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## EVIDENCE

OF

# DR. WM. SAUNDERS

DIRECTOR, DOMINION EXPERIMENTAL FARMS

# SELECT STANDING COMMITTEE

ON

## AGRICULTURE AND COLONIZATION

1899

PRINTED BY ORDER OF PARLIAMENT



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## COMMITTEE ROOM 46, HOUSE OF COMMONS, Tuesday, 30th May, 1899.

The Select Standing Committee on Agriculture and Colonization met this morning at 10.45 a.m., the Chairman, Mr. Bain, presiding.

DR. SAUNDERS, Director of the Experimental Farms, being present at the request of the committee, gave the following evidence :

Mr. CHAIRMAN AND GENTLEMAN,-It affords me much pleasure to appear again before the Committee and to have the opportunity of submitting some of the results obtained from the principal lines of work which have been carried on at the Experimental Farms during the year, hoping to have the benefit of your criticism, and of any suggestions you may think it desirable to make.

In all branches of the work conducted at the Experimental Farms honest effort has been made to gain reliable information and to give to the farmers of this country not a one-sided statement, but to present in a plain and simple manner the whole truth, regardless as to how that may conform to any preconceived theory. During the eleven years that I have had the honour of holding the position of

Director of the Dominion Experimental Farms constant effort has been made to assist the farmers of this country in their endeavours to evercome the difficulties which arise in connection with their work, and to help them to make farming in Canada more profitable. Reliable information has been continually given and to some extent the material has been supplied by the proper care of which larger crops may be expected. The principles on which in my opinion good farming rests have been many times discussed and plainly set forth during the past eleven years, including: 1. The importance of maintaining the fertility of the soil without which a suc-cession of good erops cannot be secured. In connection with this subject the proper

care of barnyard manure and the best methods to adopt in using this great and almost universal source to the farmer of plant food, has claimed much attention. The ploughing under of green erops has been treated of and especially of elover, and its value demonstrated by many experiments, in enriching the land and adding humus to the soil whereby its power of holding moisture is materially increased. The farmer has also been frequently advised to economize the elements of fertility in his land by a judicious rotation of crops.

in his land by a judicious rotation of crops. 2. The best methods of preparing the soil for crop including the important subject of underdraining, thorough ploughing, and subsequent harrowing, to bring the soil into a thorough condition of tilth. The importance in the eastern provinces of the Dominion of autumn ploughing and on the western plains of summer fallowing in order in the latter case to conserve the necessary moisture, also the advantages in some parts of the rolling of land, after sowing, to produce suitable conditions of

in some parts of the forming of hand, mice to the seed. moisture for the prompt germination of the seed. 3. The importance of early sowing has been demonstrated by a series of experi-ments which have been carried on for 9 years in six successive sowings of the more ments which have been carried on for 9 years in six successive sowings of the more important cereals, whereby it has been shown that the best results are obtained by sowing the grain as soon as possible after the land is in fit condition to receive the

seed With the oat crop it has been shown that a delay of a week in sowing beyond this period involves a loss of 10 to 12 per cent, two weeks 20 per cent, 3 weeks nearly 30 per cent and by a delay of four weeks over 40 per cent of the crop is lost. With the barley crop, a delay of one week beyond the time when the soil is fit to receive the seed involves a loss of more than 15 per cent, two weeks more than 25

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per cent, three weeks a loss of 33 per cent of the crop and four week a loss of over 45 per cent.

With the spring wheat crop a week of delay beyond the proper time results in a loss of at least 25 per cent, two weeks 35 per cent, three weeks over 45 per cent and four weeks delay causes a loss of more than half the crop. These are the results from an average of nine years experience.

4. The choosing of the best varieties of grain, fodder plants and roots to sow in the several elimates of the Dominion taking into consideration, productiveness, quality and earliness of ripening.

5. The selection of well ripened and plump seed for sowing. Along all these lines the Dominion Experimental Farms have done excellent service, the value of which is much appreciated by the farming community, and has been attested to by many unbiased and competent witnesses, both in this country and abroad.

## MAINTAINING THE FERTILITY OF THE SOIL.

The first of these great foundation principles, that of maintaining the fertility of the soil has been referred to at some length in the evidence I have given before this Committee during the past three or four years. Permit me in a few words to review the chief points which have been established by the experience gained at the Experimental Farms.

That in the case of barnyard manure it is of the greatest importance that the liquids should not be permitted to waste but should be mixed with the solids in suitable water tight troughs placed behind the animals in the barn. That the spplication of manure to the land fresh from the barnyard is the most economical method to adopt. That where manure is composted and rotted for three months its loses more than half its weight, and when this is allowed to lie another three months the loss in weight is over 60 per cent, and at the same time under the usual treatment given to this material in the barnyard it loses also a considerable portion of its valuable fertilizing constituents. In the series of experiments with fertilizers at the Central Experimental Farm, of which I gave you, last year, the results of 9 and 10 years experience, it has been shown that fresh manure ton for ton is equal in effect in its beneficial action on crops to manure which has been rotted in the ordinary way. The experience of another year has confirmed the conclusions drawn from the experiments previously reported on.

The average of the crop of spring wheat grown for eleven years on the same plot, and which has received manure in the proportion of 12 tons per acre the first year, and 15 tons per acre each year since, has given from the rotted manure an average for the whole period of 20 bushels 56 los., and from the same weight of fresh manure 20 bushels 52 lbs. The average weight of straw given during the same period has been 3,700 lbs. per acre where the rotted manure was used, and 3,699 lbs, where the iresh manure was used.

From plots of barley on which barnyard manure has been used in the proportion of 15 tons per acre for ten years, the land treated with rotted manure has given an average crop of grain for the ten years of 34 bushels 34 lbs., while the land treated with fresh manure has given 35 bushels 21 lbs. The average weight of straw has been 3,054 lbs. from the rotted manure, and 3,280 lbs. from the fresh manure.

From the plots of oats treated with the same quantities of manure for ten years the average erop of grain for ten years has been 48 bushels 14 lbs., from the land treated with rotted manure and 54 bushels 17 lbs., from the land treated with fresh manure. The strawduring the same time has averaged 3,235 lbs., from the rotted and 3,467 lbs. from the tresh manure. In the case of the wheat we have a difference of 4 lbs. per acre in favour of the rotted manure, in the barley there is a difference of 35 lbs. in favour of the fresh manure, while in the case of the oats the plots treated with fresh manure have given an average yield of grain for the ten years of 6 bu. 3 lbs. per acre more than has been had from the use of the same weight of rotted manure.

The crop of straw on the wheat plots has averaged practically the same, the difference in weight being only one pound per acre in favour of the rotted manure. On the barley plots the fresh manure has given an average of 226 pounds more straw and in the case of the oats the increase in the straw from the use of the fresh manure has been 232 lbs. as the average of the ten years test.

In the growing of Indian corn for ensilage for a period of eleven years, using manure at the rate of 12 tons per acre each year, the average of two plots has given

a greater weight of fodder from the use of fresh manure by 286 lbs. per annum.

a greater weight of todder from the use of fresh manure by 286 lbs. per annum. In the growing of mangels for ten years with barnyard manure applied at the rate of 20 tons per acre the advantage has been with the rotted manure, which has given an average of 1,943 lbs. more of these roots than the plot treated with fresh manure. With turnips the larger crops have been had from the fresh manure, the difference amounting to 658 lbs. per acre. In the growing of carrots for 8 years on plots manured at the rate of 15 tons per acre the advantage has been with the fresh manure to the extent of an average of 1 ton 222 lbs. per acre. In the growing of notatoes, which have now been tested for five years, during

In the growing of potatoes, which have now been tested for five years, during which time manure has been used in the proportion of 15 tons per aere, each year, from the average of the plots for that period we have had from the land on which the rotted manure was used an average crop of 266 bushels 17 lbs., per acre, while the plot treated with fresh manure has produced an average crop of 272 hels 32 lbs., a difference in favour of the fresh manure of 5 bushels 15 lbs., per

If the farmers of Canada would generally adopt those methods of handling and LITO applying barnyard manure which have given such good results at the Experi-mental Farm, the saving effected would be enormous. The number of cattle in the Dominion is estimated at about 41 millions and the horses at 11 millions and the total quantity of manure produced annually by these 6 million animals, including liquids and solids, is probably not far short of 100,000,000 tons. If all this manure were handled in the best manner its value in bringing increased crops would probably be at least twice what it now is.

## OTHER EXPERIMENTS WITH FERTILIZERS.

Having now continued the important experiments referred to as to the relative value of fresh manure as compared with rotted manure in the growing of spring wheat for eleven years and barley and oats for ten years, and finding the results obtained so very conclusive it has not been thought necessary to continue this special line of work longer and some important changes in the experimental work with fertilizers have been made in the tests being caried on with fertilizers. In the first place, with the view of gaining information as to the length of time which the ten or eleven annual applications of manure which have been made will continue to influence the crops, the manuring has been discontinued on these plots and the same crops are being grown without manure. Before any changes were made in the course of this work fair representative samples of the soil were taken by the chemist of the farms, Mr. F. T. Shutt, from each of the 95 plots used for the experiments with fertilizers, also from the 10 check plots on which the crops have been grown without fertilizers. When the complete results of these analyses are available, they will no doubt aid us in reaching satisfactory conclusions as to future lines of experiments in this connection. I may say that Mr. Shutt informed me this morning of the particulars he has obtained up to date. He has determined the amount of nitrogen on most of the plots on which barn yard manure has been used and they show at the present time a slightly larger proportion in the soil where the rotted manure has been used than from that to which the fresh manure has been applied; and both of course show a new much larger amount of nitrogen in the soil applied; and both of course show a very much larger amount of nitrogen in the soil than there is in the sample taken from the check plots where no manure has been

There is little doubt that the crops obtained for some years past on the plots which have been treated with artifical fortilizers at the Central Farm have been employed.

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smaller than might have been fairly expected. One reason for this lies probably in the fact that these fertilizers contain no humus, and that this ingredient in the soil has been largely exhausted by constant cropping. The capacity of the soil for holding moisture has no doubt been thus considerably reduced to the detriment of its crop producing power. To gain information on this point there has been sown this year with the grain on all the plots after the fortilizers were applied common red clover in the proportion of 10 lbs, per acre. The growth obtained from this sowing will be ploughed under late in the autumn, and in this way much humus will be added to the land, and at the same time the effects of the addition of the fertilizing material accurulated by the clover plant will be noted. Clover has also been sown on the plots hitherto treated with barnyard manure. It is expected that information of much interest and value will be gained by these modifications in the course of experiments referred to. There is no doubt that artificial fertilizers have their place in the economy of farm management, nevertheless barnyard manure on which so large a proportion of our farmers depend will, with the ploughing under of green clover, be relied on as the chief means of enriching the soil in most parts of Canada. In the evidences given you last year I referred at some length to the crops obtained from some of the plots treated with artificial fertilizers. I do not deem it

In the evidences given your has your that find a fertilizers. I do not deem it obtained from some of the plots treated with artificial fertilizers. I do not deem it necessary to go over this ground again further than to remark that the experience of another year has not materially modified any of the figures then submitted to you or affected the conclusions then reached. Since it was shown at that time that tinely ground mineral phosphate untreated, applied in liberal quantity annually for nine or ten years had produced no beneficial effect whatever, the use of this material was discontinued last season, and the Thomas' Phosphate substituted in the same quantity on all the plots to which the untreated mineral phosphate had formerly been applied. No vory marked results have been had from this change; there has, however, been a perceptible increase in the weight of Indian corn grown on some of the plots so treated and a slight addition to the weight of the crop on some of the plots of roots.

## THE PLOUGHING UNDER OF CLOVER.

The experiments which have been conducted in the growing of clover to plough under to enrich the soil and add humus to the land have shown that elover can be sown with wheat, barley and oats without lessening the grain crop for the current year. They have also shown that when ten pounds of red clover seed is used per acre, sown with the grain, and a fair catch is the result, the clover after the grain is cut makes a vigorous growth, serves the purpose of a catch crop during the summer, gathers a large quantity of nitrogen from the air and stores this up in its leaves, stems and roots; that the roots range far and deep to gather food, going deeper than most other plants can go, and converting considerable quantities of unavailable plant food into available forms. The stores of nutritive material so gathered are, when the crop is ploughed under, of great advantage to the land and add materially to its fertility. The experience of another year has added fresh testimony along this line and confirmed these conclusions.

## VALUE OF CLOVER AS AN ENRICHER OF THE SOIL.

The following experiments have afforded convincing testimony as to the value of clover when ploughed under as an enricher of the soil. In 1897 eight plots of  $\frac{1}{20}$ th of an acre each were sown with grain, two each with spring wheat, six-rowed barley, two-rowed barley and oats. On one plot in each case clover was sown with the grain in the proportion of ten lbs, of seed to the acre, while on the other plot the grain was sown without clover. The plots sown with clover had produced a good mat of growth by October when they were all ploughed about 8 inches deep. In the spring this land was disc-harrowed and harrowed with the smoothing harrow, after which the whole area was sown with one variety of oats, the Banner. These were sown on the 27th of April, and they came up on the 6th of May. The difference

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These fference in the growth of the grain on these plots was soon very noticeable und as the season advanced, especially just before the heads appeared, the difference in height and vigour of growth in favour of the plots where the clover had been grown was very remarkable. So clearly was this manifest that the difference could be distinctly seen at a considerable distance and the ontline of those plots on which no clover had been grown could be readily traced by the shorter and less vigorous growth. After the grain was fully headed the difference in growth, although not so readily seen at a distance, could be easily distinguished by close Inspection. When ready to harvest the boundaries of the several erops were carefully marked, when the grain was cut and threshed separately. The results showed an avorage increase in the yield of grain on the plots on which the clover had been grown of eleven bushels one pound per acre, and the average increase in the weight of straw was 1,114 lbs. per acre. On another set of plots grain was grown in 1897, clover being sown with it in different quantities per acre, 3 plots being left out of 15 as check plots on which no clover seed was sown. As it was intended to plant corn on this land the following year the clover was allowed to remain in the ground until the 23rd of May following by which time it had made a strong and heavy growth. On the plots where the clover had been grown with 8 lbs, of clover and upwards gave an average yield of 17 tons 1,356 pounds, while the 3 check plots on which no clover had been sown with a lbs, of clover and upwards gave an average yield of 17 tons 1,356 pounds, while the 3 check plots on which no clover had been sown with clover of an average of 4 tons 223 lbs, per aere.

Some further experiments have also been made during the past year in determining the weight of clover leaves, stems and roots per acre turned nuder when the crop is ploughed late in the autumn. These confirm the results obtained in previous years, and show that the use of 10 lbs. of clover seed per acre is attended with the best results. In the set of plots provided for corn where the clover was left in the ground all winter and allowed to grow until May following some surprising results relative to the weight of the leaves, stems and roots were obtained. Blocks of earth were cut out of these plots 4 feet by 4 in width and 9 inches deep and the leaves, stems and roots of the clover carefully collected and weighed. The weight was found to average about double that obtained by a similar method in the autumn, and points to the economy of pasturing the clover in the autumn whenever practicable, and turning it uuder in May following, in time for a crop of corn or potatoes.

An experiment was also made in inoculating clover seed with nitrogen, which is a culture of the bacillus found in the nodules growing on the roots of clover. The inoculated seed was sown on the 14th of June, and a plot alongside of it sown at the same time with seed untreated. On looking these plots over late in the autmm, they appeared on casual examination to be very much alike, but on more careful scritiny the plants from the treated seed seemed the most vigorous. On collecting the leaves, stems and roots in the manner already described it was found that the inoculated seed had produced eight tons 674 lbs, while the untreated seed gave 5 tons 205 lbs., a difference of 3 tons 469 lbs. in favour of the seed treated with nitrogen. In regard to the last point mentioned in connection with maintaining the fertility of the land, namely, by a judicious rotation of crops, this has been repeatedly urged as most important. As the proportion of the several fertilizing constituents taken from the soil by different crops during their growth varies considerably, the economy of a judicions rotation is evident. This course has been advocated from time to time when addressing farmers' meetings in different parts of the Dominion, also in replies to many letters of inquiry which have been received on this subject.

## PREPARATION OF THE LAND FOR CROP.

In reference to the next important item in good farming, the proper preparation of the land for the crop, some of the recommendations must to some extent be

varied to meet the requirements of different elimates. No success, however, need be expected anywhere in the growing of crops on wet land; in such cases underdraining is essential. The removal thus of superfluous molature raises the temperature of the soil, permits of the access of air, so essential to the formation of available plant food and to healthy growth, and admits of early seeding, all of which are matters of very great importance. The benefits of underdraining have been demonstrated at the Central Farm in the reclaiming of a considerable area of land which was formerly a swamp. Its benefits have clos been clearly shown at Nappan, N.S., and to a more limited extent at Brandon, Man. The advantages of fail ploughing in the eastern provinces of the Dominion have been repeatedly shown. The exposure of the soil to the action of frost, sunlight and air is beneficial, and spring work is materially advanced and crops can be got in earlier by the general adoption of this plan.

this plan. The reduction of the surface to a thorough state of tilth is also important, so that a fine seed-beb provided, giving conditions favourable for prompt germination and rapid growth of the young plant. The rolling of land after sowing is often useful, especially if the rain-fail is scanty, as this provides suitable conditions of moisture for rapid germination of the seed. It has been stated that rolling the land after seeding "warms the seed-bed," and that "examination made of eight farms in the spring on lands sown to grain showed that in clear weather the temperature was 3 degrees higher to a depth of 3 inches when the land was rolled than when the land was left unrolled." These particulars were taken from a book written by Prof. F. H. King, of Madison, Wis., on "The Soil." On page 232 he refers to the taking of the temperature of the soil on eight Wisconsin farms, between 1 and 4 p.m., at a depth of 3 inches below the surface, when he found the temperature in rolled land to be  $2_{10}^{\circ}$  degrees higher than on land not rolled. But he also says: "The effect of rolling the land on the temperature of the soil is often very marked, its general tendency being to make it warmer during bright clear weather, but in cloudy and cold weather it has the opposite effect, rolled land tending to cool more rapidly."

## IMPORTANCE OF EARLY SOWING.

With regard to the third element in successful farming, the importance of early sowing, I have already given you the results of a series of experiments which have been carried on for nine years, by which it has been shown that delay in seeding at Ottawa has caused an annual average loss of from 10 to over 50 per cent in crop, the proportion of loss increasing as the delay is greater. This, however, does not apply with equal force to all the climates of the Dominion. Similar experiments have been conducted for several years at all the branch farms, and the results obtained have in some instances varied considerably. At the Experimental Farm at Nappan, N.S., the results of delay in seeding have been much the same as at Ottawa, but the proportion of loss has been less. At the three western experimental farms, Brandon, Indian Head and Agassiz, although we occasionally find that late sown grain, especially oats, gives larger crops than when sown early, these instances are exceptional, and the average results show an advantage from early sowing, but the advantage is not so decided as in the eastern provinces.

#### THE BEST VABIETIES TO SOW.

We now come to the consideration of the 4th important principle in connection with profitable farming, that of the selecting of the best varieties of grain, fodder plants, and roots, for seed to sow in the several climates of the Dominion taking into consideration productiveness, quality and earliness of maturing. Long experience has taught me that attention to this point is a very essential element in successful farming. That there are varieties more productive and earlier in maturing than other sorts cannot be successfully disputed as the facts ascertained in connection

with the experimental farms as well as the experience of farmers generally afford the strongest evidence of the truth of this statement.

The question of the selection of seed is a most important one, and cannot in my opinion be too strongly recommended. It has been the practice at the Experimental Farms ever since their work was begun to select the seed grain used for sowing from year to year by separating the light and imperfect grain with the fanning mill, and by the use of suitable sieves to separate the small kernels from the plump and well matured grain and use the latter only for seed.

matured grain and use the latter only for seed. The Red Fife wheat is said to have orginated with David Fife of Otonabes Ontario, about the year 1842. The three heads which were produced the first year were preserved and the grain was soon rapidly increased from year to year. It was its unusual productiveness and vigour from the start which attracted attention. For many years Red Fife was grown extensively in Ontario and found to be very productive and useful. It was subsequently sent to the North-west country where it earried its productive habits with it and where under favourable conditions as to soil and season it continues to produce large crops from year to year. Similar remarks might be made of the Banner oat which was first brought into notice by the late Jas. Vick, seedman of Rochester, N.Y., also of the Mensury barley which was introduced from China. From the start these varieties were productive to an unusual degree and it was this fact which led to their rapid introduction and they have carried this impress of productiveness and vigour with them wherever they have been sont and have averaged bountiful crops on every favourable season.

In the four years' experience in the growing of oats wo find that the highest yielders have averaged, at all the Experimental Farms, as follows :---

	Bush.	Lbs.
Dessen	71	17
American Boauty	71	16
Columbra	70	5
Colden Deputy	67	17
Golden Deauty	66	33
Davarian	66	18
Holstein Promue	65	29
White Schonen	65	27
Early Golden Fronde	65	16
Wallis	65	9
Abundance	64	19
Golden Giant	64	11
White Russian.	64	6
Improved Ligowo		

An average for the first twelve varieties of 67 bushels 4 lbs. per acre, as the result of four years' test at all the Experimental Farms.

In Bulletin No. 32, published in December, 1898, a summary is given on page 47, showing some of the results of the year's work in this connection. I take the

liberty of reading this extract:--"The particulars presented in this bulletin show the importance of choosing the most prolific and vigorous growing varieties for seed. They also afford further proof that the tendency to great productiveness in certain sorts is to a large extent fixed and permanent. As an example, 12 varieties of oats, which are listed in this bulletin as having given the largest average crops at all the Experimental Farms for the past four years, includes 10 of those given last year as the best for three years. Further, in comparing these two lists of the best 12 sorts of oats for each Experimental Farm, we find this year at Ottawa 10 out of the former 12, at Nappan 10 of the 12, at Brandon 11 of the 12, at Indian Head 10 of the 12, and at Agassiz 9 of the 12: A careful scrutiny of the lists of the other sorts of grain will afford further avidence along this line.

evidence along this line. "The variations between the largest and smallest crops in the uniform test plots on the Central Experimental Farm, while not quite so marked in 1898 as they were in 1897, are still very large. In the cats the crops range from 89 bushels 14 lbs. to 42

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bushels 12 lbs.; in the two-rowed barley from 55 bushels 20 lbs. to 31 bushels 10 lbs.; in the six-rowed barley from 58 bushels 16 lbs. to 33 bushels 16 lbs.; in the spring wheat from 31 bushels 15 lbs. to 15 bushels, and in the pease from 46 bushels 50 lbs. to 20 bushels.

"These facts should induce farmers every where to pay more attention to the selection of the most promising sorts for seed. Any of these varieties which are among the twelve which have given the best average crops for the past four years may be sown with the confident expectation of a good crop, provided the season is fairly favourable, and the general use of these more productive sorts for seed would soon raise the average viold of the Dominion several bushels which would add some millions of dollars yearly to the receipts of the farming community in Canada.

## SELECTION OF PLUMP AND WELL-RIPENED SEED.

The last point bearing on successful farming, that of the careful selection of plump and well ripened seed for sowing, is of much importance. Good farmers have for a long time followed the practice of selecting their own impressed on it by nature which, under favouring conditions, will manifest itself. Each seed is provided with a germ wherein lies this impress of individuality, and this germ is embedded in a store of such food as is best suited to stimulate the growth of the young plant. When the seed is plump, that food supply is bountiful, and the infant plant so nourished makes rapid headway, but when the seed is imperfoctly developed, the store of nourishment is much lessened. Crops are thus often eufeebled at the star and delayed in ripening by the use of poor seed, or they ripen unevenly and lack that vigour so necessary to a liberal return. It is well known that some farmers by the selection of good plump seed and thorough preparation of the soil grow oats from four to eight pounds heavier per hushel than many of their neighbours.'

In the annual report for 1897, the following appears :----

"The advantages arising from the selection of plump, well-matured seeds of the best sorts have been frequently urged and the good results from such a course demonstrated."

## SELECTION OF SEED FROM LARGER HEADS.

Among the earliest experiments conducted at the Experimental Farm was a sories of tests specially bearing on this subject. In the spring of 1888, a consider-able number of varieties of different sorts of grain were chosen, and good average able number of varieties of different sorts of grain were enceen, and good average sized kernels sown one foot apart each way, the object being to grow very strong plants which would produce large heads from the best of which seed might be selected for sowing the following year. The weight per hundred of the kernels sown in each case was noted and on selecting the largest kernels for the second year's sowing from the finest heads it was found that the grain had increased in weight as compared with the original average unselected seeds from 25 to nearly 50 per cent. The results of this work were submitted to the Royal Society of Car.ada in 1889; they also formed the subject of a paper presented at the meeting of the "Society for the Promotion of Agricultural Science" held in Toronto in 1883. In the spring of 1889 the largest and plumpest kernels chosen from the fine ercp of 1888 were sown, but the season was unfavourable and rust prevailed on all the grain crops to an unusual degree. The result was that the crop from the very plump kernels was so small and the grain so shrivelled that the material was quite unfit for any further experiments in this direction.

Three years ago this line of work was started afresh. The largest kernels obtainable were selected and sown, but that season was not favourable and the results were unsatisfactory. Last year this branch of work was not taken up, but during the past winter the largest kernels obtainable were selected from 188 varieties, 65 of wheat, 55 of barley and 68 of oats. These have all been sown. 30 kernels in each case in two rows, each one foot apart, with two feet of space between each plot. These plants are now well up, and if the season proves favourable will I trust give us some interesting results.

Mr. McMILLAN.-It is important to solect seed, but it is just as important sometimes to get new seeds. It might be as well for me to read what Prof. Loyd, lecturer in King's College, London, says in his book "The Science of Agriculture", and the Committee can judge for themselves. "Change of seed. Assuming that the farmer has employed good gorminating seed and clean seed his crops for some time will be all that can be desired and each

year will supply him with seed for the next. In the course of three or four years, however, it will be found that the crop—and this applies specially to wheat and other cereal crops—is deteriorating. It will now be necessary to seek some new seed. This is termed the change of seed. In seeking for new seed not so much the variety will be considered as the conditions under which the new seed has been grown, and it will be desirable to select seed which has previously been grown under conditions less advantageous than those it will now be subject to. Thus seed should be selected from a colder district----" should be selected from a colder district-

-you will remember I said that we always brought our seed from the north

when we purchased seed \_\_\_\_\_\_ 'from a poorer soil, and from a soil of a different character. If therefore it is required to bring seed from a superior to an inferior climate, such as from Australia to the south of England, it can only be done in two stages; first by taking the seed to a colder and less favourable climate and soil even than the south of England-ray to Scotland-and then subsequently transferring it to the south of England. It would here regain to a great extent the vigour and properties it had originally in Australia." 'That is the opinion of one of the most scientific men in England in regard to the

change of seed. My experience after 50 years in Canada—perhaps I have not observed as keenly as some people but I have observed this closely—that much of our success as farmers we owe to change of seed. We find seed will improve for a while but it will go back and it is always necessary to change. One variety will give a greater yield than another, showing that there is a good deal in variety. Mr. CALVERT.—In changing seed, would you recommend the change from sandy

to clay soil ? Mr. McMillan.-I would, most certainly, change to a sandy coil if I could from heavy soil; or from poor to rich. I find that holds good with stock and with seed ;

I would always take stock or seed from a poorer farm than they were to go on. Mr. SEMPLE.—The facts that Dr. Saunders has brought to notice of the committee, to-day, about drainage, and that as far as manure is concerned, the only manures to be depended upon are ploughing down the clover and barnyard manure are very interesting. It will not do for the farmer to purchase artificial fartilizers; that may do for market gardeners. Then in regard to seed the best of our farmers are very careful in selecting their seed. Now, in my county, I have handled a good deal of oats, and in that county they sow the Banner oat, and after all whether it is a good or a poor year it depends on climatic conditions. Farmers are sensible enough to pro-vide the best varieties, but beyond that they cannot control the climate. The evidence brought forward to-day and the facts stated will commend themselves to the best farmare the best farmers.

Mr. ERB .- What I have heard to-day I agree with, and my experience bears it out. We should circulate among the farmers the evidence given to day.

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## By Mr. McMillan

Q. You spoke, Dr. Saunders, of fertilizers having given a certain increase; would the increase be sufficient to pay for the cost of purchasing and handling the fertilizer?

A. I suppose you refer to my statement that we substituted Thomas' phosphate last year on some of the fertilized plots for mineral phosphate finely ground, which we had found after ten years of experience to be of no value as a fertilizer.

Q. It was the Thomas' phosphate ? A. I found last year there was some increase in the corn and root crops A. I found last year there was some increase in this case fertilized by the Thomas' phosphate, but I do not think the increase in this case was sufficient to cover the cost of the fertilizer.

## By Mr. Stenson :

Q. I would like to have it explained in regard to green manure that in most cases the effects are better than when it is employed rotted; will the Professor give as particulars as to how it is spread and at what seasons on the Farm. It would be precious information for the farmers. We use it in small heaps all winter, while some wait for the spring, some wait for root crops and plough it under, and others do it in the drills?

A. The explanation as to the way these special plots are treated, of which I have been speaking is this: These are plots of  $r_{10}^{-1}$ th of an acre each, and on the first plot rotted manure is used in the proportion of 15 tons to the acre, while on the same size plot and adjoining we used fresh manure, the same crops being con-tinuously grown in each plot. Please bear in mind this is not a plan I would advise farmers to follow, but is adopted by us for the purpose of getting information.

#### By Mr. McMillan:

Q. At what season do you apply the manure? A. The manure is applied just before sowing when it is spread evently over the ground and turned under a few inches.

#### By Mr. McGregor :

Q. Do you use a disc harrow or a common harrow?

. We use a common harrow in this case and harrow lightly, otherwise we would be likely to drag some of the manure to the surface. The object is to bury the manure in the soil not more than three or four inches deep so that it may be more readily available to the crop. In these experiments the manure is com-posed of equal weights of cow manure and horse manure, the green manure is used within two or three days of the time it is made. The liquids and solids both saved and mixed together, and put on the plots, the same weight being used in both cases.

## By Mr. Stenson :

Q. All over the snow?

A. No; in both cases it is applied in the spring just before seeding, spread evenly and then ploughed in.

## By Mr. McMillan:

Q. And in what condition is the rotted manure kept during the winter? A. It is rotted for three menths before using and consists of equal parts of cow and horse manure, made into a pile in the usual way and turned over as often as is necessary to bring about rapid decay. The point I wish to make clear is that in using this 15 tons of manure to the acre, the results had in crops from the fresh manure have averged quite as good as those from the same weight of rotted manure. In leaving grean manure to rot it looses fully 40 per cent of its weight manure. In leaving green manure to rot, it looses fully 40 per cent of its weight

if left for three months, and 50 to 60 per cent of its weight when it is left for five or six months. In our experience we find the use of of green manure more economical than rotted. The plan we adopt for the winter is to distribute the green manure as made in small piles over the ground; the object of putting it in small piles being to prevent heating. These small piles freeze up quickly and thaw out again in the spring, when the manure is in much the same coudition as if it had been freshly put out. It is then ploughed under. Where this course is practicable it is the most economical way to use barnyard manure.

By Mr. Stenson:

## Q. It would not be practicable on a hill?

A. It would not be wise to place manure on a hillside in winter where the soluble fertilizers in it would be liable to be washed away in the spring. While there is some loss in allowing it to rot in a pile, there might be greater loss from leaching if the manure was placed on a hillside. In all such cases the farmer must use his own good judgment, and he will thus be able to utilize the information given him to the best advantage.

#### By Mr. McMillan:

Q. In turning that manure during those three months do you use anything to prevent the ammonia escaping?

A. Not in these experiments for the reason that it is not the practice for farmers to follow that method, and our aim has been to get our results under similar conditions to those which surround the average farmer. We used gypsum for this purpose in other cases and have found it to be a very good thing.

## By Mr. Erb:

Q. In the comparison of the yield of crops sown late and early you refer to the remarkable difference in the yield of wheat sown late and early, but you made no reference in regard to pease, does the same difference hold good in regard to that crop?

A. Not so decidedly with regard to pease. We have tried similar experiments with pease along the same line but they have not been continued for so long a time. Pease have been tested for four years and the results we have had show that this crop can be sown late with less loss than either wheat, barley or oats, indeed the difference in crop between the socond, third and fourth week in sowing pease is not very great. Pease sown the second week gave 33 bushels 30 lbs, those sown the third week 32 bushels, 26 lbs, the fourth week 30 bushels 23 lbs, the fifth week 26 bushels 42 lbs., and the sixth week 24 bushels 41 lbs., as the average of the four years test. The first week has not given as good results as the second week, the crop averaging 29 bushels 26 lbs., the reason is probably this that the date on which the first sowing is made, which is just as early as the land can be worked is rather earlier than pease should be sown. It also often happens that we have about that time strong wind storms which gather up sand from the high spots with light soil and this sand is blown against the young blades and cuts the young plants to such an extent as to injure them. The estimates I have shown that by delaying a week after that time there is a considerable loss which is further increased in proportion to the length of delay.

Having read the preceding transcript of my evidence I find it correct.

## WM. SAUNDERS.

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## COMMITTEE ROOM, No. 46 House of Commons, Thursday, 1st June, 1899.

The Select Standing Committee on Agriculture and Colonization met this day at 10.45 a.m., Mr. Bain, the Chairman, presiding.

Dr. SAUNDERS, having been cited by the Committee, gave the following evidence:-

Mr. CHAIRMAN AND GENTLEMEN.—In my remarks to you at the last meeting, I submitted evidence in regard to some important principles which underlie successful farming in Canada. As an illustration of the result of the adoption and the carrying out of these principles, I wish to bring to your notice the results we have had at the Experimental Farm in Ottawa. We have made considerable progress in the way of increased crops. As you are aware the Experimental Farm work was inaugurated in 1887. It required about two years to do the fencing, the clearing and the draining at the Central Experimental Farm, so as to get the land into fair order. Taking the three years following that period which would be the years 1889, 1890 and 1891 and comparing the average of these three years with the average of the past three years, 1896, 1897 and 1898, I think we get a fair idea as to the results which have been obtained by the carrying out of these principles by the practical methods which I brought under the notice of the Committee at the last meeting.

methods which I brought under the notice of the Committee at the last meeting. In the first three years on the Central Fxperimental Farm the average crop of oats taking all the varieties under cultivation was 32 bushels 17 lbs. to the acre. During the last three years the average crop for the whole period has been 56 bushels, 6 lbs, per acre an increase of 26 bushels and 13 lbs., a gain of more than 50 per cent.

In barley the average crops of the early three years was 31 bushels and 6 lbs., and of the later three years 43 bushels 13 lbs., being an average gain of 12 bushels and 7 lbs. per acre.

In wheat the average for the early three years of all the varieties was 15 bushels and 19 lbs., in the later three years 20 bushels and 9 lbs., showing a gain in the last period of 4 bushels and 50 lbs., nearly five bushels per acre over that of the early period.

Thus in the wheat the gain has been nearly 33 per cent and that of the barley, nearly 40 per cent.

nearly 40 per cent. These results have been brought about by the draining of the land and bringing it into a good condition of tilth, by the moderate use of barnyard manure, the ploughing under of green crops of clover, the thorough working of the land, early sowing the selection of the most productive varieties of seed and by carefully cleaning the grain and sowing only plump and vigorous seed.

It is sometimes urged that the growing of grain on small plots is no guide as to the crops you get from larger areas, and that is an objection of much force in some cases. As an indication as to how the crops from the plots compare with those of the fields, I submit to you the results obtained at the Central Farm during the past year. From the experimental plots of oats we have an average over the whole series of 66 bushels and 11 lbs. per acre. In the field plots amounting in all to 54½ acress of oats there was an average of 60 bushels and 14 lbs., a difference of nearly 6 bushels in favour of plots. But when you consider that the plots are sown on better average soil than the fields on land selected on account of the more uniform character of its soil, I think the field crops show up very well.

#### By Mr. Featherston:

Q. In the plots is there not a greater distance between the varieties than in the fields?

A. There is a pathway of three feet left between the plots, this, as I have pointed out on several occasions, affords the plots an advantage by giving them more margin than can be had in a field, and grain will usually be found more vigor-ous along the margin than elsewhere. To lessen the force of this objection we

arrange our plots so as to have them as nearly square as possible. Q. On a field where there is a space you often see three or four rows better at the outside than the grain farther in.

A. Yes, that point is vory well taken.

In the experimental plots of barley the two-rowed varieties have given an average yield of 39 bushels and 46 lbs. per acre while the field crops of four and a half acres in all have given 32 bushels and 6 lbs. In the 6 rowed barley while the average on the experimental plots was 44 bush. 28 lbs. the average of the field crops (10 acres in all) was 42 bushels and 2 lbs. In the spring wheat while the average of uniform test plots was 23 bushels and 39 lbs. the average of the field crops (9 acres in all) was 27 bushels and 13 lbs. In this later case the field crops have given an average of nearly four bushels per acre more than the plots. In pease the average erop on the uniform test plots was 34 bushels and 30 lbs, while the field crops averaged 31 bushels and 35 pounds.

In Indian corn where the objection that has just been cited would not apply the crops from plots and fields come ont very even. The average of the experimental plots cut green for ensilage was 18 tons and 1,216 lbs., and of the field crops (9 acres in all) 18 tons and 348 lbs.

The average yield during the past year from the best six varieties of turnips grown on the uniform test plots at the Central Experimental Farm was 29 tons 162 los. per acre, whereas the best six sorts at all the Experimental Farms averaged 33 tons and 1,102 lbs. per acre. This shows that the root crops throughout the Dominion have been unnshally good during the past year. The best six varieties of mangels at the Central Experimental Farm gave an average crop of 32 tons 20 lbs, per acre whereas the best six at all the farms averaged 33 tons and 898 lbs, per acre. Of carrots the best six varieties at the Central Farm gave an average of 23 tons 1,472 pounds per acre while the best six at all the farms gave 25 tons and 232 lbs. per acre. Of potatoes the best 12 sorts at the Central Farm gave an average crop of 341 bnshels 11 lbs. per acre while the best 12 sorts at all the farms

have given an average crop of 453 bushels 3 lbs. per acre. My chief object in bringing these figures before you is to show that by the application of the principles which I explained so fully at the last meeting of the Committee to all these Experimental Farms, the average crops have been increased and are much larger than those had by farmers in general. The large crops referred to are not obtained by the use of special methods of fertilizing the land nor are they the result of special skill in the operations. Everything done has been explained and nothing has been undertaken in the growing of crops at the Experimental Farms which could not be fairly well imitated by the average farmer farming in Canada.

I will now call your attention to a few of the experiments which have been car-I will now call your attention to a rew of the experiments which have been car-ried on with other crops. Horse beans were again tried at the Central Farm on eight different plots and have given an average yield, when cut green for ensil-lage, of 3 tons 817 lbs. per acre. This is an unusually light yield for horse beans, but we have found them very subject to blight, and they suffered much from this disease last year. Two field plots of horse beans were also sown and gave an average of 3 tons 522 lbs, per acre. As the crop was not sufficient to permit further tests to be carried on in the feeding of cattle with ensilage made from the mixture of corn, beans and sunflowers known as the Robertson mixture, no further feeding tests have beans and sunflowers, known as the Robertson mixture, no further feeding tests have

been made with this mixture during the past year. Sunflowers were tested on two half-acre plots, which gave an average weight in heads of 5 tons 984 lbs. per acre. Experiments have also been conducted with early

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ripening Soja beans on six different plots, and the average weight of the crop, cut green for ensilage, was 11 tons 285 lbs. per acre. It will thus be seen that during the past season, and it was the same last year, the early Soja beans have produced on an average much more than the horse beans. This year they have produced more than three times the weight which has been had from the horse beans. They seem than three times the weight which has been had from the horse beans. They seem to be equally rich in nitrogenous matter, and both horses and cattle are very fond of the Soja beans and eat them readily in the form of ensilage or when fed alone. I think these early Soja beans promise to be very useful, especially when out green and mixed with Indian corn in the silo, and that probably the use of these beans throughout the Dominion will increase rapidly, provided the seed can be got at a reasonable price. Last year the Soja bean seed was sold at \$4 a bushel, which, although the scale is small is a birth wise for the former to nor but if a larged mered although the seed is small, is a high price for the farmer to pay, but if a large demand arises for them they will no doubt be obtained cheaper. They are now imported from Japan, but may also be ripened in the Southern and Central States.

## By Mr. Featherston:

Q. How much seed did you use per acre?

A. We have been testing this point, about which there was a good deal of uncer-ty. We sowed in the first place in drills 35 inches apart, that was the widest tainty. We sowed in the first place in drifts 30 inches apart, that was the widest space allowed for the beans, and the weight of green fodder in that case was 9 tons 520 lbs. to the acre. When sowed in drills 28 inches apart the weight was 9 tons 890 lbs. per acre, very little more. you see, than in the other case. In drills 21 inches apart the yield was 10 tons 1,760 lbs. per acre. There were two sowings in 21 inch drills, the first on 26th April, and the second on 19th May. The figures I have given you were for the first sowing, and those sown on the last date in the 21 inch. drills gave a weight of 11 tons 1,480 lbs. an acre. In drills 14 inches apart the yield had increased to 12 tons 1,800 lbs. per acro, so our experiments this year at all the Experimental Farms have been planned to adopt the latter sowings which were shown last year to give the best results, and to sow in drills 14 inches and 21 inches apart,

the two distances which have given the best results. Q. What was the amount of seed you used? A. Sown in 14 inch or 21 inch drills it would take just about the same as Indian corn-the beans are a little smaller than Indian corn-which would be from half a bushel to three peeks per acre.

## By Mr. Calvert :

Q. About what height did these beans grow ?
A. They grew to an average height of about 42 to 46 inches.
Q. What time did you cut them ?

A. We cut them when the pods were well formed and the seed still green. The date of cutting was the 12th of September in this case.

#### By Mr. Rogers :

Q. How do you harvest these beans ? A. They can be harvested in the same way as corn. If you have a corn binder you can use it for this crop, or you may use a common binder. Our plots being comparatively small we cut them by hand. Where the beans are sown wide apart the stems become much more woody than where they are sown at a distance 21 inches or 14 inches, and I think either one of these widths would be a proper distance to sow. In 1897 we sowed Soja beans in drills 9 inches apart and got a heavier crop than this year, but the beans did not mature as well. Like corn, this crop requires a certain amount of area to give it light and air, but at the same time you do not want it to become woody by sowing the rows too widely apart.

## By Mr. Douglas :

Q. Is its usefulness confined to ensilage alone ?

A. We have not yet tried it for ensilage. We have fed the beans cut green to cattle, and the eattle will eat them readily. The quantity we have sown has not been sufficient to put into the silo to make a layer thick enough for a feeding test.

## By Mr. McMillan :

Would it not help to prevent the formation of woody fibre to cut it earlier ? A. Yes, no doubt, but then for ensilage we would not have the corn ready.

By Mr. Calvert :

Q. Do you cut it with the binder or the mower ?

A. You can cut it with the binder without trouble.

By Mr. McMillan :

Q. Have you sent any seed to the other provinces? We tried the common horse bean several times, brought them out from the old country, and they didn't do any good with us ? A. We sent these Soja beans to be tried at the branch Experimental Farms also.

## By Mr. McGregor:

Q. We tried horse beans some years ago from the Experimental Farm, and they were no good ?

A. Horse beans will, as a rule, do well in the moist climate in parts of the maritime provinces; they will do fairly well in Quebec and sometimes at Ottawa, but more often the crop is poor here; and as you get further west they are of little value; not profitable enough to induce people to sow them.

#### By Mr. Stenson :

Q. Have you tried to sow the Soja beans with corn? A. No, we have not. The tests we have made formerly in sowing horse beans and climbing beans with corn have fully satisfied me that this is not a good plan. The crop was exceedingly small and varied, so much that you could not get a definite quantity of beans from any given area. One plot may give a fair erop, while others give very little. So we always like to sow these beans by themselves and take a definite weight of each so that we have the materials we are using mixed in proper proportion. I may say that the evidence I have submitted as to the growth of crops on the Experimental Farm could be supplemented by similar evidence regarding the crops at the branch farms; they have also been increased by the adoption of the principles I have explained to you.

## DISTRIBUTION OF TRIAL SAMPLES.

I desire now to call your attention to the distribution of samples that has been I desire now to call your attention to the distribution of samples that has been carried on during the present year, a distribution which was closed only a few days ago. Much useful work has been done by the distribution of these samples during the last nine or ten years. We have sont out only the best and most productive varieties and they have given, as a rule, very satisfactory returns in all parts of the Dominion. The results of the work this year, just completed on the 24th of May, show that we have sent out to 33,725 of the farmers of this Dominion samples amounting in all to about 64 tons. Every pound of this material has been carefully cleaned, selected, and all small grain rejected by the use of the fanning mill and sieves, and only the plump and well matured seeds have been disseminated. I have brought for the inspection of the Committee samples of some of the varieties of brought for the inspection of the Committee samples of some of the varieties of grain which have been sent out which will corroborate what I have said about the careful cleaning of the grain at the Experimental Farm. While the usual distribu-tion in three-pound samples has been carried on as heretofore, and 29,405 three-pound samples have been distributed, a new departure has been made this season

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under which each farmer has received a sufficient quantity of seed to sow a onetenth acre plot. In the distribution of the three-pound samples no effort has been made to prescribe any particular size of plot on which these samples should be sown, the samples being small, it was scarcely practicable to do so. Some farmers have sown on a plot of one size and others on a plot double the size, hence a fair comparison of the results of the experiment one with the other owing to the difference in the area covered could not be accurately made. It was thought that by making a select list of farmers, taking a few from every county in every province of the Dominion, and choosing twelve or fourteen varieties of the best grain we had grown, and such as our reports from year to year had shown to produce the best results, and selecting the men to make this test from among those farmers who had made reports to us from year to year on samples they had received, we would in that way get into the hands of a large number of good men, in all the different climates in the Dominion, the same quantity of grain to be grown on the same sized plot. In this way we expect to get a more accurate and complete description of the results obtained from these samples and reach more correct conclusions regarding the actual service which these particularly productive sorts are able to render to the farmers of this country.

#### By the Chairman:

Q. About what is the average of the returns you receive from those to whom you sent out samples ?

A. The average returns this year are much better than heretofore. In previous years we averaged about 23 per cent of returns where we sent out samples in response to applications from individual farmers, but where we have filled applications on lists which have been received from agricultural societies and members, we have not usually received more than three or four per cent of returns, and for that nave not usually received more than three or four per cent of returns, and for that reason the Minister decided some two years ago that we should send only to those who applied individually, and it is gratifying to know that this limitation has not materially lessened the number of applicants. Farmers have applied for samples for themselves, and when doing so they have felt under a greater obligation to make the returns desired. The returns are not fully made np, but I think we must have received from 30 to 35 per cent this season.

We are improving?

Q. We are improving r A. Decidedly, in that particular. In order to make the special distribution of grain for one-tenth acre plots as effective as possible, it was thought best to give farmers their choice of varieties. One might have land more snitable for oats and others for wheat or barley, so this circular was prepared and sent out in the early winter. It was addressed to a select list of farmers, which was prepared by going over all the returns that had been received and choosing those who appeared to take the deepest interest in the work. The following circular was prepared early in the winter and a copy addressed to each of the farmers whose names had been placed on this special list :-

" DOMINION OF CANADA. " DEPARTMENT OF AGRICULTURE, "CENTRAL EXPERIMENTAL FARM, 

" DEAR SIR,-The reports received from you concerning the tests of samples sent you from the Experimental Farm show that you are interested in the important work of seed testing. By instruction of the Honourable Minister of Agriculture a work of seed testing. By instruction of the induction in inster of Agriculture a new feature has been added to the grain distribution this season, namely, that of offering a few of the very best sorts in sufficient quantity to sow a plot of one-tenth of an usere. These samples will be sent to a select list of farmers chosen from each connty and you are invited to co-operate in this work. As it is proposed to publish the results obtained in each connty this test will, in a sense, be a competitive one. The samples will be sent free through the mails, one sample only to each farmer.

"The size of the plots on which these samples should be sown is 33 x 132 feet or 66 x 66 feet and the quantity of grain to be sent of the different sorts will be as

follows:-Oats 8 lbs., spring wheat 10 lbs. and barley 10 lbs. "The following varieties have been chosen for this special distribution: Oats-Abundance, Banner, Improved Ligowo, American Beauty, Bavarian and Golden Giant.

"Of Spring wheat the Proston, Perey, Stanley and Advance. "Two-rowed barley, the Beaver and Sidney, and of the six-rowed barleys the Royal and Trooper.

"If you desire that one of these samples be sent you for trial please let me know which of the sorts named you would prefer, and name also your second choice in ease the stock of your first choice should be exhausted. An early reply is requested. An addressed envelope is inclosed. All letters forwarded to the Central Experimental Farm, Ottawa, may be sent free of postage.

#### "Yours very truly.

## "WILLIAM SAUNDERS, " Director Experimental Farm."

There was a very prompt reply to this eircular and in a few days we had returns from more than three-fourths of all those who had been addressed and there was subsequently sent to this chosen list of farmors distributed all over the Dominion 4,320 samples. As these applications came in they were classified by Dominion 4,320 samples. As these applications came in they were classified by counties—and where we found that any county was short in the number of samples applied for, efforts were made to supplement that number so as to bring it up to its proper proportions. In this way the grain has been fairly distributed over every section of the country. In some counties, especially in New Brunswick where there has been a very great interest taken in this branch of experimental work, we had so many returns, to choose from, that it was very difficult to reduce the number so as to make them even with other counties and to some a larger share was sent for the reason that the farmers in those counties have taken more interest in this work and given more satisfactory returns.

When sending out the varieties of grain chosen, some information was given on a printed slip attached to the circular giving some particulars as to how the special variety sent had succeeded on the Experimental Farms. It was thought that these particulars would tend to interest the farmer more fully in the variety of grain he had chosen.

Information was thus given with the several varieties sent out as follows :

#### THE BANNER OAT.

The Banner oat was first grown at the Experimental Farms in 1890, and has been The Banner oat was first grown at the Experimental Farms in 1890, and has been sown each year since with very satisfactory results. From the outset it has shown great vigour and has been very productive. It is a white oat with a branching head and a stiff straw. In the unifor. test plots at the Central Experimental Farm it has given an average yield during the past four years of 70 bushels 21 pounds per acre. The Banner oat has been similarly tested at all the Experimental Farms throughout the Dominion and has given, as the result of four years' trial an average orop of 71 bushels 17 pounds per acre, which is the largest yield given by any variety. The heaviest crop yet obtained from this oat at any of the Experimental Farms was at Brandon, Man., in 1898, when it gave 106 bushels 6 pounds per acre. In 1895 at Indian Head, N.W.T., an 18-acre field of this oat gave an average of 106 bushels per acre. bushels per acre.

#### GOLDEN GIANT.

The Golden Giant oat was first grown on the Experimental Farms in 1893, and has been tested each year since with very satisfactory results. It is a yellow oat with a sided head and a fairly stiff straw, which has proved vigorous and very pro- $2\frac{1}{2}$ 

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imples sent important riculture a ly, that of f one-tenth from each to publish etitive one. n farmer.

ductive. In the uniform test plots at the Central Experimental Farm this oat has given an average yield during the past four years of 65 bushels 7 pounds per acre. The Golden Giant oat has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial, an average erop of 64 bushels 19 pounds per acre. The largest crop yet obtained from this cat at any of the Experimental Farms was at Indian Head, N.W.T., in 1895, when it produced 104 bushels 4 pounds per acre.

#### BAVARIAN.

The Bavarian oat was first grown on the Experimental Farms in 1894, and has been tested each year since with very satisfactory results. It is a white oat with a branching head and a stiff straw, which has shown much vigour and been very productive. In the uniform test plots at the Central Experimental Farm this oat has given an average yield during the past four years of 62 bushels 13 pounds per acre. The Bavarian oat has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial, an average crop of 66 bushels 33 pounds per acre. The largest crop yet obtained from this variety at any of the Experimental Farms was at Brandon, Man., in 1898 when it gave 109 bushels 14 pounds per acre.

#### AMERICAN BEAUTY.

The American Beauty oat was first grown on the Experimental Farms in 1891, and has been tested each year since and given very satisfactory returns. This is a pale yellow oat with a branching head and fairly stiff straw, a vigorous grower and very productive. In the uniform tests plots at the Central Experimental Farm it has given an average yield during the past four years of 62 bushels 32 pounds per acre. The American Beauty oat has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as a result of four years' trial, an average orop of 71 bushels 16 pounds per acre, which is only one pound per acre less than the Banner, which stands at the head of the list for productiveness. During the season of 1898 a five-acre field of American Beauty gave at the Central Farm an average crop of 62 bushels 11 pounds per acre. The largest crop yet given by this variety was had at Brandon, Man., in 1898, when it produced 113 bushels 18 pounds per acre.

## IMPROVED LIGOWO.

The improved Ligowo oat was imported from France by the Experimental Farm in 1891, and has been grown each year since with very satisfactory results. It is a white oat, large and plump, with a branching head and stiff straw, a vigorous grower and very productive. In the uniform test plots at the Central Experimental Farm it has givon an average yield during the past four years of 65 bushels 30 pounds per acre. The improved Ligowo oat has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial, an average crop of 64 bushels 6 pounds per acre. The largest crop yet given by this variety was at Indian Head, N.W.T., in 1896, when it produced 92 bushels 32 pounds per acre.

#### ABUNDANCE.

The Abundance oat was imported from France by the Experimental Farms in 1891, and has been grown each year since with very satisfactory results. It is a white oat with branching head and a fairly stiff straw, a vigorous grower and very productive. In the uniform test plots at the Central Experimental Farm it has given an average yield during the past four years of 66 bushels 37 pounds per acre. The Abundance oat has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial, an average erop of 65 bushels 9 pounds per acre. The largest crop yet given by this

variety at any of the Experimental Farms was had at Indian Head, N.W.T., in 1895, when it produced 108 bushels 28 pounds per acre.

#### THE PRESTON WHEAT.

The Preston wheat is a cross-bred sort produced at the Central Experimental Farm, Ottawa, in 1888, by fertilizing the Ladoga wheat with the Red Fife. It is a bearded variety which has shown great vigour and productiveness. It has a stiff straw and ripens on an average about four days earlier than Red Fife. At the Central Experimental Farm it has been tested alongside of a large number of other sorts, under similar conditions, for four years, and has given an average yield for this period of 26 bushels 4 pounds, which is 2 bushels 4 pounds per acre more than that obtained from any other sort at Ottawa. The Preston wheat has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial at all these farms, an average of 32 bushels 17 pounds per acre, being 1 bushel 17 pounds more than that obtained from any other variety tested. The largesi erop yet given by the Preston at any of the Experimental Farms was at Brandon, Man., in 1895, when it gave 48 bushels 20 pounds per acre.

## ADVANCE.

The Advance wheat is a cross-bred sort, which was produced at the Central Experimental Farm in 1888 by fertilizing the Ladoga wheat with the White Fife. It is a bearded variety with a stiff straw, which has shown much vigour and productiveness, and ripens on an average abont three days earlier than the Red Fife. In the uniform test plots at the Central Experimental Farm it has given an average yield during the past four years of 21 bushels 20 pounds per acre. The Advance wheat has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial, an average crop of 29 bushels 8 pounds per acre. The largest erop yet obtained from this wheat at any of the Experimental Farms was at Brandon, Man., in 1895, when it gave 46 bushels 20 pounds per acre.

#### PERCY.

The Percy wheat is a cross-bred sort, produced at the Central Experimental Farm, Ottawa, in 1888, by fertilizing the Ladoga wheat with the White Fife. It is a beardless variety with a stiff straw, which has shown much vigour and productiveness, and ripens on an average about four days earlier than the Red Fife. In the uniform test plots at the Central Experimental Farm it has given an average yield during the past four years of 21 bushels 7 pounds per acre. The Percy wheat has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial, an average of 30 bushels 24 pounds per acre. The largest ercoy yet obtained from this variety at any of the Experimental Farms was at Indian Head, N.W.T., in 1898, when it gave 45 bushels 20 pounds per acre.

#### STANLEY.

The Stanley wheat is a cross-bred sort, 'a sport which occurred in the variety known as Preston, a cross between Ladoga and Red Fife. This is a beardless sort with a stiff straw, which has shown much vigour and productiveness, and ripens about four days earlier than Red Fife. In the uniform test plots at the Central Experimental Farm it has given an average yield during the past four years of 22 bushels 41 pounds per acre. The Stanley wheat has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial at all these farms, an average of 29 bushels 3 pounds per acre. The largest erop yet obtained from this variety at any of the Experimental Farms was

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at Nappau, N.S., in 1896, when it gave 49 busheis per acre; the second largest crop was at Brandon, Man., in 1895, when it gave 43 busheis 30 pounds per acre.

#### THE TROOPER BARLEY.

The Trooper six-rowed bariey is a hybrid which was produced at the Central Experimental Farm in 1889 by crossing the Swedish two-rowed bariey with the Baxter, a six-rowed sort. It has been tested each year since with satisfactory results. This bariey has a stiff straw, is vigorous in growth and productive. In the uniform test plots at the Central Experimental Farm it has given an average yield during the past four years of 48 bushels 17 pounds per acre. The Trooper barley has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial, an average crop of 46 bushels 29 pounds per acre. The iargest erop yet given by this variety at any of the Experimental Farms was at Indian Head, N.W.T., in 1896, when it produced 67 bushels 14 pounds per acre.

#### ROYAL.

The Royai six-rowed barley is a hybrid which was produced at the Central Experimental Farm in 1889 by crossing the Swedish two rowed barley with the Baxter, a six-rowed sort. It has been tested each year since with satisfactory results. This barley has a stiff straw, is vigorous in growth and productive. In the uniform test piots at the Central Experimental Farm it has given an average yield during the past four years of 53 bushels 26 pounds per aere. The Royal barley has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial an average crop of 45 bushels 4 pounds per acre. The iargest erop yet given by this variety at any of the Experimental Farms was at Brandon, Man., in 1895, when it produced 65 bushels 30 pounds per acre.

#### SIDNEY.

The variety of two-rowed barley known as Sidney is a hybrid produced by crossing the Swedish two-rowed barley with the Baxter, a six rowed sort. This eross was effected at the Central Experimental Farm in 1889, and this barley has been tested each year since with satisfactory results. It has a stiff straw, is a vigorous grower and productive. In the uniform test plots at the Central Experimental Farm it has given an average yield during the past four years of 39 bushels 38 pounds per acre. The Sidney barley has been similariy tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial, an average of 39 bushels per acre. The largest crop yet obtained from this variety at any of the Experimental Farms was at Iudian Head, N.W.T., in 1896, when it produced 61 bushels 42 pounds per acre.

#### BUATER.

The variety of two-rowed barley known as Beaver, is a hybrid produced by crossing the Swedish two-rowed barley with the Baxter, a six-rowed sort. This cross was effected at the Central Experimental Farm in 1889, and it has been tested each year since with satisfactory results. It has a stiff straw, is a vigorous grower and productive. In the uniforn test plots at the Central Experimental Farm it has given an average yield during the past four years of 42 busheis 9 pounds per acro, which is the highest yield obtained from any of the varieties tried at Ottawa. The Beaver barley has been similarly tested at all the Experimental Farms throughout the Dominion, and has given, as the result of four years' trial, an average crop of 41 bushels 12 pounds per acro. The iargest crop yet given by this variety was had at Indian Head, N.W.T., in 1896, when it produced 66 bushels 32 pounds per acre.

These few particulars placed before the farmer some of the best results obtained at the experimental farms with the varlety he had chosen.

## By Mr. McMillan:

Q. This Preston wheat did fairly weil in Ontario?

A. Yes, it has done very well in Ontario. The average of the three pound samples gave a result of somewhere about fifty, about fifty-two, pounds I think. The result of between two and three hundred tests in Ontario and Quebec were very satisfactory.

By Mr. Calvert :

Q. This Preston is a spring wheat, is it not?

A. Yes.

Q. Do you know if any of it was tried down in the western part of Ontario where I live near London

A. I am not sure. There is very little spring wheat grown there. Some samples were sent out this year, I know, in that district. The Preston has been much sought after this year by those asking for samples of wheat.

## By Mr. McMillan :

Q. Have you any evidence upon tests on the flour of the Preston wheat?

A. Not yet. We have not had a large enough quantity of Preston to test its value for flour. The millers here require a car load for this purpose and it has not been possible to obtain that quantity. About a month ago a sample of Preston was sont to the High Commissioner for Canada in England and he was asked to submit it to the best experts in England and to have the report of any test they might make sent to me, but I have not yet received any report on this wheat. I hope, however, before very long to get some information on that subject. The kernel is

a little longer but it seems to be as hard and as transparent as that of the Red Fife. As soon as it became known that a special distribution of grain for one tenth acre plots was being made a large number of applications were received from all parts of the Dominion, but we were not able to entertain many of these except in a few counties where the representation was less than in other counties. In all cases where the larger quantity could not be sent a three pound-sample was forwarded with an explanation of the reason why the larger samples could not be given. As soon as practicable after the results are received from these tests it is proposed to issue a special bulletin giving the average crop in each county with the names of the most successful growers. A very considerable interest has been manifested in this new department in our distribution work, and it is believed that this effort to gain the fuilest information on this subject and to assist in this way, some of the best farmers in each county in their efforts to improve the character of the seed grain they are using, will awaken a still greater interest in this work and materially assist in demonstrating the advantage of using the most provinces in this work and materially assist in demonstrating the advantage of using the most provinces for seed and also of thoroughly cleaning all seed grain used for sowing. The usual distribution of three-pound samples has been sent out by provinces in response to personal application as follows: Outario 7,192, Quebec 7,782, Nova Scotia 4,062, New Brunswick 4,684, Prince Edward Island 2,110, Manitoba 2,086, North-west Territories 1,187, British Columbia 302, making a total of 29,405. The special distribution for one-tenth acre plots has been made to the different provinces as follows: (Most of these were sent plots has been made to the different provinces as follows: (Most of these were sent plots has been made to the different provinces as follows: (most of these were sent) out between the 1st and 20th of March so there should be no complaint as to any of these samples being received late.) Ontario received 1,305, Quebec 1,399, Nova Scotia 423, New Brunswick 520, Prince Edward Island 181, Manitoba 228, North-west Territories 149, British Columbia 85, making in all 4,320, all of which were sent by mail. The three-pound samples this year have included a considerable number of the new cross-bred sorts produced at the experimental farm sent out with the object of more theory of the set of the new cross-bred sorts produced at the experimental farm sent out with the object of more thoroughly testing them, some of these continue to give much promise.

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he Central with the atisfactory ctive. In n average e Trooper ghout the rop of 46 at any of produced

he Central with the atlsfactory ictive. In n average The Royal ughout the crop of 45 any of the 65 bushels

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roduced by sort. This been tested ous grower Farm it has is per acro, at Ottawa, ms throughverage crop variety was pounds per

Many reports have been received from farmers who have had several years' experience with some of the varieties of grain distributed. Some have reported having from fifty to seventy-five bushels of oats as the result of the sowing of the three-pound sample at the end of the second year, and from 200 to 350 bushels at the end of the third season.

This rapid multiplication is fast bringing into more general use the best and most productive sorts in many parts of the Dominion.

#### STED TESTING.

The testing for farmers of the germinating power of samples of seed grain has also been continued with much advantage in many cases. The total number of tests made this year has been 2,400. Many instances of samples being very deficient in vitality have been met with, and by the timely information sent, many farmers have been saved from the disappointment which would unavoidably result from the sowing of bad seed. I may say that in some instances the vitality of oats, especially from some parts of Manitoba and the North west where the grain was much injured by rain during harvest and had sprouted considerably, the germinating power was reduced i 0 10 and 15 per cent, while in those places in the North-west where the barvest weather was good the percentage of vitality ran up to 90 and 97 per cent. The information given to farmers in these special cases was of great value to them and was much appreciated.

## AVERAGE CROPS FROM MOST PRODUCTIVE VARIETIES FOR FOUR YEARS.

In the evidence given before this Committee last year I gave you particulars of the average crops of the previous three years, given by the twelve best varieties grown at the different experimental farms. I now submit to you the results obtained from four years trial with east, barley and spring wheat, which will show the varieties which have done best in each part of the Dominion during this period. These particulars emphasize the importance of growing the most prolific varieties, and at the same time afford further proof of the great inherent powers of productiveness in varieties and also that the stamp of productiveness is so fixed in variety and so permanent as to permit of these varieties being taken from one part of the Dominion to another, carrying this characteristic of productiveness with them.

## FOUR YEARS' EXPERIENCE WITH VARIETIES OF OATS.

The twelve varieties of oats which have averaged the heaviest crops at the several experimental farms during the past four years, are the following :---

## CENTRAL EXPERIMENTAL FARM, OTTAWA, ONTARIO.

		T	
1.	Per sore.	Per	acre.
	Bush. Lbs.	Bush	. Lbs.
	70 21 7. Golden Giant	. 65	7
	8 White Schonen	. 64	15
2.	Golden Beauty.       67       19       9. White Russian         American Triumph.       67       15       10. Joanette         Columbus.       67       15       10. Joanette         Abundance.       66       37       11. Early Golden Protific	. 64	2
3.		. 64	1
4.		. 63	23
5.		. 62	32
6.	Improved Ligowo		

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## NAPPAN EXPERIMENTAL FARM, NOVA SCOTIA.

		Per a	acre.			Dual	The
1. W 2. O 3. B	Vhite Russian Vallis olumbus anner	Per a Bush. 66 65 64 63 63	Lbs. 21 2 19 19 13	7. 8. 9. 10. 11.	California Prolific Black Abyssinia White Schonen American Beauty	Bush. 62 62 61 51 60	Lbs. 12 4 26 16 25
6. O 6. E	An average crop of 62 bush	62 62 31 31	17 lbs.	12. per	Lincoln	60	25

25

## INDIAN HEAD EXPERIMENTAL FARM, NORTH-WEST TERBITORIES.

						Per a	cre.
1.2.3.4.5.6.	Columbus. American Beauty. Holstein Prolific. Abundance. Golden Beauty. Abyssinia.	Per 1 Bush. 88 85 85 84 82 80 80	Lbs. 18 15 26 4 7 5	7. 8. 9. 10. 11. 12.	Early Golden Prolific White Schonen Wide Awake Early Archangel Bavarian Bauner Banner	Per a Bush. 80 . 79 . 79 . 79 . 79 . 77 . 77	cre. 2 34 34 14 32 1
	An average grop of S1 bush	iels 10	) Ibs.	per	acre.		

## BRANDON EXPERIMENTAL FARM, MANITOBA.

		D				TCL	euro,	
		Peri	scre.			Bush.	Lbs.	
		Bush.	Lbs.	-	73 1	79	26	
	American Bonnty	. 92	19	7.	Bavarian		10	
	American Deauty	90	5	8.	California Prolific Black		1.	
	Banner	01	02	0	Rosedale	. 77	1	
ł	Holstein Prolific	. 81	200	10	Coldon Reguty	. 75	12	
	Farly Golden Prolific	. 81	1	10	Golden Deauty	74	1	
•	Traily Condent & Tornie Trees	. 80	27	11.	Columbus		01.	
).	White Schonen	70	29	19.	Joanette	. 10	20	
3.	Golden Giant		20	1				
	h anan of 96 hust	als 2	5 lha	net	r acre.			
	An average crop of oo bush			1				

AGASSIZ EXPERIMENTAL FARM, BRITISH COLUMBIA.

	-				Per a	cre.
1. Bavarian	Per a Bush. 60 59 56 56 56 56	acre. Lbs. 22 6 27 17 7 7 1 he	7. 8. 9. 10. 11. 12.	Early Golden Prolific Early Archangel. Crean. Egyptian. Holstein Prolific American Beauty. Early Maine	Per a Bush. 55 55 55 55 55 54 54 54	cre. Lbs. 33 30 5 33 16
An average crop of 50 busin	18 40	105.	por			

The twelve varieties of oats which have produced the largest average crops for the past four years on all the experimental farms, and hence may perhaps be regarded as worthy of being placed at the head of the list for general cultivation are the following :---

	-				Per a	ere.
	Per a	acre.			Bush.	Lbs.
	Bush.	Lbs.			05	90
	71	17	7.	White Schonen	00	20
Banner		10		Farly Colden Prolific.	, 65	21
Amorican Beauty	. 71	10	0.	Taily Colden I Innie Contract	65	16
Allerhow Donady Hitter	. 70	51	- 9,	Wallis	C.S.	0
Columbus	67	17	10.	Abundance	00	
Golden Beauty.		00	11	Coldon Giant	64	19
Ravarian	. 00	00	11.	Conten Chenty Fritter	64	11
TT 1 . ' Thuslife	66	18 1	12.	White Russian		
Holstein Fronne						

An average crop of 67 bushels 4 lbs. per acre.

1. 2. 3. 4. 5. 6.

The Improved Ligowo, which is also a very promising oat, averaged 64 bushels 6 lbs. per acre, within 5 lbs. per acre of the White Russian.

FOUR YEARS' EXPERIENCE WITH VARIETIES OF BARLEY.

## TWO-ROWED BARLEY.

The six varieties of two-rowed barley which have averaged the heaviest crops at the several experimental farms during the past four years, are the following :-

## CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

	Basson	Per a Bush. 42	Lbs.	4.	Canadian Thorpe	Per a Bush. 40	cre. Lbs. 15 38
1. 2. 3.	Danish Chevalier. Bolton	40 40 sls 22	32 15 1bs.	5. 6. pe	Sidney Newton r acre.	. 39	27

years' ported of the s at the

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ain has of tests cient in rs have om the pecially injured ver was harvest informaas much

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culars of varieties obtained show the s period. varieties, productin variety rt of the hem.

ps at the

Per acre. Bush. Lbs. 62 12 62 4 . 61 26 . 31 16 . 60 25 . 60 25

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## NAPPAN EXPERIMENTAL FARM, NOVA SCOTIA.

Por sore	Per acre.
Bush. Lbs.	Bush. Los
1. French Chevalier	4. Beaver
An average crop of 34 bushels 29 lbs.	per acre.
BRANDON EXPERIMENT	TAL FARM, MANITOBA.
Percent	Per acre.
Bush. Lbs.	Bush. Lbs
1. French Chevalier	4. Newton         43         46           5. Beaver         42         46           6. Prize Prolific         39         47
An average crop of 45 bushels 4 lbs. I	per acre.
INDIAN HEAD EXPERIMENTAL F	ARM, NORTH-WEST TEBRITORIES.
Don nore	Per acre
Bush. Lbs	Bush. Lb
1. French Chevalier         58         31           2. Danish Chevalier         56         22           3. Canadian Thorpe         54         29	4. Prize Prolific
An average crop of 54 bushels 29 lbs	, per acre.
AGASSIZ EXPERIMENTAL	FARM, BRITISH COLUMBIA.
	Pop age
Per acre.	Bush. L
1. French Chevalier	5         4. Beaver
An average crop of 35 bushels 24 lb	s. per acre.
The six varieties of two-rowed barle for the past four years, taking the average mental forms are :	ey which have produced the largest cro ge of the results obtained on all the expe
Den ser	Per aci
Fer acre Bush. Lt	Bush. I
1. French Chevalier	16         4. Canadian Thorpe
An average crop of 34 bushels 10 lb	s. per aore.
SIX-POW	ED BARLEY.
The sim manieties of six-rowed harl	ev which have averaged the heaviest cro
at the several experimental farms for th	e past four years are the following :
CENTRAL EXPERIMENTA	L FARM, OTTAWA, ONTARIO.
Per acr	e.   Per ac
Bush. L 1. Odessa 57 2. Mensury 55	bs. Bush. J 12 4. Pioneer
3. Royal	bs. per acre.
The wronge stop of of another state	

## NAPPAN EXPERIMENTAL FARM, NOVA SCOTIA.

		Don	ore	1			Per a	cre.
		Bush.	Lbs.			I	Bush.	Lbs.
		48	45	4.	Surprise		41	42
<b>1</b> .	Mensury	43	1	5.	Pioneer	••	41	32
2.	Oderbruch	42	44	6.	Vanguard	••	40	30

An average crop of 43 bushels 8 lbs. per acre.

Per acre. Insh. L'58. 34 3 33 51 33 16

Per acre. Bush. Lbs. 43 36 42 46 39 47

Per acre. Bush. Lbs. 53 34 52 6 52 4

Per acre. Bush. Lbs 35 12 34 10 32 39

sest crops

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Per acro. Bush. Lbs. 34 10 33 26 32 14

iest crops

Per acre. Bush. Lbs. 51 39 48 19 48 17

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BRANDON EXPERIMENTAL FARM, MANITOBA.

	Don			Per a	cre.
1. Common 2. Trooper	Per Bush. 56 55 55	acre. Lbs. 7 2 30	4. Nugent 5. Surprise	Bush. 51 50 49	Lbs. 32 15 23

An average crop of 52 bushels 42 lbs. per acre.

## INDIAN HEAD EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

	Per a	Lhs.		Bush.	Lbs.
1. Rennie's Improved	60	30	4. Mensury	57	24
2. Odessa	59	28	5. Bayter	55	40
3. Common	57	28	6. Trooper	55	30

An average crop of 57 bushels 38 lbs. per acre.

## AGASSIZ EXPERIMENTAL FARM, PRITISH COLUMBIA.

er acre.		Bush	Lbs.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4. Common 5. Royal	32 32 31	21 12 1
	er acre. ish. Lbs. 3 34 3 1 3 1 3 44 3 1 3 44 3 1 3 44 3 1 3 2 44	er acre. ish. Lbs. 33 34 4. Common 33 1 5. Royal 34 6. Trooper 27 1ba per agre.	er acre. ish. Lbe. \$3 34 4. Common

An average crop of 32 bushels 27 lbs. per acre.

The six varieties of six-rowed barley which have produced the largest crops for the past four years, taking the average of the results obtained on all the experimental farms are :--

		Per Bush.	acre.	1		Bush.	Lbs.
1. 2. 3.	Mensury Odessa Trooper	49 47 46	47 20 29	4. 5. 6.	Common Royal Oderbruch	40 45 44	24 2 44

An average crop of 46 bushels 27 lbs. per acre.

FOUR YEARS' EXPERIENCE WITH VARIETIES OF SPRING WHEAT.

The twelve varieties of spring wheat which have averaged the heaviest crops, at the several experimental farms during the past four years, are the following :---

## CENTRAL EXPERIMENTAL FARM, OITAWA, ONTARIO.

Per acre.	
Per acre. Bush. Lbs 22 41 22 33 22 27 21 41 21 41 21 20	s. 137110
01 01 01	1 41 1 41 21 21

An average crop of 23 bushels 5 lbs. per acre.

## NAPPAN EXPERIMENTAL FARM, NOVA SCOTIA.

	Per	acre.	T	Per a Rush	cre.
1. Wellman's Fife 2. Stanley 3. White Connell 4. Preston 5. Red Fern 6. Huron	Bush. 32 31 30 30 30 30 30	Lbs. 44 5 55 45 35 10	7. Goose 8. White Russian 9. Rio Grande 10. Old Red River 11. Advance 12. Admiral	29 29 29 28 28 28 27	50 5 55 35 20

An average crop of 29 bushels 5 lbs. per acre.

## BRANDON EXPERIMENTAL FARM, MANITOBA.

	Por	acre.			oure.
	Rush	Lbs		Bush.	Lbs
1 MTLIA Dice	39	5	7. White Connell	34	57
1. White File	38	7	8. Pringle's Champlain	34	43
2. G0086	36	50	9. Rio Grande	34	28
J. Red File	36	41	10. Old Red River	33	35
4. Freston.	36	25	11. White Russian	33	2
9. Mouarch	35	27	12. Wellman's Fife	32	25
0. Crown					

An average crop of 35 bushels 29 lbs. per acre.

## INDIAN HEAD EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

		Per a	tere.			Per	Acre.
		Bush	Lbs.			Bush.	Lbs
	Dad Elfa	42	7	7.	Percy	40	57
1.	Frequencies	42	3	8.	Crown	40	52
z.	Dangler:	41	48	9.	Wellman's Fife	40	50
3.	Deauury	41	25	10.	Red Fern	40	10
4.	I reston	41	22	11.	Stanley	. 39	10
э. 6.	White Fife	41	2	12.	White Connell	, 39	2

An average crop of 40 bushels 53 lbs. per acre.

## AGASSIZ EXPERIMENTAL FARM, BRITISH COLUMBIA.

	Per a Bush	Cre.			Bush.	Lbs.
1. White Fife.         2. Preston         3. White Connell.         4. Red Fife.         5. Herisson Boarded.         6. Rio Grande.	26 26 26 26 26 26 25	31 30 20 11 2 50	7. 8. 9. 10. 11. 12.	Old Red River	25 25 25 24 24 24 24 24	25 15 1 45 45 35

An average crop of 25 bushels 35 lbs. per acre.

The twelve varieties of spring wheat which have produced the largest crops, taking the average of the results obtained on all the experimental farms for the past four years, are :--

J.

		Per a	cre.		Duch	The
		Bush.	Lbs.		Busn.	L08.
	Proston	. 32	17	7. White Connell	 30	19
	Wallman's Fife	31		8. Rio Grande	 30	1
	Menanah	30	58	9 Goose	 29	58
2	Dense	30	24	10. Red Fern	 29	17
•	Percy	20	92	11 Old Red River	 29	17
2.	Red File.	. 30	20	19 Advance	 29	8
j,	White interime	. 30	20	12. Auvance	 	-

An average crop of 30 bushels 17 lbs. per acre.

The cross-bred variety Stanley came within 5 lbs. of Advance, having averaged 29 bushels 3 lbs. for the four years.

## THREE YEARS' EXPERIENCE WITH VARIETIES OF PEASE.

The twelve varieties of pease which have averaged the heaviest crops at the several experimental farms for the past three years, are the following :--

## CENTRAL EXPERIMENTAL FARM, OTTAWA, ONTARIO.

1.	Arthur	Per a Bush. 41	cre. Lbs. 22 10	7.	Canadian Beauty	Per a Bush. 35 35	Lbs. 30 27	
2. 3. 4. 5. 6.	Macoun Agnes Mackay Black.eytd Marrowfat	37 36 36 36	$     \begin{array}{c}       23 \\       26 \\       15 \\       12     \end{array} $	9. 10. 11. 12.	Creeper Duke Crown. Paragon.	35 35 35 34	$22 \\ 17 \\ 15 \\ 47 \\ 47 \\ 15 \\ 15 \\ 15 \\ 15 \\ 15 \\ 15 \\ 15 \\ 1$	

An average crop of 36 bushels 32 lbs, per acre.

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## NAPPAN EXPERIMENTAL FARM, NOVA SCOTIA.

		Pers	wre. 1			Per s	cre.
1.	E Crown Centennial	Per a Bush. 47 36 36	Lbs. 40 33	7. 8. 9.	Large White Marrowfat Carleton Bedford	Per a Bush. 33 33 32	cre, Lbs, 50 10 10
3. 4. 5. 6.	Black-eyed Marrowfat New Potter	36 33 33	26 53 50	10. 11. 12.	Prince Albert Paragon	32 31 30	10 33 50

An average crop of 34 bushels 50 lbs. per acre.

## BRANDON EXPERIMENTAL FARM, MANITOBA.

		Per	acre.		*	Per a	acre.
		Bush	T.b.			Bush.	Lbs.
		59	35	7.	Crown.	44	32
1.	Pride	48	39	8	Black-eved Marrowfat.	44	
2.	Mummy	18	30	9	Trilby	43	46
3.	New Potter	46	93	10	Prince	41	26
4.	Carleton	15	40	11	Agnes	40	53
5.	Kent	44	52	19	Prince Athert	40	13
6	Mackay		00	1 44.	T IMOG TE OCIVITIE INTERNET		

An average crop of 45 bushels 8 lbs. per acre.

## INDIAN HEAD EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

		Per a	T.ba			Per : Bush.	acre. Lbs.
123456	Paragon. Trilby. Carleton Crown. Duke. Prince	43 42 40 39 38 38 38	23 53 30 26 36 3	7. 8. 9. 10. 11. 12.	Golden Vine Centennial. New Potter Pride Mackay. Creeper	37 37 36 36 36 35 34	$22 \\ 20 \\ 20 \\ 33 \\ 46$
	An average crop of 38 bushe	els 12	Ibs.	per	acre.		

## AGASSIZ EXPERIMENTAL FARM, BRITISE COLUMBIA.

Bush. Lbs.           Bush. Lbs.           Arthur	7. New Potter	Bush. 23 22 22 22 22 22 21 21	Lbs. 32 45 13 7 51 27	
--	---------------	---	---	--

An average crop of 23 bushels 59 lbs. per acre.

The twelve varieties of pease which have produced the largest crops, taking the average of the results obtained on all the experimental farms, for the past three years, are :---

	Per	acre.	r	er acre.
	Bush	L.hs.	Bus	n. Lbs.
1 Cuerra	. 37	36	7. Centennial 3	3 47
2 Carleton	. 35	49	8. Paragon 3	3 40
3. Pride	. 35	16	9. Greeper	3 20
4. New Potter	. 34	•07	10. Trilby	3 14
5. Prince Albert	. 33	49	11. Duke	3 11
6. Arthur	. 00	41	112. 1010	

An average crop of 34 bushels 19 lbs. per acre.

## By Mr. Clancy:

Q. You might say what varieties of oats were first, second and third?

A. In oats Banner stands at the head of the list at the Central Farm, Golden Beauty second, and American Triumph third. At Nappan, White Russian stands first, Wallis stands second, and Columbus third, with Banner fourth. I might say that the White Russian is a variety which has usually succeeded well in the maritime provinces and to some extent over the whole Dominion.

## By Mr. Rogers :

Q. Do you judge oats by weight or by measure?

A. By weight.

## By Mr. Calvert:

Q. Are these the samples of those kinds which you have here?

A. Not all of them, we have the Banner here. These are samples brought to show the kind of grain we have been sending out for sowing on the one-tenth of an acre plots, 14 sorts in all; these are also intended to show how we clean the grain before sending it out for sowing. You will observe that the grain is mostly large and plump and quite clean.

#### By Mr. Semple:

Q. How does White Russian do at the Experimental Farm?

A. White Russian does very well, it stands ninth here on the list of the best twelve. In Manitoba the American Beauty out stands at the head of the list, although at Ottawa it stands twelfth. It should be borne in mind that in arranging these plots at Ottawa there is no variety favoured, no effort made to put this or that sort on the best spot. Our land here is no very uniform in quality, and sometimes a variety which has done well one year drops out of the list of the best sorts the next year for the reason that it has been sown on a poorer piece of ground. Sometimes the best varieties suffer from being sown in very exposed positions. This was the case with the Banner oat at Indian Head in 1897. The plot on which it was sown was very much exposed to strong winds which blew out a portion of the seed and exposed the roots of the plants so that they were much injured. That plot produced only 52 bushels 2 lbs. per acre, whereas another plot near by on the same land but sheltered from wind by a belt of trees gave from the same seed 101 bushels 16 lbs. per acre. There are thus many factors which influence the results, and it is not to be expected that the same varieties will be found in the same position on the list every year. All the varieties are exposed to like conditions and the results obtained, whether favourable or unfavourable, are honestly and fully stated.

## By Mr. Clancy :

Q. Would that not rather suggest that the tests made there are not altogether reliable, for the reason that it depends on the character of the soil rather than on

the grain itself? For instance, you have spoken of the inequalities of the land at the farm and you are not able to make true tests?

A. I do not admit that we cannot make true tests, but we must admit that differences in soil and climate materially affect the crops. Now, notwithstanding that the Banner dropped out of the list of the best 12 sorts in 1897 at Indian Head, it did so well over the whole Dominion that it stands at the head of the list at all the farms after four years' trial. We should not lay too much stress on the results of any one year but take the average for several years, the longer the time the more reliable are the results. The average results of four years shows that 11 of the 12 varieties which were best in 1897 over the whole Dominion were included in the best 12 for

which were best in 1057 over the whole Dominion were included in the best 12 for 1898, showing that there is inherent productiveness in varieties, and that this productiveness is to a large extent a fixed and permanent characteristic.
Q. What I am endeavouring to find out is this, that while it s'ood low you tried to account for it by conditions that prevailed, the character of the soil or the action of the wind, which prevented it attaining to the position it should?
A. Yes, the tig quite time, the unforcement to more closely the section.

A. Yes, that is quite true, the unfavourable conditions referred to were clearly the cause of the small erop in that case, but the large crop produced from the same seed near by showed clearly that the Banner oat was not lacking in productiveness. But there are other conditions, especially when the grain is flowering, which sometimes injure the crop which are not so easily traced. When wheat is in flower, and the pistil and stamen are soft and glutinous if the weather is unusually hot and the sun shines strongly it may strike through the two layers of chaff which covers the seed with so much heat as to wither the organs and destroy or injure the immature grain. What we want to get at in all these cases is the truth, not to recommend any special varietics, but to give the results of the crops in bushels per acre and let farmers judge for themselves as to the varieties most likely to give them satisfaction. The strongest recommendation I have given to any variety will be found in the paragraph in bulletin 32 d.aling with the 12 varieties of oats which have produced the largest average crops for the past four years on all the experimental farms. I said that "for the reason they have produced these large crops they may perhaps be regarded are reason they have produced these large crops they may perhaps be regarded as worthy of being placed at the head of the list for general cultivation." That is not a strong statement, the reason for the opinion is given in bushels per acre the farmer is left to exercise his own judgment. In all cases much more dependance can be placed on the results of four or five years experience than on the crops of any one year.

## By Mr. McMillan:

Q. In grain cut for seed is great care taken to cut them all at the same stage of ripeness?

A. Great care is taken in reaching conclusions on that question. The farm foreman watches every day for the exact time when the eutting should take place. And if the crop is not cut that day, the date when it is ripe for eutting is entered and this is given as its time of ripenng. The farm foreman at the Central Farm is a good practical farmer who has had a long experience, and I would rather trust in his judgment on this point than in my own. It is the same on the branch farms. The superintendents there have had long experience and are very reliable mon, and their judgment is taken as regarding the time of ripening of all the different varieties.

## By Mr. Stenson :

Q. What is the consequence if grain is not cut at the proper time ?

A. In some instances when crops are not eut promptly they shell badly and if left for several days after the grain is ready for harvesting much waste would occur and part of the crop would be on the ground. Q. But as regards its usefulness for seed ? A. That would not be affected if the grain is fully ripened.

Q. But if it's not perfectly ripe will its reproductive properties be destroyed ?

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Golden stands ght say 10 mari-

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A. If cut very green there is little doubt that its germinating power is injured, but if it is out within a few days of ripening and allowed to stand for a time on stock it matures fairly well. As a rule, however, plump and well ripened grain will pro-duce the best results. When grain is cut too early it is not as valuable commercially. We had a singular experience at the Indian Head farm in 1891 when there was much frosted wheat in the country and its usefulness for seed was very doubtful. Plots much frosted wheat in the country and its usefulness for seed was very doubtful. Plots of the same size were sown with good plump seed of Red Fife wheat and with Nos. 1, 2 and 3 frosted. The No. 3 was so poor in quality and shrivelled that It was considered only fit for chicken feed, yet it gave a crop of  $5\frac{1}{2}$  bushels per acree more than was had from the good plump seed. The plump seed gave 32 bushels 40 lbs. and the poor shrivelled grain yielded 30 bushels 10 lbs. per acre. I do not think such a result as this could be had on any but very rich soil. The germ of the wheat is very small and is embedded in one end of the kernel and if the kernel is large it affords a large amount of food to the plant in its early stage of growth large it affords a large amount of food to the plant in its early stage of growth. But there its usefulness ends and after it has consumed that food the plant must then take its nourishment from the soil. In the shrivelled seed there was enough food to give the plants a start and after that plenty of food was found in the soil to give it vigour and produce rapid growth. I don't think we would get the same results here where the soil has not the same amount of plant food. These results show however, that you can lay down no rigid rules in this matter which will be applicable to every case, because climate, soil and other factors influence plant growth so largely.

## By Mr. Calvert :

Q. How do you harvest these plots ?

A. We cut them by hand.

Q. Do you keep them separate? A. Yes. They are kept separate and threshed separately.

Q. How do you thresh them?

A. We have a special small machine for threshing the crops from these plots, which is easily opened so that every kernel can be cleaned out. Careful arrangement are made to prevent any mixing of the seeds of the different varieties.

Q. Is there no danger of a mixture in the threshing machine?

A. No. Every time a threshing is completed the machine is taken apart and thoroughly eleaned before the next variety is put in.

Q. Do you thresh the grain as soon as it is brought in?

A. As soon as we can, but as we usually have 500 or more of different plots every year we cannot always thresh as fast as the grain is ready, but we do it as

rapidly as we can. Q. It must take a lot of room to store the different crops until you can thresh

A. That is so; and we endeavour to thresh as large a number as we can, as them ? they come in from the field.

## By Mr. Clancy :

Q. What space do you leave between each plot?

There is three feet of space allowed between each plot.

Q. Would that have any tendency to affect the variety ?

A. No, not the slightest. The flowers of wheat, barley and oats are fertilized by their own pollen. The flower case is so tightly closed that there is no chance of the access of any foreign pollen, unless the spikelet is torn open or eaten by an insect which is a very rare thing indeed. In the ordinary course of nature there is not the slightest danger of any one variety affecting any other sort by crossfertilizing, from being grown near together.

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## By Mr. Featherston :

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Q. It is different with corn?

A. Yes, it is a very different thing with corn where the fertilizing is effected openly. The corn pollen which is formed on the tassel drops on the silk and sends a little fibre out which penetrates the thread of silk and descends to the ovary and there fertilizes the seed, but in the case of wheat, barley and oats, there is no danger of that, as every kernel is fertilized by its own pollen and that in and in breeding Is probably one of the chief reasons why some varieties as soon die out. A few years ago I examined a large number of samples of different varieties of wheat which had been exhibited at the Centennial Exhibition, and I was surprised to find that of all the varieties then exhibited very few are now known. Red Fife is a remarkable example of the power of some varieties to maintain their vigour and productiveness for a long period; this originated in 1842 and it is still one of our most vigorous and productive sorts especially in the North-west. So one cannot lay down any law in regard to the length of life of any of these varleties. It may be that the change of the seed of Red Fife from one part of the Dominion to the other —that is from Ontario to Manitoba—has exercised a very great influence upon this remain. I think it is the daty of the Agricultural Department of every government variety. I think it is the duty of the Agricultural Department of every government to look ahead in this matter of varieties so that new and vigorous sorts may be available to replace any that may run out and cease to be profitable.

## By Mr. Parmelee :

Q. You would recommend the frequent change of seed ?

A. Yes, I think it is an advantage, although as I said at the last meeting it s one of those things the advantage of which it is difficult to furnish actual proof. This practice is however held to be beneficial by most intelligent farmers, over the whole world, and this general consensus of opinion based on experience may safely be regarded as well founded.

## By Mr. Calvert :

Q. Would you consider that good proof?

A. Fairly good, but not as good as can be furnished in support of many other questions bearing on profitable farming. A man may believe that all the advantage he gets in erop is due to this one cause whereas one-half or two-thirds of it may be dependent on other circumstances. I believe in the desirability of change of seed from one place to another and from time to time from one soil to another and have practised this more or less for many years in connection with the work of the experimental farms.

## By Mr. Pettet :

## Q. Do you sow your own seed?

A. We do very often and we often send seed grain to the branch farms and they in return send seed here for a change. We sent this year to Nappan seed from Ottawa of all the varieties of wheat they required. Their wheat this year was shriveled on account of rust. The superintendents of the branch farms at Brandon and Indian Head and Agassiz exchange seed whenever they think it is desirable and I have always instructed them to carry out whatever they this desirable and 1 have always instructed them to carry out whatever they think best in this matter but we have not pursued any special line of investigation with the object of ascertaining the effect on crops of such changes of seed. I have regarded this practice as one which was everywhere recognized as beneficial. Q. You cannot tell how long you have sown any particular kind of seed? A. Yes, we have the number of years all on record on our books. The branch farms have received all their seeds at the start from Ottawa, so all had the same strain

at the beginning. The results we have published in the growing of varieties are in most cases the crops obtained from successive sowings from year to year of seed grown on the same farm; occasional changes have been made, but our uniform test plots have only been carried on for five or six years and this is but a short time in the life of any good variety of seed.

#### By Mr. Semple :

## Q. Havn't you brought any seed grain from foreign countries ?

Q. Havn't you brought any seed grain from foreign countries r A. Yes, from almost every foreign country, and we have been growing these in comparison with other new varieties which have been introduced and some which have been originated here. We have had them from Russia, Japan, Australia, New Zealand, also from England and France and many other countries. A number of varieties have been discarded after two or three years of trial because they were of such poor quaity that it was not worth while to continue them. This was especially the case with some varieties from the south of Europe, the Trimenian Sicilian, the Medea and the Greek summer wheats from southern Europe. These were all much like goose wheat, translucent with very little gluten and were manifestly inferior. We have selected the best and kept these on and have found the number quite large enough. With all the weeding out we have done there are still a very large number of varieties to look after, there are over 700 plots this year at the central farm to take records of.

## By Mr Clancy :

## Q. Did you say that the varietics you sent out are hybrids ?

A. The four varieties of wheat sent out for the special test in one-tenth acre plots well all cross-bred sorts. They are all crosses between Red or White Fife and the Ladoga, the Ladoga blood being introduced to try and produce earliness in connection with the vigour and productiveness of the Fife.

Q. What is your experience with regard to the productiveness of these hybrids? A. I have already given examples? One of these, the Preston wheat, has pro-duced as the average of four years trial on all the experimental farms, one bushel and 17 pounds, more than any other variety tested.

Q. That may be considered a proof then, that instead of keeping the same seed continually it is well to change occasionnally?

A. That, I think, is the indication.

## By Mr. Featherston :

Q. By the continuous growing of many samples of many seeds upon the farm do you find they have decreased in yield?

A. Our experience is too short to expect that. We find a difference in yield in different seasons and in different climates but have not observed any regular decrease in productiveness in any of these varieties.

## By Mr. Mc Millan :

Q. In the varieties that you have brought over from other countries, have you

found them to improve after two or three years here? A. I can searcely answer that question directly in a way that would be strictly fair to the varieties referred to. Take for example the Indian varieties of seed grain which we got from high altitudes in the Himalayas, through instructions from Lord Dufferin seven or eight years ago, some of them coming from an altitude of 11,000 feet. The methods of agriculture practised in India are so poor that the crops are very small, their best results being from 8 to 10 bushels to the acro. Where a variety has been grown for several hundred years under such conditions, and is then brought to a new country where the soil contains an abundance of plant food, there is bound to be an increase. These varieties did produce larger crops but not large enough to compare favourably with the varieties in common cultivation here, and after trying them for

several years most of them were discontinued, but we have used them to cross fertilize several years most of them were discontinued, but we have used them to cross-fertilize other varieties with, because they are so much earlier. In the case of the Ladoga wheat, I do not think that has given us, during the last three or four years, as large crops on the average as it did during the first two or three years after it was intro-duced, but in some districts it continues to do very well. A gentleman recently told me that north of Edmonton he had seen, last year, oue of the finest fields of wheat he ever saw, the Ladoga was the variety he spoke of; it stood, he said, as high as his head and produced a splendid crop. I have also had reports from Indian agents from Indian reserves in the far north praising this variety, showing that climate has a great deal to do with the usefulness of some of these sorts. has a great deal to do with the usefulness of some of these sorts.

## By Mr. Parmalee :

Q. Is Ladoga not a good milling flour ?

A. It produces flour of good quality, and good bread is made from it, but the flour having a yellowish colour this is an objection to it, and we do not want to encourage the growing of any variety which is likely to lessen the reputation of our Cauadian flour.

The next series of tables give the six best varietles of six-rowed and two-rowed barley, at each farm, and the six best sorts at all the farms, and the two-rowed varieties of spring wheat in the same way. Permit me to point out how the Preston wheat stands at the different places. It stood at the head at Ottawa, last year, with wheat stands at the different places. It stood at the head at Ottawa, fast year, with a yield of 26 bushels 3 pounds per acre, the next variety giving 23 bushels 59 pounds, a difference in favour of Prestou of 2 bushels and 4 pounds per acre. At Iudian Head, Preston stood forth on the list with a yield of 41 bushels 25 pounds, at Nappan it was fourth with a yield of 30 bushels 45 pounds, at Brandon it was fourth on the list with 36 bushels 41 pound. I may say that the three or four varieties at the head of each list come very close to each other in yield, so that a little waste in har-resting might cause some to change places. In British Columbia, Preston stood vesting might cause some to change places. In British Columbia, Preston stood second with 26 bushels and 30 pounds. In this instance you have a variety tested over the whole Dominion in many climates, ranking not lower anywhere than fourth in the lists of the twelve best varieties.

## By Mr. Rogers:

Q. Is it a good milling wheat? A. We believe it is, although that has not yet been tested, we have sont samples to London, England, to the High Commissioner for Canada to get the opinious of experts on the quality of that wheat, but have not yet heard the results. Our millers here require a carload of the grain to make a satisfactory test and as yet it has not been possible to procure that quantity. I have also given you the result of three years' experience with varieties of peace.

## By Mr. Clancy:

Q. Would you give us the varieties of pease? A. Do you want the tweive varieties or a less number of those giving the larger

crops?

Q. What would be the general yield? A. The results of the test of the 12 varieties at all the farms places Arthur, A. The results of the test of the 12 varieties at all the farms places Arthur, which is a cross-bred variety, at the head of the list with 28 bushels 53 pounds as the average yield of four years. The Creeper which is a very small pea and not of much value for marketing but good for feeding stands second with 25 bushels 53 pounds, this gives a clear gain to the Arthur of 3 bushels to 25 bushels 53 pounds, this gives a clear gain to the Arthur of 3 bushels to the acre. Prince Albert stands third with 25 bushels 46 pounds. Next in the list are two other cross-bred sorts, Carleton and Macoun. Multiplier stands sixth with 23 bushels 55 pounds. New Potter and Centennial next, these are two commercial varieties, Kentis a new cross-bred sort, Paragon, Crown and Golden Vire, are old and well-knowu varieties. These are the 12 which did best on all the Experi-mental Farms. mental Farms.

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## By Mr. Semple :

Q. How did the variety Arthur do at the Central Farm ?

A. The variety Arthur at the Central Farm stands at the head with 41 bushels 22 pounds. We have sent out a good many samples of this pea to farmers and two years ago a bushel was sent to several of the leading Canadian seedsmon who are now growing this variety for sale and they are all pleased with the crops they have had from it.

## By Mr. Calvert :

Q. You said that the average of oats on the farm during 1889-90-91 was slightly

Q. Four said that the inverse of onts on the farth during 1803-30-31 was signify over 32 bushels to the aere, and in 1896-07-98 it was 56 bushels, or a difference bet-ween the two periods of 23 bushels 56 pounds; how do you account for that? A. By our having practised what we have been teaching, by improving the land, adding to its fertility by yearly applications of barnyard manure and the ploughing under of green clover, by thoroughly preparing the soil for the seed and attending to underdraining, which is very important. By selecting the best varieties of seed and thoroughly clearing them so to sow only plump and wall rineared grain, and the seed thoroughly cleaning them so to sow only plump and well ripened grain, and the seed is sown at the proper time, that is as early as possible. We think it pays us, if we are rushed with work, to hire extra teams in order to get the seed in as early as possible. As already stated a delay of a week beyond the proper time will cause a loss of ten or fifteen per cent, and a delay of two weeks will often cause a loss of twenty-five to thirty per cent. It is by putting into practice what we have been teaching along all these different lines that we have brought about these increased crops on the Central Farm.

## By Mr. McMillan :

Q. You mentioned a while ago that you were sending out 8 lh. samples of oats for 1 acre plots, that is 2 bushels 12 lbs. to the acre; is that not rather much? A. After careful consideration of this matter it was thought best to send out that

quantity of oats. Seven lbs. would have been sufficient on the basis of two bushels per acre, the extra lb. was sent to provide against any little accidental waste in seeding which might occur. The same was done with the wheat and barley, and 10 lbs. was sent.

Q. I think if you put 2 bushels and 12 lbs. of oats where 2 bushels would with care have been been sufficient, on good land it is too much. You supply 8 lbs. for  $\frac{1}{10}$  of an acre, which is 80 lbs. to the acre. 2 bushels are 68 lbs. and you have 12 lbs. over?

A. I admit that this is a larger amount of seed than we sow in Ottawa, but in the maritime provinces farmers frequently sow 21 and 3 bushels to the acre. Had we sent the exact quantity it would to some farmers appeared very niggardly.

## By Mr. Clancy :

Q. You said you had sent the Preston wheat to some of the seedsmen?

A. Yes. Q. Have you ever found that some seedsmen are not so cautious as those of the heads of the farms about new varieties; they are sometimes disposed to boom such things under new names ?

things under new names r A. I know that is sometimes the case but we have only sent this grain to a few of our most reliable seedsmen. If we withheld these new sorts and did not take any steps to make them available to the public we might be blamed for this These seedsmen have sent the samples to special farmers to grow and as soon as a sufficient quantity is available the seed will be sold to those who want to buy them.

Q. We have known seed to be greatly boomed that is worthless ? A. We find every year that some seedsmen bring out old varieties and give them new names, and we have to undertake the work of growing these alongside of other

varieties with which they are identical in order to prove their identity. I do not think however that there is the! slightest danger of unything but straightforward dealing by the seed firms in whose hands these seeds have been placed.

## THE FEEDING OF STEERS AND SWINE.

Early in the winter of 1898-99 a series of experiments were undertaken in connection with the fattening of steers. 36 animals were procured for the purpose and divided into nine groups of four each. These feeding tests were only partly completed under my charge when Mr. T. H. Grisdale was appointed as agriculturist. This work was at once handed over to him and the result of these tests will no doubt be given in his evidence. Some experiments were made with swine which were completed before Mr. Grisdale's appointment these will now be referred to. The pigs in this case consisted of five lots of four each. No milk was given in any case to any of these swine they were fed entirely on mixtures of whole and ground grain. The mixture consisted of equal parts of oats, barley and pease, with half a part of bran, and this was fed either whole or ground dry or soaked.

## FED ON A MIXUTUE OF WHOLE GRAIN DRY.

Lot No. 24 was fed on a mixture of whole grain dry, and as much was given to Let NO. 24 was fed on a mixture of whole grain dry, and as much was given to the swine as they would eat up clean. Water was supplied freely in a separate trough. The pigs in this pen consisted of two Poland China sire, with Tamworth dam, one Tamworth sire and Chester white dam and one Poland China sire and Yorkshire dam. The four pigs at the outset weighed an average of  $67\frac{1}{2}$  lbs, each. These were rather smaller than those we usually select for such experiments. We generally have them to weigh from 70 to 80 lbs. The feeding test began on the 20th of July, and was continued for 14 weeks until the 26th of October. At the conclusion of the experiment the pigs weighed 1751 lbs, each, and 408 lbs, of grain was conof the experiment the pigs weighed  $175\frac{1}{2}$  lbs. each, and 4.08 lbs. of grain was consumed for each lb. of increase in live weight.

## By Mr. Semple :

Q. What was the daily increase in live weight? A. We did not take their weight daily, but welghed them every fortnight, the average gain per day can be easily calculated from the figures given.

## By Mr. Rogers :

Q. That was a little over a pound a day?

A. I have not figured it out, but I can do that for you if desired.

## By Mr. Clancy :

Q. I heard a man speaking the other day who said that he was able to make  $3\frac{1}{2}$ 

1bs. daily? A. We have succeeded in occasionally getting three pounds daily increase with steers; but have not succeeded in making so rapid an increase in pigs. It would be interesting to get fuller information from that gentleman on this subject. I gave him my address because I was anxious to hear the particulars, but I

have not heard from him yet.

## FED ON A MIXTURE OF WHOLE GRAIN SOAKED.

Lot 25 was put on the same mixture of whole grain, soaked on an average for 30 hours in cold water before feeding. It consisted of four cross-bred swine of exactly the same breeding as lot 24. The swine received of this soaked grain all they would

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eat up clean. This lot averaged 653 lbs. each at the start, and at the close of the experiment they weighed 195 lbs. each. The quantity of grain used to produce each pound of increase in weight in this case was 3.56 lbs.

## FED ON A MIXTURE OF GROUND GRAIN DRY.

Lot 26 consisted of four cross-bred pigs of exactly the same breeding as lots 24 and 25. These were fed for the same period and on the same mixture of equal parts of oats, barley and pease, with half a part of bran, but in this case the grain was ground and feddry. The pigs were given all of this mixture they would eat up clean, and they had all the water they required in a separate trough. The pigs in this lot weighed at the beginning 684 lbs. each, and at the close of the experiment, 195 lbs. each, and the quantity of grain used to produce each pound of increase in i.ve weight was 3.56 lbs.

## FED ON A MIXTURE OF GROUND GRAIN SOAKED.

Lot No. 27 consisted of four cross-bred pigs of exactly the same breeding as the other pens. These had an average weight of 662 pounds each at the beginning and 1901 at the end. They were fed for fourteen weeks, and consumed 3.76 pounds of grain for each pound of gain live weight.

MB. PARMELEE-Soaking does not appear to have done much good.

## By Mr. Clancy :

Q. Will you give us the different average increase on the different mixtures ? A. The avarage quantity of food consumed for each pound of increase in live weight was as follows: For the first lot 4.08, for the second lot 3.88, the third lot 3.56, and the fourth lot, 3.76.

## By Mr. Featherston:

Q. I thought the quotation was  $3\frac{7}{165}$ . A. No. It was  $3\frac{7}{165}$ 

## By Mr. Clancy:

Q. Were they all the same age?

A. They were all of the same age in the four pens, and of the same breeding.

## FED ON A MIXTURE OF GROUND GRAIN SOAKED, WITH CLOVER ADDED.

The last lot of pigs fed, lot 28, were fed with the same mixture of grain ground and soaked in cold water for thirty hours, and one-third of the weight of green cut clover was added to the ration. This lot consisted of one Poland China sire and Tamworth dam, one Tamworth sire and Chester White dam, one Poland China sire and Yorkshire dam and one pure Tamworth. These weighed on an average 68‡ pounds at the beginning and 136‡ pounds at the close. The weight of these at the finish was much less than that of the others. They did not consume the same weight of food nor make the same growth or progress in weight, that the others weight of food nor make the same growth or progress in weight that the others made which were not getting clover.

## By Mr. Featherston:

## Q. That was the average?

A. The increase at the close of the experiment showed that 3.60 pounds of meal and 1.20 pounds of clover had been consumed for each pound of gain. This experiment was included in the list last year because the suggestion was made by some gentleman in the Committee that clover should be tried with the grain. Was it you, do you remember, Mr. McMillan?

Mr. McMillan.-- I should not wonder if it was me, because we have been feeding clover and have been turning out sixteen pigs a month with very good results.

A. The clover was dried and soaked and put in with the grain. It may have A. The clover was aried and soaked and put in with the grain. It may have been the fault of the pigs that progress was so slow, but that is the result we had. They weighed 1361 pounds each at the close of the experiment, and had consumed nearly as much grain as lot 27, and they ate the clover in addition. One object in feeding the clover was to gain information as to whether it had anything to do with the softening of pork, but when killed no difference could be seen as to the hardness of the fet. of the fat.

## By Mr. Featherston:

Q. Was the pork of all this lot good?

A. The pork of all these was pronounced to be good. The Poland China cross would not come into the first class because the fat was more than 1½ inches through along the back. The pure Tamworth was a little soft, but in justice to the breed it must be said that this was a stunted little pig in the litter which had not been thought good enough to sell for breeding and hence it was put into this experimental feeding test.

Q. That is the great trouble with this soft pork, it comes from unhealthy hogs. MR. MCMILLAN-In fact it is from the hogs that do not thrive when young.

## By Mr. Featherston :

Q. You found as a result that the dry feeding is the most profitable? A. That was the case with the ground grain, but the whole grain gave the best result when soaked.

## By Mr. Rogers :

Q. Had you an opportunity of feeding with whey and milk? A. We have had much experience in feeding skim-milk, and in all cases where two or three pounds of milk has been given to each hog per day, the results in increase in weight and thriftiness of growth have been very satisfactory.

Having read over the preceding transcript of my evidence, I find it correct.

WM. SAUNDERS, Director, Dominion Experimental Farms.

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## COMMITTEE ROOM 46, HOUSE OF COMMONS, 13th June, 1899.

The Select Standing Committee on Agriculture and Colonization met this day at 10.45 a.m., Mr. Baiu, chairman, presiding.

THE CHAIRMAN.-We have present with us to-day Dr. Saunders, who desires to speak on the work of the outside Experimental Farms that are scattered over the various provinces in the Dominion.

## THE STOCK ON THE CENTRAL FARM.

DR. SAUNDERS.—MR. CHAIRMAN AND GENTLEMEN.—Before beginning what I have to say on the work of the branch Experimental Farms I wish to refer to one matter on which I wanted to speak in connection with our Central Farm work, that is our entire freedom now from tuberculosis. The cattle at the Central Experimental Farms were all tested with tuberculin in October last, and no caze was found where there was any suspicious reaction. The cattle were tested also at the branch experimental farms, and at Nappan, N.S., Brandon, Man., and Agassiz, B.C., no cases were found, but at Indian Head two animals out of fifty-two tested gave a reaction. These were killed and found to be slightly affected. It is gratifying to know that we are now practically free from that disease.

## By Mr. McMillan:

Q. Did you think there was any particular reason why your cattle should be affected?

A. The only reason I can assign for it is this, that we bought cattle from at least two different points from herds which we afterwards found were affected. These animals were examined before purchase by veterinary experts and pronounced sound. This is a very insidious disease and spreads rapidly, especially where cattle are kept in close quarters. I am cf opinion that where cattle are watered from a common trough the disease may be spread in this manner. The sputa often contains the germs of this disease and these may be taken in by another animal drinking from the same receptacle. This plan of watering the cattle was used at the Central Farm, but as soon as we realized the possibility of danger from this source the troughs were abolished. It is also probable that the experiments conducted for four years in trying to feed thirty cows on forty acres of land, had a tendency to spread the disease as these cattle were housed together for the greater part of this time.

#### By Dr. Sproule:

Q. Were these common troughs for water used in the barn? A. Yes.

## By Mr. Mc Millan :

Q. It is a trough running from one to the other?

A. Yes. These troughs were emptied and brushed out once a day, but still there was a chance of the disease germs passing from one animal to another in this way.

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## By Mr. Wilson:

Q. How do you do it now?

We water them separately. We expect shortly to introduce a device which our agriculturist Mr. Grisdale is working out by which each animal can be watered separately without carrying water to each.

Q. That is a little more trouble? A. Yes. We water with pails now and shall continue to do so until we get the watering device referred to completed.

## By Mr. Moore:

Q. I think the farmers do not understand this tuberculin matter, where it is to be got and how administered. It might be well to give a little explanation which would go out in your evidence?

A. I shall be glad to do that. The tuberculin is obtained by making cultures of the basillus which causes the disease. These give off a peculiar secretion during their growth, which is retained in the tuberculin, and when this is injected into animals affected with the disease it causes a rise in the temperature of from two to five or six degrees above normal in a few hours, and it is by that rise in tempera-ture that the presence of the disease is detected. In connection with the tests made at the several Experimental Farms, we have killed a considerable number of animals and there is only one instance which I can recall where this reaction occurred where the disease was not found. That was a young bull whose sire and dam were both diseased, and on this account as the bull was of no value the examination made was done with less care than in other cases, and that is the only case I can recollect where we did not find the disease clearly marked.

## By Mr. McMillan:

Q. Is it possible for an animal to show reaction that has not the disease?

A. It has been said so, but it can scarcely be proven that such animals have not the disease unless every part of their organism is examined and this it is very difficult to do. There is a very strong belief among veterinarians all over the world that this is a reliable means of diagnosing the disease. The tuberculin when prepared is injected under the skin of the animal and the thermometer is placed in the anas or mouth and the variations in temperature watched and recorded every two hours. If a rise in temperature takes place to the extent mentioned, it is held to be proof that the animal is diseased.

## By an Hon Member :

Q. Within what length of time does this change take place?

A. Usually in eight or ten hours. In Bulletin No. 20 of the Experimental Farm series, a very full account is given of all the tests conducted at the Central Farm. These show that the conditions vary in different animals. Usually the temperature rises within eight or ten hours and remains up for six or eight hours.

#### By Mr. McMillan:

Q. You will have to take the normal temperature before making the tests? A. Certainly; the natural temperature is usually taken before the test is made for three times at intervals of two or three hours each and the average of these is used as a basis for comparison.

## By Mr. Cargill:

Q. Do you consider this a reliable test under all cases? A. I do, sir. As I have already stated, we have killed many animals at the experimental farms here which have reacted, and have found the disease in every

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case except that one which I have referred to, and we might, in all probability, have found it in that if we had searched more thoroughly.

Q. I have been told by parties who import catle that in testing them one or two will probably react and then on a subsequent test these one or two which reacted would stand the subsequent test without reacting and probably one or two others which stood the former test will react. A. It is a well known fact that where repeated tests are made with tuberculin

A. It is a well known fact that where repeated tests are made with tuberedith if you do not allow the lapse of sufficient time, you do not get the reaction again, as a rule. That has been shown in the bulletin I have referred to. We tested animals a second time after two weeks, and these, although badly diseased, did not show any reaction from the second injection.

## By Mr. Cochrane:

Q. I understand that Mr. Cargill says that with some animals in the same herd a couple of them would react, and then after a while he tested those that had not been tested, and they would show reaction.

## By Mr. Cargill:

Q. No, no; the same lot.

A. At what lapse of time, sir?

Q. It wouldn't be more than a week or ten days.

A. I have never known of any instance of that kind.

## By Mr. McMillan :

Q. Is there any case, in your knowledge, of a healthy animal, after having been tested three or four times with tubercalin, suffering from the disease?

A. I have never known any instance of the health of the animal suffering. We had cases of an animal one year giving no reaction and the following year showing signs of the disease. The two animals I referred to as affected at Indian Head, were tested two years ago and showed no reaction, but this year they reacted, and on killing them the disease was detected. These, probably, had the germs of the disease in them at the time first tested, but not far enough advanced to bring about the reaction under the tuberculin test.

## By Mr. Ratz :

Q. What do you do with the animals which are diseased?

A. We bury them.

## EXPERIMENTAL FARM, NAPPAN, NOVA SCOTIA.

At this as well as at all the other branch farms experiments have been carried on during the yast year with grain, fodder crops and roots similar to those I have spoken of at the Central Farm.

Last season the crops at Nappan were lighter than usual with all sorts of grain. Rust prevailed to a large extent and at the Experimental Farm we suffered from this disease as elsewhere, and the crops were reduced. The average crop for all the varieties of cats grown was thirty-seven bushels per aure, the average of the best twelve sorts was forty-six bushels thirty-one pounds, and the largest crop was fifty bushels per acre. In barley the average of all the two-rowed varieties was twentynine bushels twenty-three pounds the average of the best twelve sorts, thirty-four bushels twenty-eight pounds; and the largest crop was forty bushels and forty pounds per acre. The six-rowed barley gave an average from all varieties of thirtysix bushels twenty-one pounds, the average of the best twelve sorts was forty-four bushels fifteen pounds, and the largest crop was fifty bushels per acre. In spring wheat the average of all varieties was eighteen bushels forty pounds, the average of

the best twelve sorts, twenty-two bushels twenty-three pounds, while the largest orop was twenty-five bushels twenty pounds per acre. I give you these figures to show that the falling off has been quite considerable as compared with former years, and this has been due largely to the prevalence of rust. Indian Corn did well at the Nappan Farm; the average of all the varieties was fifteen tons 1,695 pounds per sore the prevence of the best size sorts a pincteen tons 1,997 pounds and the largest. the Mappan Farm; the average of all the varieties was niteen tons 1,050 pounds per acre, the average of the best six sorts nineteen tons 1,967 pounds, and the largest crop was twenty three tons 1,850 pounds per acre. Turnips have done fairly well— roots generally succeed well in the maritime provinces—the average of all the varieties of turnips grown was twenty-six tons 551 pounds, the average of the best six sorts thirty tons 625 pounds, and the largest crop thirty tons 1,915 pounds per acre. In mangels the average of all varieties was twenty-three tons 841 pounds, the average of the best six sorts thirty tons 1,627 pounds and the largest oron the average of the best six sorts thirty tons 1,627 pounds, and the largest orop thirty-eight tons 125 pounds per acre. Carrots gave an average yield on all varieties of twelve tons 768 pounds, the average of the best six varieties was fifteen tons 1,320 pounds, and the largest crop was seventeen tons, seventy-five pounds per acre.

#### By Mr. Broder :

Q. With turnips do you test different times of sowing, earlier and later?

A. Yes, sir, we had at all the experimental farms two series of plots, one sown two weeks later than the other. At the Central Experiment Farm we carry that point further and sowed last year four series of plots at intervals of from eight to two two the series of plots at intervals of from eight to twenty days each, but at the branch farms there are but two sowings.

## By Mr. Macdonald (Kings):

Q. Have you got the names of the kinds of wheat that gave the results

A. Yes. Wellman's Fife gave the largest crop of wheat at the Nappan farm, and the varieties that stood next were Pringle's Champlain, Beauty, Progress, Alpha and Admiral, Hungarian, White Connell, Emporium and Huron. These are the varieties which averaged twenty-two bushels, twenty-three pounds per acre, the Wellman's Fife having given the largest yield, namely, twenty-five bushels and twenty nonnds per acre. twenty pounds per acre.

## By Mr. Semple:

Q. What was the result of the early and late sowing of turnips?

A. The average of the crcp of the first sowing at Nappan was 28 tons 1,185 pounds per acre while the second sowing gave an average of 23 tons 1,185 pet acre, a difference of 4 tons 1,267 pounds per acre in favour of early sowing. The quality of the turnips has generally been a little more woody from the first sowing than the second, but I do not think that is a matter of much moment, as the cattle seem to eat them just as freely as those later sown.

#### By Mr. Burnett:

Q. What was the time of the first sowing?

Q. What was the time of the first sowing? A. The first turnips were sown at Nappan on the 25th of May; the second on the 7th of June. The first sowing at the Central Farm last year was on the 28th of April, the second on the 6th of May, the third on the 21st of May, the fourth on the 11th of June. The average yield per acre from the first sowing was 25 tons 1,298 pounds, that was perhaps unduly early as it did not yield as well as the second sow-ing. The next sowing, that on 6th May, gave 26 tons 905 pounds. The average yield from the third sowing was 33 tons 330 pounds, and that from the last sowing was 24 tons 1.413 pounds. was 24 tons 1,413 pounds.

By Mr. Broder :

Q. The last sowing was in June? A. Early in June. The differences were not so largely in favour of the early sowings last year as they usually are, much depends on the season.

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## By Mr. Bell (Pictou):

Q. Which gave the biggest yield?

A. In this case the second sowing gave the largest crop, that of the 6th of May.

Q. How many tons was that?

A. Taking the average of all the varieties the yield was 26 tons 905 pounds per acre. The largest crop was given by the East Lothian, which was 30 tons 710 pounds per acre.

#### By Mr. Broder :

Q. The Kangaroo turnip has been recommended by some. Can you tell us anything about that?

A. No. That is a variety which has not been tried here. In fact, I have not heard of this sort before.

Q. They are raising it in the Eastern provinces. A. There are many instances occurring of local seedsmen giving extraordinary names to old varieties. Possibly this may be a case of that sort, as I have not met with this name in any of the seed catalogues.

Q. It is a very long turnip, not unlike a Swedish turnip. The people there have been calling it a Government turnip, that is what made me ask the question.

A. It did not come from the Experimental Farm under that name.

Potatoes have given very good results at Nappan during the past year. The average of the best twelve varieties was 378 bushels and 28 pounds, and the largest crop, 448 bushels 48 pounds per acre.

Horse beans have been tested during the past season at all the Experimental Farms by growing them in rows of different widths, and they have succeeded very well at Nappan, the largest crop there being 13 tons 400 lbs. per acre. Horse beaus have done poorly on all the other farms. In all cases these experiments have shown that growing them in rows two instead of three feet apart has produced the best results. On inquiry I find that it is a common practice in Great Britain to grow Horse beans in rows two feet apart.

Soja beans have given the largest crops at Nappan in drills two feet apart, namely 5 tons 600 lbs. per acre. The Soja beans have not done as well at Nappan as the Horse beans, whereas at the other farms they have done a great deal better. In these experiments the best results have been had when the seed has been sown in drills from 21 to 24 inches apart.

In Millets there is a new variety, the Japanese Millet, coming to the front, which promises to be very valuable as a fodder plant. It gave a yield last year at Nappan of 16 tons 1,960 lbs. per acre when grown at a distance of 15 inches between the rowe.

#### WATER SUPPLY.

For some years past the water supply at the Nappan farm has been very defective. Last year some springs were found on the farm in the woods on high ground, about three quarters of a mile from the buildings. A reservoir was con-structed near the source of the springs and the water has been brought from this in galvanized iron pipes and introduced into all the buildings. This water has been analysed by the Chemist of the Experimental Farms who says: "It is exceedingly good water, exceptionally pure, and one emirently suited to drinking and household purposes." The supply is ample for drinking and household purposes and is of excellent quality excellent quality.

## EXPERIMENTS WITH MILCH COWS.

During the last year a comprehensive test has been conducted with the whole herd of mileh cows, 27 in all, showing the cost of feed and receipt from sales of milk, setting the manure against the labour. The results show an average profit of \$14 per cow. The different animals vary very much ; the best one gave a profit of

\$28.64; the poorest one 21 cents, showing that it is very important for farmers to know what sort of animals they are feeding and to watch the results they get so that they may find out whether each cow is giving a profit or whether they are keeping some animals for the pleasure of their company.

A comparison was made by Mr. Robertson of two groups of cows about equal in quality which showed that more profit was made from cows which calved in the fall than from those which calved in the spring.

## By Mr. Wilson:

Q. Does he give any reason why? A. No; but he shows that they gave more milk and consumed more of the rough products of the farm.

## By Mr. Calvert :

Q. What did he do with the milk ?

A. He sold it to the experimental dairy at Nappan, which is conducted by the Dairy Commissioner. The milk was delivered there and sold for the making of buttter.

## By Mr. McMillan :

Q. That was a very low average of profit, \$14?

A. That was the average. If the poorer cows had been eliminated, the results would have been better. I may say that it is not the most successful experiments that give us always the most useful information. If we take the average results and can explain the conditions under which they are obtained, and point out how these may be improved, these are sometimes more valuable and impressive than if we could show a large gain from each animal.

## By Mr. McDonald :

Q. Does the profit from cows calving in the fall arise from the advanced price

Q. Does the pront from cows calving in the ran arise from the advanced price of the butter or the better quality of the milk? A. In his report the superintendent says: "One striking fact is that cows of equal quality (as near as can be judged) which were fresh in the fall gave more profit than their equals fresh in the spring, besides consuming more of the rough products of the farm. For instance, Nos. 21, 24 and 26 were fresh in the spring, and consumed \$117.62 worth of feed, paid for it and left a balance of \$63.13 to their credit. While Nos. 6, 17, 22 and 25 that were fresh in the fall consumed \$154.51, paid for it and left a balance of \$106.11, being \$10.75 per cow in favour of the fallpaid for it and left a balance of \$106.11, being \$10.75 per cow in favour of the fall-calved cow."

## By Mr. McLaren :

Q. Would that not be on account of getting better profits in the winter ?

A. That might induce the result to some extent, but I could not say how much. We get an advance on the milk sent to the dairy of 50 cents per hundred pounds, which is paid at the end of each month for all the milk delivered, then at the end of the year, after the cost of the butter has been deducted the balance of profit is divided pro rata among the patrons who have supplied the milk.

## By Mr. Calvert :

Q. You don't remember wh the average would be?

A. I do not, and the particulars are not given to us in such a way as would enable us to give that information.

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## By Mr. McMillan :

Q. The cows are pastured in summer ?

A. Yes.

Q. Cows fully fed lying in the stable in the winter will give more milk that cows in pasture ?

## By Mr. Cargill:

Q. Although the winter feeding costs more money the product in milk will be so much greater that the difference will be in favour of the winter-fed cow? A. There is a difference of \$10.75 per cow in favour of those which calved in

the fall after taking the cost of the feeding in each case.

Q. The difference in profit is in favour of the winter cow ?

## By Mr. Martin :

Q. Is the milk in both cases used for the manufacture of butter ?

A. I believe so-I do not think there has been any cheese made at this factory during the past two or three years.

Q. Is the milk sold absolutely, or is the skimmed milk returned to the farm ? A. The skim milk is returned to the farm.

Q. In making up the profits do you take into account the feeding of calves ?

A. Yes. The value of the skim milk is duly estimated.

An additional area of land has been cleared on this farm during the year and some of it brought into cultivation. Improvements have also been made in the

In the horticultural branch many additional varieties of large and small fruits buildings. have been planted and the orchards have made satisfactory growth, that which is sheltered by a belt of wood has done exceptionally well. Comparative tests have also been made of many varieties of small fruits, also with many different sorts of garden vegetables, such as pease, tomatoes and corn.

The Superintendent of the farm and the Horticulturist have devoted a good deal of time during the past year to attending meetings of farmers and delivering addresses in different parts of the maritime provinces on agricultural and horticultural subjects.

Satisfactory progress has been made in all branches of the work, and quite a number of varieties have been added to the collection of ornamental trees, shrubs and plants now being tested at Nappan as to their hardiness and general usefulness for the maritime provinces.

## THE BRANCH EXPERIMENTAL FARM AT BRANDON.

At the Brandon farm experiments of a similar nature to those I have described in connection with Nappan have been conducted, but with better results in some In connection with Mappan have been conducted, but with better results in some respects, particularly in reference to the oat crop. The Brandon farm this year takes the lead of all the Experimental Farms in the number of bushels per acre obtained of this cereal. The average crop of all the varieties tested was ninety bushels and eight pounds per acre. The best twelve sorts gave an average of 107 bushels and 13 pounds, while the heaviest yielding variety, a newly introduced oat, the White Giant, gave a yield of 114 bushels 4 pounds to the acre. Barley has also done remarkably well there, the two rowed varieties of the best

Barley has also done remarkably well there, the two-rowed varieties of the best six sorts, gave an average of fifty-nine bushels and twenty-eight pounds per acre, the average of all varieties was fifty-one bushels and thirty-five pounds, and the largest yielder, the Kirby, a newly introduced hybrid sort gave sixty-five bushels

and twenty pounds per scre. The six-rowed barleys which were tested have also done well. The average yield of all the varieties has been fifty-five bushels and seventeen pounds, the best six sorts have averaged sixty-three bushels and forty-six pounds per acre and the largest

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crop has been given by the Stelia, which is also one of the new hybrids, and gave sixty eight bushels and sixteen pounds per acre.

The yields of spring wheat at the Brandon farm have not come quite up to those The yields of spring wheat at the Brandon farm have not come quite up to those of the Experimental Farm at Indian Head this year, but they show well with an average crop of all varieties of thirty bushels to the acre, while the general average for the province of Manitobu has been about eighteen bushels. These larger crops show the advantages we have derived from a thorough preparation of the land, early sowing, using only plump and well matured grain for seed and selecting the most productive and vigorous varieties for sowing.

## By an hon. Member :

Q. How many bushels to the acre have you sown?

A. In sowing spring wheat we use a bushel and a half to the acre, of barley we usually sow two bushels to the nere, and outs will vary from a bushel and three pecks to two bushels; where short plump oats are used a bushel and three peeks is sufficient.

## By Mr. Calvert :

Q. Would the average figures you have given be taken from the small plots or from the larger field plots?

A. The averages I have quoted are the results which have been obtained from the small plots; I have, however, some figures regarding the field crops which I shall be glad to give you. They show that the field crops compare very well with

those obtained from the smaller plots. Q. You gave spring wheat at thirty bushels to the acre and the general average of the province at eighteen bushels, would that thirty bushels be from the small

plots? A. That would be from small plots. You will find however, by referring to the field crops, that the returns have been much the same. I will give you the figures of some of the field crops at Brandon.

I may say that the area occupied by field crops at Brandon is not large with any one variety as we have so many different sorts to grow.

VABIETY.	SIZE OF FIELD.	TIELD P	ER ACRE.
	ACRES.	BUSHELS.	POUNDS.
Wallman's Fife		40	
Red Fife		39	30 ·
Preston		36	
Perov		31	30
Red Fife	$ 3\frac{1}{2}$	30	, 40
White Connell		30	8
Crown	1	38	18
White Russian	1	37	43
Duiferin		34	28
Vornon		33	30

In the whole list of field crops of wheat comprising over thirty acres, the average yield has been about thirty two bushels per acre, which is a larger average than that obtained from the smaller plots.

## By an Honourable Member :

Q. Is the seed sown in drills or broadcast? A. Always in drills at the experimental farms. We have tried broadcast sowing for several years at Brandon, and the results have shown that it is much more economical to sow with the drills.

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The practice is to use more seed when sowing broadcast than in the drills, and the crop has not been so good.

## By Mr. McNeil:

Q. In speaking of these varieties you have just referred to, have you found in many years much difference in varieties? A. Yes, sir, we have found in a four years' test that some varieties will average

much more than others. And these demonstrations in bushels per aerc, caunot be set aside. Where we sow for four or five years running a number of varieties and find certain sorts coming to the top of the list every year with a large average yield, that, to my mind, is quite sufficient to justify the recommending of these varieties for general cultivation, and when tried they usually give very satisfactory results.

In Manitoba the peacrop is attracting more attention than formerly. The varieties tested have nearly all done well and have averaged 41 bushels 8 pounds per acre, the best 12 sorts giving 51 bushels 7 pounds per acre. The highest yielder was Harrison's Glory, which gave 59 bushels per acre. This is a variety which was introduced some years ago at the Agricultural College at Guelph. Ont. It came, I think from England, and has done unnsually well at Brandon. Indian Corn has also given used arong the best aix sorts having given an average yield of Corn has also given good crops, the best six sorts having given an average yield of 23 tons 1,450 pounds per acre. The yield of roots have been remarkable during the past year—the best six varieties of turnips averaging 49 tons 1,088 pounds per acre, and the best six varieties of mangels averaging 62 tons 872 pounds per acre.

Q. In the experimental plots?

A. Yes, sir, but the experimental plots are sown in precisely the same way as the field plots, in rows  $2\frac{1}{2}$  feet apart, and the yields per acre are calculated from the weight of roots obtained from 2 rows, each 66 feet long.

Q. Do you find the experimental plots and the field cultivation yield abont the same on an average?

A. Much the same where the land is of fair average quality.

A. Much the same where the land is of fair average quality. Carrots have given much lighter yields, the average from the best six varieties was twelve tons 567 pounds. The crop of potatoes has been unusually large, the average returns from the whole number of varieties tested, which was 104 in all, were 394 bushels 18 pounds per acre. The best twelve sorts have averaged 600 bushels 7 pounds per acre. The largest yielder was a seedling which was originated at the Cantral Form this cave 582 brakels 2 nounds per acre. at the Central Farm, this gave 682 bushels 8 pounds per acre.

#### TREATMENT OF OATS FOR SMUT.

Experiments have also been continued with reference to smut in grain and especially with the smut which affects oats. This variety of smut has been increasing very much in Manitoba of late years, so much so, that in some localities it has reduced the weight of the crop considerably. We have been trying experiments with a new antiseptic, Formalin or Formaldehyde. This is a liquid known in commerce under both these names, and in both instauces it consists of a 40 per cent solution of Formaldehyde in water. It is a very strong antiseptic, and we find that by taking 42 ounces of formalin, which costs about 5 cents an onnce, and mixing it with 10 gallons of water and steeping the grain in that mixture we get a complete remedy for this tronble. We have tried soaking the grain for two hours and for one hour, and we have tried it at Brandon for ten minutes and have found the result satisfactory in all cases. The grain grown on plots where the seed was so treated was completely free from smit. We are carrying on the same line of experiments this year, as this is one of the most hopeful things for smut in oats and barley we have ever tested. Smnt in wheat we can control well with blue stone, that has now been tried for many years and found to be an effectual remedy.

## By Mr. Bell (Pictou):

Q. What was the shortest time of soaking you found effectual?

A. The shortest time tried was 10 minutes. In the past most of the remedies used for smut in oats have involved soaking for twenty-four hours, but we began with the formalin by soaking for two hours. Then at Brandon it was tried by Mr. Bedford for a shorter time, half-an-hour and subsequently for fifteen and ten minutes, and he found good results from it all through. This year it is being tested on all the experimental farms for the shorter periods.

## By Mr. McMillan:

Q. What did you say was the price of the formalin? A, We have paid here, buying it at wholesale, 50 cents a pound, that is less than 4 cents an ounce. I said 5 cents an ounce. I have seen it advertised in the North-west newspapers at 75 cents a pound, that is a little less than 5 cents per ounce.

## By Mr. Bell (Pictou):

Q. Will it be necessary to saturate the grain or will it do to sprinkle the solution ?

A. I am not yet able to answer that question. One of the experiments being tried this year is to sprinkle the grain and see if that will have the desired effect.

## By an Honourable Member:

Q. I suppose you soak one lot of grain and put another in the same fluid after

A. Yes, as long as the liquid lasts.

it?

## By Mr. Bell (Pictou):

Q. Is this remedy for sale all over Canada?

A. I think you will have no difficulty in procuring it from drug stores in any town or city. The Superintendents of our North-west farms have both spoken of the usefulness of this remedy at meetings in the North-west where this is a matter of more vital importance than it is here, and they inform me that it can be procured now almost everywhere in that part of the country, and I understand it has been used by many farmers for this purpose during the past superused by many farmers for this purpose during the past season.

By Mr. McMillan :

Q. It dissolves entirely like water?

A. It mixes readily with water in all proportions.

## By an Honourable Member :

Q. After you have soaked the oats in this solution do you dry it them then? A. We spread them out for an hour or so before sowing.

#### By Mr. Moore :

Q. Were wheat, barley and oats all treated in this way? A. We tried oats only last year, but this year barley is also being tried. The covering of these cereals, being wrinkled and uneven, it has been difficult to find a satisfactory remedy. It does well with the oats, and I think will do well with barley. The ordinary remedy, bluestone dissolved in water has been found quite effective with smut in wheat.

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#### By the Chairman:

Q. This Formalin is the same article that is used for domestic purposes for destroying mold?

A. Yes it is an antiseptie and is used also in hospitals as a germ destroyer.

## By Mr. McLaren:

Q. The cheese supply men all over the country keep this in stock In large quantities?

Q. In the factories?

Q. Those who furnish dalry supplies in the different towns in Canada.

## By Mr. Bell (Pictou):

Q. What strength of bluestone do you use?

A. One pound in a pail and a half of water and that is sprinkled on ten bushels of oats. That quantity of the solution is enough to moisten every kernel of the ten bushels of wheat when stirred well with a shovel.

## By Mr. Mc Neill :

Q. How much of the formalin would be required to do say ten bushels?

A. I could not say just what quantity of the fluid would be required for ten bushels of grain—We recommend  $4\frac{1}{2}$  oz. of the formalin to be mixed with ten Imperial gallons of water. About twenty cents would cover the cost of this quantity.

Q. How much grain would that suffice for. A. We have not yet determined that point, our plan has been to immerse the grain in very coarse open sacking in the liquid and leave it there for ten or fifteen minutes then lift it out, allow the liquid to drain and empty the grain out to dry. do not know how many small sacks could be soaked in this way in ten Imperial gallons. That would be about a quarter of a barrel. The mixture would cost about eighty cents a barrel.

## By Mr. McMillan:

Q. You have never tried just dipping it and taking it out when it is merely wet. A. No sir, we should prefer leaving it in for ten minutes. It is well to give it

time enough so that every part of the grain may be well wetted. Q. If dipping woul' 'o, it could be done so much quicker. A. We are trying the year not only soaking for short periods, but also the effect of sprinkling.

## FLAX, SOJA BEANS, JAPANESE MILLET, &C.

Experiments have also been conducted at Brandon with Flax, Soja Beans, Japanese Millet and a number of different varieties of grains and clovers, from which much useful information has been obtained. Experiments have also been carried on to show the usefulness of straw as a fodder for steers. The results of these tests have shown that the animals do vory well with straw if the farmer has not hay, provided he uses with it turnips and ground barley.

By an hon. member:

Q. Would you cut the straw.

A. Yes, by all means.

## FATTENING OF CHICKENS.

Experiments have been conducted at Brandon for the pust two years in the fattening of chickens and turkeys and much useful information has been gained. These experiments have been tried by penning one group of birds and allowing the other to run at large. The groups were equal in number and in 1897 five penned turkeys gained in 24 days 11 lbs, more than the five running at large, and three plymouth rock coekerels also gained 3 lbs. 3 ozs. more in confinement. These experi-ments have been carried on without cramming the birds. They were fed all they would eat. We find that from three to four weeks is as long as it is profitable to fatten birds in confinement, and that after that time it takes a great deal more food for every pound of flesh added. Experiments this last year, 1898, with four Plymonth Book is birds as a power that they gained 506 lbs more in four weeks Rock chickens in each case showed that they gained 5.06 lbs. more in four weeks when penned than the same number of birds allowed to run at large.

#### By Mr. Calvert :

Q. What did the cost of feeding the birds come to per pound of gain ?

A. Mr. Bedford estimates it at 3 cents a pound, which I notice is a good deal less than the Dairy Commissioner reports as the cost of feeding here. Q. I think it is 6 or 6½ cents per lb., and Mr. Bedford gives us 3 cents per lb. I don't know whether the elimate has anything to do with it or would make that difference.

Q. I cannot say as to that.

## By Mr. McNeill:

Q. Is it fed whole or ground?

A. The grain was crushed and moistened, he says, for the inorning meal and fed whole for the evening meal.

Q. What was it moistened with?

A. With water.

Q. Not with milk?

A. No, not with milk.

Mr. Bedford says that the feed consumed was  $7\frac{1}{2}$  lbs. wheat,  $3\frac{3}{4}$  lbs. onts and  $3\frac{3}{4}$ lbs. barley for the 5.06 pounds of gain, and he valued the grain at one cent per pound which made 15 cents in all; so the cost of feed per pound of gain was about 3 cents.

Some interesting experiments in fattening chickens were carried on also at the Central Farm last year which will be given you by Mr. Gilbert, the poultry manager, in his evidence. These experiments seem to show that poultry can be made to increase in weight very rapidly when penned and given all they can eat without the use of the cramming machine, provided the best breeds are selected for this purpose. this purpose.

## FRUIT AND FOREST TREES.

Further experiments have also made at Brandon with large and small fruits. It is gratifying to know that the cross-bred varieties of apples, crosses between the Siberian crab and the larger and hardier apples of the east have wintered well, most of them having budded from the tips. I have had word from Mr. Mackay during the last few days that the wild types of these fraits have wintered well, but that some of the cross-bred sorts have been killed. We have thirty-six of these varieties fruiting this season here, some of them had an unusual show of large blossoms, and the fruit of the crosses between this small crab and the Wealthy apple is now about three times the size of the average of the crabs on the tree from which these crosses were produced. These are photographs of the blossoms, showing the flowers of the

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two parents and those of the progeny. The photograph shows the flowers of this cross of nearly double the size of those produced on the parent trees. Mr. Shutt kindly made these photographs for me.

## By Mr. McNeill:

Q. The male used in this cross was the Wealthy? A. Yes, we have used the Wild Siberian crab for the female, for the reason that we have found in other experiments that it is usually the female which gives constitution and hardiness to the progeny. I think that the outlook is very hopeful for getting some varieties of fruits from this source which will be really valuable for the North-west country. We shall be able to judge better as to this after we have seen the fruits which are now growing, mature. They are growing rapidly and look very promising.

Many experiments have been made on the Brandon farm with forest and ornamental trees, also with ornamental shrubs and flowers. The people in that part of the Dominion, especially, regard with the greatest pleasure and delight the accession of additional fruits, blooming plants and ornamental shrubs, and this department of the work of this branch farm is, I think, one of the most useful lines which can be followed. It makes the settlers more contented with their homes when they find that they can grow so many beautiful things about them, and thus make their surroundings attractive. These little things all count in the lives of the people, and I think that the more contented the settlers are the better it will be for the country. Much experience is being gained each year as to the hardiness of the different varieties of forest and ornamental trees, shrubs and flowers, and the number of species and varieties found useful in this part of the Dominion is steadily increasing. Many comprehensive experiments have also been carried on at the experimental farm at Brandon by Mr. Bedford, in the testing of vegetables to determine those most suitable to the climate of Manitoba.

## BRANCH EXPERIMENTAL FARM AT INDIAN HEAD.

At Indian Head, the oat crop in the test plots has averaged less than in Brandon, the whole of the varieties tested having given an average of 61 bush. 30 lbs, to the acre and the best 12 varieties an average of 74 bush. 15 lbs. In field crops they have done better. Buckbee's Illinois has headed the list of the uniform test plots with a crop of 79 bush. 14 lbs. per acre but in the field crops 15 acres of Banner have given an average of 35 bushels while 10 acres of Abundance gave an average of 82 bushels to the acre.

## By Mr. Moore :

Q. You reckon 34 pounds to the bushel, I presume ?

Yes; 34 pounds to the bushel.

Of the two-rowed barleys the crop has been good; the six best sorts gave an average crop of 54 bush. 16 lbs. and the largest crop which was given by the Danish Chevalier was 57 bush. 44 lbs. per acre. The average of all the varieties of tworowed barley was 45 bush. 37 lbs.

The six-rowed barleys have also averaged very well and have been a little more

The six-rowed barleys have also averaged very well and have been a fittle more productive than the two-rowed sorts, the best six varieties having given an average of 53 bushels and 6 lbs. per acre, the largest crop being 56 bushels 32 lbs. In Spring Wheat the Indian Head farm has given the largest crops obtained from any of the farms, the average of all the varieties tried having been 36 bushels 10 lbs. per acre, an average of 6 bushels 10 lbs higher than that at the Brandon farm, which stands next in the list. The best twelve sorts of spring wheat at the Indian

Head farm during the past year gave an average of 43 bushels per acre and these varieties have run very even in crop and range as follows :---

	1	Jush.	Lbs.	
NT.	1 White Dife	45	30	
NO.		45	20	
NO.	2 Percy	AA	20	
No.	3 Red Fifu	40	20	
No.	4 Monarch	43	20	
No	5 Stanley	43	10	
NT-	6 Wallman's Fife	43	10	
INO.	O Wenman S Filo	42	30	
No.	7 Captor	42	30	
No.	8 White Connell	49	20	
No.	9 White Russian		10	
No.	10 Preston	*2	10	
No	11 Crown	41	20	
M.	10 Drown	40	20	

Looking over the list it will be seen that the first ten come within very close range of each other; the greatest difference is 3 bush., the one at the top producing 45 and the tenth 42, showing that the averages of the productive sorts have been uniformly high at that farm.

## By Mr. McNeill:

Q. How many of these are cross-bred scrts? A. Four out of the ten are cross-breds, and one, the Percy, stands within 10

b. per acre of the highest yielder, which was the White Fife.
Q. How about the ripening of these hybrids?
A. They ripen about four days earlier on the average than the White or Red Fife, taking a series of years. In some seasons the difference is greater and in other seasons less, but that is about the average. This earlier ripening habit has been inherited from the early variety used as one of the parents in this cross. The Red Fife and White Fife wheats have been used as one of the parents in these Cr08868.

Q. You mean that they are so many days earlier than the Red Fife? A. Yes.

Nine varities of fall wheat were tested last year at Indian Head inside one of the hodge enclosures. They wintered well and made very strong growth, but rust struck them early and badly and they gave a very poor yield, the crops averaging from nine to fifteen bushels per acre.

By Mr. McMillan :

Q. What sort of a hedge was used about this enclosure ?

A. It was a willow hedge. Q. I know farmers who had rust and Barberry hedges and when the hedges

were destroyed they had no rust after that. A. That is no doubt so, on the other hand we have had Barberry hedges at the Central Farm and I have never been able to detect any difference in the rusting between the wheat grown near the hedges and that growing distant from them. There are so many conditions which influence crops that is not always safe to draw positive conclusions from such results. I have mentioned this fall wheat experiment because we have tried to grow it many times and have failed. When it does ripen at Indian Head it results.

we nave tried to grow it many times and have failed. When it does ripen at Indian Head it usually matures later than spring wheat and gives a lighter crop. Pease have shown up well at the Indian Head farm, the average of the 47 varieties tested was thirty-seven bushels fifty-nine pounds. The best twelve sorts gave an average of forty-seven bushels twenty-seven pounds. The best twelve sorts yielder, the Paragon, gave fifty-seven bushels and fifty pounds. Indian Corn has also done fairly well at Indian Head but the crops were very late. The average of all varieties was eleven tons 1,399 pounds, and the best six sorts gave an average of

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15 tons 1271 pounds. The crops of turnipe, of which very few are grown in that section of country, were very fair, the best six varieties tested giving an average of 26 tons 1,658 pounds per acro. The six best varieties of mangels gave an average of 28 tons 1,853 pounds. This is an usually targe crop for Indian Head, the season being short there root crops are usually small. Carrots have always given a small yield there, and last year they fell much short of turnips and mangels.

In the potato crop Indian Head stands this year above all the other Experi-mental Farms. The 104 varieties which were tested have given the unprecedented average of 503 bushels 16 pounds per acre. The 12 best varieties averaged 652 bushels per acre, and the largest cropper the Polaris, stands at the head with 706 bushels and 12 pounds per acre. Mr. McKay tells me they have never seen such a crop of potatoes in the North-west Territories as that of last year.

The experiments in grasses, which are so important, have been continued and attract much intrest, but owing to the very dry spring the crops of hay were light, there being no rain till June. Fields from which only one crop of Brome grass had been taken averaged 1,700 pounds per acre, while a newly sown field last year, notwith standing the dry weather, gave 2 tons 500 pounds per acre. Experiments were begun in the spring of 1898, both at Brandon and Indian Head, with the view of gaining information as to the best plants to sow for plowing under to enrich the soil. We have found that looking to the maintenance of the fertility of the land attempts to grow clover with grain as a nurse crop have always been a failure. We find that the grain takes all the moisture out of the land and that there is not enough moisture left in the soil after harvest to give the young plants a fair start, and we have never had any results worth ploughing under from such experiments. But by sowing clover on fallow land without a nurse crop we have had a good growth, and we hope that instead of having a bare fallow every third year, to sow clover, for ploughing down and in this way add to the fertility of the soil and thus help future crops of grain. On the plots devoted to this test last year we had different varieties of clover; we also sowed buckwheat and rape and plonghed these under, for the reason that some farmers advocate the growth of these plants for that purpose. These plots were all ploughed under when in the best condition in the autumn, and sown with Red Fife wheat in the spring. The yields of the different plots will be ascertained when the harvest comes on, and we shall then be able to see the results of this work.

The jests undertaken this year have been in reference to a more permanent rotation of crops. We have laid out a series of half-acre plots, leaving some for check plots, and these were sown with mammoth red clover, common red clover, Alsike clover, pease, tares, lucerne, bnckwhcat, rape and Brome grass, and these 20 half-acre plots have been arranged for a three years' test. The first series of these plots have been sown with clover which will be followed next year with wheat, and then some of them in the third year with wheat and others with oats, following the practice of some of the farmers in the district in regard to this rotation. The next series of plots are occupied this year with grain, and will have clover next year, and the following year will be sown with grain. The third series will be in grain for the next two years then following with clovers. It is proposed to carry on this work for a number of years—the plo's being so arranged as to show every year both the leguminous crops and the grain crops. I hope that in a few years we shall thus gain much light on that subject, which is so important in the North-west and be able to demonstrate that the fertility of the land may thus be maintained for a long period.

## By Mr. McNeill :

## Is the land liable to become clover sick?

A. We really know very little about clover sickness in this country, unless it be true that there are lands of that character in Prince Edward Island. That is the only part of the country where I have heard any complaint of this peculiar condition. In several instances where farmers have complained of failure in growing clover in Prince Edward Island I have found that the quantity of seed sown was very small, about four pounds to the acre. In such case if the seed chanced to be

of poor quality, not much success could be expected. Possibly this may be the true explanation of some of the failures reported.

Experiments have also been carried on at Indian Head with Horse beans, Soja beans, Japanese millet, rape, flax, tares, and Canary grass, and much useful information has been gathered regarding these crops. A large list of vegetables have also been tried to gain further information as to the sorts which are best suited to the climate of the North-west.

## FOREST TREES, FRUITS, ETC., AT INDIAN HEAD.

Experiments with forest trees have been continued, especially in the direction of discovering the most economical methods of raising trees from seed such as are suitable for that country and of planting and earing for them. Many new varieties have also been introduced there for test. The question was then asked "What does it cost to plant and keep up an acre of these trees ?" The total cost per acre for four years under different methods of planting and care has varied from \$12 to \$15 per acre. This includes the cost of planting and keeping the ground clean for the whole of this period, by which time the trees will be large enough to shade the ground and hence require no further care. That does not however include the cost of growing the young trees for planting.

#### By Mr. Calvert :

Q. About how many did you plant to the acre.

A. We have been gaining information every year on this subject and have tried them at different distances, but we find that five feet apart each way gives the best results as far as our experience has gone. The great point is to get as early as possible enough foliage to shade the ground and thus prevent the growth of weeds, then the farmer has no trouble with his tree plantation. Our latest experiment has been to plant forest trees and each cherries in alternate rows about 24 feet apart been to plant forest trees and sand cherries in alternate rows about 21 feet apart. The sand cherries make very quick growth and spread rapidly over the ground and it is expected that in two years enough shade will be had from the sand cherries so that there will be no further need for cultivation. The sand cherries would probably die out when the other trees grow large enough to shade the ground thoroughly. In this particular plantation the trees have been arranged so as to permit of cutting out those of least value, leaving permanently those of the most valuable sorts. In this case the ash and the elm are intended eventually to occupy the ground entirely,

they will probably be large enough to serve this purpose in ten years. More than 300 varieties of forest and ornamental trees and shrubs have now been tested at Indian Head during the past ten years, and much information gained as to their relative hardiness. Sufficient experience has now been gained to justify the publication of a list of the most hardy and useful species, which will probably the publication of a list of the most hardy and useful species, which will probably be issued before the close of the present year. Many sorts of small fruits have been successfully grown; currants, gooseberries and raspberries have done well. Straw-berries have not done so well, because the spring frosts so often destroy the blossoms. With the large fruits we have as yet had no success. We have tested more than 200 of the hardiest varieties of apples from Russia and other parts of northern Europe and almost every year they have been killed down to the snow line. In the past ten or eleven years we have planted over 2,000 of these apple trees, and have not yet succeded in getting an apple. We have now only the hardy cross-bred varieties to which I have referred, to look forward to, but these I think are very promising. A large proportion of the cross-bred sorts and seedlings which were planted in 1897 at Indian Head lived during the following winter. I have not received full reports yet this year, but I know that the past winter has been unusually severe in the North-west; there has been a great deal of bare ground and very little snow on it, during the severe weather. The Manitoba plum seedlings have all done well at Indian Head, but most of the seedlings of the improved varieties of native plums, have not succeeded. plums have not succeeded.

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Experiments were conducted last year in the feeding of steers, comparing the relative merits of Brome hay, wheat chaff, threshed Brome hay and native hay for this purpose. Experiments have also been conducted with poultry and in the breeding of swine.

## BRANCH EXPERIMENTAL FARM AT AGASSIZ, BRITISH COLUMBIA.

At the Agassiz farm the winter was mild, but the spring has been cold and back-ward. Similar tests to those carried on at the other farms as to the relative value of many varieties of grain have been carried on at that farm, and a large amount of useful informatiou obtained, and the results of the setests have been inspected by a large number of visiting farmers. All the experimental farms are visited every year by a large number of farmers who inspect the work going on and thus gain much useful information which they can put into practice. At this farm the best 12 sorts of oats have given an average of 62 bushels 2 pounds per acre. The best 6 varieties of two-rowed barley have given 36 bushels 2 pounds per acre, and the best 6 varieties of six-rowed barley 37 bushels 21 pounds per acre.

## By Mr. McNeill :

Q. What is the difference between the two-rowed and six-rowed barleys?

A. The difference at the experimental farm at Agassiz, British Columbia, is 3 bushels 19 pounds per acre on the average in favour of the six-rowed sorts.

The best twelve varieties of spring wheat gave 29 bushels 4 pounds per acre; pease have also doue fairly well, the best twelve sorts having given an average crop of 36 bushels 7 pounds per acre.

These crops are not by any means phenomenal, and there are, no doubt, some farmers in British Columbia who have richer land and raise larger crops. The land on parts of the Experimental Farm at Agassiz is very variable. Much of it was formerly occupied by very large trees, and where these large Douglas firs hz a been removed, an excavation of about 20 to 30 feet in diameter or more has been made in each case to get out the stump. The underlying gravel has thus been turned on the top, and these gravely patches are very poor in fertility and cannot be expected to produce heavy crops for some years.

## By Mr. McMillan :

Q. How has the two-rowed and the six-rowed barley turned out this year ?

A. On the whole, there was not very much difference; the average of all the varieties on all the farms of the two-rowed sorts was 42 bushels 29 pounds per acre, while the average of all the six-rowed sorts was 43 bushels 11 pounds per acre. The season was very favourable at Agassiz for Indian Corn, and the best six

varieties, cnt green for ensilage, have given an average of 31 tons 298 pounds per acre.

## By an Hon. Member :

## Q. That is the corn for fodder, you meau ?

Q. That is the corn for fourier, you mean r A. Yes; cut in the green state. The yield of roots has been much heavier than any we have ever had there before. The best six varieties of turuips have averaged 49 tous 262 pounds to the acre, and the best six mangels gave an average yield of 40 tons 572 pounds, while the best six varieties of field carrots gave an average of 36 tons 965 pounds per acre. The yield of carrots has been in a vance of any crops of this post me had before of this root we have ever had before.

#### By Mr. Moore :

Q. Have you made any experiments with sugar beets ?

A. Yes, but we have found that sugar beets do not usually yield as well as turnips or mangels. At Agassiz, the best yield given by any of the sugar beets was

35 tons 1456 pounds, and the poorest 21 tons 1912 pounds, not nearly as much as the turnips or mangels.

Q. That would be a higher yield than the farmers could expect of course in raising the sugar beet for the sugar factories?

A. Oh yes. About 12 to 15 tons is the common yield for sugar beets in this country.

## By Mr. Calvert.

Q. Does not that seem a very large yield, over 1600 bushels to the acre? A. Yes, it is a phenomenal yield. We have never before had any crops of roots to equal these. The returns however are made up with the greatest care and are thoroughly reliable.

## By Mr. Clancy.

Q. You selected some of the largest specimens for the purpose of making the comparison, I presume?

A. Not by any means, we do no selecting of that sort. The returns are compiled from fair average rows all grown in the same manner, and the calculations are made from the weight of roots gathered from two rows, each 66 feet long. Experiments have also been made at Agassiz in remedies for smut in oats and formalin has been found very effective and seems to be an entire preventive of this disease. We used this in the proportion of 41 ounces of formalin to 10 imperial gallons of water and the grain was soaked in this mixture for two hours.

## By Mr. McNeill.

Q. You spoke of the large yield in carrots just now. What varieties did you refer to?

A. The varieties which gave the largest erops at Agassiz were the Improved Short White, and Half long White. We have several times had 27 and 28 tons to the acre from these varieties at Ottawa.

Q. There is a variety called the Altringham Red Carrot ?

A. Yes, but that, in our experience, is one of the poorest earrots we have grown.

Q. There seems to be some difference of opinion as to this variety?

A. Yes, but we have not found it a profitable sort, it is a long eylindrical root not easy to dig. The Improved Short White is a better carrot and stands well in the list at Agassiz, and is a good cropper.

Q. There is a great difference between the crops we have had of the Altringham carrot and the average you have referred to? Difference in the seed might partly account for this?

A. We obtain all our Improved Short White Carrot seed from the one source, and send portions of the seed to each branch farm so that they all get exactly the same strain of seed for test.

Q. From the statement you have given it is evident that the different varieties

of carrot vary very much, some averaging a yield much larger than others? A. That is so, but at the same time you will find that some of the varieties which give the best returns at Agassiz do not give the largest crops at Ottawa, differences of elimate affect the results very much.

Q. But you find that the White varieties you have referred to have yielded a better crop than the Altringham variety I have spoken of?

A. Yes; they will give on the average a much better crop than the Altringham.

## By Mr. Calvert:

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Q. The returns you have given us show an average of 1,200 bushels to the acre? A. Yes; but that was at Agassiz, B.C. We have never had as heavy crops as that at Oitawa.

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377 Some further tests have been made at Agassiz in the growing of Horse beans, Soja beans and Japanese millet. The Soja beans have given nearly double the erop of the Horse beans, and the Superintendent says that they make as plendid fodder, fine when fed green to cattle, and it was preferred both by horses and cattle to any other food.

## By Mr. McGregor :

Q. Can you depend upon the growth of these beans in this climate? A. We have tried them here for two years, and they have succeeded very well thus far.

Q. Have you tried them further west?

A. Yes; we have tried them in Manitoba and at Indian Head, in the North-west Territories, with fairly good success.

## By Mr. McNeill:

Q. What kind of a bean are they?

A. The early Soja bean is a small bean which is cultivated largely in Japan. The Japanese grow many varieties of these beans, and this is one of the earliest Maturing sorts. Q. Does it grow like other beans?

A. It is much more branching than the horse bean, and when full grown it stands about 3 feet 6 in. high, and sometimes as high as 4 feet. We have had the best crops where we have grown them in rows from 15 to 20 inches apart.

## By Mr. McGregor;

Q. They will do well for the silo, will they?

A. I think they would do very well for ensilage, but we have not had enough of them growing at the Experimental Farms to enable us to test them thoroughly for this purpose, but we have tried feeding them to cattle, and the cattle eat them readily. They have been analysed by the Chemist of the Experimental Farms, and they show quite as large a proportion of nitrogen as the horse bean, and will probably be a useful introduction for feeding purposes.

## By an hon. member :

Q. Do the beans ripen at all here?

A. Our season is not usually long enough to ripen them well at Ottawa. We cut them just about the time we cut the corn and the beans are then in a green state; we did get some seed last year, about half a bushel, which we have sown and which has germinated very well, but they don't usually ripen at Ottawa. I have no doubt that they would ripen in western Ontario.

#### By Mr. Clancy;

Q. But for ensilage you have to cut them green anyway? A. Yes, certainly. I think the difficulty with reference to obtaining seed will probably be removed shortly and that seed will be grown in this country if not in Canada, in some of the warmer climates of the States, and that the seed will then be obtainable at a cheaper rate.

Some experiments have also been conducted at Agassiz with cattle, sheep and swine.

## FRUIT GROWING AT AGASSIZ.

The fruit orchards at Agassiz now contain probably the largest number of varieties to be found in any one locality in the world. The large fruits alone include over 2,000 varieties. The object in view in bringing together this large number is

to gain experience with all varieties. We find people settling here from different countries in Europe, enquiring about the particular varieties of fruit they have been accustomed to grow in their own country, and information on such points is much appreciated. Further, we are testing varieties from all parts, so that we may find out which will succeed best in this country. Our Superintendent, Mr. Sharpe reported last year on 92 varieties of apples which had fruited with him for the first time, and he had a great deal of success with them; he hus also reported on a considerable number of new varieties of pears, plums, and cherries and a large number of different sorts of small fruits. Some new varieties of plums introduced by us from France four or five years ago have been found to be eminently adapted to the climate of British Columbia, and have produced large crops. The same may be said of some varieties of pears.

## By Mr. Mc Millan:

Q. Have you any experience in growing fruit trees in British Columbia on the sides of the mountains, high up from the valleys? A. Yes, we have orchards of fruit trees at different heights, 150 feet, 500 feet,

A. Yes, we have orchards of fruit trees at different heights, 150 feet, 500 feet, 800 feet, and 1,100 feet above the valley, and in going over these last autumn I had an opportunity of testing the fruit grown at these different heights. I found that the higher up the fruits were grown the healthier were the trees, the foliage also was freer from fungus growths. I found that gooseberries grown on these higher locations were quite free from mildew while those grown in the valley were badly affected. The work in the culture of large fruits here, covers all the varieties of apples, pears, plums, cherries, peaches, apricots, &c., including in all over 2,000 varieties. Of small fruits there must be in addition at least 1,000 varieties. The work in the testing of forest and ornamental trees and shrubs has also been continued, and much information and experience gained as to the usefulness of some of our eastern timber trees in that climate. This closes what I have to say regarding the work in progress at the branch experimental farms.

#### INFORMATION ISSUED FROM THE FARMS.

Before I conclude I wish to mention one thing in connection with the work of the central and branch experimental farms, which the general public seem slow to recognize, that is the very large amount of work done by the officers of these farms in imparting information to the public generally, and this work is constantly increasing. Last year the correspondence received at the central experimental farm reached a total of 57,204 lotters. 25,147 of these were answered, the other 32,000 were such communications as could be replied to by circulars partly or wholly printed. More than 150,000 of printed circulars were sent out. At Nappan 1,573 letters were received, and answers were sent to 1,384; at Brandon 4,670 letters were received, and 3,584 answered; at Indian Head 4,702 letters were received, and 5,075 letters sent out; while at Agassiz 1,520 letters were received at the experimental farms last year, of which 36,590 had written replies sent to them. In addition 215,000 bulletins and reports were sent out. There is thus a constant flow of information going out from all the experimental farms to the public from day to day all through the year, which has already produced eminently good results, and which must in time confer still greater benefits on the agricultural interests of Canada.

## By Mr. McGregor:

Q. In planting an orchard in the west would you rather plant in the spring or the fall.

A. Our experience here is altogether in favour of spring planting. I understand that you are speaking of Western Ontario?

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Q. Yes. A. While your conditions in Western Ontario are very different from ours, and in some seasons it would be quite safe to plant trees in the fall, yet as you are never sure of the kind of winter you are going to have, I think it is much safer to plant in the spring.

Having read over the preceding transcript of my evidence I find it correct.

WM. SAUNDERS, Director Dominion Experimental Farms. 1

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