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CEREALS AND ROOT CROPS

EVIDENCE

OF

DR. WILLIAM SAUNDERS

BEFORE THE

SELECT STANDING COMMITTEE

ON

AGRICULTURE AND COLONIZATION

1902

F. # 470

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CEREALS AND ROOT CROPS.

HOUSE OF COMMONS, COMMITTEE ROOM 34,

TUESDAY, March 11, 1902.

The Select Standing Committee on Agriculture and Colonization met this day at 11 o'clock a.m., Mr. Legris, Chairman, presiding.

Dr. WILLIAM SAUNDERS, Director of the Dominion Experimental Farms, was present by request of the Committee, and testified as follows :—

Mr. Chairman and Gentlemen, it always affords me pleasure to appear before the Committee on Agriculture and Colonization, because I have thus an opportunity of presenting from year to year some particulars for your information as to the practical work going on in connection with the experimental farms of which I have charge, and your criticisms also are a benefit, which are gladly received. They are always made in a kindly spirit, and whether they reflect creditably or otherwise on my work I am always glad to have them for my guidance.

THE CROPS OF 1901.

During the past season the success attending the operations of the farmer has been somewhat varied in different parts of the Dominion. In some districts the results have been highly encouraging, while in others some important crops have fallen short of the average yield, while other crops, equally important, have been above the average. As to agricultural returns as a whole, bearing in mind the prices that have been realized for produce, the Canadian farmer has not had much ground for complaint. In some districts the crops have been unusually large and profitable. Among those most highly favoured are the great plains which form what is known as the Canadian North-west, comprising Manitoba and the North-west Territories. In some parts of the Territories the crops have been exceptionally heavy; heavier than they have ever been known to be before.

RESULTS FROM CORRECT METHODS.

While much of this is due no doubt to favourable conditions of weather, a considerable portion of this increase is fairly attributable to improved methods of farming, and one almost invariably finds, that the heaviest crops are produced by the best farmers. The summer fallowing of land in the North-west has greatly increased its crop-producing power. Before the establishment of the experimental farms this practice was almost unknown. Our superintendent at Indian Head, Mr. A. Mackay, was one of the first to experiment along this line and having thoroughly satisfied himself of its advantages, has been a most persistent advocate of this practice, and has demonstrated its utility so often at the experimental farm at Indian Head, that a large proportion of the farmers in that portion of the country have been induced to follow his example. The method of summer fallow advocated by Mr. Mackay, superintendent at the experimental station, is described by him as follows :—

'Plough deep (seven to eight inches) before the last of June and cultivate the surface several times during the growing season. Sufficient moisture is thus conserved for a dry year, and not too much for a wet one. There are few or no weeds, as all the seeds near the surface have germinated and been killed. For the past fourteen years the best and cleanest grain has been grown on fallow worked this way. This method is generally applicable in Eastern Assiniboia, but needs to be somewhat modified in portions of Alberta and Saskatchewan, where the conditions of moisture are usually different.' The modifications needed are given by Mr. Mackay, as he gains experience from time to time in his annual report.

INDIAN HEAD EXPERIMENTAL STATION.

At the experimental farm at Indian Head, the crops have been heavier this year than ever before. The highest yielding wheat in the experimental plots there this season was the Mason, a cross between Colorado and Gehun, which gave at the rate of sixty-seven bushels per acre. The Huron, a cross between the Red Fife and Ladoga, came next with 66 bushels and 49 pounds. There were 71 varieties of wheat in the trial plots at the experimental farms this year, and the average of the whole of them at Indian Head was 55 bushels 49 pounds per acre.

Wheat.—In the field crops the Preston wheat gave the largest yield. A five acre field of this variety averaged on summer fallowed land 54 bushels, 54 pounds per acre over the whole area.

(A sample of the crop of this field was produced and handed to the Committee).

A similar field of Red Fife also on summer fallow averaged 49 bushels per acre, showing an advantage in the field crops in favour of the Preston, this year, of 4 bushels 54 pounds to the acre.

Oats.—In oats the Abundance heads the list, I have a sample with me of the crop which was produced on one of the plots, and which gave at the rate of 147 bushels and 2 pounds per acre, that is from the trial plots.

(Sample produced and exhibited to Committee).

By Mr. Davis :

Q. How much per acre ?

A. 147 bushels and 2 pounds.

Mr. Robinson (Elgin):

Q. Is the Mason a red wheat ?

A. I am not quite sure of that, I have not a sample of it with me. My impression is that it is red.

By Mr. Davis :

Q. Is this a sample of the oats ?

A. This is a sample of the oats which produced 147 bushels 2 pounds per acre.

Q. Is that by measure or weight ?

A. Everything is taken by weight at the experimental farms, the bushel of oats is 34 pounds. You understand this was the result on an experimental plot of one-tenth of an acre.

Q. What was the result in the field crop ?

A. I will give you that presently. Of course the small plots produce usually a larger yield than the field crops. These plots are comparatively small and are separated from each other by a path 4 feet in width and that gives a clear space around each plot, and such margins usually result in heavier production.

By Mr. Robinson (Elgin):

Q. What variety of oats did you say gave that result ?

A. The Abundance. This is an oat which was imported by the experimental farm some nine or ten years ago from the firm of Vilmorin & Andrieux, the celebrated seedsmen of Paris. Mr. H. Vilmorin visited the Central farm about that time, and he recommended this oat, and it has done very well at the various farms, and this year it has given the highest crop at Indian Head in the field as well as on the experimental plot. At Brandon also it has given the heaviest field crop, but does not stand at the head in the experimental plots.

By Mr. Clancy :

Q. What is the history of that variety in the other provinces during the ten years you have had it ? Has it been valuable as a whole. I do not wish to divert your attention from the matters you are dealing with now ?

A. I can give you that with pleasure. The experience with the Abundance oat for six and seven years giving the average of its yield at all the experimental farms has been 70 bushels 20 pounds per acre.

By Mr. Davis :

Q. That is for the whole Dominion ?

Q. Yes. I can give you the average also here, in this province. At Ottawa it has given an average of 59 bushels 29 pounds per acre for the past seven years.

By Mr. Clancy :

Q. That is not quite up to some of the other varieties.

A. No. It has not come up here to the Banner which has given an average of 65 bushels 30 pounds per acre during the same time.

By Mr. Davis :

Q. It seems to be a sort suitable for western Canada ?

A. It seems as if the conditions this year have just suited that oat, and it has given a somewhat higher yield than usual, although it has generally ranked with the best. The average for the best 12 sorts of oats at Indian Head was 132 bushels 27 pounds, and the average of all the varieties tried, 64 in all, was 109 bushels 8 pounds, showing that the crop of oats to have been unprecedentedly large, including all varieties.

In field crops the Abundance has also taken the lead having given on a five acre field an average of 124 bushels 20 pounds per acre. Banner stands next, with an average of 117 bushels per acre, on a field of 11½ acres. I was at Indian Head just before the oats were cut, and I may say I never saw such a solid mass of heads as there were on those fields, and it was not only at the experimental farm, but all over the district it was very much the same way.

By Mr. Robinson (Elgin):

Q. What length would the straw be ?

A. In many instances it would be five feet, five and a half feet and in some cases 6 feet high. It was a wonderful sight.

Q. Did the oats lodge at all ?

A. Very rarely. One sometimes saw a field in which there were spots where it lodged, but on the whole it stood up very well indeed.

The Tartar King, a new variety recently imported from England of which I think I have a sample here—

(Sample produced for inspection of Committee).

By Mr. Davis :

Q. Have you a sample there of that White Banner oat of which you have just been talking ?

A. Yes; here is the sample of the Banner oats grown on the trial plot from which we obtained at the rate of 129 bushels 14 pounds to the acre. That was a larger crop than was got from the field.

Q. You said that the crop was 117 bushels on the field ?

A. Yes; that is correct, the Banner oat gave 117 bushels per acre as an average for 11½ acres. A sample of the Abundance oats was also shown.

The Tartar King, a sample of which I have just passed out for the inspection of the members of the Committee, is a variety which was recently produced in England by the firm of Garten Bros. The members of this firm have been working much along the lines in which we have been working in this country, in the cross fertilizing of grain, and this oat is one of the results. It has not done very well at Ottawa this past season, but at Indian Head it has given an average of 104 bushels 10 pounds per acre on 34 acres. It is a very strong strawed variety with a large kernel.

PROCESS IN CROSS FERTILIZATION.

By Mr. Clancy :

Q. What do you mean by cross fertilizing ?

A. In the process of cross fertilizing two varieties are selected for this purpose, the green head of the sort which is to serve as the female is taken just as it is coming into flower when the flower case is opened and the male organs in the flower, the stamens, taken out before the fertilizing pollen which they contain is ready to be shed. They are removed while still green, and ripe pollen is brought from the other variety chosen as the male, and applied to the pistil of the flower of the oat, and if the operation is successful you get one single kernel from each flower operated on, and each kernel gives you a more or less distinct variety. From that single kernel a large quantity is gradually produced by sowing the seed obtained from year to year. Of course it takes some years before you get any large quantity of such new sorts, but it is astonishing how rapidly the stock can be increased by systematic work.

By Mr. Bell :

Q. How much of the Preston wheat is there available ?

A. I cannot say, but I should think there would be many carloads of it now. It has been grown a good deal in the North-west recently.

By Mr. Hughes (Victoria) :

Q. What is the weight per bushel of the oats this year on the average ?

A. In the North-west they will run from 37 to 38 pounds, and sometimes as high as 40 to 42, but that is unusually heavy. The oats we have been distributing have all of them gone several pounds over the standard of 34 pounds, most of them four or five pounds over that standard.

By Mr. McEwen :

Q. Would that be just as it comes from the threshing or cleaning or would it be clipped in any shape ?

A. We always clean the oats thoroughly and in some instances, where the varieties have a long beard, we run them through a machine that takes this off. It makes a better sample, they go in smaller compass, and their vitality is not injured by this process.

Q. When you spoke of these 42 pounds, would they be clipped ?

A. Yes; mostly, but not always.

SEEDING OATS—QUANTITY PER ACRE.

By Mr. McLennan:

Q. How much oats do you think it is advisable to sow in an acre ?

A. We have found two bushels of oats gives on the whole the best results, there is, however, a good deal of difference in practice in different parts of the country. In the maritime provinces some farmers sow three bushels to the acre, and some as much as four bushels. From all the experience we have gained, this would seem to be a wicked waste of seed and I think that two and a half bushels in any part of this Dominion is enough, unless where a man is sowing oats on rough ground and broadcasts it, when it will sometimes take a little more. When oats are sown on ordinary land and by machine two bushels usually give us the best results.

PRESTON WHEAT *vs.* RED FIFE.

By Mr. Davis:

Q. What is the history of this Preston wheat ?

A. The history of Preston wheat goes back to 1888. In the spring of that year this wheat was produced by crossing the Ladoga with the Red Fife. The Red Fife was taken as the male and Ladoga as the female—and the wheat takes somewhat after both parents, although the grain resembles the Red Fife more than the Ladoga.

Q. Is it any earlier ?

A. It is 3 to 4 days earlier on the average.

Q. Than Red Fife ?

A. Yes.

Q. That is an advantage ?

A. It is under some circumstances a great advantage.

By Mr. Sproule

Q. Why is it named Preston ? Is it after W. T. R. ?

A. No; it is not. There were two wheats in this instance produced from the same kernel, twins if I may so call them, one bearded and the other beardless. One was called Stanley and the other Preston, the names being suggested in connection with one of our highly esteemed governors.

By Mr. Hughes (Victoria):

Q. How do you find the quality of the flour or fall wheat compare with Red Fife and Ladoga ?

A. If Col. Hughes will pardon me I will refer to the fall wheats presently.

By Mr. Davis:

Q. Is there a large quantity of this Preston wheat being raised in the west ?

A. A considerable quantity.

Q. How does it grade, do they take it the same as Fife ?

A. I am not sure it is being offered for sale to any extent. Most of it is kept for seed. I sent a sample to England last year and it was submitted to an eminent expert there by the High Commissioner, and he formed a good opinion of it.

Q. If they take that wheat as readily as Red Fife and it is four days earlier in maturing, it would prove a very valuable wheat for the west ?

A. I may say that it has yielded remarkably well, the average result for a seven years trial at all the experimental farms has been 33 bushels 53 pounds to the acre, a slightly higher yield than has been obtained from any other sort.

By Mr. Bell:

Q. On experimental plots?

A. Yes; it is from experimental plots that these averages are taken. Wellman's Fife comes next on the list with 33 bushels 8 pounds, an advantage of 50 pounds in favour of Preston, whereas Red Fife during the same period gave 32 bushels 30 pounds per acre.

By Mr. Davis:

Q. The yield is better, and it takes a shorter time to mature?

A. Yes.

Q. But its grading has not been established yet?

A. No. I hope to have that thoroughly investigated this year.

The grain crops of which I have been speaking, produced at Indian Head were all grown on summer fallowed land. You cannot get such large crops there on land with any other preparation than summer fallowing.

BARLEY—VARIETIES AND YIELDS.

The best six varieties of six-rowed barley gave an average of 64 bushels 1 pound per acre at Indian Head, Odessa heading the list with 68 bushels 36 pounds. In the two-rowed varieties the best six sorts have given an average of 60 bushels 33 pounds. A newly imported variety known as Standwell, also a product of the Garton Bros., England, heads the list with a yield of 67 bushels 44 pounds per acre.

Peas.—The best twelve varieties of pease at Indian Head have averaged 57 bushels 43 pounds per acre. The Oddfellow heads the list with a yield of 66 bushels. Indian corn, which is usually a light crop at Indian Head, has given an average from the best six sorts cut green for ensilage of 25 tons 493 pounds per acre.

By Mr. McEwan:

Q. Have the bugs got there yet?

A. No; pease grown there are as yet free from the pea bug. The best six varieties of turnips returned an average product of 37 tons 954 pounds per acre.

Root Crops.—Mangels produced 29 tons 586 pounds per acre.

Carrots gave a light crop, an average for the best six varieties of 12 tons 1212 pounds per acre, while the best four varieties of sugar beets yielded at the rate of 27 tons 1440 pounds per acre. I give you these particulars to show that the high yields have run all through the more important agricultural products in that country.

BEETS—VARIETIES AND YIELD.

By Mr. Hughes (Victoria):

Q. What is the average tonnage of beets in Ontario?

A. I think it is usually given as about 14 tons.

Q. And up west it is nearly double that?

A. It is so on these plots at Indian Head, but that does not necessarily mean that the yield would be the same in large fields.

By Mr. Kendall :

Q. How does the saccharine matter develop in these beets ?

A. In Manitoba the beets analysed by the chemist of the experimental farms last year gave results which were rather disappointing in that respect. They did not show a sufficient percentage of sugar to be profitably worked. I am not aware that any were analysed from Assiniboia, but those which were tested from Alberta were very satisfactory. The beets sent from both southern and northern Alberta were very rich in sugar.

Q. Can you give us an idea as to the proportion of sugar they would be likely to yield in a series of years ?

A. We have not enough experience to permit the offering of an opinion on that point. I can give you the average crop at Indian Head for the past six years, but we do not know enough about this crop yet to say how the season may influence the production of sugar.

At Indian Head, the average yield has been 16 tons 1432 pounds to the acre, and at the experimental farm at Brandon it has been 27 tons 152 pounds.

By Mr. Clancy :

Q. These are on plots ?

A. Yes.

By Mr. Stephens :

Q. Can you give us the average percentage of saccharine matter in the beets grown in Ontario ?

A. Not accurately, they run from 12 to 14 per cent, I think, but I cannot give you the exact figures. These have been published in the reports of the chemist of the Dominion experimental farms and also by the chemist of the Ontario Agricultural College at Guelph. Our chemist, Mr. Shutt, who will appear before you shortly, will no doubt be able to give you more definite information on this point.

By Mr. Davis :

Q. You say the sugar beets in Alberta are better than those in Assiniboia ; how do they compare with Ontario ?

A. I said the sugar beets analysed from Alberta had given a higher percentage during the past year than those from Manitoba. They are also I think higher in sugar content than those grown in Ontario. Mr. Shutt, however, will be able to give you more exact information on that point.

Of course we have only had a limited number of tests, but the samples have come from several different localities and in each case they have shown a high percentage.

Q. I suppose that more moisture or something of that kind has something to do with it ?

A. It is very difficult to give the reasons for these things.

Potatoes.—Potatoes at Indian Head have given marvellous yields during the past season, the tubers being of excellent quality. The most productive 12 sorts have given an average crop of 620 bushels 3 pounds per acre; Carman, No. 1, heading the list with 663 bushels 28 pounds per acre.

Q. That is in one place ? In another place the yield might not be the same ?

A. Certainly.

By Mr. Robinson :

Q. Is the Carman a white potato ?

A. Yes, it is.

From the figures given it will be seen that the crops have been very good all the way through at Indian Head except the carrots. The large crops in Eastern Assiniboia were not by any means confined to the experimental farm.

By Mr. Lovell:

Q. Do they have any trouble there with the potato bug?

A. There is no potato bug which is any serious trouble.

By Mr. Davis:

Q. When you say that, what do you mean? I never heard of a potato bug in the west?

A. I must give a word of explanation. There are several native beetles there which feed on the potato vines, varieties of blistering beetles which some times do a considerable amount of injury. These are commonly known as potato beetles or potato bugs. I have never seen the genuine Colorado beetle in that part of the Dominion.

MR. DAVIS.—There is not anything of the kind?

By Mr. Lovell:

Q. These are not considered as so destructive?

A. No; not as destructive as the Colorado beetle.

CROP YIELDS ON PRIVATE FARMS.

After the threshing was completed Mr. Mackay at my request visited 32 farmers residing between Grenfell and Moosejaw, covering about 120 miles of territory, and procured from them signed certificates which certificates I have with me as to the area they had under crop and their yield, and he secured in each case a two bushel bag as a sample. These samples have just been received in Ottawa a few days ago, and examples are being prepared to send to the exhibitions at Woolverhampton and Cork and some will be preserved to show at the St. Louis exhibition, and others will be preserved for future exhibitions. I will give you some of the statements sent in by these farmers.

Here is one from Mr. Johnston, of Qu'Appelle. He had 80 acres and grew 3,600 bushels of Red Fife wheat, an average of 45 bushels to the acre.

Mr. R. Alexander, of Regina, on 49 acres, grew 2,117 bushels, an average of 43 bushels to the acre.

Mr. Stueck, of Abernethy, had only one acre of land in summer-fallow, and from this he got 62 bushels. That is the highest yield we have heard of in field culture.

By Mr. Clancy:

Q. It would appear that this wheat has been carefully screened, and that the smaller grains, although perfect, have been taken out.

A. Yes. It has been screened since we received it. We usually take out the very small grain when preparing samples for exhibition.

By Mr. Robinson (Elgin):

Q. These samples would all rank as No. 1 hard?

A. No, I think not; some of them are a little bleached. I think they would grade about No. 1 Northern.

Mr. R. O. Miller, of Moosejaw, had forty acres, and raised 1,800 bushels, an average of forty-five bushels. Mr. Keil, of Lumsden, Assiniboia, had 100 acres, and got 5,000 bushels, an average of fifty bushels per acre.

Hon. Mr. Perley, of Woolesley, had 7,600 bushels from 200 acres, an average of thirty-eight bushels, but in Mr. Perley's case only a part of the land was summer-fallowed, and he did not keep the grain separate. On the summer-fallowed land he would have no doubt in the neighbourhood of forty-five bushels, and on the other land a less proportion.

By Mr. Davis :

Q. This Moosejaw wheat is the best grain you have here ?

A. The Moosejaw crops have turned out very well.

I have received a number of other samples, but these shown you are all I was able to get ready this morning.

Mr. Joseph Gibson, of Indian Head, threshed 22,000 bushels of wheat from 500 acres, part summer-fallow, part breaking and back-setting, an average of forty-four bushels an acre.

Mr. T. Livingstone, of Indian Head, had 9,000 bushels from 180 acres, an average of fifty bushels per acre.

Mr. George Lang, of Indian Head, had 3,760 bushels of wheat from eighty acres, an average of forty-seven bushels per acre.

J. Strong, of Rocanville, had 4,500 bushels from 100 acres, an average of forty-five bushels per acre.

L. Keil, of Lumsden, had 5,000 bushels from 100 acres, an average of fifty bushels per acre. That sample we have here.

A. Kindred, of Moffat, had 3,375 bushels from seventy-five acres, an average of forty-five bushels per acre.

Mr. C. E. Cullum, of Regina, had 1,880 bushels from forty acres, an average of forty-seven bushels.

R. Alexander, of Regina, had 2,117 bushels from forty-nine acres, an average of forty-three bushels per acre.

H. Donett, of Moosejaw, had 600 bushels from twelve acres, an average of fifty bushels per acre.

John Ranatt, of Moosejaw, had 1,880 bushels from forty acres, an average of forty-seven bushels per acre.

J. K. Pearce, of Regina, threshed 810 bushels from 15 acres, an average of 54 bushels per acre.

These are all wheat crops, and I think all Red Fife, grown on summer-fallowed land, and go to show the fine crops which the farmers of that district can grow with the best system of farming.

George Hyde, of Grenfell, had 705 bushels from fifteen acres, an average of forty-seven bushels per acre.

By Mr. Henderson :

Q. I notice that nearly all of your reports are from the Territories. How do these averages compare with the land in Manitoba, such as the Portage plains, which have been cultivated for many years ?

A. The Dominion covers a large area, and you can only take one part at a time. I was going to come to that before the committee when I got through with the Territories. My object in bringing these details before the committee was to show that the large crops were not confined to the Experimental Farm at Indian Head, but that the benefits which the farm conferred were influencing the whole country around, and in some instances the farmers have had larger crops than those grown at the Indian Head Experimental Farm.

Q. My only point was, I wondered whether the land was giving out or maintaining its fertility and producing as good results as it did when we had the virgin soil in Manitoba over thirty years ago ?

A. I think on the Portage plains, where in many instances twenty to twenty-five crops have been taken off, the yield is not so large, although the average for Manitoba is pretty nearly the same as the average which the Territorial government has given for the Territories, that is, about twenty-five bushels. But you must bear in mind that in the Territories there are probably a larger proportion of inexperienced farmers, and a good many that have sown their grain on fresh ploughed land and stubble, and have given it very little cultivation, and you have to take these small crops and put them with the larger ones, and that brings down the average to twenty-five bushels.

By Hon. Mr. Fisher :

Q. With regard to the average, I suppose that is for the actual area of wheat in any one year without reference to how much summer-fallowing there was to it ?

A. Certainly, it takes in the whole area in wheat for the year.

Q. I think, in Manitoba there is a larger area in summer-fallow there, alternately, or every second year, than there is in the Territories in proportion, is there not ?

A. I think, perhaps, there is. There is not so much summer-fallowing of land in Southern or Northern Alberta; the largest amount of summer-fallowing is in Eastern Assiniboia.

Q. Is there as much in proportion as there is in Manitoba ?

A. I think probably there is as large a proportion in that part of the Territories as there is in Manitoba, but taking the whole wheat area in Manitoba, there is a larger proportion of summer-fallowing than there is in the whole of the wheat land in the Territories.

Q. But the yield from summer-fallow will be greater ?

A. Yes, much greater.

By Mr. Davis :

Q. The samples you have here are nearly all from Eastern Assiniboia, from the districts surrounding the farm ?

A. Yes.

Q. You have no means of getting samples from the other districts, from Saskatchewan, for example. Of course, there is no experimental farm there, and you have no means, I suppose, of getting information from that district ?

A. Oh, yes, we have received a number of samples from all parts of the Northwest, as there are farmers everywhere who co-operate with us in testing the best varieties. It is not practicable to bring a very large number of samples with me here, and among those chosen this morning I do not appear to have brought any from that district.

Q. But it is natural that the farmers in the districts surrounding the experimental farms obtain greater advantages from them than those at a distance ?

A. There is no doubt that the people living near the experimental farms have a greater opportunity of benefiting from the work of the farms than those who live 200 or 300 miles away. But farmers everywhere can receive the reports of the farm containing all the results of the experiments if they apply for them, and they can then read for themselves and learn what results have been obtained, and in this way every farmer can derive profit from the work we do. They can also get samples from the farms for tests, of the most productive and best sorts of grain, which are sent free to all those who ask for them.

Q. As it is now, you raise a sample of wheat like that on the experimental farm in Assiniboia in the Territories, which answers the requirements of that particular section very well, but the Territories are so large that it might not be any good in another

part. That sample of Preston wheat you gave us a description of, if you had it sown in Saskatchewan and a sample of the result returned to you, you would know whether it was good for use in that district or not. It might be a good wheat in Assiniboia, and useless in Saskatchewan or Northern or Southern Alberta ?

A. We have, however, sent a good many samples of Preston and other good sorts of grain to farmers in Saskatchewan and Northern Alberta district, but there has not been very much grain as yet grown in Southern Alberta.

Q. I say the officers at the experimental farms should pay a little more attention to the outlying districts and not so much to those closer around home, because they have been having the benefit of the farms in their neighbourhood for very many years ?

A. I shall be glad to say something as to what we have been doing in Saskatchewan and Alberta.

Q. We have certainly seen very little of the officials in Saskatchewan ?

A. We have had the superintendent of the experimental farm for the Territories, Mr. A. Mackay, and our entomologist, Dr. J. Fletcher, held a series of meetings each summer for the past two years in different parts of Saskatchewan, and last winter our agriculturist, Mr. Grisdale, held a number of meetings with Mr. Mackay in Southern Alberta. I have visited parts of these districts myself five times within the past few years, but the country is so large that it is not possible to get over it very often. I am sure we have given as much attention, and more, to Saskatchewan in the way of visits of our officers, than we have to many other parts of the country.

By Mr. Robinson (Elgin) :

Q. The people out at Saskatchewan can get their reports from the department the same as anybody else, can they not ?

A. Yes, certainly, and they do get them in large numbers.

I hope the member for Saskatchewan will consider it his duty if he finds that any part of his constituency is lacking in information regarding the work of the experimental farms to see that the farmers there receive the reports and bulletins. Everyone who applies for copies can get them.

I beg to call your attention to Senator Perley's sample of oats. He has grown last year on twenty-five acres, 2,250 bushels, an average of ninety bushels to the acre.

Q. What variety is that ?

A. The 'Banner.' A number of other people have also had good crops of oats. Mr. Cullum, of Regina, had 1,870 bushels from seventeen acres, an average of 110 bushels to the acre.

Mr. Thos. Wilkie, of Pense, had 5,025 bushels from fifty acres, an average of a little over 100 bushels per acre.

R. Alexander, of Regina, had 4,080 bushels from forty acres, an average of 102 bushels to the acre, and John Ranatt, of Moosejaw, had 1,800 bushels from eighteen acres, an average of 100 bushels per acre.

By Mr. Clancy :

Q. Has not this year been an exception, rather, in respect to crops ?

A. Yes, it has been so ; the crops have been unusually large, but what I was trying to make clear was, also, that while we have had unusual crops at Indian Head, the farmers throughout this part of the country have participated in this general increase wherever they have been farming after the manner our Superintendent at Indian Head has advised them to follow.

Q. Well, it is quite possible, with the best methods of farming, if the season is against them, the result may be bad ?

A. Yes, the season has probably more to do with the crop in the west than anything else.

THE CROPS OF 1901 IN MANITOBA

Wheats.—The crops in Manitoba, although not quite so heavy were very fine. At the experimental farm at Brandon the best twelve varieties of spring wheat gave an average return of thirty-six bushels fifty-seven pounds to the acre, the Goose wheat heading the list with a yield of forty-two bushels. The Goose, however, is a hard translucent wheat, not very glutinous, and is not much in demand in Manitoba, although it sells at a very good figure in Ontario, where it is bought by exporters to send to France and Germany and other countries, where it is used very largely.

By Mr. Robinson (Elgin):

Q. It has more value now than formerly?

A. Yes, there is a larger demand for it now than there was a few years ago. But whether our own millers use any of it I do not know, but the demand abroad is quite large. It is an excellent wheat for the making of macaroni or pie crust, or any kind of pastry where a light porous dough is not required, and in France that wheat is regarded as one of the best wheats for bread-making. They do not care for a very light porous bread, but prefer bread which is more solid, and the Goose wheat and all that class of wheat known there as hard wheats, varieties of *Triticum durum*, are regarded as of superior quality even to our Red Fife wheat in the North-west.

But when you get to England there is a different standard there, and the highly glutinous wheats of the North-west are much preferred. It will thus be seen that markets can be found for all sorts of wheats.

In oats, the average of the best twelve sorts at the Brandon experimental farm gave 88 bushels 10 pounds per acre, the heaviest crop being that of the Early Maine, which gave 91 bushels 26 pounds per acre.

Barleys.—In six-rowed barleys, the best six sorts averaged 46 bushels 12 pounds per acre, Mensury taking the lead with 48 bushels 16 pounds. The best six sorts of two-rowed barleys yielded somewhat less, averaging 41 bushels 42 pounds per acre, the highest yielder being the Jarvis, one of the new hybrid sorts, which have been produced at the experimental farms.

Pease also did very well there, the twelve best sorts giving an average of 40 bushels 18 pounds per acre, the Paragon heading the list with 43 bushels to an acre.

Indian corn was a good crop at Brandon last year, and cut green for ensilage, gave an average of 21 tons 1,472 pounds per acre.

The best six sorts of turnips gave an average return of 28 tons 1,860 pounds per acre.

The six best sorts of mangels yielded an average of 38 tons 164 pounds per acre.

The six most productive sorts of carrots averaged 19 tons 1,673 pounds per acre, and the four heaviest yielding sugar beets gave an average of 28 tons 1,420 pounds per acre.

By Mr. Robinson (Elgin):

Q. How is the soil prepared for mangels and carrots?

A. By summer-fallowing.

Q. And manure?

A. Sometimes barnyard manure is used. It is not practical, however, to use this manure to any extent, as it makes the soil open and porous and produces unfavourable conditions if the season is very dry. The best twelve varieties of potatoes at Brandon yielded an average of 597 bushels and three pounds per acre. These figures indicate the excellence of the crops all through the Canadian North-west.

Since the general law that like produces like has a bearing on seed grain, it was deemed important to secure our main supplies of seed grain for distribution this year

among farmers throughout the Dominion from these phenomenal western crops, and several carloads have been brought to Ottawa for this purpose.

By Mr. Davis :

Q. I want to ask you a question about these potatoes; what is the best, the one that is the most prolific and gives best yields; what is the name of it ?

A. The same variety will not give the same results in the different parts of the Dominion. At Ottawa the Holborn Abundance has averaged the largest crop during a seven-years' test.

Q. Give us the North-west ?

A. The American Giant stands at the head of the list at Indian Head in a test of six years, and the Carman No. 1 at Brandon.

Q. For six years ?

A. Yes. The average yield for six years of the Carman No. 1 at Brandon was 394 bushels 57 pounds, and the average of the American Giant at Indian Head for the same period was 494 bushels 50 pounds.

Q. To the acre ?

A. Yes, to the acre, as an average of six years' testing.

By Mr. Richardson :

Q. How many bushels did the Carman No. 1 give to the acre ?

A. 394 bushels 57 pounds, a very good yield.

By Mr. Davis :

Q. Is it a white potato ?

A. Yes, it is a white potato.

By Mr. Clancy :

Q. Does it stand high outside of its quality of yielding largely ?

A. Yes, it is a potato of the best quality and is one that we are distributing largely. At Indian Head the same variety has given an average crop for six years of 408 bushels 51 pounds.

By Mr. Davis :

Q. Is it an early potato or a late ?

A. Medium early.

DISTRIBUTION OF SEED FOR THE SEASON OF 1902.

By Mr. Robinson (Elgin) :

Q. Have you some of these for distribution, of these Carman No. 1 ?

A. Yes, a considerable quantity. We have not sent out any potatoes yet. This part of the distribution is taken up as soon as the danger of injury from frost is past. We have, however, already sent out considerable quantities of seed grain of the very best and most productive sorts, nearly all of which has been brought from Indian Head, where the very large crops I have referred to were grown. I can give you the distribution as it stands now. Up to last evening we have sent out in three-pound samples a total of 10,793 as follows : 3,317 to Ontario, 3,089 to Quebec, 1,035 to Nova Scotia, 1,062 to New Brunswick, 581 to Prince Edward Island, 1,033 to Manitoba, 546 to the Territories and 130 to British Columbia. You see they have been fairly evenly distributed considering the number of farmers in each province.

By Mr. Clancy :

Q. That is for the present season ?

A. Yes. This distribution is going on at the present time at the rate of 400 to 500 samples a day, and we had sent out the number I have given you up to last night. In addition to the three pound samples, we are distributing a limited number of larger samples. These larger samples were authorized by the Minister of Agriculture three years ago, and at that time we prepared a list for these from the names of farmers who had shown great interest in the work of seed testing, and selecting a few from each agricultural constituency with the view of spreading these larger samples over the whole Dominion. Eight-pound samples of oats have been sent, and ten-pound samples of barley and wheat in each case. One of the main objects in view in this distribution was that the farmers might be able to give us the yield per acre of each variety. With the three-pound samples this was scarcely practicable, but with the larger samples, which are sufficient for one-tenth of an acre, there is no difficulty in getting this valuable information.

By Mr. Richardson :

Q. How large were these samples ?

A. Eight pounds of oats, ten pounds of barley and ten pounds of wheat. That is a little more than sufficient to show one-tenth of an acre on the basis of the quantity we usually recommend.

By Mr. Clancy :

Q. The smaller samples are three-pound samples ?

A. The smaller samples contain three pounds each. These larger samples cannot be sent to every one because we have not grain enough. Up to last night 1,642 of these had been sent out, distributed by provinces, as follows :—600 to Ontario, 401 to Quebec, 120 to Nova Scotia, 154 to New Brunswick, 52 to Prince Edward Island, 159 to Manitoba, 137 to the North-west Territories, and 19 to British Columbia.

The work in connection with this distribution is very heavy and swells the correspondence to a large volume. During the month of February the total number of letters received by the Director was 17,154 ; the first half of February the letters averaged 525 daily, and during the last half 905 per day. From the first of March until to-day I have had an average of 1,108 letters per day. The largest number received was on Monday, when 1,924 letters were received. That was the largest mail ever had at the Central farm. A large proportion of these are requests for grain samples, some are for reports, and a good many for general information. This shows that the farmers everywhere are taking a great interest in this work, and then further we get a number of letters from farmers subsequently showing how they have profited by the distribution of these grain samples. Some farmers make money by selling grain raised from these samples as seed to their neighbours, thus getting all the advantage they can out of the transaction.

By Mr. Ross (Victoria) :

Q. Do they give you a return of the results ?

A. Yes, we get a large number of returns every year of the results of the tests, and the farmers also send back specimens of the grain grown from these samples. We do not preserve them all, but we have hundreds of bags in store from all parts of the country, so that samples can be furnished from almost any district desired.

By Mr. Robinson (Elgin) :

Q. Do you remember the largest number of bushels to the acre of the oats you sent out last year ?

A. I do not, and the returns are not all entered yet.

Q. I was at one threshing of oats, which were grown from a sample you had sent out and they yielded eight and a half bushels from the eight pounds of seed.

A. That would be eighty-five bushels to the acre.

Q. Yes, about that.

A. Some of them would run over that. I know of some that have run nearly up to 100 bushels.

Q. The oat I refer to was a very stiff and straight sort ; what was the name of the variety ?

A. That would likely be the Tartar King, which has a very stiff straw. Some very good reports have come in from parties who have been growing that variety from different parts.

Q. That was not bad what I told you of—eighty-five bushels ?

A. No. I think it was very good considering that the season was not very favourable for oats.

The WITNESS.—With this large correspondence to look after, in addition to the work of the annual report, all the members of the staff are kept very busy.

By Mr. Wilson :

Q. You must want a large staff of men to reply to these inquiries ?

A. We have not a very large staff, but the work is pushed along as rapidly as possible. The work in connection with the correspondence is very much facilitated by having printed circulars ready covering different subjects so that a few words is all that needs to be written, and in that way one man can get out easily about 150 replies a day.

By Hon. Mr. Fisher :

Q. Mr. Wilson was just asking me about how many men were employed looking after the letters and sending grain at the present time ?

A. At the present time we have one French correspondent who manages the whole of the French letters, but he is generally a few hundred letters behind. He will catch up that in a few days when the mails become lighter. We have another clerk engaged all the time in opening the English letters, and it is more than he can do to open them and classify them. The letters that require special answers go into my office.

Q. But particularly the seed grain applications ?

A. The clerk who opens the letters reads them, and if they are applications for samples, he sees what the party in each case asks for, and puts a red pencil line beneath the name of the variety of grain desired. These pass next through the hands of another of our officers who writes the name of the variety to be sent where this is not specified by the applicant, and these go at once to the distribution office, where we are sending out 500 samples per day, so that about 500 letters are answered daily by sending promptly to the parties the samples asked. Applications for potatoes and corn which cannot be sent until later on, involve a reply, and in each case a letter is written to the applicant stating that his application has been received and will be attended to as soon as weather conditions will permit.

By Mr. Wilson :

Q. That greatly lessens the work, of course ?

A. Yes, it does. I have one man who is working all the time attending to the potato and corn applications in English, and the French correspondent attends to those in French. The requests are answered just as promptly as possible and this is done without materially adding to our staff.

WEST SIDE OF SOUTHERN ALBERTA, ITS INHABITANTS—THE GALT IRRIGATION CANAL.

During my journey of inspection west last year, I visited that part of Southern Alberta, bordering on Montana. A large portion of this district consists of flat or slightly rolling plains covered with prairie grasses. In the past the greater part of this area has been too dry to admit of successful agriculture, although the grazing for cattle is good. Lethbridge may be regarded as the centre of this district, and that town lies on the line of railway which runs from Medicine Hat through the Crow's Nest Pass. On arrival at Lethbridge a trip was made over a branch railway which runs south from this point to Spring Coulee. This line runs through the districts reached by the large irrigation canal recently constructed by the Canadian North-west Irrigation Company, which is known as the Galt Irrigation Canal. This canal is supplied with water from lakes fed by the melted snow of the Rocky Mountains and the overflow from these lakes forms the St. Mary's river. The intake for the canal is on this river about five miles from the Montana boundary. From this point the main canal runs 61 miles, after which the water is carried in two branch canals, one of which runs to Lethbridge 32 miles distant, and the other to the town of Stirling a distance of 22 miles. The entire length of this canal system is thus 115 miles and it brings from the mountains water sufficient, it is said, for the irrigation of 200,000 acres of land. This great engineering work is likely to transform this section of country, and by furnishing the land with needed moisture to convert it into an area of great fertility. Through the kindness of Mr. A. T. Galt and the manager of the irrigation works, Mr. C. Magrath, facilities were afforded me for seeing portions of this extensive work. Nine years ago I drove across a part of this country under the guidance of one of the mounted police. It was then almost uninhabited. There were bands of cattle here and there, timber, wolves and coyotes were occasionally seen but no settlers worth mentioning. After a drive of about 60 miles, we reached Cardston, a Mormon settlement, lying at the base of the foothills of the mountains, with a population then of about 400. Since that time, settlement has been going on rapidly over a large part of this district and the population has increased to fully 4,000.

By Mr. Davis :

Q. What do they raise principally there, I have never been up in that part of the country.

A. They raise a good deal of fall wheat. A considerable quantity of oats and have large bands of cattle and horses.

Q. Has fall wheat been a success up there ?

A. Yes.

A MORMON SETTLEMENT.

In the neighbourhood of Lethbridge the settlement is a mixture of nationalities, but that part lying south-east of what are known as the rolling hills and extending to the Montana boundary, has a population almost entirely composed of Mormons. In addition to the thriving town of Cardston, which now has a population of 1,200, there are two other rapidly growing towns, Magrath and Stirling, both of which were started in 1899. The first is now the larger place and has about 600 people, Stirling having about 550. At each of these two new settlements about 2,000 acres were under crop this year. At each place eight sections of land, containing in all 5,120 acres, are inclosed with a common fence, and within this all the crops of the community are protected from the inroads of stock. The houses of the settlers are in the towns, they are well built and most of them are neat and comfortable with pleasant surroundings.

By Mr. Wilson :

Q. How much land did you say is inclosed ?

A. 5,120 acres.

Q. What sort of a fence is it and where is it situated ?

A. The land inclosed by a common fence is outside the town in each case, and the area inclosed is eight sections.

Q. And has each person the deed of his own land ?

A. Yes; each person has his own land.

By Mr. Henderson:

Q. What kind of a fence have they ?

A. The ordinary barbed wire with posts about a rod apart.

By Mr. Robinson (Elgin):

Q. Has the land been surveyed in that section ?

A. Yes; all the land settled has been surveyed.

By Mr. McEwen:

Q. Is it wooden or iron posts ?

A. Wooden posts are used. These can be had in the river bottoms, but are mostly poplar, which is not a very durable wood for such use. The posts are all driven into the ground, so it is not much trouble to renew them when they decay.

By Mr. Davis:

Q. I understand they are starting a beet root sugar factory ?

A. Yes; I will refer to that presently. The streets are wide and each house has about an acre of land which in most instances is well cultivated with garden vegetables, flowers and small fruits. Evidences of industry and frugality were everywhere seen. The vice of drunkenness is scarcely known among the Mormons, a very large proportion of them being total abstainers. Further a considerable number of them drink neither tea nor coffee, but instead of these beverages use milk or water as they believe this practice to be healthier and find it also more economical. These people were very anxious to gain information likely to be useful to them in their agricultural work and I had many applications, which have since been supplied, for the reports and bulletins of the experimental farms, and many requests have since come in from that district for samples of best and most productive varieties of grain, &c., such as are being sent out from the experimental farms and especially of such varieties as are likely to be suitable for their climate. They seem very anxious to test everything which is likely to be useful to them. I found much intelligence and skill manifested in the methods adopted for the management of their settlements all of which were making extraordinary progress. The principle of co-operation was general among them and they have made during the time they have been in southern Alberta much more progress than any other settlement I have ever visited in the North-west. Polygamy, which is usually associated with Mormonism in the minds of most people, seems to be practically dead. It is said to be no longer a doctrine of the church and at any rate, so far as could be learned, there was not the slightest evidence of such a practice existing anywhere among the Mormons which I saw in this country.. They seem to be an industrious and law-abiding community whose methods of co-operation are very helpful and productive of contentment among their people. In each settlement the head of each family is visited once a month by two of the leading men of the community, the wife being also visited by two of the leading women. During these friendly visits inquiries are made as to the health of the family, and as to whether the supplies of food are sufficient and when cases of suffering or want are discovered, efforts are at once made to relieve them.

One of the funds available in the community for relief purposes, is known as the 'fast' fund. Every family is said to have a fast day once a month and on that day

only one meal is eaten. The value of the other two meals is estimated and an equivalent sum given to the fast fund. This practice, it is alleged, does the fasters no harm, and furnishes a fund to which all contribute, and from which supplies can be drawn to procure necessities for the relief of the needy.

By Mr. Robinson (Elgin):

Q. What nationality are these Mormons?

A. I found them to be of different nationalities and to come from many different localities; some from Utah, some from Montana, others from Wyoming. Many from England, among these a few from old London. Indeed they seemed to be gathered from all parts of this country and from the old country. By means of their methods of co-operation much is done to bind each family to the community by bonds of sympathy and common interests.

One thing that struck me as remarkable was the general interest taken in the cultivation of vegetables and flowers. The latter are seldom seen in a new settlement, but among these people almost every garden was gay with flowers, and in the town of Stirling I was informed that arrangements had been made for a flower show which was to be held a few days later than the time of my visit, when prizes were to be given for the best displays and in connection with which I was told that there promised to be lively competition.

One of the wealthy men of Utah, Mr. Jesse Knight, who is reputed to have large revenues from mines in that State, takes a very active interest in the Mormon settlements of Alberta. He has recently purchased a large cattle ranch not far from the irrigated districts of 100,000 acres for one of his sons, stocking it with 5,000 head of cattle, at a total cost of about \$450,000.

By Mr. Henderson:

Q. Did he purchase it out and out?

A. Yes, the 100,000 acres.

By Mr. Davis:

Q. From the government?

A. No; I think it was from the Galt Co. That company have a quantity of railway lands.

By Mr. McEwan:

Q. That would be \$4.50 per acre?

A. The cost of the cattle is included in that total. I think he paid about \$2.00 or \$2.50 per acre for the land.

By Mr. Davis:

Q. Is that a solid block of land in one lot?

A. Yes; a solid block, and he put up last year 60 miles of fence to inclose it. The ranch is inclosed partly by water, so that 60 miles of fencing was sufficient to complete the inclosure.

By Mr. Wilson:

Q. What was the name of the purchaser?

A. Mr. Jesse Knight.

By Mr. Clancy:

Q. How many acres did he buy?

A. 100,000 in that block.

By Mr. Wilson :

Q. How many cattle were on it ?

A. None at the time of purchase. He brought in about 1,500 stockers, bought chiefly in Manitoba and the remainder from Montana.

By Mr. Oliver :

Q. Is that irrigated land ?

A. No, it is near the irrigation area but is outside of the reach of water from the new canal.

Mr. Knight has lately bought another large tract of land on which to found a new town and settlement, adjacent to the irrigation canal, to be named after his other son, Raymond, where Mr. Knight is about to establish a large beet sugar factory. A party of surveyors were working on the open prairie, laying out this town site at the time of my visit, contracts had been made for the ploughing of 3,000 acres of land to be completed before the end of the season, and a number of four-horse teams were then busily engaged in this work. Some of the pioneer settlers of this new town had already arrived, and in the meantime were living in tents. The 3,000 acres then being ploughed will be cropped with grain during 1902, and next year, 1903, it is expected to be in good condition for the growing of sugar beets. Each farmer coming into the settlement will have 80 acres of land, and will contract in his deed of purchase to grow not less than ten acres of sugar beets each year, and in this way an abundant supply of beets will be assured. Mr. Knight is an ardent prohibitionist, and is having a clause put in each of his deeds of sale providing that in case of the establishment at any time of any saloon or drinking place upon any part of his property, such property shall be forfeited and revert to the original owner. It is expected that the beet sugar factory will be completed during 1902 and be ready to utilize the crop of 1903.

It was very gratifying to see the many evidences of industry and energy displayed among these people. In all the settlements the inhabitants have large quantities of cattle and horses. Considerable quantities of butter are made, there is also a cheese factory at Cardston and the surplus dairy products are sent to the mining town of Lethbridge and elsewhere. Poultry are very generally kept and a quantity of eggs are sold to the neighbouring towns.

The cheese factory has been in operation for several years. A large mill has been erected near Cardston, run by water-power from a mountain stream a short distance from the town where grain of all sorts is ground, and the people are thus supplied with bread from wheat of their own growing. Leaving Cardston and crossing the Blood reserve a drive of fifty miles along the plains at the base of the foot-hills of the Rocky mountains brought me to the town of Pincher, which is situated on the line of railway through the Crow's Nest Pass. Many settlers are coming into many parts of the district I travelled over, and notwithstanding that it has an elevation of from 3,000 to 3,500 feet above sea level, the climate is such that fall wheat is grown in many localities quite successfully. On the farms both at Cardston and Pincher many farmers have reaped from 30 to 40 bushels per acre. The variety grown at Cardston is a bearded wheat, which they know as Odessa. I have not been able to trace up where it comes from. About Pincher a beardless sort is most commonly grown, the name of which I could not ascertain. In all these settlements the people are in the midst of a good ranching country, and most of the residents own more or less stock. This completes what I have to say about that section, but I should be glad to answer any questions which may be asked.

By Mr. Wilson :

Q. Where did this Mr. Knight come from ?

A. He is one of the prominent Mormons in Utah. He is said to have had a dream

on one occasion about a mine, and he went and found this mine and afterwards sold it for \$500,000. From all I could learn he seems to be a man with large capital who takes a great interest in the Mormon settlement in Alberta, and is prepared to help them in every way he can.

By Mr. Davis :

Q. He has purchased lands for raising sugar beets ?

A. Yes.

Q. He is going to start an industry ?

A. So I was informed.

By Mr. Clancy :

Q. Has he made that country his residence now ? Has he left Utah ?

A. No ; but he visits there occasionally, one of his son's is said to live on the ranch and managing the cattle on the 100,000 acres, and I understood that the other son will remove to Raymond and be made the manager of the sugar beet factory which Mr. Knight is to build. I was told there that he had contracted for the bricks and that he was about to contract for the machinery, but was waiting to learn whether the arrangement for importing machinery for the sugar beet factories free of duty would be continued for another year before making his contracts. That I understand is under the consideration of the House, and is likely to be granted.

By Mr. Davis :

Q. I saw a variety of wheat sent down by a party in that district, a sort of goose wheat, with a very large long berry.

A. This is probably a variety called Polonian wheat which is chiefly grown in hot countries in Europe. I saw a small field of this at one of the Mormon settlements. It produces a very large head and a large kernel, but is not productive with us. We have tested it for several years at all the experimental farms.

Q. What do you call it ?

A. The Polonian wheat.

Q. A hard wheat ?

A. Yes, quite hard and transparent ; much like goose wheat. It does not, however, compare favourably with Red Fife as to quality or productiveness. I am sending quite a number of samples to the different settlements I have spoken of, including Red Fife, so that they may begin to grow pure seed. The settlers have found great difficulty in getting seed true to name and clean, and they showed me varieties of wheat they were growing which I was able to tell them were not the varieties they thought them to be. They were very anxious to have the best varieties and to have them true to name, and they assured me that if they could once work in a supply they proposed to keep them clean so as to grow them to the best advantage.

By Mr. Davis :

Q. Do you know anything about the varieties of grass up there, have they tried growing hay ?

A. Not to any extent. They are testing Brome grass in some places now, but the water has only been available to them this past year and I think very few of them have yet used much water for irrigation. Last year there was rather an unusual rainfall and they were able to raise crops without using much water, but where they had used water, it was very evident that it was a great advantage. The crop was much more thrifty and had a much more vigorous growth.

By Mr. Davis:

Q. In dealing with the North-west Territories and Manitoba you haven't said anything about the grasses at all. That is a question in which I am greatly interested, are you going to take that up at some other time?

A. That is usually left to be taken up by Professor Fletcher, our botanist and entomologist at the experimental farm. He is our expert upon grasses and will, I know, be glad to discuss this question fully.

Q. I should be glad to get information about it, and to have it taken up.

By Mr. Richardson:

Q. Is the irrigation system a government enterprise or was it established by a company?

A. It is a company enterprise. The North-west Irrigation Company built the canal at their own cost.

Q. They got the land, did they?

A. Yes; I understand that the land was given to them as part of their subsidy for building the railway, in alternate sections as is usually the case where land is given to a railway company. But before they began the construction of the canal they made an arrangement with the government so that they got their sections of land in a block running along the district where they proposed to build the canal. They would not have attempted to build a canal of that magnitude if every alternate section of the land along its banks was owned by other people. About 200,000 acres of land, it is estimated by the company, can be watered by this canal, running a length of 115 miles.

By Mr. Ross (Victoria):

Q. How is it built?

A. The canal is mainly a matter of excavation. In many cases the soil is compact enough when you get down to the subsoil to hold the water without much waste, but occasionally a loose piece of ground is met with and in these places and also in low spots they have to build sluices of timber to carry the water across.

By Mr. Robinson (Elgin):

Q. I suppose the parties owning the properties there have to make arrangements with the canal company to get water?

A. The canal company from what I can learn propose to make very reasonable and liberal arrangements with parties buying the land with regard to water. They have built the canal with the object of making money out of it, of course, and the settlers going in there will have to pay a reasonable price for the water.

Q. At so much per acre?

A. So I understand.

By Mr. McGowan:

Q. Have you any knowledge of the detailed cost to the company of constructing the canal?

A. I understood that the cost was from \$350,000 to \$400,000. The Mormons did a large part of the work of digging the canal. They came in there in considerable numbers and contracted for the work. They were to have a certain price per cubic yard for all the material lifted of a certain character, and for material of a more difficult nature a higher price. There were several different classes of material excavated, and the prices ranged from 12½ cents to 25 or 30 cents per cubic yard. The proportion of heavy material to move was, I understand, much larger than was originally cal-

culated, and the canal has cost considerably more than was at first anticipated. That, however, has been partly paid for, so I understand, in land, which the Mormons agreed to take in part payment for their work.

By Mr. Clancy:

Q. I suppose the canal company was really the land owners ?

A. They were the land owners. They owned the whole of the land along where the canal was to be dug and they sold portions of the land to the parties who helped them to dig the canal. The land is of very good quality there and the crops I saw were very satisfactory indeed. I have never seen prairie lands treated just in the way the Mormons treat theirs. They put four horses on a plough and break the prairie up about five or six inches deep, a practice which in Assiniboia would be thought most unwise, and after ploughing it is harrowed and sown. I saw the crops they were growing on land so treated and as near as I could estimate they were about half of what we would call a good crop. That is, where wheat would yield 30 bushels to the acre in the North-west with the usual methods, they would get 15 bushels, but that was the first year.

Q. They disced it, broke it up ?

A. Yes, and in other Mormon settlements which I saw a similar practice was followed. The difference in climate seemed to permit of the land being treated differently from what is done in Saskatchewan and Assiniboia.

By Hon. Mr. Fisher:

Q. This is done without irrigation ?

A. Yes, and the average of the fall wheat I saw would, I should think, be about 15 bushels to the acre the first year after ploughing, and from 30 to 40 bushels the second year when the land is in good condition.

By Mr. Gilmour:

Q. Do you know if fall wheat has been grown in other seasons around Pincher Creek and Lethbridge ?

A. Yes; they have been growing there for many years, I have had samples sent me in previous years by people living there who were successful in growing fall wheat. When I visited the Mormon district nine years ago, they were then growing spring wheat brought from Utah, but for some years past they have been cultivating fall wheat which is harvested earlier.

By Mr. Davis:

Q. What variety ?

A. The variety they have they call the Odessa. They are anxious to test other varieties, they are not sure that this is the best sort. I have sent them some other varieties for trial since my return.

By Mr. Oliver :

Q. Were the crops grown at Stirling and Magrath this year the result of irrigation ?

A. Not to any extent.

Q. Not the result of irrigation ?

A. No, sir; only in occasional instances were they able to use water.

Q. You mean only in an occasional instance did they require to use water ?

A. No; but that it was not available in time for use on the crop.

Q. This year ?

A. They would, I believe, have had larger crops if they could have used the water.

Q. As a matter of fact the crops grown this year were grown without irrigation ?

A. Yes. When I said the yield was from 30 to 40 bushels of fall wheat per acre, I did not include the land about Stirling and Magrath, but that about Cardston and Pincher Creek where the land has been well worked.

Q. The settlements along the foothills are in a better position in regard to moisture ?

A. They usually are. This year they have been able to raise good crops without irrigation.

Q. As a matter of fact, that has been done in previous years ?

A. Yes, it has.

Q. The idea seems to prevail that as a matter of fact the crops in that part of the country are all dependent on irrigation, whereas the fact is, that whatever may be the case in future, so far the crops in that country have been raised almost entirely without irrigation ?

A. Not altogether this year. I met with farms occasionally along the line of the irrigation canal where the settlers had used water quite freely. The water was available fairly early this spring, but in bringing water over a farm a good deal of work is required in making small channels with arrangements for supplying and cutting off the water, and as they have been busy building their houses and getting other preparatory work done, they have not had time to complete their arrangements for irrigating and the necessity did not force itself on them this year because the season was not as dry as usual.

HOUSE OF COMMONS,

COMMITTEE ROOM 34,

OTTAWA, Wednesday, March 12, 1902.

The Select Standing Committee on Agriculture and Colonization met here this day at ten o'clock a.m., Mr. Legris, Chairman, presiding.

Dr. SAUNDERS was present by request of the committee, and submitted the following evidence :—

Mr. Chairman and Gentlemen,—When I had the pleasure of appearing before you yesterday I brought under your notice some facts with regard to the crops in the great North-west, embracing the provinces of Manitoba and the Territories. My remarks ended with my arrival at the town of Pincher. Some one or two members made inquiries from me in relation to the winter wheat which is being grown at Pincher and all over that foot-hill country around Cardston, and I promised to bring a sample of the wheat this morning. These are the samples of the winter wheat grown in Pincher.

(Sample produced for inspection of committee.)

That is the beardless form of wheat. There is also a bearded form which I referred to yesterday under the name of Odessa, but of which I did not bring samples with me.

THE CROW'S NEST PASS DISTRICT.

Leaving Pincher I crossed the mountains through the Crow's Nest Pass, and spent a day at Fernie in the great coal districts of the Crow's Nest country where some large companies are operating. At the time of my visit the output there was about 1,200 tons a day, and a great many men were employed in this work. It is quite a large sized town which has been built up there. A large proportion of this coal is used for making coke which is very valuable to the miners in the interior of British Columbia. There were 300 coke ovens in operation at Fernie at that time, and it was very interesting to go about among these and have explained the particulars in regard to the conversion of coal into coke. One hundred more coke ovens were being built at Fernie at that time. At St. Michael also twenty-five miles east of Fernie 200 coke ovens were in course of construction and some fine seams of coal are being opened there. All the coke from these ovens is used for the smelting of ores in the mining districts. Such coke as was used formerly had to be brought long distances, some of it all the way from Wales and other countries. By the working of these coal mines, and the production of coke in the Crow's Nest Pass district, the cost of coke has been greatly reduced and mining operations have received an encouraging stimulus. I went into one of the mines and spent a morning there, and I could not but be struck with the enormous quantities of coal in sight. This seam which has been worked by the coal company was from 6 to 9 feet thick, most of it running 7 or 8 feet, and while an immense quantity of coal has been taken out they are really only making channels through their 6 foot seam, and leaving, I presume, nearly three-fourths of the coal standing untouched, as support for the roof. This does away with the necessity of propping the roof of the mine, and they are working it in this way right through to the other side of the mountain, and when that point is reached the remainder of the coal will be taken out, sufficient propping being used as they come back to prevent accidents. The supply in that one mine will probably last for several years.

By Mr. Clancy :

Q. How deep do they go for that coal ?

A. They do not have to dig down at all as in many other mines. The entrance to the mine is at the side of the mountain running into the seam a little above the level. It is about 30 or 40 feet above the railway where entrance is made. The mountains there seem to be literally filled with coal and evidences of coal seams are very common.

By Mr. Robinson (Elgin) :

Q. Is the coal at that mine anthracite or bituminous ?

A. The coal is bituminous. The anthracite coal is found nearer to the foot-hills of the mountains. It is near Banff, at Anthracite and Canmore.

Q. This would be a softer coal then ?

A. This is a softer coal, and is said to be very much like the Welsh coal, which is highly esteemed for the manufacture of coke for mining operations.

FARM CROPS IN BRITISH COLUMBIA.

Passing through farther westward, I arrived at the experimental farm in Agassiz early in September, and found the crops there very promising.

When the returns were all in we found that the twelve best varieties of oats in the experimental plots at Agassiz had averaged 95 bushels 17 pounds per acre. The Golden Tartarian headed the list with 103 bushels 18 pounds to the acre. The great difference in the climate in British Columbia as compared with the North-west and the eastern provinces results as we might anticipate in changing the relative positions of some of the varieties as to productiveness.

The six best sorts of two-rowed barley averaged 55 bushels 17 pounds per acre. The best six-rowed sorts averaged 61 bushels 27 pounds per acre. The Royal stands at the head of the six-rowed list, with a yield of 67 bushels 24 pounds, and the Beaver is first of the two-rowed varieties, with 61 bushels 2 pounds per acre. Both of these barleys are the product of cross-fertilization at the Central Farm, Ottawa, and were got by crossing a six-rowed with a two-rowed sort. The twelve best sorts of wheat have given an average of 49 bushels 32 pounds per acre, and the whole of the 71 varieties under trial have averaged 42 bushels 14 pounds per acre.

Pease have given an excellent yield. The best twelve sorts having averaged 58 bushels 51 pounds per acre.

The crop of Indian corn, cut green for ensilage, was below the average, on account of the cold moist condition of the season. The crop of the best six sorts which usually give from 20 to 25 tons only average this year 13 tons 1150 pounds per acre.

The turnip crop was excellent, the six heaviest croppers having given an average of 47 tons 380 pounds per acre.

Mangels were not quite so heavy, the average of the best 6 sorts was 22 tons 1640 pounds per acre.

Carrots did very well, the best 6 varieties having averaged 29 tons 301 pounds per acre.

The best four sorts of sugar beets averaged 16 tons 1451 pounds per acre. In these tests of roots I think the plots are not any more favourably located than the fields would be and these averages may be taken as a fair indication of what the field crops might give on land of similar quality.

By Mr. Clancy :

Q. The field crops seldom come up to the experimental plots in results, I think ?

A. No; not often, and I think for the reason that it is difficult to find a field in

the eastern provinces or in British Columbia that is strictly uniform in quality. Such may be found, I believe, in the North-west.

Q. Can you find such in the North-west ?

A. I think so. In the great North-west plains the soil is probably more uniform than in any other part of the Dominion.

In all countries that have been occupied by trees when the clearing takes place the surface soil is so disturbed and dug over, in rooting out the stumps that the land is made very irregular in quality, and in British Columbia where very large trees have to be taken out, and excavations made sometimes 30 to 35 feet across to get out the stumps, the gravel is turned up and mixed with the soil in such a way as to make the land very variable.

Q. That would not obtain in western Canada ?

A. Not to the same extent. In nearly all the valleys of British Columbia, the alluvial soil is underlaid by gravel and in digging out large trees much of the gravel is raised to the top and that of course depreciates the quality of the soil on such spots.

Potatoes gave remarkable crops at Agassiz where the best 12 sorts produced an average of 661 bushels 5 pounds per acre. The hay crop was also unusually heavy. The crops at the experimental farm at Agassiz may be regarded as fairly indicative of the crops on the farms in the coast climate of British Columbia. It will thus be seen that farm crops all through the west have been very good.

In the east while hay has been an excellent crop and corn for ensilage generally above the average, most of the grain crops have fallen below the average. At the Central Experimental Farm the best 12 sorts of oats have averaged 55 bushels 22 pounds per acre. I may say generally that the field crops of oats have gone nearly 50 bushels per acre, showing very little difference this year between the yield of the trial plots and those had in the fields.

The best six sorts of two-rowed barley gave 48 bushels 23 pounds. The best six sorts of the six-rowed variety gave 36 bushels 37 pounds per acre.

The twelve most productive kinds of spring wheat have given an average of 30 bushels and a half, and the best twelve sorts of peas 31 bushels 23 pounds per acre.

The six best sorts of Indian corn cut green for ensilage gave an average of 23 tons 1,007 pounds per acre.

VALUE OF ENSILAGE AS A CATTLE FOOD.

By Mr. Wilson:

Q. Have you as much faith in ensilage for feed as before ? Does the continued feeding of it show it is a success ?

A. Yes, there is no way in which we can get the same amount of nutritious food for the same cost for the feeding of steers and cattle as we can with ensilage. We find this year our ensilage has cost us less than \$1.50 a ton put into the barn. This is including \$3.00 an acre for rent of land and all the cost of growing the crop and putting it in the silo. We have not found any other crop which will furnish food as cheaply as ensilage made from Indian corn.

Q. Do you find there is any discussion among the farmers about it ?

A. Yes.

Q. They don't seem to dissent from your views of it ?

A. No, I hear no dissent from those who have had experience. There are a great many silos in Ontario and Quebec. In the North-west this has not been tried to the same extent although there we find it furnishes excellent feed.

By Mr. Wright:

Q. In our section some farmers are putting up three and four silos.

A. We use at Ottawa an average of about 500 tons of ensilage every year.

By Mr. Clancy:

Q. How does corn ensilage compare with other fodders for feeding purposes ?

A. That is a difficult question to answer; so much depends on the condition of the ensilage when fed. Some seasons the corn plant when put into the silo has not reached exactly the same degree of development as to maturity as it has in other seasons, and that would affect the proportion of digestible matter in the corn. The chemist of the Dominion experimental farms this year has been making a special study of this subject; for several years he has also been investigating recently the changes that occur in the silo in the corn during the winter, and I would prefer, as he is more conversant with this than I am, that you would defer the discussion of that subject until he comes before you.

By Mr. Wilson:

Q. Who is he ?

A. I refer to Mr. F. T. Shutt, the chemist of the experimental farms. I may say, however, that the usefulness of this cheap source of nutriment for animals is attracting increased attention both in Canada and elsewhere. Two years ago, we had a visit from Prof. Smith, of the agricultural college at Wye, Kent, England, and he was astonished at the results we obtained so cheaply by the feeding of ensilage from Indian corn. He said, 'why could not we grow this maize in Kent, and use it for a similar purpose there ?' Shortly after he returned to England he sent an order for some seed corn to test this matter, and last week I had a letter from him giving the results of his experiments, and he has succeeded in growing in Kent crops about as heavy as we have had this year, some of the varieties going as high as 22 and 21 long tons to the acre. This has awakened so much interest in England that the Department of Agriculture has requested him this year to carry on further experiments in different parts of England to test the usefulness of Indian corn as a fodder plant more generally, and he sends an order for a considerable quantity of seed to be forwarded for this purpose. It is quite creditable to us here, I think, that we are leading in this matter. During the past year we have had requests from Great Britain, France, Germany, South Africa, Egypt and the Argentine Republic for samples of the varieties that we have been growing here, showing that this question as to the relative value of varieties of grain is awakening attention in the minds of thoughtful agriculturists all over the world.

By Mr. Robinson (W. Elgin):

Q. I am fully satisfied that before many years every farmer will have a silo and secure ensilage for his stock.

A. I do not see how a farmer manages to get along nowadays without a silo. Corn shocked in the field does, of course, take the place of the silo to a certain extent. The effect of ensiling the corn is to make the food more palatable and more easily digested. It is a sort of a partial digestion in advance. We know that animals fed on coarse, dry fodder do not extract from them all the nutritious matter they contain. Some of it finds its way to the manure heap.

By Mr. Clancy:

Q. Have you made any experiments in comparing corn ensilage with corn stooked and dried in the field as feed for the cattle ?

A. Yes. Corn when stooked serves a very good purpose as cattle food, but it is not so economical or so palatable as ensilage. The animals do not eat the coarse parts of the stem, for instance, they are too woody, whereas, in the feeding of ensilage everything is eaten up clean, and the stems contain a considerable quantity of nutritive material.

By Mr. Kidd:

Q. Even if the animals feed on it, is there not a waste going off in the air if the corn stands out after November?

A. I do not think there is much actual waste of nutritive matter, but the stalks become hard and woody.

Q. Do not the frosty nights have an effect on it, and does that not take away a great deal of the substance?

A. I do not think there would be much waste from that cause. Changes go on in the silo, which Mr. Shutt will explain to you, which are sometimes detrimental and sometimes advantageous, but I do not think any material change takes place in the corn shock, if it is kept dry. If the rain should come on, that might induce changes in the foliage and thinner parts of the plant, which might be detrimental, but it is seldom there is much rain at that season in this part of the country.

By Mr. Wright:

Q. Can you tell me any reason for this: During last year I had some corn and I cut it, the Longfellow, and gave it to my cows in the field, to try to prevent the expense of carrying it to the barn. When I gave it to the cows in the field they ate the cobs and softer parts and left the rest. If I put them into the stable and fed them there, they relished the whole of it.

A. I suppose it would be about the same as with us, when we sit down to a meal we eat the viands we like the best.

Q. But in the pasture they would not eat any but the choicest parts; they would walk away and leave the rest lying there?

A. It may have been that they were fed more liberally in the field.

By Mr. Clancy:

Q. I am afraid Mr. Wright gave them too much.

A. There might have been something in that.

By Mr. Wright:

Q. They went from one pile to the other and only ate the ears.

A. They could not be expected to eat anything but the best if they had a choice.

Q. But you understand I have no pasture, they have to eat that corn or go without, and they went without until I carted it to the stable. If I put it in whole they eat it all.

A. If an opportunity occurred it might be worth while repeating this experiment. But the corn should be carefully weighed in each case and I think it would be found that if the same weight were fed in both instances and no other food given the results would be much alike.

Q. They had so small a quantity that it practically amounted to nothing.

By Mr. Robinson (Elgin):

Q. I don't think cows should be left to go so hungry that they want to eat up everything.

A. The six heaviest yielding turnips, on the experimental plots at Ottawa, gave an average of 39 tons 1,640 pounds to the acre, and the six largest cropping mangels, an average of 43 tons 1,727 pounds per acre. These crops are plot crops. The field crops were not so large, but these will be reported on to you by the agriculturist, Mr. Grisdale.

In carrots the yield has been very good, and the best six sorts have given an average of 39 tons 1,860 pounds per acre. The four heaviest yielding varieties of sugar beets

gave an average of 33 tons 497 pounds per acre, much the heaviest crop of sugar beets we have ever had.

By Mr. Clancy :

Q. Have you the results of the field experiments as well ?

A. Yes; but these Mr. Grisdale will report on to you. The value of these plot experiments lies largely in the fact that the varieties are all under exactly the same conditions and that as far as relative yields of varieties they furnish reliable data on which to figure, but as to how they will compare with the field crop much depends on the quality of the land in the field where the roots are grown. If you get a field as good as the plot, you will not find much variation, and we have sometimes had grain crops where the fields have given larger returns than the plots, but that is not common, we generally find the field crop below the plot crop in yield.

Q. So far these experiments are apt to be a little misleading as compared with the results in the field under the best conditions ?

A. You take the results on the plots and fields at Indian Head and Brandon and compare them, and the difference is not very great.

Q. But has not this been an exceptional year ?

A. We have had similar experiences at Ottawa, where the fields have given heavier crops than the plots.

Q. How do you account for that ?

A. The way I account for it is that in such instances the soil of the field where that grain was grown was better than it was in the plots.

Q. Then the conditions were not the same ?

A. Not altogether so. The grain was put in at the same time and it experienced the same weather, but in one case the land was better.

Q. But the conditions varied to the extent that the land was better ?

A. The cultivation and treatment, however, was the same.

Q. Do they get the same manure in both cases ?

A. Yes, as a rule, they do. Our experimental plots since the arrangement was made to put a larger portion of the land under a regular rotation from which we are getting valuable information—have to be carried on now on three blocks of land and these same blocks are used from year to year for the experiments. Formerly we shifted around to fresh blocks every year but now we cannot do that, because it would interfere with the fields set apart for the rotation of crops. Have I made myself understood ?

Q. Quite so.

A. That system has been in operation for three years now, and while we have not had any material inconvenience, since we have to grow the grain crops in succession on these plots and follow with roots and corn the third year, we find it is necessary to manure these special experimental fields every three years, while the general farm crops in the regular rotation are manured once only in five years.

Q. How did the experiments in plots compare with the experiments in rotation ; it must be followed up ?

A. You see we have only yet had two years to report on.

Q. Well, so far as you have gone ?

A. So far as we have gone they vary considerably. Our land is very uneven in quality. There was one of our sections, in fact two of them, which were not thoroughly drained. The main drains which were first put down were not large enough and they had to be taken up and replaced by larger ones. We have the land now in good condition, but two years ago the crops on one section were injured by water and this interfered with our experiments. But, speaking in a general way, I would say that where the land of the fields will compare favourably in quality with the land on which we have the experimental plots, the crops also compare favourably.

By Mr. Wright :

Q. Did I understand you to say that you had put in 12-inch tiles ?

A. Yes ; that is for the main drain. It runs for a certain distance with 12-inch and then it is changed to 8-inch and further on to 6-inch.

By Mr. Bell :

Q. Does that 12-inch main run full ?

A. It runs full in the spring. We had only one 12-inch main last spring, but we have two now.

By Mr. Wilson :

Q. Is it a glazed tile pipe you use ?

A. No, it is an ordinary field tile. We sometimes use a few of the glazed tiles when passing near a clump of trees ; in such case, if the ordinary tile is used the roots of the trees find their way into the tile through the crevices, and sometimes grow to such an extent as to interfere with the flow of water. At first it was thought that abundant provision for carrying off the surplus water had been made with five 8-inch tiles on 400 acres, but in the spring it was usually two or three weeks before all the water found its way off the surface. Under those conditions seeding was so much delayed that it was quite a serious drawback.

By Mr. Wright :

Q. Talking about these drains, I have clay land and we had a tile drain and where it discharged, it is almost sure to make a deep coulee or gorge where the water runs down. Is there any means of preventing that ?

A. You might try filling the gorge up with stone or gravel at the mouth of the drain.

Q. I have tried that and it carried away the stone and all.

A. Would not that depend upon the depth of stone. If you only put in a surface layer of stone or gravel, it would be likely to wash away, but if you made a bed of two or three feet deep it would, I think, withstand the water and especially if you could have two or three planks on which the water would fall arranged so as to spread it that it would not fall with its full force upon the stone and gravel.

Q. There is something very peculiar about it, the water comes out under the pine trees, and the cones of the pines are falling down where the water comes out, and there is practically a bed of these pine cones there. We have a good deal of trouble with it.

A. The potato crop has been a very good one at the Central Experimental Farm, the best twelve sorts having given an average crop of 481 bushels 15 pounds per acre. Though the crop is not so heavy as it has been on the western farms, the yield has been very good indeed.

At Nappan, in Nova Scotia, the crops on the trial plots have averaged somewhat larger than they have at the Central Farm at Ottawa. The best twelve sorts of oats have given sixty-eight bushels thirty-one pounds to the acre. Six sorts of two-rowed barley averaged forty-eight bushels three pounds to the acre, and six-rowed sorts gave fifty-nine bushels one pound, and the twelve largest yielding sorts of spring wheat gave thirty-four bushels fifty pounds per acre. Pease have done well this year, the cross-bred pea Arthur standing at the head of the list. For the last two years the pea crop at Nappan has been almost a total failure, owing to the prevalence of the pea aphid, but this year they seem to have entirely disappeared, and we have had an average of forty-six bushels forty pounds from the twelve largest yielders in the plots there.

By Mr. Cochrane :

Q. Are they troubled with the pea bug ?

A. To some extent, but not very much in the eastern provinces.

Q. Are you referring now to the experimental plots at Ottawa or Nappan ?

A. I have given the result at the other farms, and am speaking now of the crops at Nappan. Corn grown for ensilage there has given 18 tons 245 pounds as the average of the six best sorts. There is a great difference with respect to the success of growing corn in the maritime provinces, where the climate is so much cooler than it is in the west that it is generally unfavourable for ensilage. As a matter of fact corn ensilage there for that reason is not so valuable to the farmers as it is in the west, and most farmers rely more on turnips and mangels there for fodder, as they can almost always grow large crops of these roots. The turnips there have averaged in plot culture 40 tons 1,262 pounds to the acre. That is the average of the best six sorts. Mangels have averaged 37 tons 112 pounds, carrots, 29 tons 850 pounds, and the average crop of the four best sugar beets has been 29 tons 1,400 pounds to the acre. The average crop of the best twelve sorts of potatoes has been 378 bushels 24 pounds per acre. This is the lowest average we have had at any of the experimental farms this year.

THE GROWING OF SUGAR BEETS FOR MANUFACTURE OF SUGAR.

By Mr. Clancy :

Q. I notice with regard to the sugar beets, which is now a sort of leading question in Canada, that the reports regarding the plot experiments in nearly every case have given double, if not more, than the best average results that have been obtained in other countries from sugar beet.

A. Yes, that is so, and there may be a greater difference between the plots of roots and the fields than I have been led to believe. Of course I have formed my opinion by comparison of our own fields here, particularly of roots, with the plots, and also the results at Nappan. At the western farms the roots are not grown to any great extent, and outside of our plots on the experimental farms there is not much done out there in growing roots. The question of labour there is a difficult one to get over, and the roots cannot be grown satisfactorily without a good deal of labour. They must be attended to at the proper time, and a farmer has a large area of grain to look after, and much land to summer-fallow. Corn can be grown cheaper for ensilage purposes than roots. On that point, I might just give you the average results of four or five years' experiments with sugar beets, taking into account the crops obtained at all the experimental farms. These have averaged 23 tons 1,075 pounds per acre.

Q. That is for all the plot experiments ?

A. Yes, for the plot experiments, averaging the poor crops with the good ones.

Q. What was the quantity grown on the plots at the Central Experimental Farm in 1901 ?

A. The average crop at Ottawa for the four best varieties was 33 tons 497 pounds.

By Mr. Cochrane :

Q. Would that be the same kind of sugar beets that we want to produce for sugar ?

A. I will give you the names of them.

Q. No, no ; I don't want that. What I want to know is, if this is the kind we want to raise to produce sugar ?

A. Permit me then a few words of explanation. The Red Top Sugar, which stands at the head of the list at Ottawa in productiveness, is one of the newly developed sugar beets which is being grown in some parts of the Dominion for the feeding of cattle. From the examination of our chemist it is found that these contain a very fair proportion of sugar.

The Royal Giant is one not quite so rich in sugar. Vilmorin's Improved; which is one of the varieties we have been growing, is one of the richest sugar beets that is grown in France. That variety does not produce a heavy crop and hence does not come in the four best sorts. It does not grow so long a root, but it has given an average yield of 19 tons 115 pounds per acre for the past five years.

The Wansleben is also a variety rich in sugar, and these two latter sorts are among the best beets grown for sugar through the civilized world.

Q. What is the quality given by the Wansleben best ?

A. This last year the Wansleben gave at the Central Farm 25 tons 160 pounds per acre and as an average for five years 25 tons 1,496 pounds.

By Mr. Clancy :

Q. Can you say, Doctor, what variety is being grown in Michigan ?

A. I really don't know. There are many varieties of sugar beets now available, and it is very important for the sugar factory that the beets be rich in sugar. The test of sugar beet seeds is made in this way. The best growers of sugar beet seeds test every one of their beets before they are planted for seed by scooping out a little piece of the beet and working it up into a solution and putting this into an instrument called a polariscope, where the proportion of sugar in it can at once be determined. All the roots which fall below a certain standard are rejected.

By Mr. Wright :

Q. Every individual beet ?

A. Yes, every individual beet is subjected to that process by the best seed growers.

By Mr. Clancy :

Q. That is in the country where they grow them. We import all our seed from Germany ?

A. That is the practice in Germany, and the quality of the beets grown much depends on the care taken by the seed growers. While that is the practice of the best growers, there are probably quantities of seed, without taking the trouble of testing the roots in the way I have mentioned. The difference in the results are so important that the managers of sugar factories are always very particular about where they get their seed. The Vilmorin's Improved is grown by the well known seed firm of Vilmorin & Andrieux, of Paris, France. The Vilmorins have for several generations been working on sugar beets with the object of increasing their percentage of sugar, and they have been very successful. When sugar beet growing was begun in France, it is said that six per cent of sugar was about the average proportion in the beets, but by the long continuance of this plan of selection, the proportion has been gradually increased to about 14 per cent. This shows that it is possible, by continued and persistent work along certain lines, to influence nature a great deal, and this is a very striking example of the success which has been achieved by continued experiments through several generations.

By Mr. Wilson :

Q. Could you tell us the size of the best sugar beet? They are not the largest generally, are they ?

A. The best beets are said to average a half or three-quarters of a pound to a pound, usually, anything much over a pound is considered too large for the best results.

Q. That would not be bigger than your fist ?

A. Probably about that thickness, and seven or eight inches long.

Q. They are not a long-bodied beet ?

A. No, they are something like the short white carrots, but the beet is not so regular in growth as the carrot, and for that reason there is more labour in harvesting them.

By Mr. Kidd :

Q. They have more fibres ?

A. Yes.

By Mr. Robinson (Elgin) :

Q. In the manufacture of sugar, is the whole of the beet made into pulp ?

A. Yes, the whole of the beet. If the crown of the beet has been exposed while growing, the part above ground produces less sugar than the part below the surface.

By Mr. McEwen :

Q. What is the best time to plant ?

A. We find the earlier plantings always give us the larger crops.

By Mr. Wright :

Q. And a larger percentage of sugar ?

A. I cannot say as to that ; we have not kept the early and later crops apart.

By Mr. Farquharson :

Q. Your conditions differ from ours, but if we can have some information from our neighbours to the south, they say that in certain sections of the United States it is a success, and their conditions would be perhaps similar to our own, and if we could know how they treat the whole question and what kind of a beet gives them the best results, it would be of value because it would set at rest a feeling which exists here that we should have the sugar beet, and I do not know that there is very much in it. I would like to know something of the great success which appears to attend beet culture in certain sections of the United States, and how they treat the whole question there.

A. That information would not be difficult to get. Many of the experimental stations in the United States have been working on this subject for some years past—the Chemical Department at Washington has been working on it almost constantly for some years—and a number of reports have been published. The impression left on my mind after going through a number of these reports is that we are quite as favourably situated in Ontario and Quebec, as to the quantity and quality of the beets we can grow as any of the States. They had once a record-breaking season in Nebraska, when beets they sent to Washington for analysis were found to contain over 17 per cent, which has been cited by Nebraskans as proof that their State is to be regarded as the best sugar producing State in the Union. It is said they had a very dry season and that year the roots only weighed a few ounces each, and that the sugar, which ordinarily would have gone into a large root was concentrated in a small one.

Q. Fortunately they did with such a light crop.

A. One can sometimes tell the truth, and yet be misleading if you tell only one side. It is true that they grew beets that year with that large percentage of sugar, but I have not heard of it being done a second time.

By Mr. McEwen :

Q. You have got away from my question regarding the time of planting.

A. At the experimental farm two plantings were made, the first was on May 8, which gave 20 tons 570 pounds per acre; the second was two weeks later, May 22, and this gave 19 tons 42 pounds per acre. There was thus a difference of about a ton and a quarter in the yield as a result of the delay in seeding two weeks. Vilmorin's Improved, sown on May 8, gave a yield of 19 tons 225 pounds, while that sown on May 22 gave 17 tons 1,495 pounds, a difference of about a ton and a half in favour of the early sowing. We have had a similar experience for several years past and in almost every instance we have found roots to average a larger crop when sown early.

By Mr. Wright :

Q. Does that apply to the Early Rose potato ?

A. That is a somewhat different question.

Q. You said all roots ?

A. Yes, but the potato is a tuber. All the roots we have tested have usually given the larger yield from the earlier sowings, but we have not yet tried many experiments in the planting of potatoes at different dates.

By Mr. McGowan :

Q. Could you get the committee these data regarding the sugar beet ?

A. I could work that up, if desired; what States would you be interested in—Michigan ?

Q. Michigan.

A. If the statements recently made by one of the leading papers in Toronto are correct, it would seem that there are people who are interesting themselves in beet sugar production in Canada who do not want the whole truth to be known. This statement was to the effect that the Ontario government had a deputation wait upon them lately to complain that some speakers at Farmers' Institutes had said that the beet was an exhausting crop, which they contended was misleading and tending to discourage the cultivation of this crop, and they wanted a stop put to these misrepresentations. The Institute speakers were quite right; the sugar beet is an exhausting crop, and they did only their duty, when addressing farmers on this subject, to tell them the whole truth—any objections taken of this character are likely to be regarded with suspicion. It has been said, but I do not know how much truth there is in it, that the manufacturers of beet sugar machinery sometimes take a hand in booming this industry.

By Mr. Clancy :

Q. This is an important question, the two sides are presented, one side contends that sugar beets do not exhaust the land, and the other side contends that they do; what is your opinion ?

A. I gave this committee the figures last year on which my opinion was based. These were the results of a number of analyses of the roots of the sugar beet. These figures proved that the sugar beet was a very exhaustive crop.

By Mr. McGowan :

Q. Does it exhaust the land more than turnips ?

A. Yes, sir, considerably more. I may be wrong in my opinion—I am always willing to be corrected—but my impression is that this is an industry that we had better go slowly in extending at present. There is said to be a large surplus of sugar in the world, more than is required at present—experts place that at about 1,250,000 tons. The Cubans, who have been prevented from producing much sugar by the war, formerly made about 900,000 tons per annum. During the war this is said to have been reduced to about 200,000 tons. The sugar industry is rapidly reviving there and the

output of sugar from Cuba is expected to be soon much larger than it has ever been. The climate is in their favour and they have cheap labour, and it is generally conceded by those best able to judge that cane sugar can, under such conditions, be made more cheaply than beet sugar.

By Mr. Wright :

Q. 900,000 tons, did you say ?

A. Yes, 900,000 tons is said to have been about the average production before the war, and that was cut down to 200,000 tons before the end of the war.

Q. The Cuban war ?

A. Yes, the Cuban war. Meanwhile Germany erected factories to supply the greater part of this deficiency of about 700,000 tons, and these factories are, I believe, still in operation. The revival of cane sugar production in Cuba is, I am told, affecting Germany, so that the beet sugar makers are now restricting the area under beets so as to lessen the quantity produced, as it is so difficult to dispose of the product at a profit.

By Mr. Ross (Victoria) :

Q. A gentleman recently wrote in a leading American trade journal 'that if the duty on Cuban sugar alone were reduced, the beet sugar factories would have to shut up.' That substantiates what you tell us ?

A. Another thing ; reliable statistics show that the investment of capital by United States capitalists in the Sandwich Islands alone in the promotion of the cane sugar industry is far greater than all the investments which have been made in that country by the promoters of the beet sugar industry, and where you have such large interests opposed to a much smaller one, unless it has great natural advantages it is very difficult to carry on the weaker industry with success. I do not wish to be regarded as discouraging the growth of sugar beets ; if our farmers can get \$4 a ton for them, they can afford to grow them, provided they have not to haul them any great distance, but if I were a capitalist seeking investments I should not want to invest in beet sugar factories myself as matters stand at present.

By Mr. McGowan :

Q. You will get that data for us, particularly from Michigan ?

A. What lines would you like this information to cover ?

Q. The weight of crops, and the prices in different factories, if possible, it would be a good thing to have.

A. I will do what I can to meet your wishes.

By Mr. McEwen :

Q. And the cost of the labour of growing, what it costs per acre ?

A. That information has already been given in connection with the trials which have been made at the experimental farm in Ottawa, and may be found in the annual Reports of the Experimental Farms for 1900 and 1901.

By Mr. Kidd :

Q. The rate of wages will have a great deal to do with the cost of making sugar ?

A. Yes, in the West Indies and Cuba I believe the rate of wages is very low, about 25 cents a day, the workers need very little clothing and not much to eat. They

use vegetable food mainly, which the islands produce in great abundance. In Germany the rate of wages is about 50 cents for men and 37½ cents for women, a large number of whom work in the fields and factories in that country. One wouldn't expect women in this country to go to work in the fields, but in going through France I saw about as many women working in the fields as men. We could perhaps get over this difficulty partly by using improved machinery, but such improved implements would soon find their way into the hands of our competitors when their advantages were known.

The CHAIRMAN.—I think it will be better perhaps to adjourn now and defer further information for another meeting.

A. If you will permit me, I would like to finish my remarks with reference to the yields of the different varieties of farm crops, as I had nearly completed this part of my evidence.

By Mr. Cochrane:

Q. Before you go on to that, will you tell me whether you have taken any action to find out whether those roots that produced such a large crop by sowing early are fully equal in quality to roots sown later?

A. We have not submitted these to a chemical analysis, but from a casual examination they appear to be a little more stringy or woody, but practically in our feeding experiments we have not found any material difference.

By Mr. Richardson:

Q. What is likely to be the effect on the beet sugar industry in this country of the prospective reduction of the sugar bounties in Europe?

A. That might be beneficial. Great Britain, as I understand it, from the very brief notice we have received by cable, contemplates taking such action as will be equivalent to a bounty of one-halfpenny per pound on West Indian sugar, which will, if carried out, no doubt give a great stimulus to the production of sugar in the West Indian islands, where the industry has been almost ruined by the competition of the bounty-fed sugar produced from the beet in Europe. If that is correct, work on the sugar plantations is likely to be resumed. Should this bring about any protective movement in Canada in favour of West Indian sugar, that might also favour home grown sugar and thus assist the beet sugar industry here.

Q. So that the whole tendency of this action might be to advance the industry here?

A. I think that is probable as far as one can judge from the limited information available.

By Mr. Johnston (Cardwell):

Q. Do you find any difference between the effects of the fly and turnip lice upon early and late sown turnips?

A. We have not found the date of sowing to make much difference in this respect. We are not much subject in this district to the turnip fly; where this insect is prevalent it would probably injure the earlier sown roots more than those later sown. As to the attacks of the turnip lice, I do not think the time of sowing would have any influence on the injuries caused by that insect.

Q. What I meant was that when the hot weather comes, the earlier sown turnips seem to be affected by the flies and grubs and lice, while the later sown ones are not so much injured by them?

A. We have not found any material difference in that respect in Ottawa.

THE RESULTS OBTAINED IN COURSE OF SEVEN YEARS' EXPERIENCE IN TESTS GROWING OF CROPS
AT THE DOMINION EXPERIMENTAL FARM STATIONS.

I would like to occupy a few moments in completing my evidence in reference to the results had from the trial plots of the more important farm crops at the experimental farms. These have now been continued for six and seven years.

I may say with regard to the results of the seven years' tests of varieties of oats, that the Banner still stands at the head of the list, with an average, taking the results had at all the experimental farms, of 76 bushels 14 pounds per acre.

With regard to barley, the Mensury leads in the six-rowed barley, having given an average for six years of 51 bushels 29 pounds per acre, showing that these two varieties, the Banner oat and the Mensury barley, seem to be in point of productiveness above all their competitors.

The twelve varieties of spring wheat which have been under trial during the same period have given an average crop of 32 bushels 36 pounds per acre. The cross-bred wheat, Preston, stands at the head in this list, with an average yield of 33 bushels 58 pounds per acre, so that it still maintains the high relative position it has held in this respect for some years past.

By Mr. Boyd :

Q. Do you say that the Preston is at the head of the list for the whole of the experimental farms in regard to the tests of spring wheat ?

A. Yes, that is taking the average results had at each of the experimental farms throughout the Dominion.

Q. Is that the wheat known by us as the Red Fife ?

A. No, the Preston is a cross of the Red Fife and the Ladoga, which was produced at the experimental farm at Ottawa in 1888. This cross-bred wheat has produced heavier crops on the average than we have had from Red Fife growing alongside it.

Q. But it will not be as hard a wheat ?

A. Practically it seems to be as hard, but the question was already asked whether we had had it tested thoroughly to decide as to how it will grade, but we have not yet been able to do this. One difficulty in the way of testing these new varieties is to get them in quantities sufficient for that purpose, but I hope and expect to have such tests made before another year. In producing these new cross-bred sorts we have always to begin with a single kernel and from that to build up stock. Of course it takes a good while to get a car-load under such conditions.

Q. I may say from my own experience of twenty-two years up there, that I believe, it will not be in the interests of agriculture and of the wheat-growers of Manitoba to try and supersede the Red Fife wheat. I don't believe there is anything known that will take its place, or put Manitoba and the North-west in the position that Red Fife wheat has put it at the present time.

A. I quite agree with you, and I may say we have never made any efforts to supersede Red Fife. On the contrary, we have tried our best to increase the area of Red Fife grown, and to maintain its purity and high quality. With this in view we devote a large part of our land at the North-west farms every year to the growing of pure Red Fife wheat, and we distribute the crops among the farmers in Manitoba and the North-west so as to prevent deterioration of this excellent wheat. As long as we can produce in the North-west Red Fife wheat of the high standard that we now have, we want to maintain and increase the area devoted to its cultivation, but it must be borne in mind that there are other parts of the Dominion beside Manitoba and the North-west, and we have to consider these also, and in the testing of varieties to ascertain their relative quality and crop-producing power. We have found that it is a great advantage to

have them tested side by side on uniform land, such as we get at Indian Head and Brandon.

Then also it is very important to find out the relative earliness of the different sorts, and there are some districts in Saskatchewan where farmers would rather grow Preston even if it graded a point lower than Red Fife, because it comes in four days earlier and thus gives them a better chance of harvesting the crop. None of these wheats are in any way taking the place of Red Fife, nor is it our wish or desire they should, unless it can be shown they are quite equal to Red Fife in point of quality as well as productiveness. That will take a little while to work out, in the meantime I desire it to be distinctly understood that no one advocates the growing of Red Fife wheat more than I do, and I doubt if there is any one in the Dominion who has done as much to encourage its growth and maintain its purity.

By Mr. Robinson (Elgin) :

Q. Is it not a fact that all wheat deteriorates and that the Red Fife may deteriorate ?

A. That is quite true. Every kernel of wheat is self fertilized, and where self fertilization is carried on for an indefinite time there is apt to be deterioration. We find its takes place very quickly with cattle, but not as rapidly with wheat and other cereals, but how long the Red Fife will continue to maintain its present high standard no one can say. I think it is the duty of a government institution such as ours to be ready with other varieties in case the Red Fife should fail.

By Mr. Wright :

Q. Does not that tendency run in all grain, and not in grain only but in roots. For instance, potatoes run out more quickly than grains do.

A. That is true. I do not think we have now in cultivation a single variety of potato that was grown fifty years ago, and probably not one that dates back farther than thirty years ago.

By Mr. Robinson (Elgin) :

Q. Then it will be quite in order for you to keep on experimenting in that way and getting new varieties ?

A. I think quite in order. We want to aim at getting new wheats as good as any varieties now known. We want something as productive or more so, and we want to aim at the production of varieties which will be early in ripening and have greater freedom from rust.

By Mr. Boyd :

Q. I think the change on the new soil in the west will tend to keep up the strength of the wheat ?

A. I think perhaps it will, but that is only an opinion. We know that Red Fife taken from Ontario has done better in the west than it has here.

Q. We find by the change of seed from old land to the new land and back from the new land to the old land, that we can keep it up so as long as we have the new land, and wish to put the wheat there, and change back, we can thus keep the varieties strong. It may be a generation before it goes back.

A. It may be several generations, but there is little doubt that the time will come, and when it does, we want to be ready for the emergency. Then there are other parts of the Dominion where Red Fife is not so successfully grown. In parts of Quebec, we find

Preston produces excellent crops, but the Red Fife does not grow so well. When Red Fife is sown in eastern Canada it becomes starchy and deteriorates. In the North-west the climate is very favourable for this wheat, and it is produced there of the highest quality, very hard and rich in gluten. The Canadian North-west, the northern United States, and the northern parts of Russia are the only places where such high grade wheat can be grown, and the world must look for its supplies of this hard spring wheat from those countries. The millers of England have lately taken some action in regard to this question of improved varieties. They want to see varieties of wheat tested in England sufficiently hard to improve the quality of the wheat grown there, so that they may be able to use less of these hard wheats and maintain the quality of the flour they are making. A few days ago we sent forward several sacks of grain for this purpose, including Red Fife and Preston, and if the result is satisfactory it may lead to increased cultivation of spring wheat in Great Britain. I mention this to show the value of these different wheats. I am very glad that the question of Red Fife was brought up, as I recognize the great importance of encouraging its general cultivation. At the same time, letters frequently reach me from farmers asking if there is not some variety they could grow which would ripen a few days earlier than Red Fife. Hence it is important to have other varieties as nearly equal to Red Fife as possible and at the same time earlier, so as to prevent them from importing starchy wheats of poor quality which would be likely to deteriorate the quality of grain grown in that district if generally cultivated.

As a rule, Red Fife can be grown with success in most parts of the North-west, if the land is well prepared and the seed got in early.

MR. BOYD.—My anxiety and the anxiety of every person interested in the west is in having that hard Fife wheat grown as largely as possible. It was only the other day that in one of the leading milling papers in the United States, *The North-west Miller*, there were statistics to show that there are only 200,000,000 bushels of hard wheat, that is estimated, grown in the United States. One hundred million of it is available at Minneapolis, and they cannot get enough of the balance of it at Duluth to bring up their other wheat to the standard necessary for exportation, and there is pressure being brought to bear on the United States government at the present time to induce them to permit our hard wheat to go out of Manitoba to be ground for the very reason that they want to get the best rates. I bring this to the attention of Mr. Saunders, and am glad to find as I have always found, that he was deeply interested in that particular kind of wheat.

THE WITNESS.—I might say that two years ago I went to Minneapolis and spent some days there among their mills, and seeing the kinds of wheat they were working up, and I was surprised at the quantity of lower grades of wheats the millers were able to use, and still keep the grade up, by the addition of judicious quantities of hard wheat. I found cars loaded with wheat that was very smutty, but they have means of cleaning it and making a good sample. There was also considerable quantities of starchy wheat worked up. I was kindly taken through the mills and shown everything I wanted to see, and found that they had a very complete and interesting system of testing the quality of the flour they make from day to day. Every day the chief millers from the different mills, of which there are generally a number under one management, come together with samples of the flour they are making from the mixed grain used, and these samples are submitted to the chemist, who has several assistants. He determines the proportion of moist gluten in each sample, also the quality of the gluten. The quality is ascertained by putting each sample into a small cylinder furnished with a light movable cap. These cylinders which are all of the same size, and are submitted to a temperature of about 300° F. in an electrical oven, so arranged that the temperature can be easily regulated. When exposed to such heat the gluten gradually expands, fill-

ing the cylinder and pushing the light cap up as it rises. The length of the bars of gluten when finished indicates their quality. Another sample of the product of each mill is handed to a baker who mixes it with yeast and bakes in each case a small pan of buns. These are carefully examined and compared, and thus from day to day the exact quality of the flour produced is determined. These experiments were very interesting and instructive.

The CHAIRMAN.—Are we to have Mr. Pedley and Dr. Saunders to-morrow ?

The WITNESS.—I have some further matters to present to the committee, which would probably occupy another hour.

HOUSE OF COMMONS,

COMMITTEE ROOM 34,

THURSDAY, March 13, 1902.

The Select Standing Committee on Agriculture and Colonization met here this day, at 10 o'clock A.M., Mr. Legris, Chairman, presiding.

Dr. William Saunders, Superintendent of Experimental Farms, was present at the request of the Committee, and testified as follows :—

THE FERTILIZING VALUE OF GREEN CLOVER DEMONSTRATED.

Mr. Chairman and Gentlemen, the first topic I want to bring under your notice this morning is one which I have referred to once or twice before, that is the great usefulness of the ploughing under of green clover to enrich the soil, especially in all the eastern provinces of the Dominion. We have been carrying on at the Central Experimental Farm experiments for the past four or five years to determine, as far as we can, the value of ploughing under crops of green clover. The clover has been sown in each case with the spring crop of grain, and after the grain has been cut, the clover has been allowed to grow until about the middle of October, by which time a mat of growth about ten or twelve inches high has been produced, when this has been ploughed under as a preparation for the crop of the following spring.

The turning under of that clover has been of great advantage to the soil as shown in the following crops:

As a result of the experiments in growing oats after the ploughing under of such clover, twelve trials have been made in all, covering a period of four years, and in those experiments the average increase in crops from this treatment has been 7 bushels per acre. A comparison has been made with plots alongside of those treated with the clover, which have not had any clover grown on them and the results from a series of these has shown this average increase of 7 bushels of grain per acre.

Experiments with barley, covering nearly the same period, have shown an average increase in the grain of 8 bushels 31 pounds per acre.

Seventeen experiments have been tried in the same time during three years with Indian corn and these have shown an average increase in the weight of the green corn cut for the silo of 3 tons 1,694 pounds per acre.

In experiments with potatoes the average of a test covering a period of two years has shown an increase from the ploughing under of clover amounting to 33 bushels and 20 pounds per acre.

This is a very important question, especially to farmers of the eastern provinces, where clover can be easily grown. It is one of the most important questions which can be brought before them, and the growing of clover has been continued in this way from year to year with the object of impressing this fact upon the minds of farmers with greater force.

From the chemical analyses which have been made with clover, it is evident that a crop of clover such as I have described, adds to the soil about as much nitrogen as would be had from the application of ten tons of barn-yard manure to the acre. It adds also practically certain other elements of plant food for the reason that the clover roots go to a depth that other plants do not reach, and they bring up from the subsoil below stores of potash and phosphoric acid which are very useful. The larger part of the nitrogen added to the land by this method, is obtained from the air, the clover being

one of those plants which can take in nitrogen from the air, and store it up in its tissues, a power that is limited as far as we know to leguminous plants, to which the clover belong. Another important element which clover contributes to the soil is humus, or vegetable matter. The proportion of vegetable matter in the soil bears a very important relation to the power of that soil to hold moisture. If you take a sponge and dip it in water and lift it out of the water, it will drip to a certain extent, but after the dripping has ceased, the sponge still holds a certain quantity of water which can be got out of it by squeezing. In a similar way the soil has the power of holding moisture to a certain extent, and the more vegetable matter in the soil, the greater its power of holding water, and as the plant must take all its nourishment through its roots by means of water, the amount of water the soil can hold is an important item in reference to its crop-producing power. I have reported on several occasions to this committee the results we have had on a series of plots, treated with different sorts of fertilizers. In each of these series of plots there has always been two that were left without treatment with fertilizers, and these two plots have had a succession of crops grown on them for 12 or 13 years, without any fertilizing. By that means the humus in the soil has been greatly reduced. During the last two years clover has been grown on these two plots and turned under, and it has been a surprise to witness the increase in the yield of these check plots, the first crop of clover materially increased the yield of grain, and the second crop has had a still more marked effect.

By Mr. Wilson:

Q. Have you had the percentages of increase worked out?

A. Yes. The two check plots in the series of wheat plots have given an average yield for the 12 years ending with 1899, of 10 bushels 17 pounds in the one case, and in the other of 9 bushels 40 pounds to the acre.

In 1900 after the ploughing under of the first crop of clover the crops of wheat on these plots were increased from 10 bushels 17 pounds to 13 bushels 45 pounds on the one plot, and from 9 bushels 40 pounds to 11 bushels 10 pounds on the other. Last year (1901), when no additional fertilizer was used whatever, except the ploughing under of the crop of clover, the plot which had given an average of 10 tons 17 pounds for twelve years was increased to 17 bushels 20 pounds to the acre. The other which had given as a twelve years' average 9 bushels 40 pounds, gave 15 bushels 5 pounds per acre. Putting the two plots together, the average increase in two years has been 6 bushels 14 pounds, which is more than 60 per cent, all apparently resulting from the ploughing under of green clover.

Q. What is the area of the plots?

A. They are one-tenth of an acre. In barley there was a decrease in yield on plots similarly treated for both years, for which I am unable to assign any reason. The increase in oats under like conditions was very striking. After eleven crops of oats, averaging 30 bushels 20 pounds per acre, on these unfertilized plots, the yield has been increased to 48 bushels 3 pounds in the one case, and in the other from 21 bushels 9 pounds to 30 bushels 15 pounds, an average increase for the two plots of oats of 13 bushels 23 pounds of grain per acre. This, I think, is most conclusive evidence, in favour of the use of green clover ploughed under as a fertilizer. I want to emphasize this one point, that there perhaps is as much due to the action of the additional humus which is put into the soil by the decay of the clover as there is in the actual plant food which is added to the soil. Plants grown in a soil which has a low power of holding moisture, are placed at a great disadvantage and cannot make free use of the plant food existing in the soil. Further evidence as to the usefulness of green clover on other crops will be found in the annual report of the experimental farms for 1901.

By Mr. Charlton:

Q. There are one or two questions I would like to get information on. I have

found the greatest difficulty on my own farms in getting clover to take. I want to know the method you pursue in seeding, in order to get a catch?

A. We use from ten to twelve pounds of common red clover seed per acre. We have tried both these quantities several times and have had good results in all cases. ... The clover seed is sown with the ordinary seed-drill with the clover seed attachment. It is sown with the grain, so there is no additional expense as to labour connected with it.

Q. It is sown with the grain?

Q. Yes, and we have never had any trouble in getting a catch of clover at Ottawa in any year.

Q. It is sown with the grain you say?

A. Yes, with the grain.

Q. In the west we find it almost impossible to get a catch owing to the seed becoming dry because of the hot weather, which prevents it germinating and sprouting and kills it off.

A. That is owing to the heat of summer.

Q. I would not expect such a result if the clover is sown with the grain, and the grain got in early as the ground is then usually quite moist.

By Mr. Heyd :

Q. How deep do you sow it?

A. It is scattered by the sower on the surface, but the action of the grain-drill partly covers it, but we generally run a roller over the ground and that is usually sufficient to cover the seed lightly.

By Mr. Charlton :

Q. The clover is ploughed down in the first season, is it?

A. Yes, in October. I wish it to be understood that I am not discussing this subject in connection with fodder for cattle, but merely the influence of the clover on the subsequent crop. I do not say that this is the most economical method of using the clover; where a farmer can turn stock in and feed it off, that is probably the most economical method of using the crop.

By Mr. Wilson :

Q. Would it have the same effect?

A. Practically the same, because the animals eating that clover off would deposit on the soil fertilizer which would represent the humus and about 80 or 90 per cent of the elements of fertility in the clover.

Q. But it would not be so evenly distributed?

A. No, I think it would not, and that is an important point.

By Mr. Robinson (Elgin) :

Q. That would be the second crop?

A. No, the first crop.

Q. Ploughed under in October?

A. Yes, in October of the same year.

Q. Would the seed be in it then?

A. No, the clover about that time in most seasons would be fairly well in flower, but no seed would be formed.

Q. Have you tried ploughing down the first growth of the next season?

A. Yes, in May following, and where the land is to be used for a potato or corn crop, we always prefer leaving it in over winter and allowing it to grow until about the 22nd or 24th of May, and then plough it under. That gives an increased quantity of clover and more humus.

Q. Would it be in seed at that time ?

A. No ; it would not be in seed until later.

Q. Would it be in bloom at that time ?

A. I scarcely think it would.

Q. Clover is in blossom with us the first week in June; how about ploughing down the first week in October ?

A. That would not, I think, be so beneficial to the subsequent crop as ploughing under in June. It would, however, be useful and the farmer would get the benefit of a crop of clover hay.

By Mr. Wilson :

Q. How often do you repeat the practice of ploughing the clover under at the end of the first year ?

A. We are doing it every season.

Q. Instead of using ordinary manure ?

A. Not instead of ordinary manure, but to supplement its use.

By Mr. Charlton :

Q. You consider it superior to artificial manures, chemical manures ?

A. I think it is better in some respects to chemical manure, and especially for soils deficient in humus. The beneficial effects of chemical manures are much lessened when there is a deficiency of humus in the soil. If there is not enough to give the land the power of holding a considerable quantity of moisture, the crop cannot be greatly benefited by such application.

By Mr. Wilson :

Q. I understand the result from this is a great deal better than anything else at the same price.

A. One crop of clover turned under will produce a large amount of humus and will usually give to the land as much nitrogen as could be got from ten tons of barn-yard manure, and in addition the clover on account of its strong and deeply penetrating root system, gathers other elements of plant food from the subsoil and places it within the reach of subsequent crops.

By Mr. Charlton :

Q. Do you crop that ground before seeding down again ?

A. We crop the ground the following year and often seed it again with that crop. The main part of the experimental farm is devoted to a five year rotation, and the land is manured once in five years. The manure is applied with the root or corn crop; next year cereals are sown and the land seeded with clover and timothy. The next year the land is in hay, then one year pasture, and the fifth year pease and mixed grain crops seeded with clover.

By Mr. Wilson :

Q. That is part of the ordinary farm ?

A. Yes; the agriculturist, Mr. Grisdale, who has charge of this branch of the work, will be here and will give you any further particulars you may desire.

By Mr. Charlton :

Q. You do not plough down clover in that five years ?

A. The pasture is ploughed under on the fourth year, and that contains some clover, clover also is sown with the mixed crops in the fifth year and ploughed under with the manure for the roots and corn.

Another important matter on which we have had additional evidence during the past year, is in regard to the improvement of seed by selection, by picking out the large heads from a crop and using the best of the grain so obtained as seed. This work has been carried on at Brandon, Indian Head and Agassiz. At Brandon 34 varieties have been sown in plots side by side, the grain from the picked heads being grown next to the plots sown with unselected seed. This unselected seed, however, has been screened, so that it has been a good example of screened seed. The plots varied considerably in yield. In some the crops from the selected heads did best, and in some cases the best crops were obtained from the unselected seed. In the 34 plots of wheat grown from the selected hand-picked heads the average yield of the whole was 32 bushels 39 pounds per acre, whereas the 34 plots sown with the unselected screened grain gave an average yield of 32 bushels 48 pounds per acre, an average of 9 pounds per acre in favour of the screened seed.

At Indian Head only one variety of wheat was tested in this way and that was Red Fife. In this instance there were three plots sown, one from seed taken from large heads selected by hand; second, seed from the ordinary crop well screened, and third, the small seed which was left as the screenings from the well cleaned grain. The crop from the selected heads was 59 bushels 40 pounds; from the well screened seed, 67 bushels, and from the small seed screenings, 59 bushels 40 pounds. In this instance the advantage was with the screened seed, the small wheat screenings having given the same crop as the selected heads.

By Mr. Lovell:

Q. It did just as well when it was not selected, as when it was?

A. The screenings did equally well with the selected heads.

Q. What was the weight per bushel in each case?

A. The weight of the grain grown from the selected seed was 63 pounds per bushel, from the unselected screened seed 61½, and from the small screened seed 62 pounds. The selected seed gave the heaviest grain.

By Mr. Robinson (Elgin):

Q. That would hardly pay for the trouble of screening?

A. I have not yet given you all the results. At Agassiz eleven varieties of wheat and eight varieties of barley were similarly tested, the grain from the unselected heads being sown in plots alongside of those sown with the hand-picked selected heads. In this instance nine of the wheats grown from the selected heads have given the larger crops and two from the unselected heads, the average difference in favour of the seed from the selected heads at Agassiz being 5 bushels 4 pounds per acre. The eight varieties of barley sown there, all gave larger crops from the seed from selected heads. While in two instances the difference was only 20 pounds per acre, yet the average difference in favour of the seed from the selected heads of barley was 1 bushel 24 pounds per acre. It seems evident from these experiments and from others that we have tried before, that where the soil is very uniform, as it is on the North-west plains, and where it is highly charged with plant food, there is not the same advantage gained in selecting seed that we have in other parts of the Dominion, where the land is more variable and contains less plant food. We have had in a former season from rejected seed, that would not be saleable at all for seed purposes at Indian Head, as good crops as we had that year from well screened seed.

It would appear that where the seed is sown in a soil where there is an abundance of nitrogenous matter and other plant-food, and its power of holding the moisture is good, there is such an abundance of food for the young plant, that it does not matter

as to the supply laid up for it in the seed, the young plant is able through its rootlets to begin to feed at once on the abundant food with which it is surrounded. Hence it does not matter so much under these circumstances whether the seed kernel is plump or shrunken provided the germ is strong and vigorous. We have had in the past several instances where farmers from Manitoba and the North-west have sent samples of small wrinkled, shrivelled seed, but with good germinating power, asking advice as to whether such grain should be used for seed. I have invariably advised farmers not to sow such grain. In some instances it has been sown, and I have received samples after harvest of good grain produced from such seed and heavy crops reported. This can be done in other parts of the Dominion, but I mention these facts because I think they go to show that we need not expect such good results from the careful selecting of seeds in the North-west country as we may look for where plant-food is less abundant and other conditions are less favourable. It stands to reason that under average conditions plump seed, whether hand-selected or well screened, is necessary to give the plant a good start, so that it may have its roots well grown from nourishment stored in the seed itself before it is thrown on its own resources—with such a good start its chances of maturing a good crop are much increased.

By Mr. Heyd :

Q. Suppose there is a continuous selection from year to year, would not the qualities of the selected seed be a factor you did not experience in the first year ?

A. We have been carrying that on for several years, but, perhaps, we have not pursued it long enough to be able to answer such a question in a decided manner, but my impression is that the selecting of grain for seed or having the seed well cleaned and screened so that the sample may be plump, is a most important thing for the farmer in the eastern parts of Canada, and one which will in the long run well repay him for any extra trouble he may take in this way.

By Mr. Wilson :

Q. I think that the choice of plump seed for sowing would recommend itself to the common sense of everybody ?

A. Yes.

By Mr. Farquharson :

Q. In unselected seed you have more pickles ?

A. I beg your pardon.

Q. With unselected seed you have more pickles or kernels of grain, probably 50 per cent. In selecting your seed you simply throw away the small wheat. You would have many more grains in the bushel of unselected wheat. That may have something to do with the yield ?

A. That may possibly have something to do with it, although I think the reasons I have advanced are sufficient to explain the results. The evidence submitted points to the importance and value of the selecting of grain for seed, it also shows that such selected seed does not always produce the results expected. Further experiments will be conducted along this line.

The next point I wish to refer to is in connection with additional work which has been done in the cross fertilization of grain.

It has been several times suggested by members of this committee in years past that it would be a very interesting and important matter to endeavour to obtain crosses between Goose wheat, which is a very vigorous and productive wheat in Ontario, and the Red Fife. Three years ago, we succeeded in making such crosses, and some additional ones were made last year, so we now have a series of crosses between the Red Fife and Goose, and Red Fife and Roumanian, a hard, rief wheat similar to the Goose, which has on the average been more productive. We have also succeeded in cross-

ing Speltz wheat with the Colorado. The Speltz holds the grain so tight in the chaff that you cannot separate it without some difficulty, while the Colorado holds it so lightly that it drops out on the field; so, while the Colorado is otherwise a good wheat for the eastern farmer, its usefulness is much interfered with by this tendency to shed the grain in the field. The object in these experiments is to obtain a wheat which will have the power of holding the grain tightly in the chaff when cut, so as to avoid waste. Another object in view in making these crosses is to obtain varieties of wheat which will be less affected by rust. Both Speltz and Goose wheats are remarkably free from rust, and if we can by crossing, introduce into these wheats some of the qualities of the Red Fife, the value of the product would be much increased. Such government institutions as the experimental farms are the places where such important lines of work as these should be carried on. The farmer or average experimenter, with limited appliances in the way of area of land in which to sow these things, cannot conduct such experiments in any large way, and it is, I think, the duty of the state to look ahead in such matters and endeavour by constant experimentation, to produce new varieties likely to be of value to the country. We know the good qualities of certain varieties, we also know their faults. If we can by intermixing produce new sorts which will retain most of the good qualities of both parents, and less of the faults, a great step in advance has been made. We have not yet reached perfection in regard to the varieties of cereals we cultivate, what we want in a wheat is a variety as good in quality as Red Fife, and as productive, or more so, earlier in ripening, and a rust resisting sort. If we can produce a wheat combining these good qualities it would be of great value to the country, and any improvement we can make is a step in the right direction. All such investigation work should be encouraged.

Another very interesting and curious cross that we have produced is one between Red Fife and a wheat called Polonian. This Polonian wheat has a very large kernel, about three or four times the size of ordinary wheat. It is grown in Algiers and Egypt and some other countries in Europe, and produces, it is said, good crops there, but with us it has been a poor cropper. It does not seem to set well and the number of kernels in the head is much less than one would expect from its size and appearance. A single plant was grown last year from a kernel, the result of this cross, and it produced heads which were quite unlike Red Fife. The kernels also were considerably larger. The further development of this grain will be watched with much interest. The size of the kernel and the weight of the head are promising features in this new cross.

By Mr. Robinson (Elgin):

Q. Have you named this new cross?

A. No, not yet.

Q. You do not name it, I suppose, until you have a quantity of it?

A. No. As yet we have only the result of the growth of one kernel. We had on the plant three or four heads of this wheat, and every kernel has been carefully preserved for sowing. They were taken out without injuring the form of the heads, as I intended to show them to you to-day. Unfortunately, I have forgotten to bring them with me.

By Mr. Wilson:

Q. Those were the heads you had here yesterday or the other day?

A. Yes. I had them with me then. I think it is important that such work as this should go on all the time, as we want to be prepared, should any of the best sorts of grain now cultivated show evidences of giving out, to be in a position to suggest a profitable substitute. The study of varieties and the production of new sorts of grain, next to that of maintaining the fertility and productiveness of the land, is to my mind, the most important line of work we are conducting. Another point I wish to refer to

is the additional results we have had in the crossing of the Siberian crab apple with some of our best apples with the view of producing varieties of fruit which will be hardy enough to stand on the open plains in any part of the North-west or in northern Ontario, and be large enough to be useful to the people.

Q. You have a great deal of difficulty with that, don't you ?

A. After trying almost every sort obtainable, a variety was got from northern Siberia, known as the berried crab, *Pyrus baccata* ; this produces fruit of the size shown, (photograph produced for inspection of committee), with which we have now had eight years' experience in the North-west, where it has been grown in the open, and the trees have stood the test and come out hardy every year. The first cross of that variety with some of our larger apples, has given us this series of nine sorts. The fruit, as you will see, in these photographs (photographs produced) is much larger than the parent crab, large enough to produce serviceable fruits for domestic use.

By Mr. Heyd :

Q. This is No. 1 ?

A. Yes.

Q. Is this the life size ?

A. These are all the actual sizes of the fruits accurately photographed for the purposes of comparison. I have here a photograph of one of the most esteemed of the crabs, the Transcendant, this is the actual size (photograph produced), and you will observe that some of the new crosses are practically of the same size as the Transcendant, while others are a little smaller.

By Mr. Wilson :

Q. Some of them are about the size of our ordinary crab here ?

A. Yes. We have only yet fruited about 50 of these crosses, but have produced between 400 and 500 of them. During the coming season we expect to have fruits from perhaps 40 or 50 more. The crosses which have fruited are chiefly from early autumn apples. It is probable that during the coming season fruit will be had from crosses with some of the later keeping and more valuable sorts. The results thus far obtained from these experiments are very encouraging, and I think the progress we have made to have had nine from about 50 which have fruited, large enough to be of value to the community, is a greater success than was anticipated.

By Mr. Heyd :

Q. Will they reproduce themselves—these new varieties that you have fruited ?

A. No ; that is a point on which I am glad to have questions asked. When the seed of such crosses is sown in most instances, in the young trees produced there is a reversion towards the female, when the size will probably be smaller, that is the usual experience, but there will occasionally, we cannot say how often, be a reversion towards the male, which is likely to be associated with an increase in size.

Q. Which is the larger apple in this case ?

A. The male is much larger.

Q. Why not reverse it originally.

A. I do not quite understand the question.

Q. So as to get the advantage of the male, the larger or stronger, in the first place ?

A. While you may bring the productive elements of the male and female together you cannot control results.

Q. It always has been uncertain ?

A. Yes, always. Our experience with the different plants we have been working with is that about ten or fifteen per cent of the progeny from seed of the first cross, has reverted towards the male, in some instances very strongly and in others only slightly. If we can get in ten per cent in this instance, reverting towards the male, we may strike in a few years or obtain very hardy apples twice or three times the size of those of which I have shown you the photographs. That is our expectation, but in the meantime those which have been produced are large enough to be of very great value in northern Ontario and in the whole of the North-west country.

By Mr. Wilson :

Q. Are the farmers doing anything in that line for themselves in that North-west country ?

A. Not that I know of. It is too intricate a problem for the farmer to undertake. It requires some skill to cross fertilize in the first place, and then you must raise a good many seedlings in order to get even a few good ones. I hope we may have from the trees which will fruit this year something still more encouraging to bring before you next year. We are endeavouring to propagate these new and promising sorts by grafting them on the roots of the Siberian crab and by budding them on the stem. I hope by the spring of 1903 that we shall have a considerable number of these young trees to distribute through the North-western country and northern Ontario, so as to have them thoroughly tested. We have already root-grafted a few and sent them out for test, so that there are a few of them growing now at different points in the North-west country, but it is proposed to have them thoroughly tested by sending them to many different points where they will be exposed to very varied climatic conditions.

Q. These trees will have to be given away then ?

A. Yes.

Q. I suppose you will have to be careful who you give them to—the friends of the government ?

A. We know very little about politics at the experimental farm. It is, however, an important matter that we get such trees in the hands of people who will care for them. For some years past I have been accumulating a list of the names of those who take an interest in this kind of work, so that we hope to have these young trees put into good hands at many different points from beyond the limit of successful apple-growing in Ontario to the Rocky Mountains.

By Mr. Ross (Victoria) :

Q. I presume the politics of these parties who get them will not influence the growth of the trees or the result in any way ?

A. I think not. I hope also by that time we shall have some thousands of seedlings from the best cross-bred sorts to disseminate. I trust that the work along both these lines will be continued until the efforts are crowned with abundant success, and every settled part of the Dominion supplied with useful fruits of this class. In the meantime any seedlings which may be sent which produce inferior can be top-grafted with better sorts as soon as these are obtainable.

We have also been experimenting in the making of jelly from these crabs, and in my report this year I have given the best formula we have found. They make excellent jelly, as good as any from our eastern crabs.

By Mr. Wilson :

Q. How does the flavour compare ?

A. The flavour is very good. There is one here, the Charles, which compares favourably with the Transcendant and other eastern grown sorts. This apple will make excellent jelly ; it can also be used for pies, or making sauce, and the same may be said of some of the others.

TREE GROWING IN THE NORTH-WEST, FOR PROTECTION OF CROPS.

There is one other subject on which, with your permission, I will say a few words, that is concerning tree-planting on the North-west plains. The subject of providing some shelter in connection with the growing of such trees as these I have just been speaking of is important. We find that where there is a little shelter all sorts of trees grow and develop more rapidly than if they are exposed.

Q. Tree-planting is another branch, is it not; Mr. Stewart is at the head of it?

A. Mr. Stewart is carrying on work in forestry in connection with the Interior Department, but that does not interfere with the work we have been doing for the last twelve years at the experimental farms in encouraging the farmers to plant shelter belts on their farms in the North-west.

Q. And distributing trees to farmers?

A. Yes. During the last twelve years a million and a half of young trees have been sent out to about 70,000 farmers in packages of 100 each through the mails.

Q. That is a lot of them?

A. They may not have gone to 70,000 different farmers—one man may have had more than one package—but they have gone out in 70,000 packages. They have been sent only on request, and instructions for the planting and care of the trees have been forwarded with each package. There has been also supplied on request, during the same time in bags of 1 pound each, 9 tons of tree seeds, 18,000 bags.

Q. Where did you gather these?

A. Formerly these seeds were gathered in the coulees and river valleys in different parts of the North-west, now most of them are gathered on the experimental farms. Here is a picture of an Indian—a Nitchie they call them out there—gathering tree seeds on the Indian Head farm.

Q. You send them out from the western farms?

A. Yes, almost entirely. The young forest trees which are distributed are also grown on the western farms.

By Mr. Stephens:

Q. Have you seen any of the results from the seeds you sent out?

A. One cannot visit any part of the North-west without seeing more or less of the results from this distribution. There are very few farmers who have been in the country any length of time who have not a tree plantation. They can get the seeds through the mail free by asking for them. Last year there were sent from the Indian Head farm nearly 1,000 of these packages, and a large number were also sent from Brandon. The Indian Head distribution is to farmers in the Territories, and the Brandon distribution is to farmers in Manitoba. A few are also sent out from the Central farm.

By Mr. Heyd:

Q. What variety are you sending, anything special?

A. The seeds we send out are sent here from the western farms, they are chiefly Manitoba maple, green ash and sometimes scrub oak, all native trees of that country. This year we have had collected about three-quarters of a ton of green ash seed and about half a ton of Manitoba maple.

The Indian Head farm, when it was selected, was a piece of bare prairie, with not a stick of timber or a shrub in sight. On that farm now there are about 130,000 trees. Here are some views which have been taken on that farm. (Views shown to the committee). This one shows the planting in the first year around the barns. You can see how wind-swept these trees look. We had difficulty in establishing them. Here is a picture of the same place taken this last year. There is the house and the barns embowered in trees of about ten or eleven years growth.

By Mr. Wilson:

Q. Have you a picture of the Brandon farm ?

A. Yes; here is one of the first year's growth of the avenue trees, and there is another showing the avenue as it is at present, where you will see that the trees have grown quite large.

By Mr. Stephens:

Q. There is no difficulty, is there, professor, in growing trees out there ?

A. No, sir; none worth speaking of, if you choose hardy trees for planting. There is a picture from the top of the barns showing the tree plantation on the Indian Head farm. We have put out into blocks of 5 acres each a shelter belt 100 feet wide on two sides of the farm and nearly two miles long. All the roads through the farm are also planted with avenues or hedges.

By Mr. Wilson:

Q. Who will give us the results of the cattle experiments at Brandon ?

A. I shall be glad to give you information on that subject. There is a picture of a sheltered inclosure, showing the flower garden near the house at the Indian Head farm, and this is a view of some of the shelter hedges provided for the growing of small fruits and vegetables. There are some of the ornamental hedges on the farm.

Q. How long have these trees been planted ?

A. Eleven or twelve years. We are doing work in tree planting every year, but it was begun fourteen years ago.

Q. And some of these are 30 feet high now ?

A. Yes.

By Mr. Heyd:

Q. What means have you of disseminating the valuable information we get here so as to reach the ordinary farmer ?

A. In our annual reports on the work of the experimental farms. It is not in exactly the same form as it is given here, but most of the information is there.

Q. But how does it get to the farmer who wishes to profit by it ?

A. Every individual who sends an application, on which he is not required to pay postage, can get a copy of the report. We have about 50,000 names on the permanent mailing list now and others are added as fast as they come in.

By Mr. Robinson (Elgin) :

Q. Members of the House have a certain number to distribute too, have they not ?

A. No provision has been made to supply any special number of copies for members. This was formerly done, but it was found that in many cases members sent copies to farmers in their constituency who were already receiving them through personal application. Any members receiving requests for the reports will oblige by sending them to me and their wishes will be complied with at once.

By Mr. Heyd:

Q. What suggested the idea to me is the fact that I remember during this summer a large lot of very valuable reports reached me. While I was in the House here, I would have had plenty of time and an opportunity of franking them, to my constituents, but in my particular case, they came up, 50 or 60 or 70 pounds of them, in the middle of summer without being wrapped in envelopes, and the amount of labour involved in sending them out is such that I left them without sending them out and will probably put them in the fire.

A. That is the report of this committee, I presume ?

Q. Yes.

A. Not of the experimental farm ?

Q. No, these things should come in envelopes so that a man has nothing to do but put names on. After you get them and write to Ottawa, and get Hansard envelopes, it is a little too much for a man who is a busy man. He might address the envelopes while he will not go through all this work.

A. All our experimental farm reports are sent in envelopes to every one on our mailing list; about 50,000 in all.

Q. I got 200 odd of the committee reports at the house and I just did not know what to do with them.

A. I should have been glad to get them for distribution at the experimental farm.

By Mr. Cochrane :

Q. Would you explain the effect of this planting of trees on the plots adjoining ?

A. I shall be glad to do so.

Q. All right.

A. I was up at Indian Head in the summer of 1900, after they had had a series of very bad wind-storms. I went over the crops very carefully and I was surprised at the effect the shelter belts had had on the fields adjoining. I found by measurement that for every foot of tree growth, there was a protecting influence for from 50 to 60 feet on the crop in the adjoining field. Where we had a growth 12 feet in height, about 600 feet of the grain had been preserved quite green, and a little beyond that influence the ground was so wind-swept you could not see a green blade on the ground. It was a most convincing evidence of the value of the shelters.

Q. What stage was the grain in then ?

A. It was about three or four inches high. Most of the unprotected parts of the fields had the grain so destroyed that it was found necessary to plough and resow the land. Some fields partly destroyed were left, and gave small crops of from 5 to 20 bushels of wheat per acre, whereas the protected area gave of wheat about 30 bushels to the acre.

Q. Does the grain grow well right close up to the tree ?

A. We do not sow the grain close up to the trees, but generally have a roadway between the trees and the grain fields.

Q. I find in our section of the country and on our own farm that trees are very exhaustive, especially a row of maples or spruce, and I found in one instance that with a very shapely maple tree which any one of artistic taste would be glad to have about, the tree was in the corner of the fence, the field was planted in corn, and I counted thirty-four hills of corn in the shade of that tree almost useless ?

A. That is very true, but there is not much lack of space or fertility in the west, and I think a roadway between the plantation and field, is sufficient and the fields that are not protected suffer so much from wind that trees pay well for the space they occupy. We do not get such winds here, strong enough to blow the grain out of the ground. Several years ago we had an instance where a plot of Bauner oats in the partial protection of trees gave over 100 bushels to the acre, whereas one not far off but exposed gave little over 50 bushels. These instances might be multiplied, but I have perhaps said enough on that point to prove the great utility of trees as well as their beauty.

SABLE ISLAND.

By Mr. Stephens :

Q. Does the wind usually come from the same direction ?

A. Not always, but we have the plantations so placed as to break the force of the wind as much as possible from all points. Some interesting work has been done during

the past year in planting trees on Sable Island in the Atlantic. This island is about 80 miles from the Nova Scotia coast and 153 miles from Halifax. It is made up largely of a series of sand-hills, formed of white sand, which are so blown about by the wind that the configuration of the land is continually changing. Furthermore, the west end of the island has been washed away with such rapidity that within the past fifteen years the lighthouse at that end has had to be removed twice to prevent it from being washed away by the sea, and the island which about 100 years ago was nearly 40 miles long is now only 21 miles long. It is in the midst of a number of sand banks and bars where wrecks are frequent. It is of the greatest importance that this island be preserved from destruction, and the Department of Marine and Fisheries, under whose management this is, requested me some time ago to take the matter into consideration and see if some method could be suggested whereby tree-planting might be introduced there, and to endeavour to find out what varieties of trees were likely to be suitable for this purpose. When I was in France in 1900 I visited a part of the coast of Normandy, which was formerly covered with drifting sands, very similar in character to these on Sable Island, where the French government have been doing a good deal in the way of tree-planting and have completely fixed these blowing sands by the planting of pines.

Information was obtained and a selection of trees made, and in May last I went to the island in company with the Deputy Minister of Marine and two other helpers, and we took with us from Halifax 81,000 trees, which had been imported from France, largely of the varieties used there for similar purposes.

By Mr. Wilson :

Q. Do they differ much from ours ?

A. The particular pine they use there mostly is called the *Pinus maritima* or Maritime pine. This is too tender to grow in this country, but on Sable Island, the climate, although very windy, is much milder than on the main land. Since meteorological observations have been taken there for some years past, the lowest point the temperature has fallen to is four above zero. We planted about 10,000 trees during the week spent on the island and left the remainder with the superintendent and his men, and he reports that they were all planted by the latter part of June. I have had three letters from the superintendent during the season, and although the conditions there have been very trying, winds are very difficult to contend with, the reports appear to indicate that we are likely to be fairly successful.

Q. What size were these trees ?

A. From 8 or 10 inches to 2 feet high ; the last report I had was November 5. The superintendent then reported a large proportion of the pines as living and promising.

There are no regular mail communications with the island, and it is only when the supply vessels go there that letters can be sent. It is an interesting experiment in forestry which is worthy of mention. It also serves to show that the information we have gained on this subject is found useful in many parts of the Dominion.

By Mr. Richardson :

Q. What is the location of Sable Island ?

A. It is off the Cape Breton shore, about 80 miles from Liscomb Harbour.

By Mr. Cochrane :

Q. Would you recommend, from your observation of the timber belts on the ordinary farms of the North-west, belts of any considerable extent, or of any particular width for most farms ?

A. Circumstances differ so much that I don't think it would be possible to lay down any rule for such work. We have planted our principal belts at Indian Head, one hundred feet wide, and extending the whole length of the western and northern bound-

aries of the farm about two miles. We have found that width to answer very well there. It has made a dense mass of wood which not only protects from the wind, but it gathers also the snow in winter and this through the influence of the trees extends some distance out into the fields which when melted in the spring gives favourable conditions of moisture.

Q. How far are the belts apart ?

A. They are not planted at any regular distance. Besides the 100 feet belt running on the two sides of the farm, there are several large blocks of trees and some miles of avenues. Shelter hedges have been made by planting the seed of the Manitoba maple thickly, so that when it comes up the trees will make a thick hedge. Many of these hedges have been planted.

Q. How far are they apart ?

A. No regularity is observed as to distance in this respect.

Q. Say 100 or 80 rods apart ?

A. They are at different distances, some of them closer than that.

By Mr. Stephens:

Q. One row on the north and west sides of the farm of 640 acres would be sufficient, would it not ?

A. The people there seem to think that they cannot get too many trees. And when you have a square mile of land to work on, 100 feet in width of trees seems to be a small matter. We have the protection of the belt I have referred to and trees or hedges along the roadways on either side, and have also introduced here and there, wherever we thought it could be done to advantage, larger plantations; we have one of five acres.

By Mr. Cochrane:

Q. That is rather indefinite, to my mind, for Ontario. Your roads are roads through the farm ?

A. I am speaking, you understand, from a North-west standpoint where land is plentiful. In Ontario such work would be done differently. Reference has been made to the trees interfering with the crops for some distance, and farmers in Ontario would not want to devote a very large portion of good land to such purposes. We have not the same difficulties to contend with here, and hence do not need to adopt the same methods.

BROME GRASS PASTURE FOR FATTENING STOCK.

By Mr. Wilson:

Q. You did not think of saying something about cattle in the North-west. I do not know whether you have time or not ?

A. I shall be glad to answer questions.

Q. I was out in Brandon in August last year, but I have not with me the notes I made then on the result of an experiment with two young oxen there pastured on Brome grass. The result was marvellous.

A. That experiment is reported on in the annual report now in the press. Two steers were inclosed in one acre field of Brome grass, and they were given nothing to eat but what they could get from the Brome grass, and they made remarkable gains in weight. From May 8 to August 25 each steer gained 245 pounds, a total for the two of 490 pounds, which at $3\frac{1}{2}$ cents per pound, equals \$17.15.

By Mr. Cochrane:

Q. Two animals on one acre ?

A. Yes.

By Mr. Richardson:

Q. What is Brome grass. Is it peculiar to the North-west ?

A. It is a European grass which has proven to be a most important and valuable grass in the North-west. During my first visit to Manitoba and the North-west Territories in 1887, seeking information as to the conditions of agriculture there, I tried to impress on the farmers the importance of their keeping more stock, but the common reply was that they could not do so, as they had nothing but the native grasses on which to depend for pasture, and while they had been able to keep a limited quantity of cattle in the past, as settlement increased and the hay lands were taken up they had to go farther and farther away from home to secure hay, and in some instances they had to draw it as far as thirty to forty miles. Their plan then was to go out and cut the grass and make the hay in the summer time and draw it in in the winter. This, of course, took much time and labour, and the hay was too scarce to admit of any great increase in the quantity of stock that could be kept profitably. They said : If you can find us a grass which we can grow for hay, that will be a great help to us. We sent to Russia and got samples of many different sorts of grass that grow there, either for use as hay or fodder. Amongst those samples we got this Brome grass, about two pounds of it, and it was tested at all the farms, with very satisfactory results. As soon as we found its value larger quantities of the seed were ordered from Russia and northern Germany, and we established large fields of it at Indian Head and Brandon, where it has done remarkably well. It has succeeded almost everywhere and there are now many thousands of acres of that grass growing in the North-west, and the area devoted to it is increasing yearly. It makes excellent hay and good pasture, and is very hardy.

Q. What proportion of seed to the acre do you use ?

A. About ten or twelve pounds to the acre, sometimes more, but that is usually sufficient.

Q. How does it crop ?

A. In a favourable season it will usually give a crop of two or two and a half tons of hay to the acre. Sometimes it will produce more than that.

By Mr. Heyd:

Q. Have you to sow the seed every year ?

A. No ; it is a perennial grass.

By Mr. Robinson (Elgin) :

Q. Is it any good in Ontario ?

A. Yes, it has been tried with good results. We had on the experimental farm here a striking instance of the preference of cattle for it. We sowed Brome grass and timothy together in the same field so that it came up in patches ; 20 cows were put out on it to pasture. After a time it was noticed that the pasture looked very uneven and patchy, and on examination it was found that all the Brome grass had been eaten down to the ground, while the timothy was going to seed, furnishing conclusive proof of the preference that cattle had for it. It is a very succulent grass and an analysis of it shows that it compares well with other nutritious grasses.

Q. How would it do sown with clover ?

A. I cannot tell you, as we haven't tried that.

By Mr. Stephens:

Q. Is it an expensive seed ?

A. No, we have distributed in sample bags of 1 pound each, thousands of pounds of it through the North-west, sending it to every one who asks for it. We grow large quantities of the seed every year on the experimental farms at Brandon and Indian

Head for the purpose of helping the distribution of it. We have had some of it sent down here, and I shall be glad to send a sample bag to any one who may desire to try it. The samples sent are sufficient to sow about one-twelfth of an acre. If the experimental farms had done nothing else but introduce that grass to the North-west their existence would have been justified. It would be difficult to estimate its value to that country.

By Mr. Wilson :

Q. How long will it grow till it runs out ?

A. We find it best to take off three or four crops of hay and then pasture it for a year or two. It grows well for three or four years and by that time the roots of the grass thicken so much that it is better then to pasture it for a year or two before ploughing it up. When ploughed under it is a valuable grass for the reason that it supplies a large amount of fibre to the soil, giving a condition like the first breaking of the prairie.

By Mr. Richardson :

Q. Is it a heavy grower ; is it coarse ?

A. It grows from $2\frac{1}{2}$ to 3 feet high, and more in some cases. It is leafy, but not coarse.

Q. And makes good hay ?

A. It makes excellent hay for horses or cattle.

Having read the foregoing transcript of my evidence of the 11th, 12th and 13th March, 1902, I find it correct.

WM. SAUNDERS,

Director of the Dominion Experimental Farms.

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