year, while on the portions that were not so well drained the water remained longer and a light crop of hay was the result. Taking it all together

we secured from ninety to one hundred tons, where we only had from sixty to seventy last year. We have this year opened 741 rods of surface drains and strengthened the weak places in the dykes, and trust that they will now withstand the high tides.

WHEAT.

On the ninety acres of upland in crop this year we had, in addition to other crops, eighty varieties of wheat ranging in quantities of seed from 100 lbs. to 20 kernels. A statement of some of the most promising sorts is given below.

Name.	Quantity of Seed Sown.	Sown.	Harvested.	No. of Days Ripening.	Yield.	Weight per Bushel.	Character of Growth.
	Lbs.				Lbs.	Lbs.	
Rio Grande	60	May 8..	Aug. 24..	108	900	61	Bright, tall, stiff straw; very long heads.
Defiance	42	do 8..	do 27..	111	690	58	Bright, stiff straw.
Red Fern	100	do 8..	do 21..	105	1,080	57	Stout, strong straw; some rust.
Ladoga	60	do 9..	do 19..	102	660	58	Stiff do do
Onega	15	do 9..	do 12..	95	225	51	Rapid growth; short, stiff straw
Indian Hard Calcutta	6	do 9..	do 14..	97	60	60	do do
White Delhi	6	do 9..	do 14..	97	46	60	do do
California White	12	do 25..	Sept. 2..	100	46	57	Medium growth; rusty.
Gehum from India	2	June 3..	do 5..	94	13	60	

Some good seed, in small quantities, has also been secured from a number of the small plots. This will be sown another year and the results given.

OATS.

Some 60 varieties of oats were sown, the quantity of seed varying from 100 lbs. to 20 kernels. A statement showing the amount of seed, time of sowing, time of ripening, and amount of products, as well as weights per bushel, from the field plots is given below:

Name.	Quantity of Seed Sown.	Sown.	Harvested.	No. of Days Ripening.	Yield.	Weight per Bushel.	Character of Growth.
	Lbs.				Lbs.	Lbs.	
Longfellow	36	May 10..	Aug. 19..	101	561	33	Short, stiff straw; badly rusted.
English Potato	36	do 10..	do 19..	101	740	37	Very stiff, bright straw.
Rennie's Prize White	8½	do 10..	do 17..	99	350	35	Medium straw, stiff and bright.
Early English White	110	do 14..	do 19..	97	740	40	Bright, stiff straw.
English Red	79	do 14..	do 21..	99	768	32	Short, stiff straw; rusty.
Welcome	90	do 14..	do 19..	97	880	40	Soft straw; much blighted.
August White	24	do 16..	do 26..	102	388	37	Medium straw; some rust.
Flying Scotchman	80	do 17..	do 19..	94	627	28	Stiff straw; some rust.
White Tartarian	45	do 17..	do 27..	102	429	33	Small, stiff straw; rusty.
Early Blossom	55	do 17..	do 20..	95	612	35	Stiff straw; some rust.
Carter's Prize Cluster	100	do 10..	do 12..	94	1,216	38	Long, stiff straw.
Black Champion	80	do 14..	do 24..	102	1,152	36	Short, stiff straw; rusty.
Improved Waterloo	55	do 17..	do 21..	96	680	34	Fair straw; some rust.
Lincolnshire Poland White	32	do 17..	do 19..	94	180	40	Weak straw; some rust.
Imp. Black Tartarian	73	de 17..	do 21..	96	704	32	Stiff straw, but very rusty.
Victoria Prize	95	do 17..	do 16..	91	1,053	39	Bright, stout, strong straw.
Onega	60	do 17..	do 19..	94	960	30	Bright, stiff straw.

Some good seed, in small quantities, has also been secured from a number of the small plots. This will be sown another year and the results given.

BARLEY.

Of barley there were 60 varieties, ranging from 4 bushels to 20 kernels of seed. Some of the best are given in the following table :—

Name.	Quantity of Seed Sown.	Sown.	Harvested.	No. of Days Ripening.	Yield.	Weight per Bushel.	Character of Growth.
Carter's Prize Prolific	4 bush.	May 24.	Aug. 28.	96..	2,622 lbs..	52¼ lbs.	Short, bright straw.
Scholey's Imp. Chevalier	4 " ..	" 24.	" 28.	96..	1,410 " ..	52 " .	Bright straw.
Danish Chevalier	2 " ..	" 24.	Sept. 2.	101..	748 " ..	51½ " .	Short straw.
Danish Printice Chevalier	2 " ..	" 24.	" 3.	102..	644 " ..	52 " .	do do
Mensury	2 " ..	" 24.	Aug. 22.	90..	756 " ..	48 " .	do soft straw.
New Zealand	1 " ..	" 25.	" 28.	95..	350 " ..	52½ " .	do do
Polar	30 lbs..	" 25.	" 21.	88..	310 " ..	45 " .	do poor straw.
Petschora	1 busb.	" 25.	" 22.	89..	387 " ..	48½ " .	do straw.
Peerless White	3 lbs..	" 25.	" 27.	94..	40 " ..	52 " .	do bright straw.
Early Minting	3 " ..	" 25.	" 27.	94..	41 " ..	52¼ " .	do do
Selected Chevalier	3 " ..	" 25.	" 27.	94..	41 " ..	52 " .	do stiff straw.
Barley of Bhagarmany Hills.	3 " ..	" 25.	" 15.	82..	11 " ..	55½ " .	do soft straw.
Saale Barley	6 " ..	" 25.	" 27.	94..	74 " ..	51½ " .	do bright, soft straw

This grain was sown on rather poor, wet, land and succeeded well under the circumstances. Another year the land will, it is hoped, be in better condition. Some good grain from several smaller lots were secured for next year's planting.

The total amount of grain grown of all kinds was 1,790 bushels.

BUCKWHEAT.

Several varieties of buckwheat were sown. Those named in the following statement of yield, etc., were the most promising :—

Name.	Quantity of Seed Sown.	Sown.	Harvested.	No. of Days Ripening.	Yield.	Weight per Bushel.	Character of Growth.
	Lbs.					Lbs.	
Japanese Buckwheat	12.....	June 11.	Sept. 4.	85..	14 bush...	48.....	Stout, strong straw, heavily loaded.
Silver Hull do	48.....	do 13.	do 7.	86..	17 bush...	48.....	Strong straw.
Gravel do	40.....	do 13.	do 11.	90..	24 bush...	48.....	do

About 20 acres of buckwheat has been sown each year for green manure. This was ploughed under just as it was in full bloom. Notwithstanding this, there has been much trouble with a volunteer crop the following season; hence it is proposed to abandon it for fertilizing purposes, and substitute clover in its stead.

CORN.

Eleven varieties of corn were planted, all of which did well, but the large scales were not set when it was ready to cut, and we were unable to determine the weight per acre. Roughly estimated, the varieties would range as to merit in about the following order :—

Giant Prolific Ensilage, 12 feet high.
Red Cob Ensilage.
Large White Flint.
Stowell's Evergreen.

Self-Husking.
Canada Yellow.
Angel of Midnight.
Longfellow.
Early Minnesota.
Compton's Early.
Moore's Early Concord.
Egyptian Sweet.
New Corey.

POTATOES.

One hundred and three varieties were planted. The quantity of seed yield, and the character of the tubers, &c., is given below.

No.	Name.	Quantity of Seed.	Planted.	Yield.	Character of Tubers, &c.
		lbs.		lbs.	
1	St. Patrick	5	May 24	122	Long white, some rot.
2	Richter's Elegant	5	do 24	66	Long flat pink, some rot.
3	Prime Minister	5	do 24	119	Long white, few eyes, some rot.
4	Centennial	5	do 24	73	Round white and pink, few eyes, sound, late.
5	Gleason's Late	5	do 24	48	Blue long round, much rot.
6	White Star	5	do 24	98	Long round white, very sound, late.
7	Conqueror	5	do 24	90	Large white rough, few eyes, sound, late.
8	Jackson's Imp	5	do 24	116	Small round white, sound, late.
9	Asparagus	5	do 24	26	Small white irregular, sound.
10	Schoolmaster	5	do 24	102	Large round white, rough skin, sound.
11	White Sprout	5	do 24	83	Round white, many small, sound.
12	Paterson's Victoria	5	do 24	76	Small white, ill shaped, some rot.
13	Adirondack	5	do 24	62	Flat white, many small, few eyes.
14	Erfurt Early Round	5	do 24	33	Small round, ill shaped, much rot.
15	Halberstadt	5	do 24	58	Small round white, some rot.
16	William's Early	5	do 24	53	Small kidney shaped white, sound.
17	Sukreta	5	do 24	106	Flat oblong white, few eyes, some rot.
18	Early Calico	5	do 24	78	Flat smooth white, early, sound.
19	Six Weeks Round White	5	do 24	60	Small round white, sound.
20	Thorburn	5	do 24	66	Medium size pink, many small, some rot.
21	Thorburn	5	do 24	109	Long flat pink and white, some rot, late.
22	Compton's Surprise	5	do 24	73	Blue, few deep eyes, many small, some rot.
23	Prolific	5	do 24	46	Large flat white, many small, some rot, early.
24	Six Weeks Round Blue	5	do 24	38	Blue and white, small round, sound.
25	Rose's New Giant	5	do 24	187	Large long flat white, sound, late.
26	Emperor William	5	do 24	57	White flat, rough skin, medium early, sound.
27	Richter's Gem	5	do 24	100	Smooth white, few eyes, some rot.
28	Beefsteak	5	do 24	52	Small white long rough, sound.
29	Rotherant	5	do 24	74	Long rough pink, much rot.
30	Clark's No. 1	10	do 24	249	Long pink with white eyes, sound, prolific.
31	Count Moltke	5	do 24	37	Small pink, some rot.
32	Burbanks Seedling	5	do 24	90	Long white rough, sound.
33	May Queen Early	5	do 24	56	Large pink, some rot.
34	Silver Skin	5	do 24	57	Large white, some rot, early.
35	Eye Carpenter	5	do 24	100	Smooth white, few eyes, some rot.
36	English Kidney	5	do 24	52	Small white long rough, sound.
37	Erfurt Incomparable	5	do 24	74	Long rough pink, much rot.
38	Empire State	10	do 24	249	Long pink with white eyes, sound, prolific.
39	Frame Early	5	do 24	37	Small pink, some rot.
40	Paragon	5	do 24	90	Long white rough, sound.
41	Rosy Morn	5	do 24	56	Large pink, some rot.
42	Thorburn's Late Rose	10	do 24	67	Large white, some rot, early.
43	Jumbo	5	do 24	99	Long pink, sound.
44	King of the Earlies	5	do 24	47	Long white, very small, some rot.
45	Niagara	5	do 24	65	Small white round, deep eyes, some rot, early.
46	Paterson's Albert	5	do 24	101	Large white oblong, sound, late.
47	Matador	5	do 24	46	Small white, unproductive, some rot.
48	Richter's Schneerose	5	do 24	35	Small kidney shape, white, unproductive.
49	Harrison	5	do 24	93	Large pink, early, much rot.

POTATOES—*Continued.*

No.	Name.	Quantity of Seed.	Planted.	Yield.	Character of Tubers, &c.
		lbs.		lbs.	
50	Beauty of Hebron	10	do 24	149	Large pink, early, some rot.
51	Thorburn's Paragon	10	do 24	75	Large round white, sound.
52	Large Callao	5	do 24	64	Large flat white, pink eyes.
53	Early Bird	5	do 24	69	Small ill shaped, pink, sound.
54	Amylon	5	do 24	71	Small white, sound.
55	Pride of America	5	do 24	87	Very round white, deep eyes, late, sound.
56	Price from Holland	5	do 24	107	Large long white, deep eyes, sound.
57	White Late Rose	5	do 24	57	Large white, sound.
58	Snowflake	5	do 24	50	Large flat white, rough skin, sound.
59	Algiers	5	do 24	69	Very small round white, sound.
60	Lira	5	do 24	70	Medium size, few deep eyes, sound.
61	Onion Early	5	do 24	83	Medium size, red deep eyes, some rot.
62	Late Goodrich	5	do 24	77	Large round rough white, sound.
63	Early Ohio	5	do 24	113	Large pink, very productive, some rot.
64	White Elephant	10	do 24	103	Large round white, sound.
65	Early Calico	5	do 24	82	White oblong with bright red stripes, sound.
66	Prince Bismarck	5	do 24	62	
67	Richter's Imperator	5	do 24	136	Very large productive round white, sound.
68	Brownell's Best	10	do 24	119	Large flat white, rough skin, some rot.
69	Matchless	5	do 24	17	Small, white and pink seed ends, some rot.
70	Brownell's Beauty	10	do 24	90	Large white and pink spotted, sound.
71	Telephone	5	do 24	73	Small flat white, sound.
72	Bliss' Triumph	5	do 24	92	Round red, sound.
73	Early Short-topped	5	do 24	29	Small smooth white, some rot.
74	Alpha	5	do 24	63	Small white long flat, early, some rot.
75	Sharpe's Seedling	10	do 24	136	Long flat pink, sound.
76	Fidelia	5	do 24	105	Long blue, prolific and sound.
77	Dalmahoy	5	do 24	64	Small round, white, deep eyes, some rot.
78	Giant Long Dutch	5	de 24	68	Large rough white, sound.
79	Sugar	5	do 24	65	White flat, medium crop, some rot.
80	Golden Early	5	do 24	89	Round white, numerous but small, sound.
81	Kidney August	5	do 24	50	Long white, some rot.
82	Early Rose	10	do 24	154	Large light pink, very prolific, some rot.
83	Lark's Eye	5	do 24	49	Small white, early, much rot.
84	Great Eastern	5	do 24	103	Very large, round white, few eyes, sound.
85	Brownell's Superior	5	do 24	38	Long flat, dark pink, some rot.
86	Member of Parliament	5	do 24	57	Long white, sound.
87	Manhattan	5	do 24	49	Large round, blue, with some white spots.
88	Wonder of the World	5	do 24	70	Large long light pink, with white eyes.
89	Chicago Market	10	do 24	180	Large pink.
90	Mammoth Prolific	5	do 24	46	Round white, few eyes, sound.
91	American Magnum Bonum	5	do 24	37	Small unproductive, round white, sound.
92	Montana Elephant	5	do 24	34	Black round, sound.
93	Silver Dollar	....	.....	.....	Large white, sound.
94	Durning Seedling	....	.....	.....	Long blue, sound.
95	Seal Feet	....	.....	.....	
96	Crown Jewel	15	May 21	330	Oblong white, pink between eyes, sound, early.
97	Halton Seedling	15	do 21	390	Light color pink blush, oblong, some rot.
98	Stray Beauty	15	do 21	360	Bright red, round, few eyes, sound, early.
99	Rural Blush	15	do 21	390	Light pink, nearly round, deep eyes, sound, early.
100	Early Sunrise	15	do 21	360	Pink oblong, very early, some rot.
101	Dakota Red	15	do 21	360	Bright red, hardy, round, sound, late.
102	Early Ohio	15	do 21	360	Pink oblong, very early, some rot.
103	Rosy Morn	15	do 21	385	Flat pink, very early, some rot.

The following results were obtained from planting whole and different cuts in plots of thirty hills each.

	Yield.
No. 1—Whole potatoes—An even lot, not very large or small	54 lbs.
2—Half do split from seed end—An even lot	32 "
3—Three eyes—Mostly small ones	28¼ "
4—Two do Some large and some small	27¾ "
5—One eye—An uneven lot, some very small	18¼ "
6—Seed end—A good round even lot	37 "
7—Butt end—Some large and some very small	33½ "

TURNIPS.

Three and six-tenths acres of turnips were sown, the yield being 3,600 bushels.

Varieties.

Bangholm Swedes produced	1,000	bus. per acre.
Queen of the Swedes produced	950	do
Elephant do do	1,050	do
King of the do do	875	do
Carter's Prize Winner do	1,000	do
Steel Bros'. Purple Top do	1,100	do
Rennie's Prize Winner do	1,025	do

This land was very wet previous to being drained, so much so that it could not be cultivated properly.

MANGELS.

Two hundred bushels of mangels were grown, and of the three varieties tested, "Carter's New Golden Intermediate" was the most productive, "Carter's Mammoth Long Red" came second, "Carter's New Tankard Yellow" third.

CARROTS.

About 220 bushels of carrots were also grown. The four kinds tried stood in the following order for productiveness:—

Short White	1st
Carter's Orange Giant	2nd
Giant Wiltshire White	3rd
White Belgian	4th

TOMATOES.

Seven varieties of tomatoes were planted, all of which did well. In point of excellence they rank as follows, viz.:—

Livingston's Favorite	1st
Livingston's Beauty	2nd
Dwarf Champion	3rd
Perfection	4th
Conqueror	5th
Canada Victor	6th
Early Mayflower	7th

FERTILIZERS.

In addition to the barnyard manure, several kinds of fertilizers were used on the different crops with apparent good effect in most cases. In order to ascertain, if possible, their relative value, a number of tests were resorted to, with the following results:—

In one instance a plot of land that had some years ago been ploughed and cropped but had not received any manure, was taken. This land was rough and uneven, and had the appearance of being but once ploughed, and was much overgrown with weeds. After it had been well ploughed and cultivated it was divided into

eleven plots of $\frac{1}{10}$ of an acre each, with a space of three feet between each plot. On ten of these plots ten different kinds of fertilizers were applied, leaving one plot without any manure for comparison. Then the whole was sown with oats. The statement below gives the value of the fertilizers used, the yield in pounds of grain and weight per bushel:—

PLOTS for testing fertilizers, $\frac{1}{10}$ of an acre each.

No.	Name.	Value.	Proceeds.	Weight.
		$ cts.		
1	Barnyard manure	1 50	88 lbs. of oats	37 lbs. per bushel.
2	Mussel mud	1 50	47 do	33 do
3	Bone-meal	1 00	54½ do	34 do
4	Fine ground phosphate	1 00	44 do	34 do
5	Guano	1 00	49 do	34 do
6	Corn fertilizer	1 00	62 do	36 do
7	Superphosphate of lime	1 00	70 do	36 do
8	Nitrate of soda	1 00	61 do	35 do
9	Archibald fertilizer	1 00	69 do	34 do
10	"Ceres" superphosphate	1 00	68 do	34 do
11	No fertilizer		42 do	31 do

It is the intention to continue these experiments with oats on the same plots for several years.

The effect of different fertilizers on turnips was also tried. A plot to which twenty-five cartloads of barnyard manure was applied to the acre during the winter was selected. Different fertilizers were sown in the drills just before the turnip seed was sown, to the value of $18.00 per acre.

The bone-meal and guano were mixed in the proportion of 6 of bone-meal to 2 of guano.

The following were the results:—

EXPERIMENTS with different fertilizers on Turnips—1 plot of each.

No.	Name.	Cost per Plot.	Yield.
		Cts.	Lbs.
1	Archibald's phosphate	54	1,600
2	Rock guano (fine ground)	54	1,700
3	Raw phosphate	54	1,490
4	Superphosphate of lime	54	1,875
5	Nitrate of soda	54	1,415
6	No fertilizer		1,590
7	Plot from general field, bone-meal and guano	54	1,800

Stockbridge's "Special Corn Fertilizer" was applied to the corn at the rate of $10 worth per acre, and to buckwheat at the rate of $5 per acre. This was attended with the most beneficial results.

Raw plaster and guano mixed in the proportion of 4 to 2, value $5 per acre, was applied to buckwheat, with the effect of doubling the yield. Stockbridge's "Special Potato Fertilizer," at the rate of $10 per acre, was applied to potatoes, and in every case gave a large return. And although the results obtained from these special fertilizers this year were not taken with sufficient accuracy to warrant their publication, yet they were of such a character as to warrant a more careful and thorough test in the future.

PRICES OF DIFFERENT FERTILIZERS.

	Per ton.	Per lb.
Special potato fertilizer	$36 00	1⅘c.
Corn fertilizer	38 00	1 9/10c.
Guano	50 00	2½c.
Nitrate of soda	50 00	2½c.
Fine ground phosphate	28 00	1⅖c.
Superphosphate of lime	26 00	1 3/10c.
Bone-meal	40 00	2c.
Peruvian guano	60 00	3c.
"Ceres" superphosphate	40 00	2c.
Archibald fertilizer	38 00	1 9/10c.

DRAINING.

This necessary work was pushed forward as rapidly as possible, and 26 acres were drained, at an average of 30 feet between the drains. The statement below shows the cost of draining per acre, price of tiles, &c.:—

31,405 ft. 3-in. pipe at	$12 00		$ 376 86
3,670 ft. 2-in. do	8 00		29 36
396 ft. 4-in. do	16 00		6 34
618 ft. 6-in. do	36 00		22 25
36,089 ft. or 2,187 rods			$ 434 81
Cost of tiles			$ 434 81
do labor, draining			713 60
do freight			99 24
do trucking			52 35
			$1,300 00
Average cost of draining per acre			$50 00

BUILDINGS.

The buildings commenced last year are now about completed. The barn is occupied, and is found very convenient for storing hay, grain and roots, and also for stock. It will hold over 250 tons of hay and grain, with stabling for 60 head of cattle and 11 horses. The granaries are capable of holding 2,000 bushels, and the root cellars 4,000 bushels There is also a convenient feed room.

The workman's cottage was finished in the spring, and has been occupied during the summer.

The Superintendent's residence is also nearly completed.

A set of large scales have been placed in a convenient place for weighing bulky material, such as hay, grain, roots, corn, cattle, etc., which are found to be very useful in connection with our work.

CATTLE.

The cattle fed last winter have been sold at a profit, and others bought this autumn to consume the hay, straw and roots raised. They are now doing well and adding to our stock of fertilizers available for next year's crop.

WATER.

A well was dug near the barn, and a supply of good water is obtained by pumping.

FENCING.

Five hundred and sixty-eight rods of fence has been built this season with cedar posts 8 feet apart; 6 inches from the top a 2 by 4 scantling was let in 1 inch and spiked on. This, with 5 strands of barbless wire on the level, or in some places 4 strands, and a small dyke thrown up from each side, makes a good, substantial and handsome fence. The posts on each side of the main road, 414 in number, were turned, and, when the fence was completed, the posts and rails received two coats of paint.

FRUIT TREES.

All the fruit trees came through the winter safely and made a vigorous growth this season. It was intended to plant them out in the spring in orchard, but before the land was in suitable condition to receive them the trees were in leaf. It was, therefore, deemed more prudent to allow them to remain in the nursery rows another year. Thirty of the trees were set out in November and the balance will be planted in the coming spring. This will give us an opportunity to note the difference betwcen fall and spring setting.

STRAWBERRIES.

All the strawberries wintered well and made rapid growth in early spring. But in order to have a good lot of healthy plants to set another plot, the vines were not disturbed, but allowed to run until all the new plants required were secured. Notwithstanding this, a small lot of good fruit was picked. In point of excellence they appeared to rank as follows, viz.: Crescent, 1st; Manchester, 2nd; Wilson, 3rd; Woodruff, 4th; Sharpless, 5th; New Dominion, 6th; Capt. Jack, 7th; May King, 8th; Maggie, 9th; Daniel Boone, 10th.

RASPBERRIES.

All wintered well. New shoots were allowed to grow to produce canes for extending the area for another year. Some fine fruit was produced, and in point of excellence would rank about as follows: Turner, 1st; Caroline, 2nd; Golden Queen, 3rd; Hansell, 4th; Philadelphia, 5th; Cuthbert, 6th; Highland Hardy, 7th.

BLACKBERRIES.

The blackberries wintered well and made a good growth during summer, and also produced some good fruit. New shoots were allowed to grow, as in the case of the raspberries. Their quality and excellence of growth would entitle them to rank as follows: Snyder, 1st; Taylor, 2nd; Lucretia Dewberry, 3rd.

GOOSEBERRIES.

The gooseberries grew remarkably well, the Houghton being the most vigorous and productive. The Downing came next, with the Smith's Improved a good third.

CURRANTS.

The currants made only a fair growth and bore very little fruit. They appeared to stand in about the following order: White Grape, 1st; Red Dutch, 2nd; White Dutch, 3rd; Victoria, 4th; Fay's Prolific, 5th; Raby Castle, 6th. The black currants grew healthy and strong, and rank as follows: Black Naples, 1st; Champion, 2nd.

GRAPES.

All the grapes that were healthy last year came through the winter safely and made a fair growth. There was some fruit on the Concords.

CABBAGE.

Eleven varieties of cabbage were planted, some of which grew very large. In point of excellence they rank as follows: Henderson's Early Summer, 1st; Win-

ningstadt, 2nd; Early Jersey Wakefield, 3rd; French Oxheart, 4th; Large Drumhead, 5th; Fottler's Drumhead, 6th; Marblehead Mammoth, 7th; Late Flat Dutch, 8th; Savoy, 9th; Extra Blood Red, 10th; York, 11th.

CUCUMBERS.

Boston Market, Medium Green, Green Prolific, London Long Green, Long Green, and Nicol's Medium Green, were planted and did well.

GRASSES.

The following grasses and clovers were sown in plots, and so far are doing well: Of clovers—Bokhara, Trefoil, Large Late, White Dutch, Alfalfa, and Sainfoin. Of grasses—Creeping Bent, Red Top, Meadow Foxtail, Sweet Vernal, Tall Oat, Yellow Oat, Crested Dog's Tail, Orchard Grass, Tall Fescue, Sheep's Fescue, Hard Fescue, Meadow Fescne, Red Fescue, Fine Leaved Fescue, Water Meadow Grass, and Wood Meadow Grass.

EXHIBITIONS AND FARMERS' INSTITUTES.

Some of the products of the farm were shown at the Maritime Exhibition, held at Moncton, N.B., during the third week of September, and at Amherst, N.S., the following week.

The exhibits consisted of 66 varieties of grain in glass jars, and 82 varieties in the straw; 103 varieties of potatoes, 8 of turnips, 3 of mangels, 12 of cabbage, 8 of tomatoes, 6 of cucumbers, 3 of buckwheat, 9 of clover and grasses, and 13 varieties of corn.

The exhibition at New Glasgow, N.S., was visited, but we were unable to make an exhibit at that place, as the time intervening between the one held at Moncton and Amherst and this one was too short in which to arrange another exhibit.

I attended the "Farmers' Institute" of New Brunswick, held at Fredericton, during the month of Jannary, where addresses were delivered and papers read by the following gentlemen, viz.: "Dairying," by Dr. D. M. Twitchell, associate editor *Maine Farmer;* "Butter Making," by W. G. Gilbert, Dorchester; "The Dairy Interest of New Brunswick," by G. E. Baxter, of Perth, N.B.; "Winter Dairying," by P. C. Black, Secretary Dairymens' Association of Nova Scotia; "Experimental Farms," by Prof. Wm. Saunders, Director of Experimental Farms, and W. M. Blair, Superintendent of Experimental Farm at Nappan; "Care and Management of Sheep," by C. H. Black, Amherst, N.S.; "Ensilage," by J. Baxter, M.D., Chatham, N.B.

These papers were all fully discussed, and a great interest was taken in them by those present.

I also attended the meeting of the Fruit Growers' Association of Nova Scotia, held at Wolfville, January last. Much enthusiasm was manifested in the proceedings, and fruit growing in all its details was earnestly discussed, as well as the difficulties encountered by the ravages of injurious insects, and how to overcome them. These discussions were taken part in by many prominent fruit growers of Kings and Annapolis, as well as by Prof. Saunders, Director of the Experimental Farms, who spoke at some length on the general question of fruit growing, and the work of the Experimental Farms in connection therewith. He also gave many valuable hints with a view to the prevention and destruction of insects injurious to fruits.

I was also present at a meeting of the Nova Scotia Dairymen's Association held at Truro in March last. The discussions were carried on by many prominent farmers of Nova Scotia, and Prof. Smith, of the School of Agriculture, Truro; W. F. George, of Sackville, N. B.; Howard Trueman, of Point de Bute, N. B.; W. H. Blanchard, of Windsor, N.S., and J. W. McKay, of Stellarton, gave a valuable paper on "Silage and Silos;" H. F. Page, of Amherst, on the "Holstein as a Dairy Cow;" W. W. Hubbard, Secretary of the Farmers' Association of New Brunswick, on "How to Maintain the Fertility of our Farms;" B. Eaton Paterson, B. S. A., N. B., on "Increasing and Improving our Butter Production;" "Creameries," by W. J. Gilbert, New

Brunswick; "Prevention and Treatment of Milk Fever," by Prof. F. C. Greenside; "A Plea for Butter Factories," by H. B. Hall, Nova Scotia; and "Feeding Calves and Pigs," by Jas. Cheesman, Boston.

A Farmers' Institute was attended at Amherst, on the 22nd January, where general farm topics were discussed by a number of leading farmers of Cumberland, assisted by Prof. Saunders.

I also attended several meetings of farmers in Colchester and Cumberland, and took part in the discussions, and from what I have seen and heard I am convinced that a growing feeling is manifested in favor of "Farmers' Institutes," and associations of a kindred nature, with a view to obtaining further knowledge in the art of agriculture.

I have the honor to be, Sir,
Your obedient servant,
W. M. BLAIR.
Superintendent.

NAPPAN, 31st December, 1889.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

To Wm. Saunders, F.R.S.C., F.L.S., F.C.S.,
Director Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the following report of the operations on the Manitoba Experimental Farm for the year 1889.

WEATHER.

The past season has been one of the driest this Province has experienced for a number of years, and the crops are in consequence generally light. In those districts favoured with local showers the yield has been good and in nearly all parts of the Province the sample has been excellent. On this farm at no time during the growing season has sufficient rain fallen to thoroughly moisten the roots of the grain.

WHEAT.

Owing to our not getting possession of the farm until late last season very little of it was in a fit condition for a wheat crop, and the field originally intended for this cereal was partly overflowed at seed time with water from the springs in the bluffs, and the field finally selected was not suited for a dry season.

Although the yield of wheat was very small, it is deemed advisable to give the returns and endeavour to throw some light on the suitability of the different varieties for a dry season.

Thirty-eight varieties of wheat were sown, and except in the case of the fall-sown grain the land was wheat stubble, fall ploughed, and the seed drilled in. The Red Fife sown in the fall was grown on fallow land. It did not germinate until some time after the spring-sown grain, but stooled out well and kept up a steady growth all the season. The experiment has been repeated this season with two varieties of spring wheat, and the same varieties will be sown next spring on adjoining land, receiving similar preparation.

Below will be found the results of the several experiments with wheat.

Variety.	When Sown.	When Harvested.	Bushels per Acre.	Weight per Bushel.
				Lbs.
Red Fife	Nov. 3, 1888	Aug. 14	21 55/60	63
Red Fern	April 8, 1889	do 12	7 1/2	63
Rio Grande	do 8, "	do 10	6	63
Club	do 8, "	do 12	3 1/2	62 1/4
Red Fife	do 8, "	do 12	4 30/60	61 1/2
Ladoga	do 8, "	do 8	4 3/60	61
Eureka	do 9, "	do 10	8	63 1/4
Old Red River	do 9, "	do 13	7 30/60	62 1/2
White Connel	do 9, "	do 13	7 3/60	62
Red Connel	do 9, "	do 13	7 1/60	60 1/4
White Fife	do 9, "	do 13	6 1/2	62
Saxonka	do 9, "	do 10	6 30/60	62 1/2
Russian Hard Tag	do 10, "	do 14	7 30/60	64 1/2
Judket	do 10, "	do 14	7 35/60	62
California White	do 10, "	do 9	6	62
Golden Drop	do 10, "	July 31	5	61
White Delhi	do 10, "	do 31	2 30/60	63
Indian Red Calcutta	do 10, "	do 31	2	62 1/4

FROZEN VS. UNFROZEN SEED.

These samples of seed were all graded by the Winnipeg grain examiner. Plot No. 1 was located in the valley; soil, rather stiff clay loam. Plot No. 2, on side of bluffs, about 60 feet above the valley; soil, light sandy loam, seed drilled in, in every case.

Variety.	When Sown.	When Harvested.	Yield per Acre.	Lbs. per Bushel.
Plot No. 1.			Bush.	
No. 1 Hard Red Fife	April 11	Aug. 10	10 2/60	61
No. 3 do	do 11	do 10	6 4/60	61
No. 1 Frosted Red Fife	do 11	do 10	10	61
No. 2 do	do 11	do 10	9 2/60	61
No. 3 do	do 11	do 10	10 2/60	61
No. 4 Frosted or Rejected Red Fife	do 11	do 10	8	61
Plot No. 2.				
No. 3 Hard Red Fife	April 5	Aug. 1	6	60½
No. 1 Frosted Red Fife	do 5	do 1	4 1/3	60
No. 2 do	do 5	do 1	4 1/3	60
No. 3 do	do 5	do 1	4 1/3	60
No. 4 Frosted or Rejected Red Fife	do 5	do 1	3 2/3	59½

OATS.

Twenty-one varieties of oats were tested. The land used for this purpose was originally intended for wheat, and was in fair condition; soil, rich loam, with a southern exposure. The land was fallow in 1888, and a heavy crop of green weeds and volunteer wheat was ploughed in late in August of that year. Except where a test of broadcast against drilling was made, the seed was all drilled in. The plots were side by side, and the soil nearly uniform.

The results of the several tests are as follows:—

Variety.	When Sown.	When Harvested.	Yield per Acre.	Weight per Bushel.
			Bush.	Lbs.
Longfellow	April 16	July 31	31 1/4 2/4	33½
Black Champion	do 17	Aug. 3	30 2/4 2/4	34
do Tartarian (Ont. seed)	do 16	do 3	30 2/4 2/4	39
August White	do 16	do 3	30 2/4 2/4	37
Early Caldor	do 17	do 3	28 2/4 2/4	37½
Red Oats	do 15	do 5	27 2/4 1/4	34
White Poland	do 16	July 30	26 2/4 2/4	37
English Potato	do 16	Aug. 2	26 1/4 1/4	37
Early Blossom	do 16	do 3	24 2/4 2/4	34
Winter Grey	po 16	July 30	24 2/4 1/4	34½
Flying Scotchman	do 16	do 30	24 1/4 2/4	38½
Welcome	do 17	do 29	23 3/4	43½
White Russian	do 15	Aug. 5	21½	41
Rennie's Prize White	do 17	July 30	19 2/4 1/4	44½
Carter's Prize Cluster	do 17	do 29	17 2/4 2/4	42
English White (Ont. seed)	do 17	do 29	19 2/4 1/4	44
Glenrothern	do 16	Aug. 3	16 4/4	31
Onega White	do 16	July 30	16 4/4	30½
Cream Egyptian	do 15	Aug. 5	13 4/4	40
White do	do 15	do 2	13	39

STUBBLE *VS.* FALLOW.

Variety.	Whén Sown.	When Harvested.	Yield per Acre.	Weight per Bushel.
			Bush.	Lbs.
Black Tartarian (fallow)	April 30	Aug. 14	49 1/2	34 1/2
do (wheat stubble)	do 30	do 14	30	39

DRILL *VS.* BROADCAST SOWING.

Welcome (drilled in)	April 18	July 29	14	43 1/2
do (broadcast machine)	do 18	do 29	6 3/4	43 1/2

DEEP *VS.* SHALLOW SOWING.

Black Tartarian, 3 inches deep	April 18	Aug. 5	26 3/4	37
do 1½ do	do 18	do 5	23 1/4	37

THICK *VS.* THIN SOWING.

White English, 8 pecks per acre	April 19	Aug. 6	19 5/4	40
do 9 do	do 19	do 6	17 7/4	40
do 10 do	do 19	do 6	20 7/4	40
do 11 do	do 19	do 6	24 1/4	40
do 12 do	do 19	do 6	26 2/4	40

BARLEY.

Barley sown on fallow land yielded fairly well, but that sown on stuble suffered severely from drought.

The Danish varieties will be noticed as leading in yield on stubble ground. This new importation promises to be a vigorous grower and well adapted for a dry year. It will also be noticed that stable manure had no appreciable effect on this grain; this was no doubt owing to lack of moisture. With our usual rainfall the result would in all probability be quite different. Nearly all varieties were a bright sample.

TESTS WITH BARLEY.

LATE AGAINST EARLY SOWING (FALLOW LAND.)

Variety.	When Sown.	When Harvested.	Yield Per Acre.	Weight Per Bushel.
				Lbs.
Prize Prolific	April 17	August 9	26	53 1/2
do	do 26	do 9	19 3/4	53 1/2
do	May 3	do 14	27 3/4	54

WITH AND WITHOUT STABLE MANURE.

Prize Prolific, no manure	May 13	August 23	25	53 1/2
do 12 loads per acre	do 13	do 23	25	53 1/2
do 24 do	do 13	do 23	25	53 1/2

FALL AND SPRING PLOUGHING OF STUBBLE.

Variety.	When Sown.	When Harvested.	Yield per Acre.	Weight per Bushel.
English Malting, fall ploughing	April 26....	August 16....	7 4/16	53½
do spring ploughing	do 26....	do 16....	8 2/16	53

ON SUMMER FALLOW.

English Malting	April 17....	August 9....	26 12/16	53
Prize Prolific	do 17....	do 9....	26	54½

ON WHEAT STUBBLE LAND.

Danish Chevalier	April 30....	August 15....	13 3/16	56
do Printice Chevalier	do 30....	do 15....	12¼	55½
Two-rowed Duck-bill	do 30....	do 9....	10 12/16	54 3/4
Peerless White	do 29....	do 16....	8 15/16	54 3/4
Beardless	do 29....	do 16....	8 13/16	54½
Thanet	do 29....	do 15....	9 12/16	55
Golden Melon Improved	do 29....	do 15....	7 14/16	54½
Swedish	do 29....	do 16....	7 4/16	55
New Zealand	do 29....	do 9....	6 12/16	55½
Large two-rowed	do 29....	do 9....	5	54
Petschora	do 30....	do 15....	4 8/16	49½
Mensury	do 29....	do 16....	2 4/16	52¼
Polar	do 29....	do 16....	1	49½

HAY LAND.

The meadow of native grass, cleared of scrub last season, has proved quite an acquisition, and has furnished sufficient hay to feed the horses used on the farm during the year.

GRASSES AND FODDER PLANTS.

In view of the fact that the native hay meadows of the Province are becoming exhaused, considerable attention has been paid during the season to experiments with grasses, clovers and fodder plants. The dry season has affected the yield to a certain extent but it is quite evident that many of the fodder plants now extensively grown in the eastern Provinces can be introduced here with advantage.

NATIVE GRASSES.

Fourteen varieties of native grasses were collected on this farm in the autumn of 1888, and were sown in April last. Of these the following six varieties grew, and most of them compare favourably with the cultivated varieties sown beside them.

Variety.	When Sown.	Per cent. of Germination.	Height, 1st Nov., 1889.
	1889.	p. c.	inches.
Bromus Kalmii	April 15....	100	14
Elymus Canadensis	do 15....	100	24
Poa Serotina	do 15....	100	20
Elymus Virginicus	do 15....	100	16
Triticum Caninum	do 15....	100	24
Muhlenbergia Glomerata	do 15....	100	22

CULTIVATED GRASSES AND CLOVERS.

Thirty varieties of cultivated grasses and clovers were sown during the past season, but owing to the drought only the following germinated :—

Variety.	When Sown.	Per cent. of Germination.	Height, 1st Nov., 1889.	—
	1889.	p. c.	inches.	
Tall Fescue	April 15....	25	8	Drilled
Hard Fescue	do 15....	25	6	do
Agrostis Dispar	do 15....	10	6	do
Agrostis Vulgaris	do 15....	50	7	do
Timothy	do 15....	75	7	do
Fiorin	do 15....	50	6	do
Meadow Foxtail	do 15....	50	5	do
Perennial Rye Grass	do 15....	50	8	do
Italian Rye Grass	do 15....	40	14	do
Meadow Fescue	do 15....	62	12	do
Orchard Grass	June 1....	20	6	Broadcast.
Clovers.				
Lucerne Clover	do 1....	90	8	do
Common Red Clover	do 1....	50	12	do
Alsike Clover	do 1....	40	4	do
White Dutch Clover	do 1....	30	6	do

FODDER PLANTS.

Of fodder plants, 19 varieties were tested; all were sown in drills. For corn, the common two-horse wheat drill was used; the others were sown with a small garden hand drill. The land was kept free of weeds by means of a horse cultivator, and it now is in excellent condition for next year's crop.

Variety.	When Sown.	When Cut.	Height.	Yield per Acre.	Distance between Rows.
			Feet.	Lbs.	Inches.
Giant P. & S. Ensilage Corn	May 28....	Sept. 6....	6.....	17,511.....	40
Canada Yellow do	do 28....	do 6....	4.....	11,848.....	40
Red Cob Ensilage do	do 28....	do 6....	5.....	11,586.....	40
Horse Tooth do	do 28....	do 6....	4.....	10,759.....	40
Compton's Early do	do 28....	do 6....	3 6/12.....	10,672.....	40
Longfellow do	do 28....	do 6....	3 9/12.....	10,541.....	40
Early Eight-rowed Yellow Corn	do 28....	do 6....	4.....	9,670.....	40
White Flint Corn	do 28....	do 6....	4.....	8,929.....	40
Angel of Midnight Corn	do 28....	do 6....	3.....	8,450.....	40
Self-Husking Corn	do 28....	do 6....	3 1/2.....	8,058.....	40
Kaffir Corn	do 28....	do 6....	3 8/12.....	4,748.....	40
Millets, &c.					
Pearl Millet	June 1....	Sept. 2....	2 8/12.....	6,316.....	40
Large African Millet	May 30....	do 2....	3.....	3,789.....	40
White Millo Maize	do 29....	do 2....	3 3/12.....	3,655.....	40
Hungarian Grass	June 6....	do 2....	2.....	3,558.....	20
Millet (common)	do 6....	do 2....	2.....	3,189.....	20
Johnston Grass	May 30....	do 2....	3 6/12.....	2,831.....	40
Egyptian Rice Corn	do 30....	do 2....	3 9/12.....	2,700.....	40
Golden Wonder Millet	do 31....	do 2....	3 1/2.....	2,178.....	40

POTATOES.

The collection of potatoes grown this year consists of 96 varieties; 100 sets of each sort were planted. They were all ploughed in, in rows—soil, sandy loam.

It is evident from the variable yield under similar conditions that the productiveness of this tuber depends largely on the variety of seed used.

The quality of each of these varieties will be ascertained during the present winter.

Variety.	Yield from 100 Sets.	Variety.	Yield from 100 Sets.
	Lbs.		Lbs.
Pride of America	53½	Erfurt Incomparable	20
Thorburn	38½	Price from Holland	19½
Early Rose	36½	Prince Bismarck	19½
Saint Patrick	35	Bliss' Triumph	19½
Early Bird	35	Alpha	18½
Thorburn's Paragon	34	Williams' Early	18
Rosy Morn	34	Late Goodrich	18
Paterson's Albert	33	Silver Skin	18
Great Eastern	32½	Halberstadt	18
Chicago Market	32	Gleason's Late	17½
White Star	32	Empire State	17
Conqueror	31½	Brownell's Beauty	17
Brownell's Best	31	King of the Earlies	17
Golden Early	31	Amylon	17
Albino Early	30	Dalmahoy	17
Thorburn's Paragon	30	Algiers	16
Early Conqueror	30	White Sprout	16
May Queen	29½	Early Frame	16
Vanguard	29	Centennial	15½
Erfurt Early	28	Richter's Elegant	15
Richter's Imperator	28	Rose's New Giant	15
Wonder of the World	28	Beefsteak	15
Six Weeks, Round White	28	Jackson's Improved	15
Early Calico	26	Stewart	14
Clark's No. 1	25½	Giant Long Dutch	13½
Mammoth Prolific	25	Early Callao	13
Lark's Eye	24½	Brownell's Superior	13
Adirondack	24½	Early Calico	13
Member of Parliament	24½	Sugar	13
Manhattan	24	Richter's Gem	12½
Sharpes' Seedling	24	Prime Minister	12
Emperor William	24	Matador	12
Burbank's Seedling	23	Rotherant	11½
Thorburn's Late Rose	23	Marigold	11
Eye Carpenter	22	Matchless	11
White Elephant	22	Lira	10
Prolific	22	Gennessee Seedling	9
Telephone	22	Compton's Early	8½
Early Short	22	Paterson's Victoria	7½
Harrison	22	Morning Star	7
Jumbo	22	Six Weeks, Round Blue	6
Kidney August	21½	Asparagus	6
Richter's Schneerose	21	Count Moltke	5
Sukreta	21	English Kidney	5
Large Callao	21	H. & S. late White Rose	3½
Beauty of Hebron	21	Fidelia	3
Snowflake	20		

TURNIPS.

The following 13 varieties of turnips were sown in flat drills; 1 variety sown on a ridged drill failed to germinate: Soil, a deep rich sandy loam:—

Variety.	When Sown.	When Pulled.	Yield per Acre.
Early White Stone	June 5	October 12	280 bushels.
Purple Top Strap Leaf	do 5	do 12	279 do
Extra Early Millan	do 5	do 12	260 do
Golden Ball	do 5	do 12	254 do
Orange Jelly	do 5	do 12	254 do
Early Red Top Strap Leaf	do 18	do 12	226 do
Prize Hardy Swede	do 10	do 11	213 do
Early Purple Top	do 18	do 12	209 do
King of Swedes	do 6	do 12	201½ do
Queen of Swedes	do 5	do 12	181 do
Pomerian White	do 18	do 12	171 do
Carter's Elephant Swede	do 6	do 12	151 do
White Stone	do 18	do 12	124½ do

MANGELS.

Four varieties of mangels were sown, three in flat drills and one in both flat and ridged drills. Owing to the extremely dry weather a large proportion of the seed failed to germinate, hence the yield is small.

Variety.	When Sown.	When Pulled.	Yield per Acre.
Mammoth Long Red	May 23	October 14	116 bushels.
Carter's New Tankard	do 23	do 14	62 do
do Golden Intermediate	do 23	do 14	57 4/5 do
Drill vs. Flat.			
Yellow Turnip Mangel, flat sowing	do 31	do 14	71 4/5 do
do do drill do	do 31	do 14	60 do

FRUIT TREES.

Early in April of this year, 487 fruit trees were procured, 382 were apple, 27 paer, 42 plum, 25 crab apple and 11 cherry. In addition to the foregoing, 294 one year old apple trees were received from the Central Experimental Farm at Ottawa. Nearly all were hardy varieties, many of them of Russian origin. They were all planted during April in nursery rows 5 feet apart and 3 feet apart in the rows.

It has been observed that the wild fruits of the Province thrive best when protected by timber or scrub.

With this fact in view, two plots of thick oak, hazel and rose bush scrub were cleared and planted with fruit trees, grape vines and strawberry plants. This clearing involved considerable labour but the result so far has been highly satisfactory.

For comparison, a portion of the above fruits were also planted on the open prairie without protection.

Below will be found a description of the plots, also a list of the trees, etc., planted in each, and the number living when winter set in.

PLOT No. 1.

Situated on the open prairie, slightly northern exposure, soil deep sandy loam, subsoil porous. In this plot were planted 130 apple trees, of which 10 died ; 10 crab apple, all living; 13 pear, all living ; 35 plum, all living ; 5 cherries, all dead ; 13 grape vines, 10 living; 1,350 strawberry plants, of which only 178 lived.

Compared with the other plots, the growth was quite small on all kinds of trees, and the foliage was much injured by hot winds.

PLOT No. 2.

Situated on the side of river bluffs, southern exposure, scrub 4 to 9 feet high on all sides, soil rich sandy loam mixed with leaf mould.

The following were planted in this plot: 142 apple trees, 10 crab apple, 13 pear, 6 plum, 2 cherry, 22 grape vines, and 1,065 strawberry plants. All of the trees lived and made good growth; 442 of the strawberries grew and produced a large number of new plants.

The growth of everything in this plot was more vigorous than in either of the other plots, and the hot winds had no appreciable effect on the leaves.

PLOT No. 3.

Also on bluff side, but with a northern exposure. Scrub on north-east and west: planted with 59 apple trees, 1 dead; 4 crab apple trees, all living; 1 pear dead, 2 plum, both living; 3 cherries, all dead; 810 strawberry plants, of which 152 lived.

STRAWBERRIES.

Early in May of this year, 3,225 strawberry plants were procured. They were planted 6th May, in rows 3 feet 6 inches apart and 1 foot between plants.

During the last week in May severe frosts destroyed a large number of plants, especially on the open prairie. All losses were, however, more than made up by new runners. A few plants were set out on 18th April, and all were destroyed by the frost of 21st April.

The results of the tests with this fruit are as follows :

STRAWBERRIES.

Variety.	Plants Set Out.	Old Plants living	New Plants.	Total Plants, Sept. 18, 1889.
Wilson's Albany	1,200	373	1,614	1,987
Crescent Seedling	750	131	1,528	1,659
Captain Jack	525	183	1,256	1,439
Manchester	300	55	203	258
Daniel Boone	225	17	62	79
Sharpless	225	13	49	62
	3,225	772	4,712	5,484

GRAPES.

Late in April thirty-five vines of nine varieties were planted in rows 8 feet apart and 9 feet apart in the row. The collection included five vines of each the following varieties: Champion, Worden and Moore's Early, four each of Early Victor and Concord, and three each of Ives Seedling, Rogers No. 3, Delaware and Lady.

One each of Early Victor, Ives Seedling and Rogers No. 3 have died; the others all lived and made good growth; one of Moore's Early fruited.

Before winter set in the vines were cut back and covered with earth.

CURRANTS.

The plantation of this fruit consists of 961 bushes, and includes four varieties of Black, five of Red and one of White. They were planted six feet by four feet; time of setting out ranged from 6th to 30th April.

The following percentage lived and made a fair growth, 95 per cent. of the Black, 74 per cent. of the Red, and 50 per cent. of the White.

Before winter set in 10 inches of earth was drawn around the bushes.

GOOSEBERRIES.

With the exception of one variety the gooseberries have stood the drought remarkably well.

The following sorts were planted the same distance apart as the currrants: 26 of Houghton Seedling, 25 Downing, 10 Woodwards Whitesmith. All these grew. Of 12 native, 11 grew; 10 Industry, only 2 grew.

RASPBERRIES AND BLACKBERRIES.

Of the 23 varieties of this fruit tested, a number were injured in transit, and all were seriously affected by the drought.

The Snyder, Hilborn snd Turner, in the order named, were most promising.

FOREST TREES AND SHRUBS.

There is an increased interest manifested in forestry and arboriculture throughout the Province. Several thousand ash-leaf maples were planted by farmers in this district last season, and enquiries for tree seed are received from all parts of the North-West.

Early this spring ,12000 forest trees and shrubs were received from the Central Experimental Farm at Ottawa. This collection consists of 118 varieties.

A strip of land 100 feet wide on the western limit, and extending the length of the farm, has been set apart for a permanent shelter belt. During the past season 585 yards of this has been planted with 31 varieties of forest trees, set 9 by 9 feet apart. The remaining trees have been planted in nursery rows, and will be set out permanently next spring. Of the trees planted this season all the alders, poplars and willows grew; of the other varieties the followng proportion were living when winter set in: 80 per cent. of pine, 60 per cent. of spruce and arbor vitæ, 90 per cent. of elm and maple, 86 per cent. of ash, 66 per cent. of birch, 60 per cent. of walnut, 34 per cent. of hemlock, and 48 per cent. of black cherry.

A plantation of native trees and shrubs has been started and additions will be made as opportunity offers.

SEEDLINGS.

During October of last year several bushels of native ash and maple seeds were sown in rows 3 feet apart. These came up in early spring, but were all destroyed by the wind storm of the 17th and the frost of the 20th April. Another sowing was made the last week of April. The 6,000 ash and 7,000 maples from this sowing have made good growth and will be available for permanent planting next spring.

AVENUE TREES.

The avenue of large ash-leaf maples commenced last season has been completed during the year.

Of the 100 trees planted in this avenue during October, 1888, 90 per cent. grew, of 471 trees set out in April last, 96 per cent. grew, and 66 per cent. of those planted in July.

Trees having about two-thirds of the length of their branches removed, when planted, have succeeded best. All the avenue trees, owing to drought, were watered four times, four pails to a tree each time.

FALL WHEAT.

One acre of Manchester fall wheat was sown on 26th August, followed by two other varieties on 2nd September. The seed germinated quickly, and before winter set in a good growth had been made.

BEES.

In June of this year two hives of Italian bees were procured. Reaching the farm late, very little surplus honey was obtained. Both hives swarmed in July, and when placed in the cellar on 1st November all four hives contained a full supply of honey for winter use.

FENCING.

Three and three-quarter miles of additional fence has been erected during the year, making a total of $6\frac{88}{100}$ miles. This, with the portion protected by the immediate banks of the river, completes the enclosure of the farm.

ROAD-MAKING.

The remaining three-quarters of a mile of the road crossing the farm from east to west has been graded and well gravelled. This road is now an excellent one, and makes a good approach to the farm.

DRAINING.

The open ditches dug last year proving satisfactory, 1,100 additional yards were opened during the past season. Square timber culverts were used where the drains crossed the roads.

EXHIBITS AT AGRICULTURAL FAIRS.

Samples of the products of the farm were prepared and shown at the following fall exhibitions: Brandon, Oak Lake, Virden, Rapid City and Minnedosa. The exhibits were well spoken of, and much interest shown in the work of the farms.

NEW BREAKING AND SUMMER-FALLOW.

About sixty acres of new land on the higher portions of the farm has been broken, backset and harrowed ready for the seed, and about twenty-five acres of the valley land summer-fallowed. The fallow land has been ploughed twice and harrowed several times.

BUILDINGS.

The buildings at present in use on the farm are small and inconvenient, and furnish no accommodation for cattle. During the past year the contract has been awarded and work commenced on a commodious bank barn, the basement to be used for horses and cattle, and the upper portion for storing grain, hay, &c. It is expected to be ready for occupation by next harvest. Arrangements have also been made for the erection of a house for the use of the Superintendent.

I have the honour to be, Sir,

Your obedient servant,

S. A. BEDFORD,

Superintendent.

BRANDON, Man., 10th January, 1890.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF A. MACKAY, SUPERINTENDENT.

INDIAN HEAD, N. W. T., 28th December, 1889.

WM. SAUNDERS, F.R.S.C., F.L.S., F.C.S.
Director, Experimental Farms,
Ottawa.

SIR,—I have the honour herewith to submit to you my report on work done on the North-West Experimental Farm at Indian Head—the crops sown and the returns so far as are yet known, the varieties and number of fruit and forest trees planted, their growth and present condition, and to submit the results of experiments with cereals and other agricultural crops.

The season just past has been one of great severity on all crops grown in the North-West Territories. It may justly be called a year of extremes. Last winter was one of almost unknown mildness. March was so very fine that thousands of acres of grain were sown during the last two weeks, and at no time in the history of the country was the ground in such favourable condition. No sooner, however, were the crops sown, than heavy winds commenced, followed all the summer by exceptionally dry weather. In many places the settler had his good prospects injured by winds, and finally almost ruined by succeeding drought. In some localities where soil was favourable and the farming done in accordance with the requirements of the country the crops did fairly, and considering the excessive dry weather, remarkably well.

The Experimental Farm suffered in company with every other farm in the country; perhaps very few suffered as much from winds, but dry weather, though reducing the yields, was not so disastrous as to many. In this portion of the Territories, at least, every settler knows the importance of properly preparing his land. For several years after the country became open for settlement everyone imagined that grain would grow, no matter how put in, but now the man is devoid of reason that thinks he is sure of a crop without any exertion on his part. It is true that we have had one year since 1882 that required little or no preparation to give a most abundant crop, but only too many know how little was received in the remaining years by poor cultivation.

Our seasons point to only one way in which we can in all years expect to reap something. It is quite within the bounds of probabilities that some other and perhaps more successful method may be found, but at present I submit that fallowing the land is the best preparation to ensure a crop. Fallowing land in this country is not required for the purpose of renovating it, as is the case with worn out lands in the east, and it is a question yet unsettled how much or how little the fallows should be worked, but as we have only one wet season during the year, it is found beyond doubt that the land must be ploughed the first time before this wet season is over, if we expect to reap a crop the following year. This wet season comes during June and July, at a time when every farmer has little or nothing else to do, and then this work should be done. Usually seeding is over by the first of May, and to have the best results the land for fallow should be ploughed from 5 to 7 inches deep as soon after this as possible. Land ploughed after July is of no use whatever, unless there is rain in August, which very seldom comes to any great extent. A good harrowing should succeed the ploughing, and all weeds or volunteer grain be kept down by successive cultivation. A good deal of uncertainty is felt in regard to a second ploughing, some holding that it is useless; others maintain that it is an injury, while others again have found it to give from five to ten bushels per acre more than one ploughing. So far the result on the Experimental Farm has been that two ploughings have given by far the best returns. Especially was this the case where the first

ploughing was done in May or June. There is no doubt but that two ploughings cause more growth of straw, and consequently in a wet year the grain is longer by several days in ripening, and that the danger from frost is greatly increased by these few days delay; but taking the seasons so far passed, 1884 excepted, it can safely be recommended to plongh twice, with as much surface cultivation between as possible. Above all, it is of the greatest importance that the first ploughing should be deep and done in time to receive the June or July rains.

Fall ploughing of stubble land has not given good results, and unless our seasons change there is no reason to expect anything but a poor retnrn from land ploughed while in snch dry condition as it always is in the fall. A much better way is to allow it to remain until spring, with as long stubble as possible to retain the snow, then sow on the stubble and plough in 3 inches deep. The seed, if put down on damp, hard soil, with a loose covering on top, will at once commence to grow and before dry weather sets in will have considerable top covering.

The foregoing remarks are respectfully submitted to settlers in the North-West Territories.

LAND IN CROP.

My last report stated that 215 acres had been prepared for crop during the snmmer of 1888. This was utilized as follows: Wheat, 74 acres; barley, 19 acres; feed oats, 40 acres; new varieties of oats, 19 acres; peas, 8 acres; nursery and wind break, 12 acres; roots, corn and patatoes, 7 acres; roads, 16 acres; around buildings and divisions between varieties of grain, 13 acres.

WHEAT.

Wheat being the chief and the most important product of this conntry, a larger acreage was given to it than any other grain. Thirty-seven varieties were sown, including 16 from India, the area ranging from a field of 24 acres of Red Fife down to plots of one-tenth of an acre. The land being in good condition and the frost out sufficiently, seeding was begun on the 25th of March.

In order to gain information on the early ripening qualities and difference in yield of as many of the varieties sown as possible, Red Fife, White Fife, Ladoga and Saxonka were chosen for the earliest test. These were sown on the 25th and 26th of March in as large quantities as two drills could overtake. The land had been worked in the same way; the same quantity of seed was sown to the acre, and the same nnmber of acres of each variety sown in the two days; bnt, unfortunately, the winds did so mnch injury to the Ladoga and Saxonka plots, from their being on a more exposed portion of the farm, though alongside the Red and White Fife, that practically this test has been of no nse.

On the 8th of April, Red Fife, White Fife, Ladoga, Saxonka, Eureka, Red Fern, Clnb and Judket were sown on measured acres, one acre to each variety. The land was in good order. All had been fallowed, except one-half of the Jndket plot, which had a small crop of Millet the year before, of which the yield was only two bushels. All the plots were sown by drill, with one and one-half bushels each.

The grain came np very evenly together, and until abont a foot high no difference could be observed. The winds had thinned all the varieties considerably, bnt all were treated alike, so far as could be detected, but afterwards the Eureka and Red Fern (which I think are the same wheat) pushed ahead, and finally gave the most straw, though not the most grain, as will be shown further on. In ripening the Ladoga was fourteen days earlier than Red or White Fife, ten days earlier than Eureka, Red Fern, Club or Judket, and four days earlier than Saxonka.

In testing new wheats nine varieties were sown on the 1st April, and eight varieties on the 6th. All were intended to be sown on the 1st and 2nd, but a snow storm delayed the latter lots four days. On the 1st Indian Karachi, Hard Calcutta, Club Calcutta, Bearded Red, No. 1756, Defiance, Chilian White, Paine's Defiance, and Improved Summer Cob, were sown. On the 6th Magyar, Greek Summer, Russian Hard Tag, Wright's Wheat, California White, and Onega, as will be seen in table of yields, &c. Two varieties, White Delhi and Red Calcutta, matnred in four months

and one day; three varieties in four months and two days, being the same time as the Ladoga in the acre plots sown seven days later. These five were very short in the straw, though extra good in the grain, as will be noticed by comparing weight per bushel. Future trials can only determine whether the early propensities will remain, and the deficiency in straw be improved with more favourable seasons.

FROZEN WHEAT.

Three grades of frozen Red Fife wheat were obtained, and sown by drill on same day, and under exactly the same conditions. No. 1 grade contained 10 per cent. frozen grain; No. 2 grade from 50 to 70 per cent. frozen, and No. 3 grade 90 per cent. frozen—in fact, No. 3 grade was very poor chicken feed. The grain was sown on the 9th April, on fallowed land, at the rate of two bushels per acre. All the grades came up together, and at no time could any difference be observed, except that Nos. 2 and 3 grades had more smut balls than No. 1. Through an error in drawing in no accurate account could be taken when it came to be threshed, but it is safe to say that allowing one bushel for smut in favour of No. 1 grade, there was no difference in, the yield of grain, and none whatever in the quantity of straw.

DRILL AND BROADCAST SEEDING.

Twelve acres of Red Fife wheat were sown by drill and twelve acres broadcast. Each plot of ground had been prepared in the same way; 1½ bushels were sown by drill, and 1¾ broadcast. The winds were so severe on the broadcast grain that the result when threshed was useless as a comparison. The only instruction it affords is, that drilled grain did better last year than broadcast. This applies equally to all grain sown on the farm, except peas, which were sown by drill entirely. The other grains were tried both ways, and in every case the drilled grains stood the winds the best.

As both methods have advocates, and many fine crops grown last year from broadcast seeding, where somewhat protected from winds, one year's trial on the Experimental Farm should not be taken as indicating that drilling in grain is better than broadcast. Could any way be devised that the land could be left in drills in the fall 3 inches deep and 7 inches wide, broadcast seeding on this would be far preferable to drilling, on account of the ground being always too wet early in the spring for the drill to work properly.

INDIAN WHEATS.

Of the sixteen varieties of Indian wheat sown, two matured in four months and one day, three in four months and two days and two in four months and six days. Two varieties did not head out; in all probability they were fall wheats.

Eureka wheat gave the largest quantity of straw to the acre of any grain on the farm. Russian Hard Tag followed it very close; both are bearded. The Eureka being close, compact and long heads, with rather coarse straw. The Russian Hard Tag has open and medium-sized heads, with fine straw.

SMUT.

Smut, this year, was very prevalent all over the Territories. On the Experimental Farm several varieties of wheat were very much affected, Judket being so much so that one-fourth of the heads were entirely smut balls. Club wheat was also badly injured. Rio Grande, Scotch and Golden Drop were considerably hurt, while Red Fife, White Fife, Ladoga, Saxonka and Eureka were comparatively free. In the Indian wheats no smut was observed. Blue vitrol dissolved in water and mixed with the seed has been the only remedy so far tried on the Experimental Farm. One pound dissolved in one pail of water and thoroughly mixed with ten bushels of grain gives good results, though not perfectly efficacious.

CROP ON FALL PLOUGHING.

Two acres of land were ploughed last fall after a crop of millet had been taken off the ground. This spring three bushels of Red Fife wheat was drilled in on the two acres. The yield was not more than five bushels per acre. Alongside these two acres ten were drilled in on fallow land which returned over twenty-five bushels per acre.

FALL WHEAT.

Nine varieties of fall wheat were sown in August, 1888. The fall being favorable most of the grain was covering the ground when cold weather set in. There being very little snow, the wheat was exposed the greater part of the winter; nevertheless it came through fresh and apparently in good condition. As soon, however, as the frost had left the ground and alternate thawing and freezing took place—which usually occurs during the first two weeks in April—a change for the worse was observed, and by the end of April all was dead.

This fall three varieties were sown, but the soil was so very dry that they had only appeared above ground when checked by cold weather. One-half of each variety has been covered with two inches of straw with the object of retaining the frost above the roots until as late in the spring as possible.

RYE.

Two varieties of fall rye were sown in August, 1888. Like the wheat, they apparently came through the winter safely, but in the end shared the same fate.

The following table shows variety, date of seeding, maturity, yield per acre and weight per bushel. The first eight varieties are the acre lots. The next nine are those sown on 1st April, and the following eight those sown on 6th. The balance were sown at various dates.

Variety.	When Sown.	When Matured.	Yield per Acre.	Weight per Bushel.
			Bush. Lbs.	Lbs.
Red Fife	April 8	August 24	28 20	64
White Fife	do 8	do 24	20 49	64½
Ladoga	do 8	do 10	21 30	64½
Saxonka	do 8	do 14	12 30	64½
Eureka	do 8	do 20	24 00	65
Red Fern	do 8	do 20	23 16	65
Club	do 8	do 20	18 11	65
Judket	do 8	do 20	20 45	63
Indian Karachi	do 1	do 3	18 00	66½
Hard Calcutta	do 1	do 3	12 08	65½
Club Calcutta	do 1	do 3	11 40	63
Bearded Red	do 1	do 7	18 50	64
No. 1756	do 1	do 7	19 20	65¼
Defiance	do 1	do 13	25 36	64
Chilian White	do 1	do 13	35 40	66
Paine's Defiance	do 1	do 13	5 60	63½
Imp. Summer Cob	do 1	do 13	22 40	64
White Delhi	do 6	do 7	19 40	66
Red Calcutta	do 6	do 7	31 40	64
Magyar	do 6	do 27	30 10	63½
Greek Summer	do 6	do 13	10 00	64½
Russian Hard Tag	do 6	do 17	26 40	65½
California White	do 6	do 12	22 15	65¼
Wrights	do 6	do 10	23 18	64¼
Onega	do 6	do 8	10 26	60½
General Crop.				
Red Fife	do 1	do 16	25 00	65
White Fife	March 26	do 16	17 35	64½
Ladoga	do 26	do 10	13 00	64½
Saxonka	do 26	do 13	15 24	64½
Rio Grande	April 9	do 15	12 04	65
Golden Drop	do 9	do 14	12 34	65
Talavera	do 9	do 20	19 00	63
Scotch	do 9	do 25	23 00	63½
From High Elevations in India.			3 lbs. sown.	
Seoraj, 7,000 feet	do 15	do 26	20	65½
Kangra, 3,000 feet	do 15	do 26	27	64
Palampur, 3,000 feet	do 15	do 26	28	64
Simla, high elevation	do 15	do 26	48	63
Spiti Valley, 11,000 feet	do 15	do 26	40	62
Moultan, 7,000 feet	do 15	do 26	23	63

BARLEY.

As it was considered important that English Two-Rowed Barley should be tested in this country, with a view of ascertaining whether it could be profitably grown for exportation; a considerable portion of well worked fallow land was sown with 14 varieties of this grain. All were put in by drill on the 10th of April, 1¾ bushels per acre were sown, except the English Malting Barley, the grain of which was very large; 2 bushels per acre of this was used. Four varieties were greatly injured by winds, namely: Thanet, Peerless, Chevalier and Danish Chevalier The remainder, though not seriously affected by winds, were mostly short in the straw from the dry weather. In looking at weight per bushel, in table below, it will be seen that our climate is well adapted to their development, though from the yields received per acre it cannot be said as yet, that they can be grown with profit. Yet the past year must not be taken as even a fair season for barley; in all probability it has been the worst in the last seven years. Twice the blades were split and torn by winds, and the dry weather was so severe and prolonged that the only wonder is, that barley would grow at all.

In addition to the above 14 varieties of English Two-Rowed, 19 others were sown at various dates, from the 10th April to 25th May. Twelve of these were new from India, and arrived rather late to give them a fair test. Two of the Indian varieties are hulless, weighing 64 and 67 lbs. per bushel, and give promise of being valuable for feeding purposes.

One variety of six-rowed barley was sown, but though fair in straw, and earlier in maturing than any of the two-rowed, was small and poor in grain.

The following table gives variety, date of seeding, harvest, yield per acre and weight per bushel.

	Variety.	Sown.	Harvest.	Yield.	Weight.	Remarks.
					Lbs.	
	Golden Melon	April 10	Aug. 22	17·33	55	
	Thanet	do 10	do 22	21·17	52¼	
	Peerless	do 10	do 22	16·16	53	
	Danish Chevalier	do 10	do 22	12·36	55	
	Chevalier	do 10	do 22	26·33	53	
	English Malting	do 10	do 22	23·19	53½	
	Swedish	do 10	do 12	24·31	55¼	
	Danish Printice Chevalier	do 10	do 22	13·43	53½	
	New Zealand	do 10	do 15	23·05	54	
	Mensury	do 10	do 9	12·21	51	
	Petschora	do 10	do 14	7·37	51½	
	Two-rowed, from P. E. Island	do 10	do 14	13·27	53½	
	Beardless	do 10	do 26	27·14	55	
	Two-rowed	do 10	do 14	18·04	55	
	Black	do 10	.....	.....	.....	Eaten by gophers.
	Six-rowed	do 10	.....	.....	.....	Not threshed.
	Saale	May 23	Aug. 31	19·27	53	
	Early Minting	do 10	do 26	13·36	53½	
	Selected Chevalier	do 10	do 26	12·00	52	
	Peerless White	do 10	do 26	18·40	52	
Indian Barleys.	Bhagarmany Hills	do 25	do 16	.....	62	3 lbs. each of these barleys were sown. Yield ranges from 40 lbs. down to 12 lbs.
	Khagan	do 25	do 31	.....	51	
	Moultan	do 25	do 16	.....	50½	
	Sialkot	do 25	do 16	.....	49½	
	Mardan	do 25	do 16	.....	52	
	Spiti, 11,000 ft. elevation	do 15	do 13	.....	62	
	Kulu, 7,000 ft. do	do 15	do 13	.....	51	
	Simla, high do	do 15	do 13	.....	49	
	Kangra, 3,000 ft. do	do 15	do 13	.....	53½	
	Seoraj, 7,000 ft. do	do 15	do 13	.....	52	
	Lahoul, 11,000 ft. do	do 15	do 26	.....	64	
	Palampur, 3,000 do	do 15	do 13	.....	52½	

The small yield and light weight of Saale, Early Minting, Selected Chevalier and Peerless White, is no doubt owing to their having been sown so late. The seed was very fine, and had they been got in early would have made much better returns.

OATS.

Of all the crops on the farm, oats suffered most from frosts, winds and dry weather. Three varieties only escaped without much injury from winds, while all the rest were greatly damaged. Four were entirely blown out of the ground, and though seed was a second time harrowed in, were again so greatly injured, that to save weeds from going to seed, everything was ploughed under.

Carter's Prize Cluster, Welcome and Tartarian, suffered least from winds, but dry weather reduced the yields very considerably. The Prize Cluster oat gives promise of being a valuable grain for our short seasons, maturing in three months and 18 days.

Five acres of fallow land were sown with oats for feeding purposes, on the 22nd March. Ten acres of fall ploughing were sown on the 23rd also for feed; both these plots were so much injured by spring frosts, that winds soon after completely killed every blade.

The two plots were resown on the 20th and 10th May respectively. The return from the fallow is not threshed but will average 20 to 30 bushels per acre; from the fall ploughing not over two bushels per acre. The failure of the first seeding was caused mainly from a heavy frost four days after the grain was sown, and after it had become swollen and partially grown, and from winds baring the already enfeebled roots.

Twenty-two varieties in all were sown, 2½ bushels per acre broadcast, and two bushels by drill were used.

As will be noticed, several varieties give promise of being valuable for the North-West on account of their early ripening qualities, and good weight per bushel.

Variety.	Sown.	Harvest.	Yield.	Weight.
				Lbs.
Black Champion	April 9....	August 26....	26.2	30
Glenrothern	do 9....	do 26....	25·6	35
August White	do 9....	do 26....	19·29	40½
Early Calder	do 9....	Blown out.		
Hallet's Pedigree Tartarian	do 9....	August 26....	15·6	36
Longfellow	do 9....	do 26....	16·6	37½
White Egyptian	do 9....	do 26....	15·18	42¼
English Potato	do 9....	do 26....	13·3	40
Welcome	do 9 ...	do 10....	25·31	44¼
Cream Egyptian	do 9....	do 26....	10·24	42
Early Race Horse	do 9....	Blown out.		
Red	do 9....	August 22....	9·7	34
Early English White	do 9 ...	do 22....	14·24	43
Victoria Prize	do 10....	Blown out.		
Poland	do 10....	do		
Flying Scotchman	do 10....	August 14....	11·6	44½
Black Tartarian	do 10....	do 17....	32·15	39½
Lincolnshire Poland	do 10....	do 15....	15·00	41
Early Blossom	do 10....	do 15....	13·8	42
Carter's Prize Cluster	do 12....	do 1....	34·13	45½
White Wonder	do 23....	do 15....	13·6	42½
White Bonanza	do 23....	do 17....	27·6	45

PEAS.

Five varieties of peas were sown by drill at the rate of 2½ bushels per acre of small and three bushels large. Two were so badly injured by winds that to save the land from being filled with foul seeds, the whole of one and the greater part of the second were cut while green and the straw used for fodder.

The remaining varieties were also greatly damaged, but were left until ripe before being cut. The straw in no case being long, but was well podded and the peas plump and sound.

Several varieties of Indian peas were also sown in small plots. Three of these matured, while three never podded. Those that ripened are a dark grey color and small in size. The straw was very short and apparently dwarfed.

Black Eyes yielded $13\frac{20}{60}$ bushels per acre. Multipliers 21 bushels, Extra Early's $10\frac{24}{60}$ bushels, and Crown 12 bushels. Golden Vine cut while green.

GRAIN SOWN AS SINGLE PLANTS.

In addition to the grain already mentioned as sown, 71 varieties of wheat, 66 of barley and 76 of oats, were planted in rows two feet apart and one foot in the rows. Like all other grain these received a full share of the winds and were more or less injured. While some had $\frac{1}{4}$ to $\frac{1}{2}$ destroyed others were entirely blown out. On account also of the thinness of the grain on the ground only very few varieties ripened before frost came in September. These will be carefully threshed and counted, and although it is feared that no reliable record can be obtained as to the relative yield of the different sorts, some valuable seed may be secured for future trials.

GRASSES AND CLOVERS.

Knowing the great importance of grasses and clovers to the future prosperity of the North-West Territories, as many varieties as it was possible to obtain were procured and sown on well prepared land. Timothy, Alsike, Lucerne and Red Clover were sown with grain, these again with Perennial Rye Grass, Italian Rye Grass, Kentucky Blue Grass, Sanfoin, Meadow Fox Tail, Meadow Fescue, Sheep Fescue, Tall Fescue, Crested Dog Tail, Meadow Oat Grass, Sweet Vernal, Red Top, Orchard Grass and White Clover were sown in plots without grain.

I am sorry to report that hardly a blade of any of these grasses or clovers ever came up, being near the surface the wind swept all away.

As soon as possible after the damage was done a fresh supply of seed was obtained from Ontario, but it was well on in May before they could be sown the second time and several of the varieties did not germinate.

From the second seeding, Perennial Rye Grass, Italian Rye Grass, Orchard Grass, Meadow Fescue, Sheep Fescue, Crested Dog Tail, Red, Alsike, Lucerne, Sanfoin and White Clovers have done fairly well considering the dry weather. The remainder of the varieties have not appeared.

In addition to the foregoing, 33 varieties of grasses and clovers were sown in small beds, beside these 12 varieties of North-West native grasses were sown also in small beds. I regret to say that with the exception of two of the native grasses, all were entirely destroyed and could not be replaced in time to do any good the same season.

FODDER PLANTS.

Hay being scarce in many parts of the country, tests were made the past summer with different plants and grains, with the view of finding substitutes for fall and winter feeding. On account of the dry weather no great success has been obtained, though entire failure has not been the result of the trials so far made.

Thirteen varieties of corn were planted from the 24th May to the 1st of June. Some were planted in rows 4 feet apart and 3 feet in the rows, some in rows 2 feet apart and 1 foot in the rows, while others were sown by drill in rows 14 inches apart. The corn planted in rows 4 feet apart made the greatest length, that in rows 2 feet apart the most bulk, while the corn sown by drill was very poor; Red Cob Ensilage, Horse Tooth, Early Minnesota, Giant Prolific and Sweet Ensilage, making the greatest bulk. These five varieties were in tassle when cut down on the 6th September for fear of frost, which came two days after.

Early Corey and Early Marblehead were very short but much earlier than any other sort planted, and with a more favorable year would, no doubt, ripen. The

remaining varieties planted were Angel of Midnight, Longfellow, Self-Husking, Eight-Rowed Yellow, White Flint and Canada Yellow. These were mostly planted in shelter belt among trees and left to retain snow. All were very poor and very late.

In addition to corn, 5 varieties of Millet were tested, Common, Golden, White, Yellow and Large African. The common Millet was entirely smothered by dust a few days after it came up, was sown a second time, making half a ton per acre. The other varieties did not head out, the best only making a growth of a few inches.

About half an acre of Rape was sown on the 1st of June, and notwithstanding winds and dry weather, made a very fine showing. Without a doubt this plant will make a most valuable fodder for summer or early fall feeding for sheep, and as we have little rains and no dews, no danger need be apprehended from cattle eating it.

Some Indian fodder plants were sown, but arriving late, and the season not being favorable, they made poor growth.

Spring Rye was also sown for fodder; from the rapid and strong growth made it will without a doubt make a valuable substitute for hay if cut before the straw becomes too hard. As it matures long before any frost comes, it is believed with a good silo, this cereal will make first-class ensilage—sown 9th April, harvest 29th July. A mixture of oats and peas were also sown for fodder; the oats so completely smothered out the peas that the field was left for an oat crop—$\frac{2}{3}$ oats and $\frac{1}{3}$ peas were sown at the rate of 3 bushels per acre.

FLAX.

A small plot of flax was sown on the 18th April—like the millet it was smothered with dirt—was a second time sown, but being late, frost injured it before fully ripe.

BUCKWHEAT.

Four varieties of buckwheat were tried—common, Japanese, and two from India. The common and Japanese were greatly retarded in their growth by winds injuring their tender leaves. The common variety stood the unfavorable weather best, and though very short in the straw ripened before frost came. The Japanese was cut down before maturing, while the two from India did not head out. All the varieties were sown on 13th May.

ROOTS AND VEGETABLES.

The past season has been the worst on roots and vegetables since 1882, and it is safe to say that not one settler in twenty in the North-West has any to use—very few ever attempt to grow field roots of any kind, yet they can be raised with as little trouble and less expense than in Ontario. Settlers generally plant a few potatoes. If the season is favorable a good crop is raised, if poor, failure is the result, yet in no country is a crop so sure, if the land is in proper condition. It is true the yield may not be large in a year such as just passed, but entire failure need never be apprehended. So far we have no bugs. Rot is unknown, and the only danger to be guarded against is dry weather. By planting on fallow land, and keeping the surface often stirred this may be greatly avoided, and a fair crop is almost absolutely sure, no matter how dry the season may be.

On the Experimental Farm seven varieties of turnips were tried. The land had been fallowed, and ten days before sowing the seed, was ploughed, harrowed and rolled. A new way of sowing the seed was tried, and, proving successful, can be recommended wherever dry weather is experienced. In making the ordinary turnip drill, the plough throws fresh soil up, and along this fresh soil—but on the ground not stirred—the seed was sown, the plough going back to complete the drill covered the seed two inches deep. When all was done, a heavy roller was used and the new soil packed firmly on the old. Three days after the seed was sown the plants were above ground, and not until their leaves covered the ground did dry weather or anything else retard their growth.

Seed was sown in the first week in June, two pounds per acre being used—drills 33 inches apart. Once a week the scruffler was used among them and the top soil kept well loosened. Over 300 bushels per acre were obtained, and but for the dry weather the crop would have been a heavy one. The varieties sown were Carter's Hardy Swede, Carter's King of Swedes, Queen of Swedes, Elephant Swede, Orange Jelly, Early Milan and Snow Ball. Elephant Swede did the best and Queen of Swedes the worst of any sown.

Three varieties of mangels were tried: New Golden Intermediate, New Tankard and Mammoth Long Red. These were sown in drills 33 inches apart in the last week in May. Like the turnips, they grew from the start. In the entire plot there was not a blank, and though, as with the turnips, dry weather lessened the yield, nearly 400 bushels per acre were secured. Mammoth Long Red 1st, New Golden Intermediate 2nd, and New Tankard 3rd, being the order in which the three sorts yielded.

CARROTS.

Two sorts were sown: Belgian and Orange Giant. Although the land was the same and had been worked in the same way as for turnips and mangels, yet the crop was a very great failure. As is well known, carrots take a long time to germinate. No doubt this and dry weather accounts for the poor crop.

POTATOES.

Six pounds each of 108 varieties of this root were planted on the 11th of May The land had been fallowed and a few days before planting was ploughed, well harrowed and rolled. Early in the fall before, 20 loads of well rotted barnyard manure had been applied. When ready to plant, drills 33 inches apart were opened, the seed dropped 14 inches apart, then covered with the plough, harrowed and rolled down. When commencing to appear above ground the harrow was run twice over them, and once each week afterwards the scruffler was used and the soil kept loose on top. When nearly covering the ground earth was hilled up to the plants and then left until they were taken up.

Fourteen out of the 108 varieties ripened by the 25th August; 26 others were full grown, though not ripe, when frost on the 9th September cut down the vines. The remainder were in all stages of growth at this date and are evidently not suited to our season.

Though all the sorts are not yet tested as to their eating qualities, Early Rose, Beauty of Hebron and Morning Star are found to be as good, if not better, than any. Early Conqueror, which gave the largest yield and also had the greatest number of large tubers, is not so good a table potato as the three above mentioned.

The names of potatoes full grown at time of frost are given below: the first fourteen being those that were ripe on the 25th August. Color, size and yield are also given.

The 40 varieties returned 2,345 lbs. from 240 lbs. planted, an average in round numbers of 58 lbs. each. Each sort occupied a drill 75 feet long by 33 inches wide, or the 211th part of an acre, returning an average of 204 bushels per acre, Early Conqueror leading at the rate of 282 bushels per acre.

POTATOES.

Variety.	Color.	Size.	Yield.
			Lbs.
Early Rose	Brown	Large	64
Morning Star	do	do	60
Beauty of Hebron	do	do	54
Lee's Extra Early	Red	do	64
Stray Beauty	Brown	do	48
Early Bird	White	do	73
May Queen	Red	Medium	47
Gleason	Blue	do	50
Matchless	Red	do	40
Rosy Morn	Brown	Large	64
Wonder of the World	Red	Medium	60
Sharpe's Seedling	do	do	68
Bliss's Triumph	do	Large	58
Early Ohio	Brown	Medium	54
Richter's	White	Large	66
Brownell's Beauty	do	do	46
Clark's Triumph	Brown	do	56
Adirondack	White	do	46
Alpha	Brown	do	50
Richter's Gem	White	Small	62
Jumbo	do	Large	67
Member of Parliament	do	do	53
Great Eastern	do	do	60
Rose's New Giant	do	do	70
Empire State	do	do	65
Harrison	do	do	50
Conqueror	do	do	68
Goodrich	do	do	58
St. Patrick	do	Medium	62
Early Bird	do	do	68
Thorburn	Red	Large	63
White Elephant	White	do	52
Thorburn's Paragon	do	Medium	56
Early Conqueror	do	Large	83
Genesse Seedling	do	do	46
Snow Flake	do	do	48
Vick's Pride	do	do	56
White Star	do	do	76
Sugar	do	Medium	55

VEGETABLE GARDEN.

A good plot of ground was set apart for a garden, and at the proper season all kinds of vegetables were sown or planted. Before anything had made a start, the seeds were swept away, and afterwards were found growing a quarter of a mile off. After a fresh supply of seeds could be obtained from Ontario, the garden was sown the second time, but as it was late before this could be done, onions, carrots and parsnips were a failure, while beets, beans, lettuce and raddish were very good. Cabbage and cauliflower were set out four times and as often destroyed, but from the fifth planting a fair crop of medium-sized heads were obtained. Tomatoes were four times destroyed, but from a few plants set out in a protected place, a good crop was obtained, though only very few ripened before frost came. Citrons and cucumbers were of medium size. Peppers full grown. Watermelons, squash and pumpkins very poor.

FOREST TREES.

The season has been one of very great severity on all kinds of trees; most of March was very mild, and the frost going out of the ground nearly a foot, trees suffered greatly by the alternate thawing and freezing which took place from 27th March, up to 15th April. After this date winds commenced and twice cut all young leaves or buds that had before started. After the winds were over, dry weather set

in and finished the destruction of many hundreds of trees set out in the spring, as well as retarding the growth of all that were planted last year and had survived the winter.

While no kind of tree was proof against so many enemies, some suffered much more than others. Norway spruce, which last year did remarkably well, is this year almost a total failure, arbor vitæ also suffered greatly. Austrian pine did very poorly last year, but much worse this. Native maple, (box elder) and native elm trees have stood by far the best of anything set out. It is worthy of notice that out of 982 young elm trees which were grown at the Central Experimental Farm, Ottawa, from seed obtained in Manitoba, 955 are living; while out of 600 American elms, sent also from the Central Experimental Farm, only 350 are alive.

Eleven thousand eight hundred and twelve trees were received from the Central Experimental Farm and set out in various places on the farm here, and great numbers were planted in a wind-break which is being formed along the western boundary, others were set out around Superintendent's house, while all seedlings and many entire varieties were planted in nursery rows. In addition to those received from the Central Farm, several thousands were transplanted from those put out the year before. The large majority of these had been taken up the fall previous and covered with sand in a cellar.

The following varieties of forest trees were received from the Central Experimental Farm and planted; the amount in each variety and number living when winter set in are also given:—

Variety.	No. Received.	No. Living.
White Spruce	1,018	602
Norway Spruce	675	100
Hemlock Spruce	153	21
Scotch Pine	421	198
Austrian Pine	400	158
Riga Pine	43	28
Arbor Vitæ	650	158
Red Cedar	50	48
Manitoba Maple	500	450
Norway Maple	875	652
Soft Maple	75	26
Rock Elm	135	125
Manitoba Elm	982	955
American Elm	600	350
Green Ash	95	60
White Ash	140	116
Black Ash	105	98
Mountain Ash	75	64
Yellow Birch	71	61
European Birch	50	43
Canoe Birch	100	80
Black Walnut	53	30
Locust	374	186
Catalpa	850	559
Black Cherry	114	89
American Beech	200	32
Cotton Wood	2,000	216
Barberry	118	104
European Alder	50	42
American Sycamore	41	34
European Larch	500	100

NOTE.—The Cotton Woods were received from Minnesota, United States, and were in a very damaged condition on reaching here.

FOREST TREES PLANTED IN 1888.

In reporting on the trees planted last year, I beg to say that native maple, mountain pine, Norway spruce, red cedar, American arbor vitæ, elm, ash, mountain ash, canoe birch, Russian mulberry, black cherry, barberry, cranberry, alder and wahoo came through the winter in a more or less damaged condition; mountain pine, canoe birch and mountain ash standing it the best. Norway spruce and the cedars apparently came out well, but have done poorly all summer.

Maples were all cut down and only the native variety and Norway maple making a start in the spring. Not a single soft, sugar, red or striped maple grew. White and black ash were cut down, but made a fair growth during the summer. Green ash was also cut down to the ground but many grew afterwards. Five varieties of elms were planted and made a nice growth during the summer of 1888. These were all greatly injured, only about one-third grew the past season. Russian mulberry and black cherry have stood the winter and dry summer well. Barberry, cranberry, alder and wahoo were damaged very little by the winter, but have done poorly since.

I regret to say that locusts, butternuts, walnuts, oaks, beech, basswood, hickory, sycamore, Lackberry, hawthorn, hornbeam, ailanthus and catalpas were all dead when spring opened. Except one locust and four walnuts, not a tree of any of these varieties stood the winter. I may say that all the last-mentioned trees, hickory, butternut, &c., were dead before spring frosts visited us, while all the damage done to the first named varieties was mainly owing to these frosts; especially was this the case with Norway spruce, hemlock spruce and the cedars.

Before winter set in last year, I had a number of each of all the above varieties taken up, numbering in all several thousands, and placed in saud in the cellar, and this spring had them planted in wind-breaks and on banks of coulée. I regret to say that nearly all have died; though green and fresh when set out, they soon succumbed to winds and dry weather.

LARGE MAPLE TREES PLANTED.

Early in October, 1888, 700 maple trees (box elder) were obtained in Brandon. Of these, two-thirds were planted as soon as possible after reaching here, and one-third healed in and left until spring. The trees were planted along boundaries of farm and on avenues leading to buildings. With the exception of four, every tree of both fall and spring planting died down to the ground. At this point I had them cut off in June, and, without a single exception, all have made a most vigorous growth since then. The four that did not require to be cut down were entirely healed in or covered up, the branches being covered the same as the roots.

TREE SEEDS.

In the fall of 1888 some four bushels of ash-leaved maple seed, gathered in the Qu'Appelle Valley, were sown in drills three feet apart. This spring they appeared above ground, but before they could take much root were blown completely out of the ground. The same land with considerate addition was resown, and though late before this could be done have grown fairly well—though nothing in comparison to the growth of the same sort of trees the season before. Two bushels of hickory and walnuts were planted in May, forty-three young trees six inches in height is so far the result, but a large increase is looked for next spring. In September last several pounds of elm, and in October a large quantity of maple seeds were sown.

Maple tree seeds sown in spring of 1888 which attained a height of from ten to twenty inches last summer, were several times early in the season almost covered with dirt blown in from adjoining land. This considerably retarded their growth at first but during August and September good headway was made. Many thousands will be ready for transplanting next year.

Ash seed which was sown in spring of 1888 came up making slow growth that year, made also very slow this. Sugar maple and basswood seed failed to appear, but in all probability they were blown away.

WILLOWS, POPLARS AND SHRUBS.

Nine varieties of willow were planted in the spring in nursery rows. Forty-five out of the forty-six set out are alive and made good growth, and promise well for this country.

Twenty-five out of twenty-six poplars set out are living and made a thrifty growth. Eight varieties of this tree were planted of which Populus Certinensis Sargeant, and Populus Bolleana are the best. A considerable number of poplar cuttings were also set out, the greater part of which, took root and made a good top.

Seventy-one varieties, consisting of 1863 shrubs, were planted. Among these lilac, caragana, and eleagnus did the best. The two latter shrubs were planted also in 1888 and of the trees or shrubs put out, stood the winter and dry summer by far the best.

Out of all the shrubs planted only 963 are living, of some varieties the entire number is lost.

LARGE AND SMALL FRUITS.

The failures in fruit trees the past year have been very great. In comparison with 1888 they are quite noticeable. Last year 200 apple trees were planted; every tree was alive when winter set in and 125 are living now. This year 352 trees were set out, and on the 1st October 92 were dead.

Twelve crab apple trees were planted in 1888, ten were living on 1st October, 1889, while out of 189 trees set out this spring 97 were dead on the same date.

In small fruits the failures are equally great among currants and raspberries, while strawberries were almost an entire loss. As the soil was in far better condition for trees or small fruits this year than last, and as much care taken in planting them and afterwards, there can be no doubt but that the severe winds and dry weather wholly accounts for the loss sustained.

APPLE TREES, 1889.

The following apple trees were planted last spring in nursery rows three feet apart. Number of each sort planted and living on 1st November are also given:—

	No. Planted.	No. Living.		No. Planted.	No. Living.
Arabka Dept	25	20	Hibernal	4	1
Longfield	10	0	Yellow Anis	7	5
Mottled Anis	11	6	Vargul	3	2
Repka Malenka	9	4	Sandy Glass	13	8
Whitney No. 20	19	18	Ukraine	3	3
Arabka	10	10	Liveland	7	0
Titovka	10	7	Russian Apple	6	2
Barloff	5	4	Plikanoff	10	7
English Borovinka	4	4	Red Anis	11	11
Red Anis	8	3	Autumn Streaked	10	9
G. Duke Constantine	4	0	Leiby	10	9
Zalotoreff	3	3	Yellow Anis	10	8
Bogdanoff	1	1	Getmans	4	2
Ostrakoff	6	3	White Borodovka	8	7
Enormous	8	5	Hibernal	10	8
Rennet	2	1	Titovka	10	10
Cross	7	5	Titus	10	8
Antonovka	19	19	Grandmother	10	10
Switzer, Dept	9	9	Red Duck	10	10
Golden White	9	5	43 varieties Russian apple trees	...	...
Babushkino	8	5			
Herren	4	3			
Red Repka	3	3	Total	342	257
Label defaced	2	2			

CRAB APPLES, 1889.

	No. Planted.	No. Living.		No. Planted.	No. Living.
Common wild crab	80	44	Orange	30	6
Stanley	22	21	Late Winter	9	3
Minnesota	8	0	Welcome	10	9
Briers' Sweet	10	2			
Gibb	20	7	Total	189	92

APPLE TREES PLANTED 1888.

Alexander	8	6	Mann	9	4
Wealthy	3	3	Duchess	5	4
Walbridge	3	1	Scott's Winter	3	1
Mackintosh Red	3	2	Grimes' Golden	3	1
Talmans Sweet	3	2	Tetofsky	3	1
Keswick Codling	3	2	Canada Baldwin	3	3
Red Astrachan	3	2	Fameuse	6	2
Anis	3	3			
Golden Russet	3	1	Total	64	38

CRAB APPLE TREES, 1888.

Hyslop	3	2	Whitney	3	3
Transcendant	3	3			
Red Siberian	3	2	Total	12	10

PEARS.

In 1888, 2 Beurré Hardy, 2 Clapp's Favorite, 2 Howell, 2 Flemish Beauty, 2 Seckel, also 5 of No. 392, and 5 of 347 Russian were planted. At present only one Flemish Beauty is living. All the other varieties died. No pears were set out this year.

PLUMS.

Two each of Golden Drop, Moore's Arctic, Lombard, Mariana and German Prune, and 5 each of Wolf Plum, Speer Plum, and Rollingston and 9 of Early Red were planted last year. Of these one each of Moore's Arctic, Lombard, Mariana, and German Prune, and 7 of the Early Red, are alive. None were added to the list this year.

CHERRIES.

Thirty-four cherry trees were planted in 1888, consisting of five each of Ostheim, Morella, Vladimir and Early Richmond. Two Vladimir and one Early Richmond stood the winter.

With a few exceptions, all the large fruit trees put out last year were wrapped up to the branches with oat straw or tarred paper and banked well up around the base. It was found in the spring that the few trees left uncovered were completely dead from the top of the limbs to the ground on the south-west side; the strip dead being about one half an inch in width. No tree covered was hurt in this way, those dying were killed later on after frost had gone from their roots and alternate thawing and freezing took place.

This year a good deal more straw is being used, the limbs, as well as the trunks, being covered. More earth is also put about the base and before winter is over coarse strawy manure will be spread thickly over the ground.

CURRANTS.

This year's plantation consisted of five varieties containing 744 trees. On the 1st November 555 bushes were alive. Last year 178 bushes of eight varieties were planted; of this number 153 were living when winter set in; with the exception of two dozen planted in a protected place, none of the bushes this year have done very well; many have died and those that have survived seem stunted.

Those that came through the winter of last year's planting have done very well the past season and give good promise for the coming year. Lee's Prolific, Red Dutch and White Grape, bore a few currants of excellent quality.

The ground was banked up around the trunks slightly last year, this year it is heaped up to the branches and the branches covered with coarse manure which will be left on until all danger from spring frosts is over.

The following are the varieties set out, in 1888 and 1889, number planted and living at present time :—

1888.

	No. Planted.	No. Living.		No. Planted.	No. Living.
Victoria	25	24	Lee's Prolific	24	20
Champion	12	10	Fay's Prolific	25	25
Raby Castle	27	20	Red Dutch	20	16
White Grape	20	15	Black Naples	25	23
		1889.			
Lee's Prolific	325	246	Raby Castle	228	159
White Grape	165	129	Black Naples	19	19
Red Grape	7	6			

RASPBERRIES AND BLACKBERRIES.

Like the currants, great numbers of the raspberries set out in the spring, succumbed to winds and dry weather; winds did more harm than dry weather, for in a small plantation set out, protected from them, though the soil was quite as dry as any on the Farm, the growth of the vines was very gratifying.

The bushes planted last year were laid down on the approach of winter and covered with about two inches of earth or coarse manure. A good deal of this earth or straw was blown from off the vines, and wherever this was the case, the vines were quite dead as far as uncovered; all that had their covering on up to the 10th of April were quite green and perfect. Shortly after this, the vines putting forth leaves under the covering, I had them all stripped except a few vines of the Philadelphia variety, but it proved too early, as every vine so stripped was cut down a few nights after, and only those not uncovered until the 20th of the month bore fruit.

In the fall I had as much earth put over the vines, and in addition a heavy coating of strawy manure is now being applied over all.

Those of last year's planting have made a good growth this season, except Taylor and Lucretia Dewberry; Philadelphia making the greatest headway.

1888.

Varieties.	No. Planted.	No. Living.	Varieties.	No. Planted.	No. Living.
Golden Queen	26	20	Caroline	48	42
Turner	107	104	Cuthbert	104	100
Hansel	23	10	Philadelphia	99	96
Snyder	28	15	Taylor	25	10
Lucretia Dewberry	25	None			

1889.

Turner	249	227	Hilborn	53	45
Cuthbert	75	22	Mammoth Cluster	79	48
Doolittle	22	3	Rancocas	18	14
Taylor	8	None	Snyder	10	9
Parnell	8	3	Clarke	11	8
Reider	10	10	Marlboro'	9	7
Brandy-wine	20	14	Hornet	9	3
Hebner's Cluster	3	2			

GOOSEBERRIES.

During the spring of 1888 twenty-four Houghton, twenty-four Downing, and twenty-six Smith's Improved were planted. Four of Smith's Improved died before winter set in. With this exception all are living at present. Only a few bushes of the Houghton variety bore fruit the past season, but it is expected from the good growth made this year they will bear heavily next summer.

None were set out this season.

GRAPES.

Sixty-four vines of eighteen varieties of grapes were planted last year, but none lived through the winter though all were well protected.

STRAWBERRIES.

If poor success attended last year's planting of strawberries, it was still worse this year; out of nearly 3,000 plants only 100 are alive. All or mostly all made a start, but a very hot wind in May, followed by the dry weather afterwards, killed them by hundreds.

Last year May King, Wilson, Daniel Boone, Woodruff, Crescent, Manchester, Sharpless, New Dominion, Maggie, Capt. Jack, Cumberland Triumph and James Vick were planted. The Wilson made the best growth and was the most promising when winter set in; this spring, though all the plants were living, they bore no fruit and have made little or no headway all summer. New Dominion, Capt. Jack and Crescent stood the winter and spring fairly well, and each variety had a few imperfect berries this season. New Dominion, both in growth of plant and yield of berries, doing the best. Excepting these three varieties and the Wilson all were dead by the first of May.

A slight covering of straw was put over the plants last winter after the ground had become frozen, and left on until spring frosts were over. This winter the same course is being followed, but more straw is being put on.

WILD FRUIT.

In the spring of 1888 a collection of native fruit trees and bushes was obtained in coulées and other places, and planted on the farm, and though all made a most vigorous growth during that summer, none bore fruit this year except a few bushes of black currants. Spring frost, no doubt, was wholly the cause of this, and when we consider that wild fruit was an entire failure the past year, while other years thousands of bushels go to waste all over the country, we may easily conclude that the past season has been a very unfavorable one for all fruit trees.

It is, perhaps, worthy of notice here that all native fruit trees or bushes grow on the south bank of streams or in coulées protected from the early spring sun. The steeper the banks, and the more inaccessible they are to April or May suns, the more favourable situations they are for fruit.

GOPHERS.

In many parts of the North-West Territories, these destructive little animals were very numerous the past season. Wherever crops were light—from whatever cause—they did great damage, in many cases clearing off entire fields. In light, sandy soil or gravelly subsoil they are found in the greatest numbers, though no sort of land is exempt.

On the Experimental Farm poison was used to keep them in check, and except one small plot of black barley on the banks of the coulée, which was destroyed, no harm was done to the crops the past year.

Commencing in the spring, as soon as the animals come out of their winter quarters, strychnine is dissolved in water and wheat soaked in this, and placed in their burrows. As usually from eight to ten come at a birth, often more, it is very important that attention should be paid early to these pests.

WATER.

I am sorry to report that digging or drilling for water on the Farm has not been very satisfactory. Last fall two wells were put down—one at the superintendent's house, 65 feet, in which a good supply of water was obtained, but which cannot be used until first boiled; the second well was dug and drilled, to the depth of 108 feet, at the barn, without finding any water. This fall I have had the Provincial well-auger testing various places about the buildings, but have not as yet been successful in finding a sufficient quantity for stock, hence the only supply yet available is that in the dams in the coulées.

BUILDINGS.

All the buildings under way when my report was sent in last year have been completed. The horse stable is commodious and very comfortable. The basement of the barn is equally commodious, and will no doubt prove comfortable when we have stock to fill it. The barn is quite large enough for grain, but a storehouse or granary for the many varieties of grain when threshed, and an implement house, are greatly needed.

The superintendent's, horticulturist's and foreman's houses are comfortable, though the foreman's is not large enough for the purpose required of it.

FENCING.

Before winter set in last fall a little over one mile of fencing had been completed. As soon as seeding was over this spring, work was again commenced, and before harvest came on the entire Farm was enclosed. Sawn cedar posts from British Columbia, a top rail and four strands of wire compose the fence. Necessary gates for three sides have been provided, and a second coat of paint was being put on when winter stopped the work.

ROADS AND DAMS.

During the summer considerable additions have been made to the roads on the Farm. Two new dams for retaining water in the coulées have been built, and the old ones extended and made more secure. The erection of the buildings necessitated a great deal of grading, especially around the barn and stable, where wide approaches had to be made. This was accomplished as soon as the buildings were ready for use.

LAND READY FOR CROP.

On account of the great addition to the amount of horse work to do on the Farm the past summer, such as root crops, harvesting, grading, &c., the teams on the Farm were not able to overtake the same quantity of fallow as was prepared in 1888. One hundred and fifty acres have, however, been got ready, and twenty acres of stubble land ploughed for testing purposes.

HORSES.

In the month of September one span of horses was added to the working force, making now four teams.

METEOROLOGICAL.

During the summer, through the kindness of the Minister of Marine and Fisheries, there was sent from the Meteorological Office in Toronto to the Experimental Farm a set of instruments for taking observations of temperature and rainfall. Since the first week in September observations have been taken three times daily and returns sent weekly to head office. During this time on six days it has been 80 or over, 87 being the highest. September 9, 11, 12, 14, 16, 17 and 26th were below freezing, the lowest being on the 12th, when it stood at 20 below freezing. Rain has fallen during the time observations have been taken to only ·61 of an inch: snow from 4 to 6 inches. Prevailing winds have been south-west and north-west.

FALL EXHIBITIONS.

Four exhibitions were attended the past fall at which products of the Farm were shown. Regina on the west, Moosomin on the east, and Qu'Appelle and Indian Head in the centre, were found to be as many as could be overtaken after the grain and other exhibits could be got ready. Nearly 100 varieties of grain, including wheat, barley, oats and peas, were shown in 5 lb bags—50 varieties of these were exhibited in the straw; 104 varieties of potatoes were shown and proved very attractive to those attending the various fairs. At the close of the exhibitions all of the potatoes and much of the grain were distributed among the settlers.

I have the honor to be, Sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

WM. SAUNDERS, F.R.S.C., F.L.S., F.C.S.,
Director Experimental Farms,
Ottawa.

SIR,—I beg to submit the following report of the work done on the British Columbia Experimental Farm since taking possession, 19th September, 1889.

None of the land having been in crop since it was purchased by the Government, notwithstanding that much of it was underbrushed last year, it was covered again with a rank growth of ferns and underbrush. This we started to mow with brush scythes, and have gone over about one hundred and twenty acres, and the brush on about seventy acres has been burnt.

The orchard of three acres has been carefully and thoroughly gone over. It has been ploughed twice, the trees dug about and pruned, and all dead limbs, brush and grass removed and burned.

Of the land on the farm that had been previously under cultivation, about twenty-five acres has been ploughed and harrowed; sixteen acres of this has been ploughed twice and thoroughly worked up. We have also ploughed about twenty-five acres of land that had not been ploughed before. This has been a tedious job, as a considerable number of large fir stumps had to be grubbed out and in many instances the whole tree to remove. Some of these trees were over 6 feet in diameter and nearly 200 feet long. This work has been delayed by the rains, rendering the burning very difficult. About half of this field, say fifteen acres, has been thoroughly harrowed and the roots gathered up and taken off, and it is now ready for cross-ploughing as soon as the frost is out of the land.

It is intended to have this ready for fruit trees and other crops early in the spring.

We have received from the Central Farm about 1,500 small fruit plants, viz., strawberries, raspberries, blackberries, gooseberries, currants, etc., all of which have been carefully planted. From other sources also a considerable number of fruit trees and grape vines have been received, as follows:—

	Trees	Varieties.
Apples	277	78
Pears	143	36
Plums	121	36
Peaches	84	26
Cherries	121	48
Apricots	21	7
Nectarines	3	1
Quinces	8	3
Grape vines	202	79

All of which have been put in nursery rows, and will be planted out as soon as the condition of the ground will permit.

About 8,000 forest trees, chiefly of eastern hardwoods, have also come to hand, which are planted in nursery rows, and as they are mostly of one or two years growth, will do very well in nursery until they are needed for shelter belts, etc.

Acting under your instructions, a number of grape vines and a variety of forest trees will be planted on the rocky hillsides on the east side of the farm.

If it can be shown that grapes, or such timber as the black walnut, butternut, elm, ash and maple can be successfully grown in such places, this will provide for utilizing a considerable area of land otherwise of no value, and be a source of future profit to land owners, and a great benefit to the Province.

About fifteen hundred young native cedars have been collected and planted in nursery rows, with the intention of using them for hedges and other ornamental purposes as soon as they are ready to plant out.

From the Central Farm and other sources there has been received a large number of ornamental and flowering shrubs, plants and bulbs, which have been put out in the nursery until land can be got ready for their permanent location. We also have a number of samples of fall wheat and rye, all of which have been sown on land carefully prepared, and quite a number of them have made a very satisfactory growth.

The live stock on the farm consists of two heavy draft teams and one medium team, bought in Ontario and brought out here. By working them carefully for a short time they have become gradually acclimated and have had no sickness as yet. There was also bought in Manitoba one registered short-horn cow and a bull calf. From the poultry department of the Central Farm was obtained four coops of different breeds of fowls of four each. They have grown well, but being young, have not yet begun to lay.

The old house and stable which were on the farm have been repaired, and answer a temporary purpose very well—the house for a boarding house for the men, and the stable for our stock and feed. A temporary poultry house has been built, 24 by 12 feet, divided into compartments, and an implement shed is nearly completed, 27 by 12 feet. This work has been done during stormy weather and at very slight expense.

The ground at present is frozen too hard to plough, but as there are a great number of large stumps to take out and fallen timber to burn, and the frost does not interfere with such work, although the winter is said to be unusually severe, there is plenty of work to be done.

As to the farm itself, I think it could scarcely be more suitable for experimental purposes, as there are all varieties of soil, from a rich clay to a gravel and on the eastern boundary the mountains rise several hundred feet, with narrow benches and slopes, giving a good opportunity to test the value of such places for different kinds of fruit and forest trees.

I have the honour to be, Sir,
Your obedient servant,
THOS. A. SHARPE,
Superintendent.

AGASSIZ, 10th January, 1890.

BULLETIN No. 6.

BARLEY.

By Wm. Saunders, F.R.S.C., F.L.S., F.C.S.,
Director Dominion Experimental Farms.

The barley crop is one of great importance to the farmers of Canada. The annual product of this cereal for the past seven years in Ontario alone is estimated by Mr. Blue, in his Agricultural Statistics of Ontario, at nearly twenty millions of bushels, while the crop for 1888 is put at over twenty-three million bushels. Statistics from other Provinces in the Dominion are not available, but their products would largely augment the figures given. Canadian barley is usually of good quality, and the surplus, not required for home consumption, has heretofore commanded a ready sale, at remunerative prices to maltsters in the United States, and such sales have averaged, during the past eleven years, 9,135,455 bushels annually, yielding an average yearly revenue to Canadian farmers during this period of $6,587,592. The export of barley has materially increased of late years, and as the country becomes more thickly settled and a larger area of land brought under cultivation there will, no doubt, be still larger quantities of this grain to dispose of. During the eleven years referred to, the production of barley in the United States has increased from about 42 million bushels in 1878 to 58 millions in 1889, but the increasing consumption has kept up with the increased supply, and hence the demand for Canadian barley has until recently been maintained.

SUBSTITUTES FOR BARLEY.

The demand for barley for the manufacture of beer in the United States has of late been materially lessened by the use of various substitutes. From official returns published in the United States, it appears that while 2½ bushels of barley were used in the manufacture of a barrel of beer in 1888, only 1 bushel was used for the same quantity in 1889, the balance being chiefly made up of corn, rice and glucose. As these ingredients enable the brewer to make his beer at less cost than from barley alone, it is scarcely probable that Canadian barley, however good it may be, will continue to find a market in the United States in such quantities and at such prices as in the past.

MARKET OF GREAT BRITAIN.

It is important then for Canada, that other outlets be provided for the surplus barley, and the only other country which requires more barley than it produces is Great Britain. The average importation of barley into the United Kingdom for the past eleven years has been about 33 million bushels, the imports for 1888 having been over 40 million bushels. A considerable quantity of this is six-rowed barley, but that is used only for grinding and distilling, and commands but a low price; the grain used for malting, for which there is a very large demand, is two-rowed barley, and of this there are many varieties, all of which, when of good quality, bring relatively high prices. The quota of barley which Canada has sent to Great Britain for the ten years ending with 1887 average 112,000 bushels. In 1878 it was 524,569 bushels, in 1887 only 5,827 bushels, showing that we have practically lost the small market we had there, and for the reasons that we have not grown the varieties of barley which the English maltster requires, and that our six-rowed barley has commanded a better price in the United States than could be obtained for it in Great Britain.

TWO-ROWED *versus* SIX-ROWED BARLEY.

The British brewer's preference for two-rowed barley is very strong, and the question is sometimes asked whether that preference is founded on the greater

intrinsic worth of this sort, or on prejudice arising from long usage. To submit this point to a practical test, a sufficient quantity of the two-rowed malting barley was imported from Great Britain in the early part of 1889 and a like quantity of the best six-rowed barley purchased here. These were sent to a competent Canadian maltster and brewer, and both lots made into beer, and from the report received of the results of this comparative test we learn that the two-rowed barley yielded 13 per cent. more of extract than the six-rowed, showing that the preference for this barley is well founded. The covering or husk forms about one-sixth of the weight in two-rowed barley, and from one-fourth to one-fifth of the six-rowed; this will account for a part of the difference.

It must ever be borne in mind that on no account should the two-rowed and six-rowed varieties of barley be mixed, for when that is the case the sample is of little value for malting purposes, and for this reason: In the manufacture of malt the barley is first steeped to soften it, and when it has reached the proper condition is spread on the floors of the malt-house to germinate; growth is allowed to advance to a certain stage and then suddenly stopped by rapid drying. The plump kernels of the two-rowed barley take longer to soften and are slower in germinating than the comparatively thin grains of the six-rowed, hence the six-rowed will pass through the different stages in the process and be ready for drying from one to two days sooner than the two-rowed. To leave the six-rowed that length of time on the floor after it is ready for drying would result in decay and the growth of mould, which would seriously injure the quality of the malt. For this reason no maltster will have anything to do with mixed barleys.

CAN TWO-ROWED BARLEY BE SUCCESSFULLY GROWN IN CANADA?

This is a vital question, which demands careful consideration. Since the establishment of the Experimental Farms of the Dominion an extensive series of experiments have been planned and carried out for the purpose of obtaining evidence on this point, and of ascertaining what varieties of two-rowed barley are most suitable and what districts are likely to produce the best samples. These tests have been undertaken on a comparatively large scale by the several Experimental Farms, and in order that the experiments might be made to cover as large an area as possible, sample bags of two-rowed barley of about three pounds each have been distributed among farmers throughout the Dominion for test.

RESULTS OF TESTS ON THE EXPERIMENTAL FARMS.

The cultivation of barley on the Central Experimental Farm has been carried on with many sorts and in several different methods. Experiments with field crops have been conducted to ascertain the relative yield and quality of the several varieties under such conditions, and also with the individual sorts grown under exactly the same circumstances, with the view of testing their relative tendencies to fertility. The fact is too often overlooked that there is in every variety of grain, and indeed in every kernel of each variety, an inherent impress of vigour and productiveness which favorable conditions will always bring out and which unfavorable conditions cannot entirely suppress. With a view of obtaining light on this very instructive problem the following methods were adopted, which have been carried out for the past two years on the Central Farm:

A very uniform piece of land was selected—a sandy loam, rather light in character—this had received a coating of barnyard manure in the spring of 1887, which was followed by a crop of spring wheat. The land was ploughed early in the autumn and lightly ploughed and harrowed the following spring. Fifty kernels of each variety of barley were planted in two rows, the grains being placed a foot apart and with two feet of space between each sort. Every seed had thus ample room for development, and when the grain was two or three inches high a uniform top dressing was given to the whole of a mixture of fertilizers in the following proportions per acre—200 lbs. of nitrate of soda, 500 lbs. of bone dust, and 1,000 lbs. of

unleached wood ashes. The growing grain was occasionally hoed to keep the ground free from weeds, and when ripe the crop of 1888 was harvested as follows:—One of the best examples of each sort was threshed and cleaned separately, the number of heads counted and the yield ascertained; a second selection of three or four more of the most vigorous plants were similarly treated, and those remaining were harvested together and their average yield obtained. During 1889 the same varieties were planted, with such additional sorts as could be got, and the whole of the plants in each case harvested and threshed together. In the following table the results of these tests are given, the number of heads on the single selected plant in 1888, also the yield, the average number of grains obtained from the second selection of three or four plants, the number of plants remaining and the average yield of these unselected ones, followed by a column in which the average of the whole is given. The number of single plants of each sort which matured in 1888 is also given and the average yield in each case. A ready means is thus afforded of comparing the fertility of the different varieties, also the results obtained from the same variety for the past two years.

Those sorts of which a record is given for 1889 only were not obtained until the spring of that year.

Two-Rowed Malting Barley.	Records for 1888.						1889.	
	Single Selected Plants.		Second Selecti'n	Unselected Plants.		Total Aver'ge.	No. of Plants.	Average No. of Grains.
	No. of Heads	No. of Grains.	Average No. of Grains.	No. of Grains.	Average No. of Grains.			
1 Annet Scotch	44	778	493	27	314	359	45	628
2 Australian	23	523	366	43	278	290	46	684
3 Bestehorns	42	834	630	39	498	515	40	783
4 Beardless	.....	.....	.....	.....	.....	.....	17	596
5 California	33	680	755	41	587	554	43	549
6 Chevalier (from Germany)	28	498	373	37	325	333	44	546
7 Chevalier, Danish	51	1203	733	40	512	543	45	691
8 Chevalier, Danish Printice	36	832	593	40	421	445	43	653
9 Chevalier, Improved, O. & M.	29	581	436	43	300	317	26	430
10 Chevalier, Scholeys	38	799	590	34	419	442	40	568
11 Chevalier, Hallet's Pedigree	61	907	509	41	380	400	43	583
12 Carter's Prize Prolific	.....	.....	.....	.....	.....	.....	45	546
13 Cheyney	29	694	687	34	446	471	40	605
14 Danish (from London Market)	49	997	950	37	623	656	48	613
15 Denmark (from Germany)	29	702	569	30	544	549	46	722
16 Dutch (from Germany)	37	816	719	40	348	384	.....	.....
17 English Malting	42	886	412	30	481	487	43	666
18 Emperor	27	633	519	41	440	449	41	624
19 Golden Drop	28	684	694	38	446	469	36	656
20 Golden Melon (from Germany)	36	784	657	33	476	499	38	693
21 Golden Melon, Improved O. & M.	33	776	564	39	406	425	37	610
22 Italian	41	902	490	40	452	466	46	684
23 Kalina	17	332	428	40	355	361	43	652
24 Imperial	32	663	428	32	284	306	46	600
25 New Zealand	58	1114	918	33	692	721	46	794
26 Odessa	31	677	.....	12	439	457	44	933
27 Peacock	27	746	463	36	476	481	41	543
28 Prolific	48	609	726	33	454	469	44	686
29 Phœnix von Thalen	23	529	436	40	307	322	45	715
30 Peerless White	36	913	777	41	540	564	39	616
31 Screened French	49	1014	672	40	389	422	44	586
32 Swedish	56	943	939	30	590	601	45	644
33 Thanet, Improved	28	749	737	39	508	529	42	707
34 Victoria	43	309	303	31	361	354	43	732
35 White Erfurt	32	686	762	40	426	454	46	686

The dates of sowing and harvesting have also been recorded and the average time required for the two-rowed barleys in 1888 was 86 days, and in 1889 111 days,

showing a wide difference in this respect between the two seasons, the former of which was very dry, the latter very wet—probably 95 to 100 days would be about the average of a series of years in the Ottawa district.

All the varieties of two-rowed barley are later in ripening than the six-rowed sorts, the difference varying from five or six to ten or twelve days.

In comparing the average results for 1888 with those for 1889, it will be seen that all the varieties have yielded better during the year, some of them giving double, and in one or two instances nearly three times the crop of the previous year. The season was not very favorable, although perhaps more so for barley than that of 1888. A part of this increase is no doubt due to the fact that the seed from which these late samples were produced was all carefully selected, the kernels large and plump and taken from the grain grown as single plants in 1888, whereas those sown in 1888 were average grains taken without selection from a field crop. Possibly some portion of the increase may also be due to acclimatization, for it is an undoubted fact that barley brought from another, and perhaps dissimilar and distant climate, seldom does so well the first year as it will the second or third season.

Several varieties of two-rowed malting barley were not received in time to be sown with the others, and the kernels were planted a foot apart like the others, but from 10 to 16 days later. The results are instructive as pointing to the advantage of early sowing:—

	No. of plants.	Average No. of grains.
Selected Chevalier O. and M.	37	177
Early Minting	37	141
Peerless White	35	197
Californian Chevalier	29	169
Dutch	37	174
Frobestier	33	142

FIELD CROPS OF TWO-ROWED BARLEY ON THE EXPERIMENTAL FARMS, 1890.

	Central Experimental Farm.		Exp. Farm. Brandon, Manitoba.		Exp. Farm, Ind. Head, N.W.T.		Exp. Farm, Nappan, N.S.			
	Yield per acre.	Weight per bush.	Yield per acre.	Weight per bush.	Yield per acre.	Weight per bush.	Quantity sown.	Weight of yield.	Weight per bush.	Weight per bus. of seed imported.
	Bus.	Lbs.					Bus.	Lbs.	Lbs.	
Beardless	50½	51⅜	..	54½	27¼	55	..	..	..	56
California	21¼	49¼	..	..	..	..	..	..	..	..
Carter's Prize Prolific	31½	50½	..	54	..	..	4	2622	52½	54½
Chevalier, Danish	31⅛	50½	27¾	56	12⅜	55	2	748	51½	57
Chevalier, Danish Printice	36¼	50¼	..	55½	14	53½	2	644	52	..
Chevalier, Improved O. & M.	..	..	..	..	26⅔	53	..	..	..	..
Chevalier, Selected O. & M.	31⅛	51	..	..	12	52	3 lbs.	41	52	..
Early Minting	25⅜	50⅜	..	..	13⅜	53½	..	..	..	..
English Malting	34¼	50½	27	53	23⅛	52½	..	..	..	54½
Golden Melon Improved	26	48¼	..	54½	17⅜	55	..	..	..	58
New Zealand	26½	51	..	55½	23	54	1 bus.	350	52½	..
Peerless White	36½	51	..	54¼	18⅜	52	3 lbs.	40	52	..
Swedish	49	50¼	..	55	24½	55¼	..	..	..	..
Thanet Improved	44	48½	..	55	21⅓	52¼	..	..	..	..
Saale	22	51	..	..	19½	53	6 lbs.	74	51½	55½

Ten varieties were grown in field plots on the Experimental Farm at Brandon, but the yield per acre is given of two only, for the reason that these were sown on summer fallow, the others on wheat stubble, and under such different conditions any comparison as to yield in a dry season would be misleading and throw discredit on varieties which would have made a good record on summer fallow. In these instances the weight per bushel only are given. The yield on wheat stubble varied from 14 to 6¼ bushels per acre.

The Superintendent of the Indian Head Farm, when submitting his report, says: "Thanet and Danish Chevalier were greatly injured by winds. The small yield and light weight of Saale, Early Minting, Selected Chevalier and Peerless White is, no doubt, owing to their having been sown so late. The seed was very fine, and had they been got in early would have made much better returns."

The samples of the crops received from Brandon and Indian Head are very bright and handsome; those from Nappan, N.S., and those grown at Ottawa are good samples, but more or less discolored.

The Carter's Prize Cluster and Saale barleys were obtained from James Carter & Co., London, England; Beardless, Improved Chevalier, Selected Chevalier, Early Minting, Improved Golden Melon, Peerless White and Improved Thanet, from Oakshott & Millard, Reading, England; Danish Chevalier and Danish Printice Chevalier, through the courtesy of the President of the Danish Royal Agricultural Society at Copenhagen; Danish, English Malting, New Zealand and Swedish, from Harris & Co., London. England, and the other varieties from Haage & Schmidt, of Erfurt, Germany. All the samples of seed imported were unusually fine, and weighed from 54 to 57 pounds per bushel.

RESULTS OF BARLEY DISTRIBUTION.

We shall next consider the results obtained by farmers in different parts of the Dominion from the samples of two-rowed malting barley which were distributed for test; 946 sample bags were sent out, containing from 2¾ lbs. to 3 lbs. each. Some of the farmers have reported promptly, but a large number of the reports are yet to come in. The following are taken from among the more favorable results:—

Carter's Prize Prolific.

This variety, judging from thirty reports received, has succeeded remarkably well. In Ontario, Henry Jennings, of Victoria Square, got 176 lbs., weighing 53 lbs. per bushel; Henry R. Wilson, Winona, 147 lbs., which weighed 55¼ lbs. per bushel; Duncan McDonald, of Glen Robertson, Glengarry, had 120 lbs., weighing 52½ lbs. to the bushel; and Colin Philips, of Brougham, got 110 lbs., which weighed 54 lbs. per bushel.

In Quebec, Duncan Stewart, of Inverness, had 60 lbs., which weighed 53¼ lbs. per bushel; and Joseph Guérin, of St. Gabriel de Montréal, 45 lbs., weighing 51½ lbs. per bushel.

In New Brunswick, W. T. Hall, of Georgetown, had 47 lbs., weighing 48½ lbs. per bushel; other samples sent from this Province weighed 53½ and 50½ lbs. per bushel, but the yield is not given. No reports on this barley are yet in from Nova Scotia. In Prince Edward Island, Benjamin Cole, of Centreville, got 95 lbs., an extra good sample, which weighed 50 lbs. to the bushel.

In Manitoba, McKee Bros., of Heaslip, had a yield of from 80 to 90 lbs., weighing 51 lbs. to the bushel; and Duncan McCuaig, of Portage la Prairie, 68 lbs., which weighed 52⅔ lbs. per bushel. Major Boulton, of Shellmouth, sends a sample which weighs 52 lbs. to the bushel, but was unable to give the exact yield.

From Moose Jaw, N.W.T., Mr. John Smail had a yield of 100 lbs., which weighed 53 lbs. per bushel; and from British Columbia comes a report of the largest yield yet recorded: Mr. S. A. Agassiz, of Agassiz, had a crop of 365 lbs. from 2½ lbs. of seed.

Danish Chevalier.

This variety also promises well. From Ontario samples have been received from George Fisher, of Freeman, who harvested 125 lbs. from 1 lbs. 13 oz. of seed, weighing 54¼ lbs. per bushel; Daniel Baxter, of Belmont, had 115 lbs.; J. J. Coyne, Chesterville, 96 lbs., which weighed 48 lbs. to the bushel; A. W. Peart, of Freeman, 94 lbs., weighing 52 lbs. per bushel, and Thomas Manderson, of Myrtle, 75 lbs., weighing 53 lbs. per bushel.

From Quebec, John Murphy, of Dalling, reports a yield of 45 lbs., weight 48 lbs. per bushel.

In New Brunswick, James Kerr, of Summer Hill, Queen's Co., had 130 lbs., weighing 47½ lbs. to the bushel; and from Prince Edward Island, Fred R. Mellish, Union Road, Montague Bridge, reports a yield of 42 lbs., weighing 49½ lbs. per bushel. From the North-West Territories a very bright and handsome sample was sent by J. L. Hawk, of Medicine Hat, who harvested 57 lbs., weighing 56⅓ lbs. per bushel. Reports from other Provinces have not yet been received.

Danish Printice Chevalier.

Very few reports have yet been received of the tests of this variety. In Ontario, Thomas Manderson, of Myrtle, had a crop of 83 lbs., weighing 53 lbs. to the bushel; J. Baxter, of Pickering, 48 lbs., which weighed 52 lbs. per bushel; and John A. Bruce & Co., of Hamilton, 42 lbs., weighing 52 lbs. per bushel.

From Nova Scotia, C. Newcomb, of Weymouth, reports a yield of 122 lbs. The other Provinces have not yet been heard from.

English Malting.

Of this variety the following reports are from Ontario: A. W. Brown, of Rebecca, had 130 lbs. from 2¾ lbs. of seed, which weighed 52½ lbs. per bushel; Mr. McNaughton, of Greenock, Guelph, 102 lbs.; weight, 53¼ lbs. per bushel; W. M. Graham, of Peterboro', reports 68 lbs.; and Thomas Manderson, of Myrtle, 67 lbs., weighing 54 lbs. per bushel.

In Quebec, Wallace Oliver, of Magog, had 45 lbs., weighing 51 lbs. per bushel. From Nova Scotia, Donald McLennan reports a yield of 3 pecks from 2¾ lbs. seed, weighing 52½ lbs. per bushel; and in Prince Edward Island, John McDonald, of St. Peter's Lake, had 50 lbs., weighing 54⅞ lbs. per bushel.

Major Boulton, of Shellmouth, Manitoba, sends a good sample of this barley grown by Denmark and Martin, of Russell, Manitoba, weighing 52½ lbs. per bushel, but is unable to give the yield. From British Columbia, Donald Graham, of Spillamacheen, reports a yield of 174 lbs. from 2¾ lbs. of seed; and W. A. Johnson, of Quesnell, 64 lbs., weighing 50¾ lbs. per bushel.

Beardless.

Beardless barley is scarcely a correct name for this variety, as it is bearded like other sorts, but often sheds its beard when fully ripe, and in every plot there will be found more or less of wholly or partially naked ears as the time of harvest approaches; the beard dropping so readily from the grain when mature is a great advantage in threshing and cleaning.

Very few reports have yet been received of the test of this handsome barley and in most of those at hand the yield is not given.

J. Dearness, of Granton, Middlesex, Ont., got 55 lbs. from 3 lbs. of seed. John A. Bruce & Co., of Hamilton, Ont., from a like quantity obtained 40 lbs., weighing 54 lbs. to the bushel. The other Provinces are not yet heard from.

The results now submitted of the tests of these five leading varieties of two-rowed malting barley over a very large area in Canada are sufficient to show that even in an unfavorable season for barley-growing there is a wide territory over which two-

rowed barley for the English market can be grown with advantage, and the yield obtained from the samples sent out as well as in field culture at the Experimental Farms would indicate that heavier crops of two-rowed barley of the varieties named could be raised than of the ordinary six-rowed barley. It is not practicable to entirely change any important crop in a single season, especially when it covers so large an area; it is better for many reasons that such a change should come more slowly, but it does seem feasible to bring this about to a very large extent within a comparatively short time.

IMPORTANCE OF PURE SEED OF GOOD QUALITY.

From what has been said as to the absolute necessity of having the two-rowed barley unmixed if it is to command a ready sale, good pure seed is the first necessity. The quantity of pure seed now available at the several Experimental Farms is probably sufficient to give to every farmer who will apply for it a 3 lb. sample. If this quantity is carefully and early sown on a good piece of land, well prepared, the average return is not likely to fall much below 2 bushels, and with 2 bushels of pure seed available for the spring of 1891, sufficient to sow an acre or more, every possessor of such barley will probably have from 25 to 40 bushels available for sowing in the spring of 1892, and with a little extra care I am convinced that the yield could be made to exceed this estimate. In this way a practicable solution of the difficulty of supplying Canadian barley growers with good seed of pure two-rowed barley would be had, and from that time forward two-rowed barley could be grown in large quantities for the English market. Whether it might not be desirable to hasten this change by the importation of a few thousand bushels of good seed for sale to farmers is a question well worthy of careful consideration. The two-rowed would not be likely to supersede the six-rowed in every locality. A very large quantity of barley is required every year for feed, and the fact that the two-rowed sorts are on an average from a week to ten days later in ripening than the six-rowed might be an objection to their growth in some places.

The large yearly outlay by the United States maltsters in the purchase of Canadian barley has long been the subject of serious consideration. In 1885-6 the Chemical Division of the Department of Agriculture at Washington undertook the analysis of a large number of samples of barley; of these 60 were obtained from different parts of the United States, and 12 from Canada. The Canadian samples were all from the Province of Ontario and from commercial sources. Mr. Clifford Richardson was intrusted with the work, and the results of the analyses were favorable to the Canadian samples. In summing up his conclusions Mr. Richardson says: "It may safely be said that the Canadian grain is the best in the market and superior to our own." After comparing the results of his own work with 127 analyses of European barley he says: "The specimens which have been examined from Canada are well above foreign averages in starchiness. Experience and care have taught the Canadians, in connection with their favorable climate, the means of producing an excellent grain superior to other parts of the country." He further states: "Our investigations as a whole seem to prove that, while at present Canadian barleys are superior to those grown in the United States, the result is due more to a lack of understanding of the proper localities and methods of cultivation than in any obstacle in the way of extending the production to an extent to do away with our dependence on importation. Field experiments are now most desirable as a means of deciding upon the best varieties and methods as soon as a study of the climatic conditions shall enable us to select those portions of the country best suited to this cereal."

Since the publication of this report the means for carrying on such experimental work have been liberally supplied by the United States Government, and in every State in the Union Experimental Stations have been established which are subsidized by the Federal Government. In the estimates for the current year $630,000 is appropriated directly to the Experimental Stations to aid them in carrying on their work, and in addition to this $1,359,000 for the other work carried on by the Agricultural Department, a large sum being devoted to special lines of scientific

investigation having a direct bearing on agriculture. In commenting on the necessity for these appropriations, the Secretary of Agriculture, in his report for 1889, says the "amount should not be measured by the past, but rather by what a great agricultural country should pay at this time towards sustaiuing, protecting and promoting a calling which lies at the foundation of its prosperity and power."

The stimulus which this activity and large expenditure is giving to agriculture among our neighbors will, no doubt, result in improved methods in farming, and increased returns to the nation, and they are mentioned in this connection mainly for the purpose of impressing upon Canadian farmers the fact, that apart from the question of the use of substitutes for barley—which is probably the main cause of the present depressed condition of the barley market—it is not likely that the United States will long continue to be so largely dependent on Canada for good barley. Hence it is important that our farmers bestir themselves, and by bringing more skill to bear on their work, growing those crops which are best suited to their land and likely to give the best returns, and carefully selecting good seed, make the most of the fertile soil and good climate with which they are favored. It is not to be expected that malting barley of high quality can be grown in every part of Cananda; many districts will, no doubt, be found where it will attain a greater degree of perfection than in others. This has been the experience in Great Britain, where Suffolk, Norfolk and parts of Essex and Herts are held to be specially adapted for barley; similar experience has also been had on the continent of Europe. The only way to ascertain where specially favourable conditions exist, is by testing this grain in every promising locality, noting the results and repeating the tests until sufficient facts are available on which to base conclusions.

TWO-ROWED BARLEY IN DENMARK.

In proof of what may be done to improve the barley crop of a country, the case of Denmark, now a large exporter of malting barley to Great Britain, may be cited. In a recent number of the Journal of the Royal Agricultural Society of England is a paper on barley from a maltster's point of view, by Robert Free, in which he says: "Only a few years ago the barley production of Denmark was practically confined to a coarse thick-skinned native grain, suitable only for distilling or grinding, and the change is mainly due to the energetic action of the Danish Royal Agricultural Society with the assistance of the Government. In 1883, a committee of the society was formed to ascertain by what means of cultivation, &c., the best possible quality of barley, yielding the greatest commercial value, might be obtained, and a subvention of £300 per annum was granted by the State to the society for this purpose. The committee accordingly distributed some 800 lots of seed, each consisting of half a hundred-weight of fine Chevalier barley, to farmers in districts where it was found that barley could be profitably grown. The condition was imposed upon the recipient that he should report the results of the experiment, and an annual exhibition of malting barley was established at Copenhagen, where their commercial value was appraised by experts. It has been found that in every case, out of seven or eight kinds of imported seeds, the 'Chevalier' gave the most profitable returns to the farmer, and this has natuarally led to its general adoption.

The experiments in cultivation have also had an important influence. Early sowing was found to be most satisfactory, for the spring in Denmark is generally dry, and it is therefore desirable to get the seed into the ground while it retained some of the winter moisture. As to harvesting, it was ascertained that the best time to cut was when the grain was fully matured and the ears began to droop. Useful hints based on the experience gained were also circulated among the growers by the Society as to stacking, threshing and storing, and the practical result of the whole has been to revolutionize this branch of agriculture in Denmark, the annual money outlay, be it observed, amounting to no more than £300. It is now estimated that one-third of the arable land in Denmark is devoted to barley culture, and the total yield is about 2,750,000 quarters."

HINTS ON BARLEY-CULTURE.

The opinion is generally held by farmers in Great Britain that land to be used for barley-growing should be prepared beforehand by manuring some preceding crop, and that the application of barn-yard manure to a crop which remains on the land so short a time as barley does is not likely to produce satisfactory results. The roots of barley grow rapidly but do not strike deep; they are comparatively feeble and short-lived, and are not adapted to use such fertilizing materials as are not fully prepared to be taken in. On the other hand, it is important not to use such manures as would stimulate growth too rapidly, which would make the crop run to straw rather than grain. In Germany, where large crops of barley are grown, it is common to grow two crops in succession, after a crop of sugar beets, for which the land is heavily manured. Few crops respond more readily to generous and judicious feeding than barley, or languish more decidedly where food is wanting. In England, when the land is otherwise in good order, barley is usually dressed with such artificial fertilizers as are readily soluble, such as 200 or 300 pounds of superphosphate, with from 50 to 100 lbs. of nitrate of soda per acre, applied before seeding.

A moist soil is necessary to start the plants promptly: when too dry germination is apt to be long delayed. One of the chief reasons why sandy soil is not found suitable for barley is that such soil is not capable of holding moisture to the same extent as a loamy soil. Experiments conducted in Germany have demonstrated that a rich loamy soil a foot deep will hold and retain more than double the quantity of water which a light sandy soil can retain. Hence, having twice as much water at the start, supplemented by summer showers, loamy soil is placed at an immense advantage over sandy soil, apart from the question of nutriment. This also is one of the chief reasons why sandy soil, no matter how heavily manured, rarely gives crops as good as can be obtained with less fertilizing from good deep loams.

On the other hand, a wet soil is detrimental, and land for barley-growing should be well drained. A light, rich, friable loam is generally regarded as the most suitable soil for barley, although it does well on a clay loam if thoroughly worked until it is reduced to a fine mellow condition. A well pulverized and clean seed bed is all-important. Barley is said to do best in a warm, dry atmosphere, with occasional light showers; a free circulation of air and plenty of light are also essential conditions to success. The questions of admission of light and circulation of air have an important bearing on thick seeding; the width between the rows and the direction in which the rows should run also require further and frequent tests. Weeds probably do more harm to such crops by the exclusion of light and air than from what they take in the way of nourishment from the soil. Early sowing is also much favoured, sowing as soon as the ground is dry enough to be well pulverized. This is said to counteract the tendency to over-luxuriance, which sometimes injures the crop in rich soils. When drilled, two bushels of seed to the acre is commonly used; some farmers use less, but a full allowance of seed prevents excessive tillering and consequent irregular and later ripening.

The selection of good, plump seed cannot be too strongly urged, as so much depends on giving the plants a good start at the outset. Experiments have shown that selected, extra heavy seed, has produced nearly three times the weight of actual growth in the first fifteen days after sowing than was obtained from light seed. It is important, especially in districts liable to drought, that this vantage point of growth in the beginning should not be overlooked. From the time when the blade appears above ground to the time of the appearance of the ear the plant is most active in gathering and storing in its stems, leaves and roots food for the maturing of the grain, and during the growth of the grain a transfer takes place of a large part of these stores of food from the leaves and roots to the seed; hence it may be said that a crop of barley is comparatively safe as to food supply when the plants have reached in full vigor that stage in their growth when seeds have begun to form in the ears.

"Barley for malting," says an eminent English maltster, "should be allowed to ripen thoroughly before harvesting, for thus only can a really mellow grain be secured. When cut too early the grain becomes steely, and hence of far less value to

the maltster." Some Canadian growers advocate cutting early, so as to secure a brighter barley, but this is a mistake It is better to run the risk of a little discoloration—for this does not materially injure barley for malting—than to cut it before it matures. In threshing, great care should be exercised to avoid breaking the grains, as broken kernels reduce the value of the grain, are worthless for germinating and injurious to the malt. After threshing, and when put into bins or heaps on the barn floor, the heaps should at first be turned over every few days, otherwise the moisture in the grain may result in its acquiring an earthy flavor, which will greatly injure it. Before being marketed the grain should be thoroughly cleaned and put through the fanning-mill often enough to blow out and separate all the light and broken grains; and all admixture with foreign seeds should be carefully avoided; a good, plump, clean sample commands a higher price, and a readier sale, and the light grain separated can be profitably used as feed.

It is believed that two-rowed barley will produce on an average as many measured bushels as six-rowed. Taking the market reports in the *Mark Lane Express*, of London, for the five weeks ending 6th January, we find that malting barley from Austria has ranged in price from 34 to 38 shillings per quarter of 448 lbs., from California 35 to 40, while the Saale barley has commanded from 40 to 44 shillings. Taking as the basis for an estimate the barley from Austria, the English shilling at 25 cents, and allowing 20 cents per bushel to cover expenses of transport from Toronto or Montreal to Liverpool or London, this would leave for the grower here from 86 to 98 cents per bushel of 56 lbs. With such possibilities in view and the pressing necessity of securing other and more permanent outlets for at least a portion of the surplus barley of this country, this subject is one which should command careful consideration and united effort.

SIX-ROWED BARLEY.

The six-rowed barleys are often spoken of as four-rowed; there are, it is said, varieties of four-rowed barley in cultivation, particularly in Scotland, but none of these have yet come under my observation. Among the varieties of six-rowed barley differences as to relative fertility and vigour are found similar to those among the two-rowed sorts. The following have been grown as single plants, treated in exactly the same manner as the two-rowed barleys and with the results given in the table:—

	Records for 1888.						1889.	
	Single selected plant.		Second selection.	Unselected plants.		Total average.	No. of plants.	Average No. of grains.
	No. of heads.	No. of grains.	Average No. of grains.	No. of plants.	Average No. of grains.			
Baxter's New Six-rowed	..	..	..	..	..	..	38	841
Bombay Karachi	21	514	483	38	361	378	38	678
From Assiniboine Reserve N.W.T. (Grown by Indian named Rabbit Skin.)	21	1197	729	36	421	471	28	945
Greek Six-rowed	15	600	713	41	196	250	38	852
Imperial Improved American	48	1892	1365	33	806	881	39	1233
Mensury	13	613	601	36	640	636	44	1201
Oderbruch	16	762	629	36	579	589	41	809
Odessa Six-rowed	16	687	727	25	690	695	45	826
Petschora	24	825	545	28	448	472	42	1033
Polar	15	789	414	33	332	353	39	916
Rennie's Improved Six-rowed	17	980	895	36	572	614	41	921
Smyrna	22	740	690	41	203	238	41	933
Spring	16	1075	839	28	636	675	41	1034

Baxter's new six-rowed barley is a promising sort, which originated with Mr. J. Baxter, of Pickering, Ontario, and was received for test in the spring of 1889. At that time Mr. Baxter wrote as follows: "I have a small quantity of a new barley (or improved) six-rowed; it is a short, thick kernel, weighs 56 pounds to the bushel, about ten days earlier than our common six-rowed, good straw. This barley originated with me four years ago, from one grain; with three years sowing I have 1½ bushels." Mr. Baxter was requested to send a small quantity for trial, which he kindly did. The sample was very plump in berry, and shorter than usual, but there was not enough of it to test the weight per bushel. The yield of the single plants given above shows this to be a fertile variety; the grain is shorter and more rounded than any of the other sorts, and from a small plot in the field a crop was grown equal to 36¼ bushels per acre. The grain grown was not as plump as the seed sown, and weighed 48 lbs. to the bushel; and a further sample from Mr. Baxter's own crop of this year weighs 50 lbs. per bushel. The claim made for earliness is not thus far fully borne out in our experience, as will be seen from the following:—

	Sown.	Harvested.	Time of Maturing.
Baxter's New Six-rowed	May 6	August 5	91 days.
Bombay Karachi	" 4	" 4	92 "
From Assiniboine Reserve	" 9	" 7	90 "
Greek Six-rowed	" 4	" 5	93 "
Imperial Improved American	" 6	" 10	96 "
Mensury	" 4	" 5	93 "
Odessa Six-rowed	" 6	" 5	91 "
Petschora	" 9	" 1	84 "
Polar	" 9	" 1	84 "
Rennie's Improved Six-rowed	" 4	" 1	89 "
Smyrna	" 6	" 4	90 "
Spring	" 6	" 5	91 "

Petschora and Polar were both one week earlier than Baxter's barley, but the grain is not nearly as plump. These two barleys (which are probably identical) have, however, improved since they were imported two years ago, as will be seen by reference to the results both from single plants and field crops. The Petschora was brought from the neighbourhood of the Petschora River, in the northern part of Russia, and the Polar from latitude 67, in the same country, north of Archangel and within the Polar circle. The locality where this barley was grown is said to be the extreme northern limit for the cultivation of cereals in Europe. From many careful comparisons made at different periods in their growth, I am of opinion, notwithstanding the difference in yield of single plants, that the barleys known under these two different names are identically the same.

Results of Field Crops.

	Central Experimental Farm.	
	Yield per Acre.	Weight per Bushel.
Baxter's New Six-rowed	36¼	47⅓
Bombay Karachi	29⅓	36½
From Assiniboine Reserve	45	46
Greek Six-rowed	53	44⅔
Imperial Improved American	43	40¼
Mensury	21¾	4 ¼
Oderbruch	26½	44
Odessa Six-rowed	61	45⅔
Petschora	30	43½
Polar	34¾	44¼
Rennie's Improved Six-rowed	45½	45¼
Smyrna	...	46½
Spring	45¼	44¼

The Mensury barley was sown on a piece of rather low land, which was quite dry in 1888, and hence not then underdrained; but 1889 being a very wet season, this plot was seriously injured by water, and hence the yield must not be taken as a fair criterion of what returns Mensury barley would give under favourable conditions. This barley, which weighed 46¼ lbs. per bushel at Ottawa, weighed 48 lbs. at Nappan, N.S., 52¼ lbs. at Brandon, 51 lbs. at Indian Head. Petschora weighed at Ottawa 43½, at Nappan 48¼ lbs., at Brannon 49¼ lbs., and at Indian Head 51½ lbs. Polar, which weighed 44¼ lbs. at Ottawa, weighed 45 lbs. at Nappan and 49½ lbs. at Brandon.

BARLEYS FOR FEED.

Reference will next be made to the results of tests of a few varieties of barley which are grown exclusively for feeding, all of which—with the exception of the Earliest Two-rowed Black—are hulless; that is, they thresh out like wheat, clean from hull, and they cannot be used for malting. Most of them are very prolific, and where feeding barleys are required are well worthy of more extended trial than they have hitherto had. The first two on the list are two-rowed, the others are six-rowed.

—	Records for 1888.						1889.	
	Single selected plant.		Second selection.	Unselected plants.		Total average.	No. of plants.	Average No. of grains.
	No. of heads.	No. of grains.	Average No. of grains.	No. of plants.	Average No. of grains.			
Earliest Two-rowed Black	44	747	845	32	439	482	44	571
Large Two-rowed Naked	27	476	326	27	266	281	46	557
Guymalaye	16	819	562	38	418	441	44	1528
Small Blue Naked	27	1326	613	36	577	599	44	1362
Naked from Nepal	13	322	280	31	157	172	28	1175
Hulless Black	12	540	596	36	298	333	39	689
Six-rowed Wheat Barley	33	1705	1131	36	744	806	39	1713

These barleys are all very heavy. The large Two-rowed Naked from single plants weighs 61¼ lbs. per bushel, and from a field crop which gave 25½ bushels per acre the weight was 54¾ lbs., time from sowing to harvesting 90 days. Guymalaye weighed 57½ lbs., time 89 days; Small Blue Naked, 55⅜ lbs., time 89 days; Naked from Nepal, 58¼ lbs., time 90 days; Hulless Black, 60⅓ lbs., time 90 days; Six-rowed Wheat Barley, 55 lbs., time 89 days; and Earliest Two-rowed Black, 44 lbs., time 91 days. Perhaps a better idea can be given of the prolific character of these hulless sorts by giving the weight of yield in each case. From 46 kernels of Large Two-rowed Naked 3 lbs. 13¼ oz. was harvested; from 44 kernels of Guymalaye, 4 lbs. 8 oz.; from 44 kernels of Small Blue Naked, 3 lbs. 9¼ oz.; from 28 kernels of Naked from Nepal, 2 lbs. 6¼ oz., from 38 kernels of Hulless Black, 2 lbs. 9¾ oz.; and from 39 kernels of Six-rowed Wheat Barley, 4 lbs. 1 oz.

BARLEYS FROM INDIA.

Among the samples of cereals, &c., which were sent last year by the Government of India for test at the Experimental Farms in Canada, there were a number of varieties of barley selected from crops grown at different altitudes in the Himalayas, varying from 450 to 11,000 feet. Judging from the test of a single season, the following are the most promising. The grain is light in weight in most instances, excepting the hulless sorts, which are very heavy. It is probable that all of them will do better another year, as by that time they will be somewhat acclimatized. All the varieties are six-rowed.

Barley from Palampur, Grown at an Altitude of 3,000 feet.

This barley is much like the common six-rowed of this country, and resembles the Bombay Karachi barley, grown from seed imported from the Corn Exchange, London, England. When received, the Palampur barley weighed 47¾ lbs. per bushel; it was sown on the 19th of April and harvested on the 3rd of August; time, 107 days; it ripened on the Experimental Farm at Indian Head in 90 days. Grown as single plants, one foot apart, 35 plants gave an average yield of 935 fold; weight 45 lbs. per bushel. This barley grown at Brandon weighed 51 lbs. and at Indian Head 51½ lbs. per bushel.

Barley from high elevation in the Simla District. (Elevation not given.)

This proved to be a mixed barley of two distinct sorts, both six-rowed, weighing 48½ lbs. per bushel. In No. 1 the ear is short, about 2 inches only, set very thickly with grain; No. 2 is about 3½ inches long and less compact. Grown as single plants, No. 1 gave an average of 636 fold from 21 plants, and No. 2 of 787 fold from 16 plants. Weight of No. 1, 45 lbs. per bushel; No. 2, 43½ lbs.; yield of mixed sorts in field culture, 36¾ bushels per acre. Both were sown on the 19th of April and harvested 1st August; time, 105 days. At Indian Head this barley ripened in 90 days, and weighed 49 lbs. per bushel.

Barley from Seoraj, Altitude 7,000 feet.

This barley, which weighed 47½ lbs. per bushel, was also mixed. A part of it seemed to be a variety of winter barley, which made a strong bushy growth of leaf but did not head out at all. Grown as single plants, the average yield from twelve plants which ripened was 646 fold; sown 19th April; ripened 4th August; time, 108 days; weight per bushel, 44⅔ lbs. At Brandon this weighed 49⅔ lbs., and at Indian Head, where it ripened in 90 days, 52 lbs. per bushel.

Barley from the Kulu District, Altitude 7,000 feet.

This variety weighed 44¼ lbs. per bushel; it made vigorous growth of leaves, but the ears were produced unevenly at intervals. Grown as single plants, the average yield from 36 plants was 782 fold. This sort lodged badly, ripened late and weighed 39 lbs. per bushel; sown 19th April; ripened 12th August; time, 116 days. At Indian Head this barley ripened in 90 days and weighed 51 lbs. per bushel, and at Brandon 50½ lbs.

Barley from the Kangra Valley, Altitude 3,000 feet. Weighed 48⅜ lbs. per bushel.

Not a vigorous grower. In plots of single plants it produced an average of 617 fold from 44 plants, the grain weighing 47¼ lbs. per bushel; sown 19th April; ripened 1st August; time, 105 days. At Indian Head this barley ripened in 90 days and weighed 53½ lbs. per bushel; at Brandon in 101 days.

Barley of Lahoul, Altitude 11,000 feet.

This is a hulless barley, which weighed 58½ lbs. per bushel, short plump kernels, some of them of a peculiar bluish colour. Grown as single plants the average yield from 34 plants was 553 fold, grain weighing 56 lbs. per bushel. The growth was vigorous, but it ripened late; sown 19th April; ripe 22nd August; time, 126 days. At Indian Head this ripened in 106 days and weighed 64 lbs. to the bushel. At Brandon it ripened in 107 days.

Barley of the Spiti Valley, Altitude 11,000 feet.

This was also a hulless barley, of a faint steely blue colour, which weighed 58 bs. to the bushel. Both these barleys are very different in appearance from any

other varieties hitherto tested at the Experimental Farms. This is a short, plump grain, which ripens earlier than that from the same elevation in Lahoul. At Ottawa it was sown 19th April; ripe 2nd August; time, 106 days; weight, 57½ lbs. per bushel. Grown as single plants the average yield from 24 plants was 351 fold. The growth was not vigorous but the heads were comparatively large, 3 to 3½ inches long. At Indian Head this barley ripened in 90 days and weighed 62 lbs. per bushel; at Brandon it ripened in 101 days.

Several other sorts made a promising growth, but were received too late to give them a fair chance in comparison with the other varieties.

The importance of this subject can only be fairly seen when the magnitude of the interests involved are considered. The total barley crop of the Dominion is probably about 30,000,000 bushels, with an average yield of from 20 to 25 bushels per acre. While this is much larger than is produced in some countries, it falls below the average in Great Britain. Recent returns give the yield of barley in England, Scotland and Wales, for the year 1889, as 31·58 bushels per acre; in 1888 it was 33·14, showing a falling off last year of 1·56 bushels. The results of the tests given in this Bulletin show that there are great differences in the fertility of different varieties, and it is well known that favourable conditions of soil are essential to a vigorous growth. With fertile strains of vigorous seed and skilful and judicious management in the preparation of the soil there seems to be no good reason why the farmers of Canada should not be able to work their crops nearly, if not quite, up to the English standard. Such a result is worth striving for; every bushel added to the acre would amount to $480,000 annually to the profits of the farmers, and taking the crop at 30,000,000 bushels, the yield at 25 bushels to the acre and the price 40 cents per bushel, the increase of one pound in weight to the bushel would result in an annual gain of $250,000. With depending issues so great as this, no effort should be spared to place within reach of Canadian farmers the very best strains of seed which the world affords, and to disseminate among them all the information which can be gathered, bearing on the conditions essential to success.

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BULLETIN No. 6.

BARLEY.

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