APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR		WM. SAUNDERS.
AGRICULTURIST		JAS. W. ROBERTSON.
HORTICULTURIST		JOHN CRAIG.
CHEMIST		F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST		JAS. FLETCHER.
POULTRY MANAGER		A. G. GILBERT.
SUPT. EXPERIMENTAL FARM,	Nappan, N.S.	WM. M. BLAIR.
do do	Brandon, Manitoba	S. A. BEDFORD.
do do	Indian Head, N.W.T.	ANGUS MACKAY.
do do	Agassiz, B.C.	THOS. A. SHARPE.

FOR

1893

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OTTAWA
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1894

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GENERAL VIEW—EXPERIMENTAL FARM, NAPPAN, N.S.

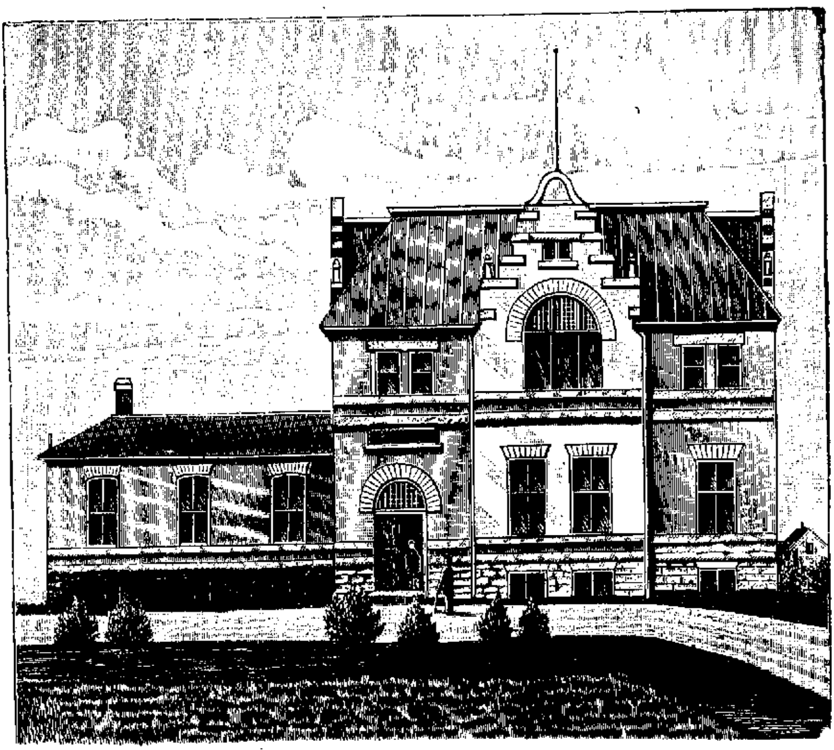


Figure 1.—Office Building, Museum and Chemical Laboratory of the Central Experimental Farm.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

OTTAWA, 30th November, 1893.

SIR,—I have the honour to submit for your approval my seventh annual report of the work done and in progress at the several experimental farms established in different parts of the Dominion.

You will also find appended reports from the following officers of the Central Experimental Farm: From the Agriculturist, Mr. James W. Robertson; from the Horticulturist, Mr. John Craig; from the Chemist, Mr. Frank T. Shutt; and from the Entomologist and Botanist, Mr. James Fletcher. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the branch experimental farms there are reports from Mr. Wm. M. Blair, superintendent of the experimental farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, superintendent of the experimental farm for Manitoba, at Brandon; from Mr. Angus Mackay, superintendent of the experimental farm for the North-west Territories, at Indian Head; and from Mr. Thos. A. Sharpe, superintendent of the experimental farm for British Columbia, at Agassiz.

In these reports the results are given of much careful experimental work relating to agriculture, horticulture and arboriculture embodying the outcome of much practical work in the fields, orchards, barns, dairy and poultry buildings; also of scientific investigation of chemical problems in the laboratory and the careful study of the life history and habits of noxious insects and plants with suggestions of measures calculated to lessen the injury they cause.

The great and increasing demand among farmers for these reports is a gratifying indication of the growing desire for information among this class of the community and of the high esteem in which these records of the experimental farms are held. It is hoped that the facts brought together in the present issue will be found quite as valuable to the agricultural community as those contained in any of the preceding reports.

I have the honour to be, sir,

Your obedient servant,

WM. SAUNDERS.

The Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS.

REPORT OF THE DIRECTOR.

(WM. SAUNDERS, F.R.S.C., F.L.S., F.C.S.)

The season of 1893 has been very varied, both in its character and results, in different parts of the Dominion. Almost everywhere the spring season has been backward, and cold and wet weather delayed seeding. In the western and central parts of Ontario, a moist spring with an abundant hay crop was followed by a period of severe drought, which, while it did not materially affect the yield of winter wheat, had a marked influence on the different varieties of spring grain, making the average crop light. Summer dairying was also affected by the drying up of the pasture lands: later, timely rains, however, helped the root crops, which turned out fairly satisfactory. In the eastern portions of the province spring growth was also tardy and backward, but under favourable conditions as to moisture an excellent hay crop was gathered. The latter part of the summer was unusually wet, especially just preceding and during the grain harvest, and rust prevailed to such an extent that the weight and quality of spring grain was redneed far below the average, and the returns were in some respects disappointing. The wet weather, however, kept the pasture lands in good condition, and was favourable to the growth of roots for stock, and many varieties have given a generous yield. Fodder corn has also in most localities turned out fairly well.

In most parts of Quebec the season has been favourable, the yield of hay has been good and the subsequent luxuriance of pasture growth most advantageous for dairy farming, in which this province has of late made most gratifying progress. The returns of other crops have also been fairly satisfactory.

In the Maritime Provinces the early part of the season was dry and the hay crop below the average, but later on timely rains occurred in many localities, which were followed by fairly good yields in the harvest season. The later crops of roots were very fine.

In Manitoba and the eastern portions of the North-west Territories, the early part of the summer gave promise of an abundant crop which seemed almost assured, when on the 5th August, within two or three weeks from the usual time of harvest, there began a most unusual heated term. The thermometer ranged during six consecutive days in the neighbourhood of and above 90° F.; and on the 7th rose to 104°—107° F. in the shade. The high temperature on this particular day was accompanied by a parching hot wind, which blew up from the arid and desert regions south in the United States, and which almost scorched the leaves of the growing grain and brought about premature ripening with a considerable loss of bulk. This untoward circumstance reduced the promise of a generally abundant crop with a probable average of about 25 bushels per acre to one of about 14 bushels, the reduction being brought about partly by a diminished size of kernel and partly by the drying up of the later kernels which in a favourable season form towards its close in the upper part of the spikelets which compose the head of wheat. In some sections of the eastern part of Assiniboia the influence of the heated term was less felt and the yield of wheat has been excellent, many large farms having given a return of from thirty to forty bushels per acre. In Saskatchewan and Northern Alberta the yield of all cereals has been good, the heads being plump and well filled.

In the interior climates of British Columbia, there have been few unusually heavy crops, but the yields in most instances have been fairly satisfactory, while in the coast climate the returns from the grain harvest have been below the average.

While the modifications in crops brought about by conditions of climate are beyond the control of the farmer, there are many conditions which he can influence which are most important in their bearing on plant growth and which under favourable circumstances materially affect the returns. Among these none is more important than the

MAINTENANCE OF THE FERTILITY OF THE SOIL,

which is the chief aim of all good farming and on which a continuance of good crops mainly depends. In the soil a large store of fertility has been laid up for man's use, which may be regarded as a savings bank reserve for the farmer, and by judicious treatment may be continually added to and improved, but by careless and injudicious management may be prodigally wasted. All soils are the result of the disintegration of rocks by the forces of nature and the intermixture therewith of organic matter, resulting from the decay of animal and vegetable remains. They vary much in fertility, partly owing to difference in composition of the rocks from which they have been formed, partly to the variable proportion of organic matter they contain, and partly to their mechanical condition and texture. These variations are commonly distinguished by special terms such as clayey, loamy, sandy or gravelly soils, indicating the materials which form the larger proportion of their bulk. The productiveness of a soil also depends partly on its power of holding water and of drawing supplies of moisture from below. Water which in the soil is usually more or less charged with carbonic acid gas is the universal solvent which nature employs to convey food to the rootlets of plants. A good loamy soil will hold much more moisture than either clay or sand and retain it longer, and among the main advantages resulting from a thorough working of the soil are the prevention of loss of water by lessening rapid and excessive evaporation during the summer, also the opening of it and making it more porous, so that its power of retaining moisture may be increased and its particles at the same time exposed to the beneficial action of air and frost. All soils contain more or less plant food in a soluble form which is immediately available for the use of growing plants—on the other hand there is always a large proportion of the elements of fertility, the immediate use of which the farmer cannot command, and which can only be made available gradually through the influences referred to.

CONSTITUENTS TAKEN FROM THE SOIL.

Of the mineral constituents which enter into the composition of soil, quite a number are taken up by living plants in varying proportions, but of many of the ingredients the quantities used are small and the store of such contained in the soil is usually very ample. There are, however, three ingredients which plants take in comparatively large proportions from the land, which must sooner or later in some measure be restored to it if continual good crops are to be looked for. These are nitrogen, phosphoric acid and potash. All arable land contains these important ingredients and usually in considerable proportions.

It is estimated that an acre of soil a foot deep, weighs on an average about 3,500,000 lbs., and that good ordinary loam in Europe, estimated from the results of many analyses will contain an average of not less than 3,500 lbs. per acre of nitrogen and sometimes more than that. The quantity of phosphoric acid varies in the same area from about 3,000 to 6,000 lbs., and potash from 5,000 to 8,000 lbs. From the analyses made by the Chemist of the Experimental Farms, Mr. F. T. Shutt, during the past three years, some of the samples being representative of large areas, it would appear that the soils of Canada compare favourably with those of Europe in their richness in these important constituents.

Seventeen samples from different parts of the eastern provinces, presuming the fertile soil to have a depth of nine inches have averaged as follows: Nitrogen 6,247 lbs. per acre, phosphoric acid 3,596 lbs., and potash 6,510 lbs. Thirteen samples from different parts of the North-west plains, have also been submitted to analysis. These soils are deeper and may safely be estimated at twelve inches, and on this basis they show an average in nitrogen of 10,115 lbs. per acre, phosphoric acid 5,040 lbs., and potash 10,500 lbs.

When any of these important constituents are present in the soil in unusually large proportion, plants will sometimes, under such circumstances, take up such material in larger quantity than where the same crop is grown on poorer land. The proportions, however, which are taken from the soil are on the whole fairly uniform and for some of the more important crops may be approximately stated as below. As far as the material has been available, the figures in the following estimates have been compiled from the analyses made by the chemist of the experimental farms, supplemented by information from the "Compilation of Analyses of American Feeding Stuffs," issued by the United States Department of Agriculture, 1892. The proportions of phosphoric acid and potash have been calculated from analyses conducted by Dr. Goessmann, published in the 10th annual report of the State Agricultural Experimental Station, Amherst, Mass., 1892, and from Wolff's tables as given in "How Crops Grow," by Johnson.

——	Nitrogen, in lbs.	Phosphoric Acid, in lbs.	Potash, in lbs.
A wheat crop of 25 bushels per acre, with 2,200 lbs. of straw, takes—			
For the grain weighing 1,500 lbs.	28·50	12·68	8·54
" straw " 2,200 "	12·03	4·96	10·57
Total	40·53	17·64	19·11
A barley crop of 35 bushels per acre, with 2,000 lbs. of straw, takes—			
For the grain weighing 1,680 lbs	33·26	13·28	8·86
" straw " 2,000 "	12·22	3·86	19·39
Total	45·48	17·14	28·25
A crop of oats of 50 bushels to the acre, with 2,200 lbs. of straw, takes—			
For the grain weighing 1,700 lbs.	32·13	10·48	8·05
" straw " 2,200 "	13·90	4·74	24·83
Total	46·03	15·22	32·88
A crop of Indian corn grown for fodder purposes, to the period when the ears are in the late milk or glazing stage, takes from the soil for each ton	5·80	2·96	6·54
In the following estimates of the fertilizers extracted from the soil by root crops, the roots alone are considered, it being understood that the tops are cut off and left on the ground to be ploughed under and the fertilizing constituents they contain returned to the soil:—			
A crop of turnips takes from the soil for each ton of roots grown	3·30	1·86	5·50
" mangels " " "	3·03	1·84	7·66
" carrots " " "	2·35	2·22	6·53
" sugar beets " " "	4·79	1·92	9·06

It is a very important question, but one concerning which on account of its complex character, no very exact information can be given as to what effect the various natural and artificial fertilizers have on particular crops, and which are the most economical to use, to replace the important constituents taken from the soil by constant cropping. The results obtained from any method of treatment will, as a matter of course, depend largely on the proportion of these respective ingredients existing naturally in the soil; much also depends on the character of the season, whether it be favourable or unfavourable for the crop. Some conclusions however more or less general in their character, may be drawn from careful experiments on any soil, and with the object of gaining information on this important topic, a series of experiments was planned and begun on the Central Experimental Farm six years ago, which may be outlined as follows:—

TESTS OF THE ACTION OF FERTILIZERS ON SOME CROPS.

A piece of sandy loam, more or less mixed with clay, which was originally covered with heavy timber, chiefly white pine was chosen for these tests. The timber was cut many years ago, and among the stumps still remaining when the land was purchased, there had sprung up a thick second growth of trees, chiefly poplar, birch and maple, few of which exceeded six inches in diameter at the base. Early in 1887 this land was cleared by rooting up the young trees and stumps and burning them in piles on the ground from which they were taken, the ashes being afterwards distributed over the soil as evenly as possible, and the land ploughed and thoroughly harrowed. Later in the season it was again ploughed and harrowed, and most of it got into fair condition for cropping.

The plots laid out for the experimental work with fertilizers were one-tenth of an acre each, 21 of which were devoted to experiments with wheat, 21 to barley, 21 to oats, 21 to Indian corn r maize, and 21 to experiments with turnips and mangels. Owing to the difficulty and unavoidable delay attending the draining of some wet places, it was not practicable to undertake work on all the plots the first season. The tests were begun in 1888 with 20 plots of wheat and 16 of Indian corn, and in 1889 all the series were completed excepting six plots of roots, Nos. 16 to 21 inclusive, which were available for the work in 1890. The season of 1889 was wet when several of the plots were found to be insufficiently drained and the crops suffered in consequence. This will be mentioned when the results for that season on these particular plots are given. In the tables the result of the crop of each year is shown, also the average for the whole period during which the experiments have been continued.

In 1890 it was found that all the grain plots had become so weedy that the growth of the crops was much interfered with, and with the view of cleaning the land one-half of each of the wheat and oat plots was sown with carrots in 1891, and one-half of each of the barley plots with sugar beets. In 1892 the other half of each plot in each of these series was sown with carrots. In 1893 it was thought desirable to continue this cleaning process, and carrots were again sown on the half of the wheat and oat plots occupied with this crop in 1891, and also on the half of the barley plots cropped with sugar beets that year. It is expected that at the end of another season, the whole of these plots will be sufficiently free from weeds to warrant their being sown entirely with grain again. In the meantime some information has been gained by these tests as to the effect of the different fertilizers on carrots and sugar beets, which will be given in this connection.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of 1½ bushels per acre, and each year they have all been sown on the same day. The variety chosen at the outset for sowing was the White Russian, and this was continued during 1889, 1890 and 1891. In 1892 Campbell's White Chaff was substituted and this variety was also sown in 1893. The following are the records of the dates of sowing, coming up and ripening of the wheat each year:—1888, sown May 23rd, appeared above ground May 28th, ripe August 24th. 1889, sown May 17th, came up May 22nd, ripe August 30th. 1890, sown April 28th, come up May 13th, ripe August 12th. 1891, sown May 9th, came up May 18th, ripe August 24th. 1892, sown May 6th, came up May 15th, ripe August 14th. 1893, sown May 27th, came up June 2nd, ripe August 23rd. It will thus be seen that the White Russian wheat required from the date of sowing to maturity a period of 93 days in 1888; 105, in 1889; 106, in 1890; and 107, in 1891, or an average for the four years of nearly 103 days. The Campbell's White Chaff matured in 100 days from the date of sowing in 1892 and in 88 days in 1893, an average for the two years of 94 days.

TREATMENT OF SOIL.

The usual treatment of the soil on all the grain plots has been to gang plough soon after harvest and after the shed grain and weeds have well started to plough again about 7 inches deep. In spring the plots have been disc-harrowed twice before applying the fertilizers and again harrowed with the toothed or smoothing harrow before sowing. On those plots where barnyard manure has been used, the manure has been lightly ploughed under as soon as possible after it has been spread on the land and harrowed with the smoothing harrow before sowing. Wherever barnyard manure is spoken of it is understood to be a mixture of horse and cow manure in about equal proportions.

REMARKS.

The season of 1891 was quite favourable for wheat growing whereas 1890 and 1893 were specially unfavourable which will in a measure account for the great variation in the crops of these years notwithstanding the quantities of fertilizers applied to the land in the intervals. This also serves to show that the character of the season has a more immediate effect on the crop of the year than any application of fertilizers no matter how complete or liberal that may be. We may however rest assured that the useful elements of fertility stored in the soil will not be lost, but that they will materially aid in every favourable season by increasing the crop returns.

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in the years 1889, 1890 and 1891 and $1\frac{1}{2}$ bushels in 1892 and 1893. Two-rowed barley has been used for seed throughout the whole period. The variety chosen for the first three years was tho Saale barley, which is highly esteemed by the brewers of Great Britain, followed by the Goldthorpe in 1892 and the Duckbill in 1893. In 1889 the seed was sown May 17th, came up May 22nd and the grain was ripe August 20th. 1890, sown April 28th, came up May 13th, was ripe August 11th. 1891, sown May 9th, came up May 16th, was ripe August 17th. 1892, sown May 6th, came up May 15th, was ripe August 18th. 1893 was sown May 27th, came up June 2nd and was harvested August 20th. The average time required from the date of sowing to maturity during the three years in which the Saale barley was used as seed was $99\frac{2}{3}$ days, the Goldthorpe matured in 1892 in 104 days from date of sowing and the Duckbill in 1893 in 85 days.

EXPERIMENTS with Fertilizers on Plots of Wheat $\frac{1}{10}$ acre each.

No. of Plot.	Manure applied each Year.	1st Season, 1888. Variety, White Russian. Yield of Grain. Per acre		Yield of Straw. Per acre	2nd Season, 1889. Variety, White Russian. Yield of Grain. Per acre		Yield of Straw. Per acre	3rd Season, 1890. Variety, White Russian. Yield of Grain. Per acre		Yield of Straw. Per acre	4th Season, 1891. Variety, White Russian. Yield of Grain. Per acre		Yield of Straw. Per acre	5th Season, 1892. Variety, Campbell's White Chaff. Yield of Grain. Per acre		Yield of Straw. Per acre	6th Season, 1893. Variety, Campbell's White Chaff. Yield of Grain. Per acre		Yield of Straw. Per acre	Average for the whole Period. Yield of Grain. Per acre		Yield of Straw. Per acre
		Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year since......	12	30	Not taken.	16	..	4220	12	30	2660	22	40	2690	20	40	3260	12	30	3070	16	8⅓	3180
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year since....	16	40	do	16	30	4290	10	30	2220	24	20	2860	18	20	2860	14	..	2790	16	43⅓	3004
3	Unmanured.....	12	30	do	10		3480	4	40	590	16	20	2140	6	40	1460	7	..	1420	9	31⅔	1818
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre..........	13	10	do	10	20	3460	4	15	645	18	20	1260	6	..	1360	7	20	1600	9	54⅙	1665
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre..........	14	10	do	12	10	4270	6	50	1425	18	20	3420	9	..	2320	9	10	2310	11	36⅔	2749
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using..........	14	20	do	16	50	4520	7	35	1300	22	20	2490	15	20	2880	8	40	2120	14	10⅚	2662
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre..........	13	30	do	8	5	2895	5	30	1200	17	40	2880	7	40	1960	5	..	2520	9	34⅙	2291
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre........	11	40	do	6	50	1460	4	45	695	21	00	2460	6	40	1760	4	50	1320	9	17½	1539
9	Mineral superphosphate, No. 1, 500 lbs. per acre..........	13	10	do	10	..	1930	4	35	665	21	10	2570	7	40	1840	7	20	1180	10	39⅙	1637
10	Mineral superphospate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre....	12	40	do	10	15	3165	6	25	1225	24	20	4600	10	40	2520	8	20	2240	12	6⅔	2750

11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	12 40	do .	7 30	2130	6 50	1060	23 20	3010	10 ..	2340	9 20	2410	11 36⅔	2190
12	Unmanured..........	14 50	do .	3 10	1370	6 20	965	16 50	2270	8 20	1500	5 ..	1280	9 5	1477
13	Bone finely ground, 500 lbs. per acre. .	14 ..	do .	3 20	1080	6 45	970	20 ..	2360	8 45	1495	4 ..	2020	9 28⅓	1585
14	Bone finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	16 ..	do .	3 50	1320	8 5	1025	24 20	3170	10 20	1800	7 20	1900	11 39⅙	1843
15	Nitrate of soda, 200 lbs. per acre......	16 40	do .	7 15	2745	9 30	1275	21 ..	3230	9 20	1860	9 20	1700	12 10⅚	2162
16	Muriate of potash, 150 lbs. per acre. . .	15 10	do .	7 40	1720	8 20	1030	26 ..	3020	10 20	1620	9 40	1630	12 51⅔	1804
17	Sulphate of ammonia. 300 lbs. per acre	14 ..	do .	7 55	2055	7 45	1135	20 40	3320	7 40	2100	6 50	3290	10 48⅓	2380
18	Sulphate of iron, 60 lbs. per acre.....	13 30	do .	10 15	2165	6 30	685	21 20	3960	10 20	1580	6 20	1560	11 22½	1990
19	Common salt (sodium chloride) 300 lbs. per acre	11 50	do .	10 ..	1680	5 40	630	15 ..	2410	10 40	1540	8 30	1670	10 16⅔	1586
20	Land plaster or gypsum (calcium sulphate) 300 lbs. per acre.	13 40	do .	10 15	3375	4 35	485	20 40	2650	10 40	1360	8 ..	1400	11 18⅓	1854
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre each year since............. . . .	No crop tak'n in 1888. . .	....	11 10	2510	5 30	675	20 ..	2650	10 40	1480	8 20	1360	11 8	1735

EXPERIMENTS with Fertilizers on Plots of Barley, $\frac{1}{10}$th acre each.

No. of Plot.	Manure applied each Year.	1st Season, 1889. Variety Sown—Saale, two-rowed.			2nd Season, 1890. Variety Sown—Saale, two-rowed.			3rd Season, 1891. Variety Sown—Saale, two-rowed.			4th Season, 1892. Variety Sown, Goldthorpe, two-rowed.			5th Season, 1893. Variety Sown, Duckbill, two-rowed.			Average for the whole Period.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure well rotted, 15 tons per acre.	26	2	1·50	17	11	1852	37	24	3510	35	40	3980	28	16	3080	28	$47\frac{2}{5}$	2854
2	Barn-yard manure, fresh, 15 tons per acre.	22	4	1840	24	4	2875	40	40	3800	32	24	3460	29	38	3630	29	$41\frac{1}{5}$	3121
3	Unmanured.	18	16	1570	10	35	1440	22	44	2030	10	20	1860	7	24	1220	13	47	1624
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre.	17	19	1515	11	10	833	28	26	2330	8	16	1600	10	10	1320	15	$6\frac{3}{5}$	1520
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre.	19	33	1755	12	16	1805	35	10	2980	10	20	2380	18	16	2540	19	$9\frac{2}{5}$	2292
6	Barn-yard manure partly rotted, and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using.	23	16	1980	19	38	1875	42	4	2990	27	44	3280	13	36	2120	25	18	2449
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre.	18	36	1800	13	39	1803	33	16	3240	15	40	2920	24	38	2320	21	$14\frac{3}{5}$	2417
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes unleached, 1,500 lbs. per acre.	15	40	1440	10	15	825	31	12	2590	12	44	2200	17	4	1680	17	23	1747
9	Mineral superphosphate No. 1, 500 lbs. per acre.	24	28	2020	14	8	1570	30	40	4510	19	28	2100	15	40	1550	21		2350
10	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre.	20	40	2000	15	5	1670	33	36	3190	21	32	2880	25	10	2390	23	15	2426
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	20	20	2380	16	7	1885	33	16	3390	13	36	2580	25	40	2680	21	43	2583
12	Unmanured.	15	25	1155	11	12	760	21	42	2050	12	44	1 00	6	42	1110	13	33	1395
13	Bone, finely ground, 500 lbs. per acre.	14	38	1040	9	28	685	23	36	2200	12	24	1720	17	44	1290	15	34	1387
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	18	36	1900	13	11	1790	28	46	2510	20		2460	19	28	1500	20	5	2032

15	Nitrate of soda, 200 lbs. per acre........	18	26	2210	18	26	2140	33	36	3760	15		2720	25		2940	22	8	2754
16	Muriate of potash, 150 lbs. per acre.....	19	3	1955	19	23	1925	32	34	2810	12	44	2340	23	36	1590	21	28	2124
17	Sulphate of ammonia, 300 lbs. per acre..	18	26	1410	15	25	1975	28	36	3510	13	16	2320	18	36	2540	18	47	2351
18	Sulphate of iron, 60 lbs. per acre.... ..	23	36	2060	13	1	865	32	44	3440	12	44	2140	16	42	2030	19	43	2107
19	Common salt (sodium chloride) 300 lbs. per acre..........................	25	00	800	22	4	1955	41	12	3140	22	4	2380	25	30	2350	27	10	2125
20	Land plaster or gypsum (calcium sulphate), 300 lbs. per acre....	25	35	1765	19	8	1690	34	8	2950	18	16	2060	17	4	1390	22	43	1971
21	Mineral superphosphate No. 2, 500 lbs. per acre..........................	21	42	1050	14	28	735	36	42	3980	18	36	040	17	24	1760	21	44	1913

EXPERIMENTS with Fertilizers on Plots of Oats, $\frac{1}{10}$th acre each.

No. of Plot.	Manure applied each Year.	1st Season, 1889. Variety Sown, Early English.			2nd Season, 1890. Variety Sown, Prize Cluster.			3rd Season, 1891. Variety Sown, Prize Cluster.			4th Season, 1892. Variety Sown, Prize Cluster.			5th Season, 1893. Variety Sown, Prize Cluster.			Average for the Whole Period.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	16	6	1800	40	20	2615	41	6	2630	48	28	3520	18	18	3410	33	2	2795
2	Barn-yard manure, fresh, 15 tons per acre	14	24	2000	45	10	2860	40	..	2910	47	2	2920	32	32	3200	36	..	2778
3	Unmanured	15	5	1885	31	26	1260	39	14	1120	31	26	1460	15	10	1760	26	23	1497
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	15	20	2070	35	30	1570	27	22	2600	36	16	1580	18	8	1680	26	26	1880
5	Mineral phosphate, untreated, finely ground; 500 lbs. nitrate of soda, 200 lbs. per acre	13	18	1840	40	20	1655	58	8	2870	55	10	3120	28	18	3660	39	8	2629
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	19	4	2350	41	6	2365	46	16	2990	38	6	2380	21	26	2740	33	18	2565
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	12	7	1985	36	16	2350	50	..	3190	47	2	4120	18	28	3590	32	31	3047
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	14	29	2565	41	6	2160	55	30	3200	35	10	2160	17	22	2140	32	33	2445
9	Mineral superphosphate, No. 1, 500 lbs.	13	33	2525	32	32	1940	41	6	2350	29	14	1920	18	8	1840	27	5	2115
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	13	8	2150	37	32	2035	55	10	2990	43	18	3480	13	28	3730	32	26	2877
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	12	32	2060	32	32	1760	42	12	2620	37	22	2540	23	18	2510	29	30	2298
12	Unmanured	12	22	2770	26	16	1080	33	18	2150	26	16	1500	15	30	1280	23	..	1756
13	Bone, finely ground, 500 lbs. per acre	11	26	2000	27	32	1555	37	22	2210	33	18	1960	18	28	2060	25	32	1957
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	15	1	2090	31	6	1555	38	8	1260	30	..	2340	17	2	1850	26	17	1819
15	Nitrate of soda, 200 lbs. per acre	15	5	1785	31	21	1845	44	..	3050	60	20	1700	19	14	3140	34	5	2304

16	Muriate of potash, 150 lbs. per acre....	11	16	3010	35	20	1950	37	22	2710	41	6	2060	24	4	2270	30	..	2400
17	Sulphate of ammonia, 300 lbs. per acre.	11	26	2700	34	27	2017	41	6	3050	48	8	4420	24	24	4000	32	5	3237
18	Sulphate of iron, 60 lbs. per acre.......	16	6	2450	32	32	1260	37	22	2750	44	4	2440	18	18	2220	29	30	2224
19	Common salt (sodium chloride) 300 lbs. per acre..........	15	10	2180	34	4	2020	30	20	2100	32	32	2340	24	4	2090	27	14	2146
20	Land plaster or gypsum (calcium sulphate), 300 lbs. per acre...	16	28	2930	31	6	1030	31	26	2200	37	22	2200	21	16	3190	27	26	2322
21	Mineral superphosphate No. 2, 500 lbs. per acre.	15	..	2290	23	23	1055	32	2	2480	42	12	2020	17	2	1980	26	1	1965

REMARKS.

It will be observed that the yields of barley throughout the five years during which these tests have been continued are much more even in character than those of the wheat or oats. This is no doubt due partly to the fact that the land devoted to these plots is more uniform throughout than that set apart for the wheat and oats, and partly for the reason that the roots of the barley plant being comparatively near the surface are more immediately influenced by the application of fertilizers. The plant also seems to be more robust. As in the case of the wheat, it will be seen that the season of 1891 was favourable for this crop.

OAT PLOTS.

The quantity of seed sown per acre on the oat plots was 2 bushels in 1889 and 1890, and $1\frac{1}{2}$ in 1891, 1892 and 1893. The variety chosen for sowing in 1889 was the Early English, but as that seemed to be very subject to rust, the Prize Cluster was substituted in 1890 and has been continued each year since. In 1889 the seed was sown 18th May, came up 25th May and was ripe 16th August. 1890, sown 26th April, came up 14th May, ripe 8th August. 1891, sown 9th May, came up 16th May, ripe 16th August. 1892, sown 6th May, came up 15th May, ripe 16th August. 1893, sown 27th May, came up 2nd June, and was ripe 15th August. The Early English oats required 90 days in 1889 from the date of sowing to that of ripening, while the experience of the four subsequent years gives 96 days as the average time required to bring the Prize Cluster to maturity.

REMARKS.

The yield of oats by the different plots for the five years during which these tests have been continued, will be found very variable. A comparison of the figures shows that the year 1891 was the most favourable one in the series when all the plots averaged over 41 bushels per acre. The seasons of 1890 and 1892 were also favourable: in the latter, the plots averaged about 40 bushels, and in the former nearly 35 bushels. In 1889 and 1893 the crops were much lighter.

CORN PLOTS.

In conducting the experiments with the plots of Indian corn the object has been to obtain the largest weight of well matured green fodder for the silo, and to have that fodder so far advanced that when the corn is cut the ears shall be in the "late milk" or "glazed" condition. It was decided to test two varieties each year, growing $\frac{1}{20}$ of an acre of each. At first a 'dent' corn, the Mammoth Southern Sweet was grown, with one of the flint sorts known as the Canada Yellow, and the cultivation of these two was continued during 1888, 1889 and 1890. In 1891 another 'dent' corn, the Red Cob Ensilage, was substituted for the Mammoth Southern Sweet, while the Rural Thoroughbred White Flint, one of the larger and stronger growing of the flint varieties replaced the Canada Yellow. Since neither of the dent sorts named attained to a sufficient degree of maturity to make good ensilage, another change was made in 1892, and two flint varieties grown, the Thoroughbred White Flint, and an earlier sort known as Pearce's Prolific. The stronger grower of the two sorts selected each year has been designated No. 1, and the less vigorous sort No. 2. The dent varieties all rank as No. 1, and in 1891 the Thoroughbred White Flint is classed as No. 2, but in the two following years this useful sort being a more vigorous grower than Pearce's Prolific, has found a place in the No. 1 series. For the first four years the No. 1 series was planted in drills 3 feet apart, using about 24 pounds of seed to the acre, and thinning the plants when up to 6 or 8 inches apart, and the No. 2 in hills 3 feet apart each way, 4 to 5 kernels in a hill. During the past two years both sorts have been grown in hills.

In 1888 they were planted June 7th, came up June 13th, and harvested September 12th. 1889, planted May 23rd, came up June 4th, harvested September 12th. 1890, planted May 21st, came up May 31st, harvested September 8th. 1891, planted May 21st, came up May 31st, harvested September 22nd. 1892, planted May 23rd, came up June 3rd, harvested September 17th. 1893, planted June 9th, came up June 19th, harvested October 3rd.

REMARKS.

The yields of corn for the several years are quite variable, the better crops having been realized in 1889-1890 and 1891. In 1889 the entire series of plots under No. 1 averaged 18 tons, 1895 lbs, and those under No. 2, 10 tons, 1503 lbs; in 1890 No. 1 plots 15 tons, 728 lbs; No. 2, 10 tons, 1528 lbs., and in 1891 the No. 1 plots gave an average return of 16 tons, 1265 lbs., and the No. 2 plots 11 tons, 816 lbs. An anomalous result appears in the yield of plot 1 as compared with plot 2 for 1891. The yield of plot 1 on which well rotted manure is used was for that year at the rate of 15 tons 1,440 lbs. per acre, whereas the yield from plot 2 where the same weight of fresh manure is used was 33 tons and 20 lbs. The advantage if any in using fresh manure would be quite insufficient to account for this difference. On several occasions individual plots have been injured and the yield much lessened by the young plants being eaten off by cutworms, and as this plot is the outer one in the series, it would be specially liable to such depredations; although it has escaped record, it is quite probable that the short crop in this instance has resulted mainly from that cause. The yield from plot 4 to which 500 lbs per acre of finely ground untreated, mineral phosphate have been applied each year has in most instances been less than the crop from No. 3, the adjoining unmanured plot: this has resulted from a part of plot 4 lying comparatively low, and as a consequence the corn suffers in wet seasons. Plots 18, 19 and 20 have given comparatively poor returns for several years past. On these the soil is heavier and colder than on the other plots and not so suitable for corn, particularly in wet seasons.

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under so that the fertilizing constituents they have taken from the soil might be returned to it, one-half of each $\frac{1}{10}$ acre plot in the series has been devoted to mangels and the other half to turnips. The varieties in each case have been changed from time to time and sometimes several varieties have been used on the same plot. In 1889 the variety of mangel chosen was the Mammoth Long Red, while on the half of the plot devoted to turnips two varieties were used mentioned in the table as Nos. 1 and 2, 28 rows being sown with Carter's Prize Winner and 2 rows with Carter's Queen of Swedes. In 1890 three varieties of mangels were sown, 14 rows with Mammoth Long Red, 5 with Mammoth Long Yellow, and 5 rows with Golden intermediate. These are designated in the table as Nos. 1, 2 and 3. Carter's Elephant Swede was selected that year for the turnip plot. In 1891 three varieties of mangels were used and six of turnips. The mangels consisted of 18 rows of Mammoth Long Red, 3 of Yellow Fleshed Tankard and 6 rows of Golden Tankard. The turnips were 6 rows of Lord Derby Swede, 4 New Giant King, 3 Imperial Swede, 6 Champion Swede, 4 Purple Top Swede, and 4 rows of East Lothian Swede. In the table the mangels are referred to as Nos. 1, 2 and 3. and the turnips as Nos. 1, 2, 3, 4, 5 and 6. In 1892 and 1893, the Mammoth Long Red was used alone in the division for mangels while the variety of turnip chosen for 1892 was the Improved Purple Top Swede, and in 1893 the Prize Purple Top Swede. The season of 1889 gave the largest returns both for mangels and turnips: the crops in 1890 and 1892 were also fair; while those of 1891 and 1893 were very poor. In the first year of the course the mangel division of plots 11 and 13 suffered from imperfect drainage and during

EXPERIMENTS with Fertilizers, on plots of Indian Corn, $\frac{1}{10}$th acre each, cut green for Ensilage.

No. of Plot.	Manure applied each year.	1st Season, 1888.				2nd Season, 1889.				3rd Season, 1890.				4th Season, 1891.				5th Season, 1892.				6th Season, 1893.				Average for the whole period.			
		½ Plot No. 1—Mam. Southern Sweet, weight of green fodder.		½ Plot No. 2—Canada Yellow, weight of green fodder.		½ Plot No. 1—Mam. Southern Sweet, weight of green fodder.		½ Plot No. 2—Canada Yellow, weight of green fodder.		½ Plot No. 1—Mam. Southern Sweet, weight of green fodder.		½ Plot No. 2—Canada Yellow, weight of green fodder.		½ Plot No. 1—Red Cob Ensilage, weight of green fodder.		½ Plot No. 2—Thoroughbred White Flint, w. of green fodder.		½ Plot No. 1—Thoroughbred White Flint, w. of green fodder.		½ Plot No. 2—Pearce's Prolific, weight of green fodder.		½ Plot No. 1—Thoroughbred White Flint, w. of green fodder.		½ Plot No. 2—Pearce's Prolific, weight of green fodder.		No. 1—Weight of green fodder.		No. 2—Weight of green fodder.	
		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Barn-yard manure, well rotted, 12 tons per acre...	14	500	13	500	19	1200	9	1320	20	1900	15	1600	15	1440	13	700	15	760	13	700	10	400	7	1460	16	34	12	380
2	Barn-yard manure, fresh, 12 tons per acre...	13	1420	14	960	22	400	11	1520	22	445	14	1220	33	20	14	660	15	820	9	140	12	1320	6	1380	19	1737	11	1647
3	Unmanured...	10	1100	11	120	10	1660	6	1120	15	320	10	1370	13	300	8	360	10	420	4	1040	6	1320	3	440	11	187	7	741
4	Mineral phosphate untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre each year since..	12	1360	9	1720	14	1200	6	1780	12	170	6	1100	9	1260	6	1120	5	1740	4	320	3	660	2	1580	9	1398	6	270
5	Mineral phosphate, untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre, each year since; nitrate of soda, 200 lbs. per acre....	13	360	13	420	17	600	9	40	12	120	12	760	19	1460	9	900	12	880	5	680	6	880	5	940	13	1050	9	290
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using...	14	500	14	1800	23	1200	11	1880	19	240	14	120	24	1820	17	820	15	1620	8	140	12	300	8	1160	18	613	12	987
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre...	14	200	14	640	21	1200	11	1280	15	1280	11	1060	23	120	11	1620	15	980	8	540	11	20	8	800	16	1633	10	1990
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre...	13	1540	14	1040	18	1300	10	460	15	1330	8	170	14	780	10	40	9	1720	7	400	8	1300	5	1280	13	828	9	565
9	Mineral superphosphate No. 1, 500 lbs. per acre...	14	1000	14	480	19	500	11	340	11	1840	10	1400	13	980	9	1300	10	360	6	660	6	1600	5	1800	12	1380	9	133

10	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre.	13 50	13 940	20 1800	12 800	18 1780	11 940	15 620	15 1460	13 560	7 1500	12 900	7 100	15 1285	11 623
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	15 1180	16 680	22 1400	11 1420	20 1710	15 250	18 1920	16 1220	14 20	9 1400	12 860	9 400	17 848	13 228
12	Unmanured	13 1340	17 40	18 650	14 180	15 1620	10 340	12 1980	10 1860	8 1840	6 1340	7 1840	4 1680	12 1878	10 1240
13	Bone, finely ground, 500 lbs. per acre.	13	17 1220	19 800	10 60	13 480	10 580	15 1340	7 1920	9 660	7 360	8 260	5 1180	13 257	9 1553
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	14 1080	15 380	18 1100	10 340	14 1820	9 40	16 1480	10 1480	8 1240	6 1480	8 60	5 600	13 1130	9 1053
15	Nitrate of soda, 200 lbs. per acre......	13 480	15 1620	21 1000	11 1800	15 1120	13 210	17 1540	13 820	12 1120	7 1500	10 660	5 1860	15 320	11 635
16	Sulphate of ammonia, 300 lbs. per acre.	14 320	15 380	20 800	13 20	15 830	12 1000	19 660	13 480	11 1460	6 1500	10 200	6 420	15 428	11 300
17	Mineral superphosphate No. 1, 600 lbs.; muriate of potash, 200 lbs.; sulphate of ammonia, 150 lbs. per acre	No crop taken in 1888.	No crop taken in 1888.	16 600	9 860	16 600	11 840	17 860	13 1820	10 820	8 480	10 1960	5 1760	14 568	9 1552
18	Muriate of potash, 300 lbs. per acre...	"	"	16 200	9 1660	12 720	6 660	12 980	7 320	6 1760	5 80	5 760	4 360	10 1284	6 1016
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90; muriate of potash, 200 lbs., substituted each year since; dried blood, 300 lbs.; mineral superphosphate No. 1, 500 lbs. per acre	"	"	17 1800	10 1340	13 1240	9 1160	11 320	9 1740	9 1840	7 1660	10 120	5 760	12 1064	8 1332
20	Wood ashes, unleached, 1,900 lbs. per acre........	"	"	16 400	10 100	14 80	5 340	11 1560	9 1020	6 1400	6 1120	5 1760	5 460	10 1840	7 608
21	Bone, finely ground, 500 lbs.; sulphate of ammonia, 200 lbs.; muriate of potash, 200 lbs. per acre...........	"	"	20 00	13 1240	16 1650	7 1925	12 1140	9 1480	9 650	7 520	8 1200	5 1700	13 928	8 1773

EXPERIMENTS with Fertilizers on Roots; Plots of Mangels and Turnips, $\frac{1}{10}$ acre each.

No. of Plot.	Manure applied each Year.	1st Season, 1889.				2nd Season, 1890.				3rd Season, 1891.				4th Season, 1892.				5th Season, 1893.				Average for the whole Period.			
		West ½ Plot.		East ½ Plot.		East ½ Plot.		West ½ Plot.		West ½ Plot.		East ½ Plot.		East ½ Plot.		West ½ Plot.		West ½ Plot.		East ½ Plot.					
		Mangels, Mammoth Long Red—weight of roots.		Turnips, 2 varieties, Nos. 1 and 2—weight of roots.		Mangels, 3 varieties, Nos. 1, 2, 3—weight of roots.		Turnips, Carter's Elephant Swede—weight of roots.		Mangels, 3 varieties, Nos. 1, 2, 3—weight of roots.		Turnips, 6 varieties, Nos. 1, 2, 3, 4, 5, 6—weight of roots.		Mangels, Mammoth Long Red—weight of roots.		Turnips, Improved Purple Top Swede—weight of roots.		Mangels, Mammoth Long Red—weight of roots.		Turnips, Prize Purple Top Swede—weight of roots.		Mangels—weight of roots.		Turnips—weight of roots.	
		Per acre		Per acre		Per acre		Per acre		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Barn-yard manure, well rotted, 20 tons per acre	19	340	16	1200	22	320	11	460	22	1220	9	1180	22	1900	9	1060	20	260	8	220	21	808	11	24
2	Barn-yard manure, fresh, 20 tons per ac.	17	1760	18	400	22	1740	12	580	21	1480	9	1100	21	200	13	1080	20	360	9	180	20	1508	12	1068
3	Unmanured..................	14	840	15	1000	11	780	5	160	6	1410	6	240	9	1020	6	580	7	360	2	1065	9	1682	7	209
4	Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre	13		13	1600	10	760	6	1600	5	1690	5	560	8	720	9	520	7	220	2	1520	8	1878	7	1160
5	Mineral phosphate, untreated, finely ground, 1,000 lbs.; nitrate of soda, 250 lbs.; wood ashes, unleached, 1,000 lbs. per acre	16	1560	13	1300	14	1660	5	920	10	1370	4	1350	12	1440	9	1760	11	460	1	1760	13	498	7	218
6	Barn-yard manure partly rotted and actively fermenting, 12 tons per acre; mineral phosphate, untreated, finely ground, 1,000 lbs. composted together, intimately mixed and allowed to heat for several days before using...	17	700	11	1800	19	1800	9	1580	19	1020	11	400	16	620	12	580	13	380	7	1720	17	504	10	1216
7	Mineral phosphate, untreated, finely ground, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, substituted by muriate of potash, 250 lbs. in 1891 and subsequent years; nitrate of soda, 200 lbs. per acre..........	16	1500	12	900	12	360	10	1820	7	1210	3	580	8	1620	10	540	7	245	2	245	10	987	7	1617

8	Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, substituted by muriate of potash, 250 lbs. in 1891 and subsequent years; nitrate of soda, 200 lbs. per acre	20	17 1300	15 1120	12 840	6 120	4 1360	17 60	10 1800	12 950	7 1150	14 450	10 1290
9	Mineral superphosphate, No. 1, 500 lbs. per acre	13 1600	13 600	9 780	9 400	8 1470	5 440	11 740	8 1460	5 1650	3 850	9 1648	7 1950
10	Nitrate of soda, 300 lbs. per acre......	14 400	15 1100	13 1940	9 440	10 1880	3 860	17 1340	9 1120	13 165	1 1190	13 1945	7 1742
11	Sulphate of ammonia, 300 lbs. per acre.	4 600	15 900	12 1440	11 1340	6 490	4 420	13 1060	9 1980	11 400	2 860	9 1200	8 1500
12	Unmanured........................	10 1900	14 1200	8 1000	10 1200	4 570	2 60	9 880	7 1340	3 1970	1 510	7 864	7 462
13	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre.	9 1800	12 1600	10 1540	12 520	6 840	2 890	12 120	6 1920	11 1640	2 580	10 388	7 702
14	Wood ashes, unleached, 2,000 lbs. per acre.	13 200	13 800	13 740	10 1760	10 1600	1 1700	13 60	9 660	9 1520	2 1790	11 1824	7 1342
15	Common salt (sodium chloride), 400 lbs. per acre	13 400	14	12 960	12 480	11 830	3 680	11 220	7 1640	7 770	1 1950	11 836	7 1750
16	Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per acre.	No crop	in 1889.	16 1400	20 320	12 830	6 1860	14 1000	8 840	12 680	3 1140	13 1977	9 1540
17	Mineral superphosphate, No. 1, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	"	"	17 260	18 680	9 130	6 540	12 500	7 1440	11 750	2 680	12 910	8 1335
18	Mineral superphosphate No. 1, 500 lbs.; muriate of potash, 200 lbs. per acre..	"	"	17 700	18 1360	11 1190	7 500	12 800	9 1140	10 1960	4 990	13 162	9 1997
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890; muriate of potash, 200 lbs., substituted each year since; dried blood, 250 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre......	"	"	18 1220	17 1960	11 1450	5 640	13 1600	9 600	13 1210	5 230	14 870	9 857
20	Wood ashes, unleached, 1,500 lbs.; common salt (sodium chloride), 300 lbs. per acre	"	"	17 40	18 880	15 350	6 1210	15 1500	9 420	12 580	4 70	15 117	9 1115
21	Mineral superphosphate, No. 2, 500 lbs. per acre.......	"	"	20 1680	17 1180	15 1870	5 1600	14 1720	9 800	14 370	5 1890	16 910	9 1397

the past three years the crop of turnips has been much diminished by the attack of a species of rot which has affected the roots when partly grown and resulted in rapid decay. This disease has been common on many farms in the Ottawa district, and no remedy has yet been discovered for it. It was hoped that change of seed might affect the crop favourably, but this seems to have no appreciable effect. During the past wet season the yield has been greatly reduced from this cause. From 4 to 6 lbs. of mangel seed and 6 lbs. of turnip seed is the quantity which has been used per acre each year, and both have been sown in rows 2½ feet apart. The treatment of the land has been as follows: Ploughed in the autumn after the crop is gathered, disc-harrowed once in the spring, harrowed with smoothing harrow once, then ridged and sown. The land used for the turnips, which are usually sown later than the mangels, is allowed to stand after disc-harrowing, then cultivated once and ridged immediately before sowing. In 1889 the mangels were sown May 23rd, came up June 2nd and were pulled October 13th. The turnips were sown May 23rd, came up May 30th, were pulled October 14th. In 1890 mangels were sown May 21st, came up May 30th and were pulled October 15th. The dates of the sowing and coming up of the turnips for this year have been lost, but they were pulled October 16th. In 1891 mangels were sown May 16th, came up May 27th, pulled October 16th. Turnips were sown June 6th, came up June 11th, were pulled October 19th. In 1892, mangels were sown May 14th, came up May 24th and were pulled October 19th. Turnips were sown June 11th, came up June 16th, were pulled October 29th. In 1893, mangels were sown May 31st, came up June 7th, were pulled October 21st. Turnips were sown June 15th, came up June 20th and were pulled October 21st.

PLOTS OF CARROTS AND SUGAR-BEETS.

The plots of carrots and sugar-beets, consisting of $\frac{1}{20}$ acre each, were sown on alternate halves of the wheat, barley and oat plots for the purpose of cleaning the land from weeds. They were begun in 1891 and have been continued to the present. The plots after wheat and oats have been sown with a field carrot known as the Improved Short White. The plots after barley were sown in 1891 with 11 varieties of sugar-beet as stated in the table. The varieties were Dippe's Klein Wanzleben 4 rows, Bulteau Desprez 4 rows, Vaurica Yellow Giant 2 rows, Vilmorin's No. 1, 4 rows, Large Sugar 4 rows, Klein Wanzleben 4 rows, Vilmorin's Improved White 2 rows, Green Necked Brabant 2 rows, Vilmorins No. 2, 4 rows and 8 rows each of seed sent for test by Mr. A. Musy, of the Farnham Beet Sugar Factory designated I. B. and C. H. In 1892 the plots after barley were sown with the Guerande or ox-heart carrot and in 1893 with the Mammoth White Intermediate, a field carrot recently introduced. In 1891 the sugar-beets were sown 11th May, came up 26th May and were pulled 18th October. The carrots grown after wheat and oats, were sown 11th May came up 26th May and were pulled 29th October. In 1892 the carrots grown after barley were sown 11th May came up 26th May and were pulled 29th October; those after wheat were sown 6th May came up 20th May were pulled 31st October, and those after oats sown 6th May came up 20th May and were pulled 3rd November. In 1893 the carrots grown after barley were sown 30th May came up 7th June and were pulled 23rd October; those after wheat and oats were sown 30th May came up 6th June and were pulled 23rd and 24th October.

These plots have given fairly uniform returns varying but slightly from what might have been expected from the fertilizers used. The sugar-beets on several of the plots in 1891 were partly destroyed by cut-worms which will account for unexpected variations in yields that year. The carrots after oats also suffered similar injury that season. On plots 18, 19, 20 and 21 after oats, the soil is heavier than on the other plots and less suitable for carrots which will in part account for the relatively smaller yield on these plots as compared with those after wheat.

EXPERIMENTS with Fertilizers on Half-Plots of Carrots and Sugar Beets, $\frac{1}{20}$ acre, after Wheat, Barley and Oats.

No. of Plot.	Manure applied each Year.	1st Season, 1891.						2nd Season, 1892.						3rd Season, 1893.						Average Yield of Carrots.			
		East ½ Plot.		West ½ Plot.		East ½ Plot.		West ½ Plot.		East ½ Plot.		West ½ Plot.		East ½ Plot.		West ½ Plot.		East ½ Plot.		Improved Short White for three years.			
		Carrots, Improved Short White, after wheat—yield of roots.		Sugar Beets, 11 varieties, after barley—yield of roots.		Carrots, Improved Short White, after oats—yield of roots.		Carrots, Improved Short White, after wheat—yield of roots.		Carrots, Guerande or Ox-Heart, after barley—yield of roots.		Carrots, Improved Short White, after oats—yield of roots.		Carrots, Improved Short White, after wheat—yield of roots.		Carrots, Mam. White, Intermediate, after barley—yield of roots.		Carrots, Improved Short White, after oats—yield of roots.		After wheat—yield of roots.		After oats—yield of roots.	
		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	27	600	18	1390	23	1600	20	940	16	1800	20	940	19	80	21	200	15	850	22	1207	19	1797
2	Barn-yard manure, fresh, 15 tons per acre.	29	600	17	1120	26	1300	21	900	16	1660	19	640	20	550	20	90	16	1230	24	17	20	1723
3	Unmanured	22	....	8	870	15	500	14	1280	12	1080	12	180	15	40	14	1940	10	280	17	440	12	987
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	21	1600	7	130	16	900	14	1400	12	1820	12	1060	14	1570	12	630	9	1850	17	190	12	1937
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	25	1020	13	1540	20	1400	16	1240	14	1880	15	1240	17	10	15	1500	12	1870	19	1423	16	833
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	31	600	16	1840	28	800	18	1400	16	1980	18	1940	18	1720	21	1050	13	120	22	1907	20	287
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	18	1000	11	1190	24	200	17	440	15	1060	18	200	14	1830	15	1900	15	660	16	1757	19	353
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	11	800	9	360	19	400	15	1440	14	40	16	1900	12	1680	15	1300	12	820	13	640	16	373
9	Mineral superphosphate, No. 1, 500 lbs. per acre	10	600	11	900	17	1500	15	1640	15	1780	15	80	11	390	16	270	9	740	12	877	14	107
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. p. a.	21	800	13	1440	15	460	18	440	13	1740	14	580	13	390	18	330	12	280	14	543	13	1773
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	25	1800	13	120	6	1940	19	1300	17	1320	12	1880	15	330	17	170	12	1150	20	477	10	990
12	Unmanured	23	600	8	510	6	1900	14	1600	11	400	10	1200	14	1870	13	960	7	550	17	1357	8	550
13	Bone, finely ground, 500 lbs. per acre	21	1000	8	400	6	700	16	1820	10	1960	11	340	16	500	14	1910	8	1490	18	440	8	1510
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. p. ac.	24	800	10	1630	13	..	20	1980	14	500	15	....	19	1330	17	1310	16	950	21	1370	13	1650
15	Nitrate of soda, 200 lbs per acre	22	400	15	555	19	1800	20	620	13	1860	20	20	18	170	14	580	17	500	20	397	19	107
16	Muriate of potash, 150 lbs. per acre	22	1400	8	1460	17	....	18	80	14	800	20	1280	18	1990	17	1500	15	1260	19	1823	17	1513
17	Sulphate of ammonia, 300 lbs. per acre	16	700	11	40	12	800	15	1220	12	1700	18	960	12	1430	15	750	13	760	14	1783	15	173
18	Sulphate of iron, 60 lbs. per acre	19	1000	10	1760	15	260	13	1900	9	1740	13	1720	14	740	16	250	11	380	15	1884	13	787
19	Common salt (sodium chloride), 300 lbs. per acre	20	1600	12	1580	17	260	15	1740	13	1440	18	620	14	870	15	1560	15	280	17	70	17	53
20	Land plaster or gypsum (calcium sulphate), 300 lbs. per acre	20	1200	11	295	18	460	18	1180	12	1680	19	1600	14	720	18	1790	13	870	17	1700	17	310
21	Mineral superphosphate, No. 2, 500 lbs. per acre	21	200	10	1895	17	800	14	1240	13	720	18	1260	12	1580	17	210	11	1950	15	340	16	3

GENERAL CONSIDERATIONS.

While a period of six years in the testing of the effects of manures on crops is altogether too short to permit of drawing positive conclusions on any point, yet when a considerable degree of uniformity is found in the results throughout the series they may justify an experimenter in calling special attention to them.

The results obtained from plots 1 and 2 throughout the whole series in uniformly large average returns serves to confirm the correctness of the view generally held as to the beneficial action of barn-yard manure. It is, however, worthy of note in this connection, that in its application to wheat, barley and oats, manure used fresh from the barn has produced a higher average of grain than an equal weight of manure which has been well rotted. In the barley plots the fresh manure also gives a heavier weight of straw, while in the oat and wheat plots the advantage, as far as the crop of straw is concerned, is slightly in favour of the rotted manure. On the corn plots the fresh manure has given much the heavier crops on the No. 1 series, while the rotted manure has a slight advantage in No. 2. In the case of the roots the advantage is on the side of the rotted manure with the mangels, with the sugar beets grown in 1891, and with the carrots after barley in 1892; but the fresh manure gives the larger returns with the turnips, also with all the crops of carrots after wheat and oats and with the carrots after barley in 1893. These facts when carefully compared indicate a considerable advantage thus far in the use of fresh manure over that of rotted weight for weight, which is a most important point in the economy of manures, since, during the process of rotting, mannure loses about 40 per cent of its weight, and to this loss must be added the cost of twice handling, and usually that of turning once or twice during the process of fermentation. The explanation of this rather unlooked for result, probably lies in the fact that the liquid portions of the manure, the richest in nitrogen, have much of their most valuable constituent volatilized and lost during the process of rotting.

The unmanured plots, Nos. 3 and 12, show fairly uniform results throughout, the slight differences being easily explained by variation in soil.

The crops given by plot 4 in all the series seem to show that mineral phosphate untreated no matter how finely ground has little or no effect as a fertilizer, and that the effects observable where nitrate of soda and wood ashes are used in conjunction with the untreated mineral phosphate are probably due entirely to the action of these added fertilizers. There is however no doubt that the mineral phosphate when treated with sulphuric acid and rendered soluble by being changed to the superphosphate is a most valuable addition to the fertilizing constituents of the soil.

It would appear that, when the finely ground mineral phosphate is intimately mixed with barn-yard manure in an active state of fermentation and composted for several days, better results are obtained than would be expected from the proportion of manure used and it is probable that under these circumstances some portion of the mineral phosphate is rendered soluble by the action of the ferments in the decaying manure.

The addition of highly nitrogenous fertilizers, such as nitrate of soda and sulphate of ammonia, while usually producing a fair increase in the weight of grain, has a more marked effect on the weight of straw, which is increased very considerably.

It is somewhat singular that the inferior quality of superphosphate of lime known as No. 2 has given in nearly all the tests better average results than have been obtained from the use of the more costly No. 1 quality: no explanation can yet be offered for this unlooked for result.

The experiments with the use of common salt alone, and land plaster or gypsum alone, have resulted in better average yields than was expected. These results are most probably due in large measure to the influence which both these substances exert in liberating potash in the soil, by reducing insoluble potash compounds to soluble forms and also of influencing the texture of the soil so as to enable it to retain more moisture. The use of salt alone seems to be specially beneficial to the barley crop. The tests made with sulphate of iron on grain crops have also given better results on the average than was looked for.

Some of the less favourable results obtained from the use of artificial fertilizers which from the nature of their constituents are known as complete fertilizers are unexpected and disappointing and cannot at present be explained. In all probability the experience of a few more years will throw further light on the subject.

DISTRIBUTION OF SEED GRAIN.

This useful department of the work of the experimental farms has demanded increased attention during the past year in consequence of the very large number of applications which have been received from all parts of the Dominion. This gratifying appreciation of the value of this distribution of useful varieties of seed grain, while manifest in most of the provinces has been most marked in the province of Quebec. 11,113 samples of 3 lbs. each were sent to this province, an increase of 2,596 over last year, and there still remained at the close of the distribution two or three thousand applications which had been received late and which could not be supplied, as the available stock of good grain was exhausted. To nearly all the provinces of the Dominion the number of samples sent from Ottawa in 1893 was in excess of any previous year. There was a slight falling off in the number sent to the North-west Territories, also to British Columbia. This apparent deficiency has been partly if not wholly made up by the larger quantity of samples sent to farmers direct from the experimental farms in the North-west Territories and British Columbia. At all the branch farms a distribution of such samples now takes place annually to the great satisfaction of the farmers in the provinces and territories where these institutions are located. It is highly desirable that all applications for samples of seed grain should be made as early in the year as practicable, if delayed there is much greater difficulty in meeting the wishes of applicants. The distribution consists mainly of samples of the principal cereals and not more than two are sent to any one applicant. No seeds of field roots, garden vegetables or flowers are supplied.

The samples sent out during the early months of 1893 were distributed as follows:—

Prince Edward Island.

Oats	150
Barley	133
Wheat	131
Pease	21
Indian corn	67
Potatoes	17
	519

Number of applicants supplied 281.

Nova Scotia.

Oats	486
Barley	460
Wheat	254
Pease	65
Indian corn	278
Potatoes	81
	1,624

Number of applicants supplied 860.

New Brunswick.

Oats	476
Barley	425
Wheat	351
Pease	154
Indian corn	353
Potatoes	55
	1,814

Number of applicants supplied 1,024.

Ontario.

Oats	1,516
Wheat	956
Barley	940
Pease	476
Potatoes	289
Indian corn	283
	4,460

Number of applicants supplied 2,261.

Quebec.

Barley	3,338
Oats	2,809
Wheat	2,663
Pease	620
Indian corn	1,385
Potatoes	298
	11,113

Number of applicants supplied 6,416.

Manitoba.

Oats	267
Wheat	183
Barley	179
Pease	84
Indian corn	176
Potatoes	19
	908

Number of applicants supplied 507.

North-west Territories.

Oats	256
Barley	167
Wheat	148
Pease	69
Indian corn	75
Potatoes	26
	741

Number of applicants supplied 382.

British Columbia.

Oats	71
Wheat	58
Barley	44
Pease	20
Indian corn	5
	198

Number of applicants supplied 100.

The following list shows the number of three-pound packages of the different varieties which have been distributed:—

Oats.

Banner	2,471
Prize Cluster	1,454
White Wonder	787
Holstein Prolific	702
Improved Ligowo	345
Abundance	161
Rosedale	111
	6,031

Barley—Two-rowed.

Duck-bill	1,594
Kinver Chevalier	1,142
Danish Chevalier	733
Prize Prolific	672
Goldthorpe	547
Canadian Thorpe	249
	4,937

Barley—Six-rowed.

Baxter's Six-rowed	505
Rennie's Improved	199
Oderbruch	45
	749

Wheat.

Campbell's White Chaff	1,813
Ladoga	1,005
Red Fife	695
White Fife	361
White Connell	311
Rio Grande	292
Campbell's Triumph	149
Red Fern	118
	4,744

Pease.

Mummy	1,509

Indian Corn.

Rural Thoroughbred White Flint	773
Pearce's Prolific	722
Longfellow	716
North Dakota	411
	2,622

Potatoes.

Thorburn	257
Lee's Favourite	241
Early Ohio	171
Wonder of the World	74
Beauty of Hebron	42
	785

Total number of samples distributed	21,377
Number of applicants supplied	11,831

Since it has been found necessary to close the operations to be reported on for this year earlier than in the past, so that the annual report might be prepared and distributed in good season, the usual summary of the reports received from those to whom the samples were sent is necessarily omitted.

TESTING THE VITALITY OF GRAIN AND OTHER SEEDS.

During the past season the vitality of 1,957 samples of seed grain and agricultural seeds has been tested at the Central Experimental Farm and reported on. These have been received from almost every part of the Dominion and the results have conveyed to the farmers, who have sent them for test, much useful information. As will be seen in the appended table the 613 samples of wheat tested have varied much, from those perfect in germinating proportion to such as had entirely lost the power of germinating. The 383 samples of barley have varied in vitality from 100 to 22 per cent, and the 744 samples of oats tested from 100 to as low as 4 per cent. The average vitality of all the samples is a little below the average of last year.

The season of 1893 has in many sections been unfavourable for the perfect development of grain, and in some districts very wet weather occurred preceding and during harvest time, causing discolouration of the grain and in some instances mouldiness and sprouting in the field. It is important that farmers residing in districts where the conditions have been unfavourable should forward for test such samples concerning which any doubts as to vitality and usefulness for seed may exist. Samples sent for testing should not weigh less than one ounce, they can be sent to the Central Experimental Farm, at Ottawa, free through the mail, and in order that the returns may all be made before the time of seeding arrives they should be forwarded as early as practicable.

RESULTS of Tests for 1892–93.

Kind of Seeds.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	613	100·0	0·0	70·6	11·2	81·8
Barley	383	100·0	22·0	61·8	23·1	84·9
Oats	744	100·0	4·0	82·6	10·4	93·0
Rye	8	95·0	79·0	....	....	88·6
Pease	35	100·0	12·0	....	....	65·7
Corn	22	100·0	6·0	....	....	70·9
Clover	6	81·0	10·0	....	....	61·3
Grass	5	91·0	23·0	....	....	54·2
Beans	5	96·0	64·0	....	....	78·4
Sunflowers	9	96·0	78·0	....	....	85·8
Turnips	14	96·0	35·0	....	....	73·0
Mangels	5	84·0	14·0	....	....	32·4
Beets	6	46·0	28·0	....	....	37·0
Carrots	11	52·0	8·0	....	....	31·3
Cabbage	13	94·0	21·0	....	....	76·2
Cauliflower	3	82·0	61·0	....	....	69·0
Onions	7	88·0	15·0	....	....	53·5
Tomatoes	11	76·0	9·0	....	....	49·1
Radish	9	80·0	8·0	....	....	43·5
Parsnips	4	56·0	0·0	....	....	22·5
Celery	6	65·0	25·0	....	....	42·6
Pepper	3	53·0	1·0	....	....	23·6
Lettuce	2	89·0	82·0	....	....	85·5
Spinach	2	38·0	28·0	....	....	33·0
Cucumber	6	56·0	0·0	....	....	30·0
Musk melon	2	32·0	28·0	....	....	30·0
Water melon	2	36·0	10·0	....	....	23·0
Flax	2	90·0	59·0	....	....	74·5
Thyme	2	15·0	0·0	....	....	7·5
Sweet marjoram	2	12·0	12·0	....	....	12·0
Sage	2	47·0	0·0	....	....	23·5
Summer savory	2	33·0	0·0	....	....	16·5
Tobacco	1	....	....	....	....	66·0
Pumpkins	1	....	....	....	....	4·0
Leek	1	....	....	....	....	6·0
Endive	1	....	....	....	....	54·0
Tares	1	....	....	....	....	97·0
Asparagus	2	....	....	....	....	0·0
Tree seeds	4	....	....	....	....	0·0
Total tumber of samples tested, highest and lowest percentage and average vitality	1,957	100·0	0·0	....	....	83·8

EXPERIMENTS WITH FALL WHEAT.

During the past season twelve varieties of fall wheat have been tested varying in size from about $\frac{1}{20}$th to $\frac{1}{2}$ acre. The land on which they were sown was a sandy loam of medium quality. It received a fair coat of barn-yard manure in the spring of 1892, was lightly ploughed to cover the manure and sown with oats. After the oats were harvested the land was immediately gang ploughed to start shed grain and weed seeds and ploughed again and harrowed in September before the wheats were sown. The plots were all sown on September 9th, and the results are given in the appended table.

Name of variety,	Length of straw.	Character of straw.	Length of head.	Kind of head.	Date of ripening.	Yield per acre.	Weight per bushel.	Proportion rusted.
	Inches.		Inches.			Bush. lbs.		
Manchester......	40 to 45	Stiff......	2½ to 3½	Beardless	July 24...	24 03	57¾	Considerably.
Early Red Clawson	35 to 40	do	3 to 3½	do ..	do 24...	20 38	58¼	do
Martin's Amber...	40 to 43	do	2½ to 3½	do ..	do 24...	18 37	58½	Badly.
Jones' Winter Fife.	46 to 48	do	3 to 3½	do ..	do 24...	18 36	54	do
Robert's (Carman's No. 3)	40 to 42	do	3 to 3½	Bearded..	do 22...	18 33	55¾	do
Willit's (Carman's No. 2)	42 to 45	do	3 to 3½	Beardless.	do 24...	17 42	53¼	do
Democrat.........	46 to 48	Fair......	3 to 3½	Bearded..	do 24...	17 23	56½	do
Johnson (Carman's No. 55)...... ...	40 to 42	do	3 to 3¼	do ..	do 24...	16 50	53	do
Stewart (Carman's No. 51).........	45 to 48	Stiff.....	3 to 3½	do ..	do 24...	16 50	54	do
Tasmania	40 to 42	Fair.....	3 to 3½	do ..	do 22...	15 26	58	V'ry badly
Golden Cross......	40 to 42	do	3 to 3¼	do ..	do 22...	14 34	58¾	do
Welds No. 4.....	40 to 45	do	3½ to 4	do ..	do 24...	12 42	56¼	do

EXPERIMENTS WITH SPRING WHEAT $\frac{1}{20}$TH ACRE PLOTS.

There were tested during 1893, thirty-two varieties of spring wheat. These were sown on clay loam, the previous crop was hay. The land was ploughed in the summer of 1892, shortly after the removal of the hay crop, ploughed a second time late in the autumn and gang ploughed and harrowed in the spring before sowing. It was intended to sow all the plots the same day, but owing to unfavourable weather this was found to be impracticable, a part were sown on May 26th and part on the 27th. The particulars of growth will be found in the appended table, and it will be observed that the yield of most sorts was unusually light, a result brought about mainly by rust, from which all varieties suffered. Rust first appeared on the leaves of the spring wheat during the second week in July, and gradually spread to the stems, and by the end of the month it showed itself in a very marked degree, the earlier ripening varieties being most affected. About the middle of August the earlier sorts were cut, but in every instance the yield was poor and the grain was small and did not reach its usual condition of maturity. The harvest weather was also bad and rain fell on an average every second day during August and the first week of September, the total rainfall during this period being over nine inches. Under such conditions it was impossible to save the crop satisfactorily, and after it was cut it was several weeks before it could be dried and housed. In the meantime it was found necessary to untie and spread the sheaves and tie again several times, and with so much handling much of the grain was unavoidably shed; on this account the comparison of varieties as to yield and quality is not of much value this year.

TEST OF VARIETIES OF WHEAT SOWN MAY 26TH AND 27TH.

Name of variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Date of Ripening.	Number of days Maturing.	Yield per Acre.	Weight per Bushel.	Proportion Rusted.
	Inches.		Inches.				Bus. lbs.		
Herison's Bearded	36 to 42	Stiff	1¼ to 2	Bearded	Aug. 23	89	25 00	56	Considerably.
Preston	42 to 46	do	2½ to 3½	do	do 22	88	20 20	57¾	do
Dions (resembles Red Fern)	46 to 48	Fair	3 to 4	do	do 30	95	18 00	58¾	Slightly.
Pringle's Champlain	42 to 51	do	3 to 4	do	do 26	91	17 40	54¾	Badly.
Wellman's Fife	36 to 52	Stiff	2¾ to 3¾	Beardless	do 28	93	16 02	55¼	Considerably.
Crown	42 to 48	do	2¾ to 3½	Bearded	do 23	88	16 00	55¾	do
Red Fife	40 to 48	do	2½ to 3	Beardless	do 28	94	14 20	55	do
Beaudry	36 to 42	Fair	2½ to 3	Bearded	do 23	88	14 20	58	do
Stanley	43 to 48	Stiff	2½ to 3½	Beardless	do 22	88	13 50	56¼	do
Red Fern	47 to 52	Fair	3 to 4	Bearded	do 30	95	13 40	55¾	do
Alpha	42 to 48	Stiff	2½ to 3½	Beardless	do 23	89	13 20	57	do
White Russian	42 to 49	Fair	2¾ to 3¼	do	do 23	88	13 00	53	do
White Fife	36 to 44	Stiff	2½ to 3½	do	do 28	93	12 30	55	do
Ottawa	36 to 44	Fair	2¾ to 3½	Bearded	do 15	80	11 40	50¼	Badly.
Abundance	41 to 46	do	2½ to 3¼	do	do 17	82	10 40	53	do
Rio Grande	46 to 53	Stiff	3 to 4	do	do 31	96	10 20	53¾	do
Black Sea	36 to 45	Fair	2½ to 3½	do	do 15	80	10 20	51	do
Albert	36 to 48	do	2¾ to 3½	do	do 15	81	10 00	50	do
Ladoga	36 to 45	do	2¼ to 3¼	do	do 16	81	9 40	50	do
Hungarian Mountain	36 to 42	Stiff	2¾ to 3½	Beardless	do 28	94	9 40	51¼	do
Huestons	38 to 48	Fair	3 to 4	do	do 25	91	9 30	47¾	do
Great Western	40 to 52	Stiff	3 to 4	Bearded	do 31	96	9 10	50	do
Prince	36 to 45	Fair	2¾ to 3½	do	do 15	80	8 50	51	do
Carleton	36 to 45	do	2¾ to 3½	do	do 15	80	8 40	59¾	do
Beta	40 to 45	do	2½ to 3¼	do	do 19	84	8 20	52	do
Manitou (not distinguishable from Red Fife)	42 to 48	Stiff	3 to 4	Beardless	do 28	93	7 40	49¼	do
White Chaff	36 to 45	Fair	2½ to 3	do	do 20	85	7 00	48	do
Colorado	36 to 47	Weak	2½ to 3¼	Bearded	do 19	85	6 20	57	Very badly.
Azima, Russian	33 to 48	do	3 to 4¼	do	Sept. 1	98	5 30	52¼	Badly.
White Connell	40 to 48	Fair	2½ to 3	Beardless	Aug. 27	93	5 27	44	do

FIELD CROPS OF SPRING WHEAT.

Rio Grande.—Soil part sandy loam and part clay loam. The previous crop was barley on the sandy loam, and corn on the clay. The land was ploughed in the autumn of 1892, disc harrowed and harrowed with the smoothing harow in spring of 1893 before sowing; 3½ acres sown May 15th, 1½ bushels per acre, ripe August 27th; time to mature, 104 days; yield per acre, 20 bushels, 50 lbs., weight per bushel, 55¼ lbs.; length of head, 3¾ to 4 inches; bearded, length of straw, 48 to 50 inches, all standing well and rusted, but not so badly as other varieties.

Wellman's Fife—Soil, sandy loam; previous crop, oats; ploughed in autumn of 1892, gang ploughed in spring of 1893, and harrowed with smoothing harrow before sowing, 1 acre, sown May 13th, 1½ bushels per acre, ripe August 22nd, time to mature, 101 days, yield per acre, 13 bushels, 37 lbs., weight per bushel, 53½ lbs.; length of head, 3 to 3¾ inches, beardless, length of straw, 36 to 42 inches, straw stiff, all standing well, but considerably rusted.

Campbell's White Chaff.—On clay soil, the previous crop was corn. The land was ploughed in the autumn of 1892, had a light coating of manure, 10 to 12 tons per acre in the spring of 1893, then ploughed lightly and harrowed with smoothing harrow before sowing, 2$\frac{1}{7}$ acres, sown May 22nd, 1½ bushels per acre, ripe August 22nd, time to mature, 92 days, yield per acre, 10 bushels, 3 lbs., weight per bushel, 54 lbs. Length of head, 2½ to 3 inches, beardless, length of straw, 34 to 40 inches, considerably broken down and very badly rusted.

EXPERIMENTS WITH BARLEY.

Twelve varieties of 2-rowed barley, and 12 varieties of 6-rowed were tested for comparative earliness and yield during the past season on plots of $\frac{1}{20}$ acre each. It was intended to sow these all on the same day, but heavy rains prevented this and the sowing of some of the plots was unavoidably delayed for two days. These plots were adjoining those of the spring wheat on similar clay loam, and the land received the same treatment.

The barley was not nearly so much affected by rust as the wheat was, but it was apparent on the leaves about the same time. It appeared on the stems of the 6-rowed sorts about the last of July, and on the 2-rowed a week later, the 6-rowed varieties were not much injured, but the 2-rowed sorts suffered considerably.

TWO-ROWED BARLEY—TEST OF VARIETIES.

Name of variety.	Length of Straw.	Character of Straw.	Length of Head.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
	Inches.		Inches.				Bus.	lbs.	Lbs.	
Thanet	36 to 39	Weak	3½ to 4½	May 29	Aug. 20	83	40	40	43¾	Slightly.
Swedish female, with Baxter's six-rowed, male, plant 3	24 to 36	Fair..	2½ to 3½	do 29	do 13	76	30	10	49¾	do
Improved Chevalier	33 to 39	Weak	2¾ to 3½	do 29	do 19	82	30	..	45¾	Considerably.
French Chevalier	32 to 39	do	3½ to 5	do 29	do 23	86	27	14	44	Slightly.
Kinver Chevalier	36 to 39	do	4 to 5	do 29	do 22	85	20	20	43	do
Newton	32 to 41	Stiff..	2¾ to 3¼	do 27	do 25	90	19	11	43¼	Considerably.
Danish Chevalier	30 to 37	Weak	3½ to 5	do 29	do 26	89	18	36	44½	do
Duck-bill	30 to 36	Stiff..	2½ to 3	do 27	do 21	86	18	16	...	Slightly.
New Golden Grains	36 to 39	Weak	4	do 29	do 22	85	17	44	41¾	do
Canadian Thorpe	30 to 33	Stiff..	2¼ to 3¼	do 27	do 23	88	15	40	44	Considerably.
Prize Prolific	24 to 38	Weak	2¾ to 3¼	do 29	do 26	89	15	40	43½	do
Goldthorpe	32 to 36	Fair..	2¾ to 3¼	do 27	Sept. 9	104	12	34	44	do

SIX-ROWED BARLEY.—TEST OF VARIETIES.

Name of variety.	Length of Straw.	Character of Straw.	Length of Head.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
	Inches.		Inches.				Bus.	lbs.	Lbs.	
Mensury	31 to 44	Fair..	2¾ to 3¾	May 29	Aug. 10	73	47	24	46¾	Slightly.
Swedish female, with Baxter's six-rowed male, garden type	30 to 34	Stiff..	2 to 3	do 27	do 11	76	44	28	47¾	do
Common six-rowed	33 to 42	Fair..	2¼ to 3	do 27	do 6	71	41	32	48¾	do
Odessa	28 to 33	do	2½ to 3	do 29	do 11	74	38	26	46	do
Summit	33 to 36	do	2½ to 3¼	do 27	do 11	76	35	..	48¾	do
Rennie's Improved	33 to 41	Stiff..	2 to 3	do 29	do 8	71	34	8	48¾	do
Baxter's female, with another barley male, name lost	34 to 40	Fair..	2 to 2¾	do 27	do 8	73	33	16	48	do
Baxter's	33 to 38	do	2 to 2¾	do 27	do 9	74	29	8	48½	do
Surprise	31 to 36	Stiff..	2 to 3	do 27	do 12	77	28	14	47	do
Oderbruch	30 to 39	do	2½ to 3	do 29	do 9	72	25	40	48¾	do
Guaymalaye Hulless	24 to 36	Weak	3 to 3½	do 29	do 19	82	16	12	49½	do
Petschora	30 to 36	Fair..	2¾ to 3½	do 29	do 8	71	15	40	43¾	do

FIELD CROPS OF BARLEY.

Duck-bill, Two-rowed.—On sandy loam; previous crop was vegetables; ploughed in spring of 1893, and harrowed with smoothing harrow before sowing, $2\frac{1}{8}$ acres; sown May 12th, $1\frac{3}{4}$ bushels per acre; ripe, August 7th; time to mature, 87 days; yield per acre, 22 bushels, 15 lbs.; weight per bushel, $42\frac{3}{4}$ lbs.; length of head, $3\frac{1}{2}$ to $3\frac{3}{4}$ inches; length of straw, 39 to 43 inches, all standing well but considerably rusted; no smut.

Oderbruch, Six-rowed.—On light sandy loam; previous crop was corn; land ploughed in autumn of 1892; gang-ploughed in spring of 1893, and harrowed before sowing; 2 acres; sown May 31st; $1\frac{3}{4}$ bushels per acre; ripe, August 10th; time to mature, 71 days; yield per acre, 22 bushels 19 lbs.; weight per bushel, $46\frac{1}{4}$ lbs.; length of head, $2\frac{1}{2}$ to 3 inches; length of straw, 28 to 30 inches; all standing well, but rusted considerably; a very few heads of smut.

Baxter's Six-rowed.—On light sandy loam; previous crop was corn; ploughed in autumn of 1892; gang ploughed in spring of 1893, and harrowed before sowing; 1 acre; sown, May 31st; $1\frac{3}{4}$ bushels per acre; ripe, August 10th; time to mature, 71 days; yield per acre, 14 bushels, 33 lbs.; weight per bushel, 48 lbs.; length of head, 2 to $2\frac{1}{2}$ inches; length of straw, 30 to 32 inches; all standing well; a considerable quantity of smut, and more or less rust.

Rennie's Improved Six-rowed.—This was grown alongside of Baxter's six-rowed, on similar soil; the preparation of the land was the same; $2\frac{1}{4}$ acres; sown, May 31st; $1\frac{3}{4}$ bushels per acre; ripe, August 11th; time to mature, 72 days; yield per acre, 19 bushels, 33 lbs.: weight per bushel, $47\frac{1}{4}$ lbs.; length of head, $2\frac{1}{2}$ to 3 inches; length of straw, 32 to 36 inches; all standing well; very little smut, but somewhat rusted.

EXPERIMENTS WITH OATS.

The rust which struck the wheat and barley about the middle of July affected the oats to a much greater extent, spreading over leaves, stems and panicles, and exhausting the plants to such a degree that early in August, in most cases, all growth appeared to have ceased, and the grain dried up prematurely; comparatively few of the kernels filled, and the crop for the greater part was very light both in yield and weight of grain. To publish particulars of such results would only tend to mislead, as no satisfactory evidence could be gained of relative earliness or yield under such conditions. In many instances those oats grown on the heaviest and best soils, which under ordinary conditions would have given good returns, gave the poorest results. The best yield was from a field of a variety known as Abundance, which gave 36 bushels 11 lbs. per acre, weighing $33\frac{1}{4}$ lbs. per bushel, while the same variety grown on a heavier and better soil was so eaten up with rust that it gave only 11 bushels 11 lbs. per acre, weighing 20 lbs. per bushel.

Spraying for Rust.

About the time when the rust began to appear one-half of a large number of experimental plots of oats and wheat were carefully sprayed from top to bottom with the usual solution of copper carbonate, and on some of the plots the spraying was tried a second time but there was no perceptible difference between the sprayed and unsprayed portions, the remedy seemed to have no influence in staying the progress of the rust.

EXPERIMENTS WITH PEASE.

Twelve varieties of pease were sown on plots of $\frac{1}{10}$th of an acre each as a test of relative earliness and productiveness. All were sown on 29th May, and in the following table will be found the particulars of the results obtained. The soil was clay loam, adjoining the $\frac{1}{10}$th acre plots of barley, and had similar preparation.

TEST OF VARIETIES OF PEASE.

Name of variety.	Date of Ripening.	No. of days Maturing.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel. Lbs.
Canadian Beauty	Sept. 1	95	34	40	61¾
Prussian Blue	Aug. 30	93	33	30	62¾
Prince Albert	Sept. 2	96	29	..	62¼
Pride	Aug. 21	84	27	50	62
Large White Marrowfat	do 30	93	26	20	61¼
Centennial	do 25	88	25	10	61½
Black-eyed Marrowfat	do 30	93	24	..	60½
Crown	do 28	91	23	20	62¼
Multiplier	do 30	93	22	50	62½
New Potter	do 30	93	22	50	61
Mummy	do 23	86	22	40	62
Golden Vine	do 28	91	18	20	61½

OTHER PLOTS OF PEASE.

Canadian Beauty.—Sown on light sandy loam, previous crop was oats; ploughed in autumn of 1892, gang-ploughed and harrowed in spring of 1893, $\frac{1}{18}$ acre. Sown May 27th, 2½ bushels per acre, ripe August 25th, time to mature, 90 days, yield per acre, 35 bushels, weight per bushel, 61¼ lbs.

New Potter.—Adjoining Canadian Beauty on similar soil with same treatment $\frac{1}{18}$ acre, sown May 27th, 2½ bushels per acre, ripe August 25th, time to mature 90 days, yield per acre, 30 bushels 49 lbs., weight per bushel, 62¾ lbs.

Centennial.—On light sandy loam, ploughed in autumn of 1892, on which was spread a light coating of manure, about ten tons per acre, in spring of 1893, which was turned under with gang plough and harrowed before sowing; ½ acre. Sown May 27th, 2¾ bushels per acre, ripe August 25th, time to mature, 90 days, yield per acre, 30 bushels 15 lbs., weight per bushel, 61¼ lbs.

Golden Vine.—Sown on land adjoining Centennial, of same character and received same treatment, ½ acre. Sown May 27th, 2½ bushels per acre, ripe August 25th, time to mature, 90 days, weight per bushel, 62 lbs.

FALL RYE.

Variety *Reading Giant* sown on light sandy soil, previous crop was partly oats and partly wheat. Land ploughed, then harrowed three times, no manure was used. Sown Sept. 8th, 1892, 1½ bushels per acre, ripe July 27th, 1893, yield per acre, 25 bushels 8 lbs., weight per bushel, 54 lbs.; length of head, 3 to 3½ inches, average length of straw, 58 inches, badly lodged, no rust or smut.

EXPERIMENTS WITH TURNIPS.

Eighteen varieties were tested in 1893 in experimental plots in two sets sown eight days apart. In sowing the first set only fourteen varieties of seed were used and they were sown 1st June in rows 2½ feet apart, the second series with eighteen varieties was sown 9th June also $2\frac{1}{2}$ feet apart. Both were pulled on the 25th October. The yield per acre has been calculated from the quantity obtained from 2 rows, 33 feet long and $2\frac{1}{2}$ feet apart.

The land used for these experiments was a heavy sandy loam of good quality which was manured in the fall of 1891, about 18 tons being applied to the acre and an oat crop was grown on it in 1892. It was ploughed from 7 to 8 inches deep in the autumn of 1892, and gang-ploughed in the spring of 1893 and harrowed three times and rolled before sowing. The seed was sown on the flat which we find to be less economical than in ridges, the crop requiring more labour in thinning and hoeing than when sown in ridges.

The rot which has prevailed in the turnips here for the past two years and was referred to in the annual report for 1892 injured the crop again this year, but in a less degree than formerly, the injury however has been sufficient to lessen the yield very much.

EXPERIMENTS WITH TURNIPS—FIRST SERIES—SOWN JUNE 1ST.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Marquis of Lorne	16	1,132	552	12
Prize Purple Top	13	1,456	457	36
Carter's Prize Winner	13	400	440	00
Bangholm Improved	12	156	402	36
Jumbo or Monarch (Steele)	11	1,628	393	48
Mixed, from Agassiz, B.C	10	1,648	360	48
Mammoth Purple Top	10	1,120	352	00
Carter's Elephant Swede	10	592	343	12
Bronze Purple Top	9	1,800	330	00
Sutton's Champion	8	1,424	290	24
Skirving's Purple Top	8	1,160	286	00
Selected East Lothian	8	764	279	24
Jumbo or Monarch (Vilmorin)	8	764	279	24
Clyde Improved	6	1,992	233	12

EXPERIMENTS WITH TURNIPS—SECOND SERIES—SOWN JUNE 9TH.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Carter's Elephant Swede	14	908	481	48
Selected East Lothian	13	796	446	36
Purple Top, seed grown at Agassiz, B.C.	12	552	409	12
Clyde Improved	11	572	376	12
Bronze Purple Top	11	440	374	00
Simmer's Giant Swede	11	440	374	00
Skirving's Purple Top	11	176	369	36
Jumbo or Monarch (Vilmorin)	10	856	347	36
Marquis of Lorne	10	64	334	24
Prize Purple Top	9	1,800	330	00
Simmer's Champion Purple Top	9	744	312	24
Carter's Prize Winner	8	1,688	294	48
Elephant Swede (Agassiz)	7	1,972	266	12
Sutton's Champion	7	784	246	24
Mixed, from Agassiz	7	652	244	12
Bangholm Improved	7	124	235	24
Mammoth Purple Top	6	672	211	12
Jumbo or Monarch (Steele)	4	844	147	24

EXPERIMENTS WITH MANGELS.

Ten varieties of mangels were sown on land adjoining the turnips; the treatment and preparation of the soil will be found under that heading. The seed was sown in rows 2½ feet apart, and the plants afterwards thinned out to 8 to 12 inches apart. Two sets of these plots were sown, the first on 1st June, the second on 9th June; both were pulled 25th October. The yield per acre has been calculated from the result obtained from two rows each 33 feet long and 2½ feet apart.

EXPERIMENTS WITH MANGELS—FIRST SERIES—SOWN 1ST JUNE.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Champion Yellow Globe	21	504	708	24
Mammoth Long Red	20	656	677	36
Giant Yellow Intermediate	19	16	633	36
Canadian Giant	17	1,904	598	24
Gate Post	17	1,640	594	00
Red Globe	17	584	576	24
Warden Orange Globe	14	1,964	499	24
Golden Tankard	13	1,720	462	00
Red Fleshed Tankard	13	1,720	462	00
Erfurt Model	12	1,872	431	12

EXPERIMENTS WITH MANGELS—SECOND SERIES—SOWN 9TH JUNE.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Giant Yellow Intermediate	21	1,560	726	00
Red Globe	21	768	712	48
Mammoth Long Red	18	300	605	00
Champion Yellow Globe	17	452	574	12
Golden Tankard	16	1,264	554	24
Gate Post	14	512	475	12
Canadian Giant	12	816	413	36
Warden Orange Globe	12	156	402	36
Red Fleshed Tankard	10	1,912	365	12
Erfurt Model	8	764	279	24

EXPERIMENTS WITH CARROTS.

Eleven varieties of carrots were sown on land adjoining the mangels, and similar in character; the treatment and preparation of the soil was the same as that for turnips, and the particulars will be found under that heading. The seed was sown on the flat, in rows 18 inches apart. There were two sets of plots; the first sowing was on 1st June, the second on 9th June, and they were both pulled 25th and 26th October. The yield per acre has been calculated from the produce of two rows 33 feet long and 18 inches apart.

FIRST SERIES, sown 1st June.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Mammoth White Intermediate	28	320	938	40
Giant Short White	27	1,440	924	00
Improved Short White	25	1,920	865	20
White Belgian	24	840	814	00
Large Short White Vosges	23	640	770	20
Chantenay Half Long Scarlet	22	660	744	20
Early Gem	18	300	605	00
Half Long Coreless	17	1,640	594	00
Half Long Red Danvers	16	1,880	564	40
Carter's Orange Giant	15	1,240	520	40
Long Scarlet Altringham	12	860	414	20

SECOND SERIES, SOWN 9TH JUNE.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Mammoth White Intermediate	30	1,600	1,026	40
Improved Short White	28	1,200	953	20
Giant Short White	25	160	836	00
White Belgian	20	1,140	685	40
Large Short White Vosges	19	940	649	00
Half Long Red Danvers	19	720	645	20
Carter's Orange Giant	19	60	634	20
Chantenay Half Long Scarlet	17	1,200	586	40
Early Gem	17	540	575	40
Half Long Coreless	13	1,940	465	40
Long Scarlet Altringham	11	1,760	396	00

EXPERIMENTS WITH SUGAR-BEETS.

Four varieties of sugar-beets were sown during 1893 on land adjoining that on which the mangels were sown. The treatment of the soil and its preparation will be found under the heading of turnips. There were two series of plots: one was sown on 1st June, the second on 9th June, and both were pulled 25th October. The seed was sown on the flat, in rows 18 inches apart and the yield per acre has been calculated from the weight of roots obtained from two rows each 33 feet long and 18 inches apart.

EXPERIMENTS WITH SUGAR BEETS.—FIRST SERIES, SOWN 1ST JUNE.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
White Green Top Brabant Improved	20	700	678	20
French	17	100	568	20
Klein Wanzleben	15	360	506	00
White Improved	15	140	502	20

Excerpt from Exp Farms Reports 1893

EXPERIMENTS WITH SUGAR BEETS.—SECOND SERIES, SOWN 9TH JUNE.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
French	19	1,600	660	00
White Green Top Brabant Improved	18	740	612	20
Klein Wanzleben	17	1,860	597	40
White Improved	17	100	568	20

THE BEET-SUGAR INDUSTRY.

by Dr. Wm. Saunders, Director, Experimental Farms, Can

Much interest has attached for many years past to the cultivation of sugar beets, on account of the high percentage of sugar with which they can now be grown, also for the reason that so large a proportion, considerably more than one half, of the world's supply of sugar is now made from the sugar-beet. For several years past experiments have been carried on at the experimental farms and elsewhere with the best seed obtainable from many sources. The results of these tests indicate (as shown in the analyses published by the Chemist of the Farms in previous reports) that the sugar-beet grown in most parts of Canada when raised from the best seed will on the average contain as large a percentage of sugar as similar beets grown in any other part of the world.

During the latter part of 1891 the Dominion Government caused an inquiry to be made in regard to this industry and I was requested to undertake the work. On the 28th of October of that year I visited the beet-sugar factory at Farnham, Quebec, the only factory then in operation in Canada. I then proceeded to Philadelphia where I obtained from a son of Mr. Claus Spreckles information regarding the recent progress of the beet-sugar industry in California. Washington was next visited and much additional information obtained from Dr. H. W. Wiley, Chemist of the Department of Agriculture, whose general investigations into this subject have given him a world wide reputation. I also visited the beet-sugar factories in operation at Grand Island and Norfolk in Nebraska, where all the information desired was given me by the proprietors, Messrs. Oxnard Bros. On my return a report was prepared on this subject which was submitted to the Honourable Minister of Finance on the 1st of February, 1892 and subsequently distributed in the House of Commons. In this report the rise and progress of this industry in Europe, the United States and Canada were sketched; the various systems of bounty (without which it does not appear that this industry could be sustained) were explained and statistics given as to the relative cost of production of cane and beet-sugar. In summing up the evidence presented, the following remarks were made:—"It is probable that the strongest objection to the encouragement of this industry on the only basis on which it is claimed it could be established, will be found in the fact that it would require when fully developed an annual subsidy of about \$4,000,000 for the raising of which as long as we have free sugar, other industries must be taxed. This subsidy might in the course of time be lessened, but in view of all the facts presented, of the greater richness of the sugar cane when grown in the tropics and the probabilities of further improvements in the quality of the cane and in the process of manufacture it is not likely that the bounty could ever be much reduced without crippling the industry."

In the second part of this report the improvement of the sugar-beet is treated of, the most improved methods of cultivation explained and other related subjects discussed. This report was favourably received by the larger part of the press of Canada and many copies have been solicited by parties interested in this subject in the United States including Senators and Members of Congress.~~*~~

~~*Copies of this report may be had on application.~~

EXPERIMENTS WITH POTATOES.

Sixty-one varieties of potatoes have been tested side by side on sandy loam of medium quality. The land received a coating of manure of about 18 tons per acre in the autumn of 1892, which was at once ploughed under. In the spring of 1893, the land was gang-ploughed and harrowed twice.

In planting, the seed end of the potatoe was cut off and rejected and the tubers then cut into pieces with two or three strong eyes, planted one foot apart in the rows, with the rows 2½ feet apart, the seed was then covered with a hoe. The potatoes were planted from May 27th to 30th, came up June 12th to 15th, and were harvested on the 19th September.

TEST of Varieties of Potatoes.

Name of variety.	Size of Plot.	Total Yield per acre of Sound and Rotten.		Yield per acre of Sound.		Yield per acre of Marketable.		Yield per acre of Unmarketable.		Yield per acre of Rotten.	
	Feet.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Burnaby Seedling	66 x 2½	347	36	96	48	90	12	6	36	250	48
Geo. McKenzie, from	66 x 2½	341	00	121	00	116	36	4	24	220	00
Seattle,	132 x 2½	322	18	113	18	111	06	2	12	209	00
White Beauty	132 x 2½	321	12	107	48	100	06	7	42	213	24
Crown Jewel	132 x 2½	315	42	90	12	82	30	7	42	225	30
Holborn Abundance	132 x 2½	315	42	237	36	221	06	16	30	78	06
London	132 x 2½	315	42	146	18	136	24	9	54	169	24
Sharpe's Seedling	132 x 2½	309	06	165	00	156	12	8	48	144	06
Dakota Red	132 x 2½	297	00	209	00	194	42	14	18	88	00
Lee's Favourite	132 x 2½	292	36	161	42	147	24	14	18	130	54
Daisy	132 x 2½	288	12	118	48	104	30	14	18	169	24
Pearce's Extra Early	132 x 2½	281	36	96	48	83	36	13	12	184	48
Northern Spy	132 x 2½	278	18	151	48	140	48	11	00	126	30
Clark's No. 1	132 x 2½	278	18	148	30	139	42	8	48	129	48
Early Ohio	132 x 2½	276	06	103	24	93	30	9	54	172	42
Thorburn	132 x 2½	264	00	103	24	96	48	6	36	160	36
Everett	132 x 2½	261	48	125	24	118	48	6	36	136	24
Early Thorburn	132 x 2½	261	48	125	24	118	48	6	36	136	24
do Sunrise	132 x 2½	257	24	93	30	91	18	2	12	163	54
do Puritan	132 x 2½	255	12	124	18	106	42	17	36	130	54
Harbinger	132 x 2½	253	00	112	12	103	24	8	48	140	48
I. X. L.	66 x 2½	253	00	57	12	53	54	3	18	195	48
T. K. Fullerton, from	132 x 2½	253	00	73	42	...	...	...	...	179	18
Vick's Extra Early	132 x 2½	253	00	58	18	51	42	6	36	194	42
Rural Blush	132 x 2½	251	54	206	48	174	54	31	54	45	06
State of Maine	132 x 2½	250	48	61	36	56	06	5	30	189	12
Empire State	132 x 2½	248	36	71	30	67	06	4	24	177	06
Lizzie's Pride	66 x 2½	246	24	165	00	158	24	6	36	81	24
Polaris	132 x 2½	240	54	96	48	86	54	9	54	144	06
Lee's Favourite, Mrs. Foster	132 x 2½	240	54	83	36	...	...	...	...	157	18
Hale's Champion	132 x 2½	234	18	...	...	...	...	...	...	...	...
Chicago Market	132 x 2½	232	06	89	06	82	30	6	36	143	00
Early Rose, C. E. F	132 x 2½	226	36	107	48	100	06	7	42	118	48
Beauty of Hebron	132 x 2½	221	06	144	06	128	42	15	24	77	00
Early Rose, Brandon	132 x 2½	216	42	77	00	69	18	7	42	139	42
Green Mountain	132 x 2½	214	30	40	42	38	30	2	12	173	48
Burpee's Extra Early	132 x 2½	213	24	70	24	64	54	5	30	143	00
Vanier	132 x 2½	212	18	176	00	155	06	20	54	36	18
Irish Champion	132 x 2½	207	00	104	30	75	54	28	36	103	24
Hopeful	132 x 2½	201	00	50	36	46	12	4	24	150	42
Blue Cup	66 x 2½	195	48	83	36	77	00	6	36	112	12
Seedling No. 214	132 x 2½	178	12	82	30	78	06	4	24	95	42
do No. 115	132 x 2½	172	42	9	54	9	21	0	33	162	48
do No. 230	132 x 2½	171	36	27	30	20	54	6	36	144	06
Algoma No. 1	132 x 2½	169	24	36	18	35	45	0	33	133	06
Early Gem	132 x 2½	163	54	55	00	40	42	14	18	108	54

TEST of varieties of Potatoes—*Concluded.*

Name of variety.	Size of Plot.	Total Yield per acre of Sound and Rotten.		Yield per acre of Sound.		Yield per acre of Marketable.		Yield per acre of Unmarketable.		Yield per acre of Rotten.	
	Feet.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush,	Lbs,
Seedling No. 25	132 x 2½	161	42	84	42	67	06	17	36	77	00
Vanguard	132 x 2½	160	36	27	30	26	57	0	33	133	06
Pearce's Prize Winner	132 x 2½	147	24	40	42	36	18	4	24	106	42
Delaware	132 x 2½	143	00	15	24	14	18	1	06	127	36
Bras d'Or Seedling	132 x 2½	137	30	39	36	33	00	6	36	97	54
Manitoba Kidney White	132 x 2½	109	27	0	33	...		...		108	54
Seedling No. 33	132 x 2½	102	18	7	42	6	36	1	06	94	36
do No. 54	132 x 2½	90	12	8	48	7	42	1	06	81	24
do No. 77	132 x 2½	80	18	8	48	6	36	2	12	71	30
Red River Valley	132 x 2½	72	36	...		...		...		72	36
Seedling No. 188	132 x 2½	56	39	3	51	3	18	0	33	52	48
Brant	66 x 2½	52	48	2	12	...		...		50	36
Seedling V	66 x 2½	48	24	24	12	17	36	6	36	24	12
do No. 140	132 x 2½	30	48	2	12	1	39	0	33	28	36
do X	66 x 2½	22	00	6	36	4	24	2	12	15	24

THE HAY CROP.

The crop of hay at the Central Experimental Farm has been remarkably good during the past season. About 104 tons have been harvested of extra good quality, the yield running from 2 to 2½ tons per acre. This important fodder crop has also given very satisfactory returns over the larger part of the provinces of Ontario and Quebec.

In view of the very short supply of hay in Great Britain and some of the countries on the continent of Europe, and the consequent high prices prevailing, it was deemed desirable that the attention of Canadian farmers should be promptly called to the importance of making the best of the advantage which this shortage offered, and by taking extra care in the curing of their hay to have it of that quality which would command a ready sale at the highest price.

On the 30th of June, 1893, copies of the following letter were sent to the press which was generally and widely published and commented on:

HAY FOR THE ENGLISH MARKET.

To the Editor of ———.

SIR,—Hay is the most important and valuable of all Canadian crops, and this year the yield promises to be most abundant. The scarcity in Europe has led to increased demand in Canada, and if the incoming crop be of good quality and well cured it will no doubt command high prices. Hay containing a considerable proportion of clover is preferred in Great Britain, and this is more difficult to cure properly than hay composed chiefly of timothy. Permit me to draw the attention of farmers generally, through your columns, to the method of curing hay practised at the Central Experimental Farm, where under the good management of the farm foreman it has given excellent results. It is also, I find, the practice of many of the best Canadian farmers. When the first flower-heads of the clover have about half withered cut the hay in the morning, after the dew is off, and begin at 1 p.m. to shake it up with forks or tedder, and cock up early enough in the afternoon to permit of the work being completed before the dew falls in the evening. The cocks are allowed to stand undisturbed the next day, but during the following morning the hay is spread again to finish the drying, and drawn to the barn or stack before evening. If favoured with fine weather, the hay so cured will be of excellent colour, quality and fragrance, and will command the highest price. If the weather is unfavourable or showery, keep the hay in cocks until it becomes fine again. Many farmers adopt the plan of allowing the newly cut hay to dry at once, as it falls from the mower, without putting it in cocks. Hay so cured is usually more or less bleached and does not retain the fine colour and aroma which distinguishes hay of first quality, and does not command so ready a sale or so high a price.

WM. SAUNDERS,

Director Experimental Farms.

Ottawa, June 30th, 1893.

The attention of English dealers in hay was also called to the large surplus which Canada would have to offer, and letters of inquiry from prominent firms in Great Britain and France, were published in the press, as received. The attention of the Eastern Boards of Trade was also called to this matter, and many letters written to the larger dealers in Canada giving them information. A considerable foreign demand for Canadian hay was thus created, and large shipments have been made.

SMUT IN WHEAT.

For several years past much depreciation has occurred in the value of wheat in Manitoba and the North-west Territories from the presence of bunt or stinking smut. This parasitic fungus has infested the grain in large percentage, and owing to the unpleasant odour of the spores which attach themselves to the grain during the process of threshing, much wheat which would otherwise have commanded a good price has been reduced in value and sometimes rendered unsalable.

In *Bulletin* 3 of the Experimental Farm series, published in March, 1888, prepared by Mr. James Fletcher, Entomologist and Botanist to the Experimental Farms, this subject was brought prominently before the farmers of Canada, the life history of this and another species of smut which injures cereals, described, and remedies recommended for preventing the injury they cause.

Since that time systematic experiments have been carried on at the Experimental Farms at Brandon, Man., and Indian Head, N.W.T., which have demonstrated that bluestone, or copper sulphate (a remedy long used in England for this purpose), is a most economical and reliable means of preventing this evil. The results of these experiments have been fully presented in the annual reports of the experimental farms, but in order to bring the matter more immediately and prominently under the notice of the farmers in the Canadian North-west, who are the chief sufferers from this trouble, a circular was prepared embodying in a condensed form the results of the experience gained, with directions for the use of the remedy, and 25,000 of these were printed and distributed among the western farmers a few weeks before the period of sowing. The following is a copy of the circular:—

TO THE FARMERS OF MANITOBA AND THE NORTH-WEST TERRITORIES.

SMUT IN WHEAT.

The heavy losses which have of late years fallen on many farmers in Manitoba and the North-west Territories from depreciation in the value of their wheat from the presence of smut, should be a warning to every settler to adopt the preventive measures which have been thoroughly tested and shown to be efficient on the Dominion Experimental Farms at Brandon, Man., and Indian Head, N.W.T.

The "bunt" or "stinking" smut is the result of a fungous growth which is propagated by very minute spores, visible only with a magnifying glass of high power. These spores are scattered over the wheat by the breaking of the "smut balls" during the process of threshing, and they give to the grain a characteristic and offensive odour. If smutty wheat be sown untreated these spores will vegetate and develop minute thread-like growths, which find their way through the tissues of the young wheat plant, and multiply in the sap. Later in the season a proportion of the kernels in the head will be found to have their normal contents entirely consumed, to have become unnaturally swollen and the interior filled with a black mass of smut spores. These altered and swollen kernels are commonly known as "smut balls." Full particulars of the life history of this species of smut will be found in bulletin No. 3 of the Experimental Farm series, prepared by Mr. Jas. Fletcher, Entomologist and Botanist.

REMEDY.

Dissolve one pound of bluestone (copper sulphate) in a pailful and a half of water (about three gallons) and sprinkle the solution on ten bushels of seed wheat, previously spread in a tight wagon box, or on a clear floor space in barn or house, keeping the grain constantly stirred while the solution is being applied, and mixing the whole thoroughly so that every kernel of the wheat may be wetted. In a very few hours the seed will be in good condition to sow with the drill. A good plan is to apply the treatment in the evening and sow the grain the following morning. If the water be used warm and the lumps of bluestone be broken, the solution may be made in a few minutes. As the solution of bluestone lessens in some degree the germinating power of wheat, and more so when it remains long in contact with it, the safe plan is to treat the seed but a short time before sowing.

In the tests which have been carried on with this remedy for the past three years at the Experimental Farms at Brandon and Indian Head, the worst smutted samples procurable have been selected for sowing, and the results have shown, by comparing the crop from the treated with that from the untreated grain, that this remedy is thoroughly efficient. It is also easy of application, and its cost is trifling; usually about one cent per bushel of seed.

It has been often observed that a smutty crop will sometimes result when good clean seed has been sown. This is believed to arise from smut spores in the soil coming in contact with the grain when germinating. As millions of these spores are spread in all directions by wind during the period of threshing and carried long distances, there are doubtless large numbers of them in the soil in all the wheat growing districts of the country. Hence it is much safer to treat all seed before sowing, whether it is perceptibly smutty or not, as the coating of bluestone on the treated grain will protect the seed from attack by spores in the soil.

Having thoroughly satisfied ourselves of the efficacy and reliability of this remedy, and of the importance of its general use, we would strongly recommend that all seed during the coming season be treated in accordance with the directions here given, believing that every settler who acts on this advice will realize an increased crop, which will bring a higher price, and he will also assist in raising the standard of quality of the wheat grown in Manitoba and the North-west Territories to one of uniform excellence.

WM. SAUNDERS,
Director Experimental Farms, Ottawa.

S. A. BEDFORD,
Supt. Experimental Farm, Brandon, Man.

ANGUS MACKAY,
Supt. Experimental Farm, Indian Head, N.W.T.

The Winnipeg Board of Trade also issued a circular on this subject, and the press generally commented on the necessity of farmers everywhere using this remedy, so that this evil might be lessened, and if possible, stamped out. The results have been most gratifying; many tons of bluestone were bought and used in the manner directed, and the crop of this year is said to be almost entirely free from smut. As a precautionary measure this method of treating the wheat should be continued for several years.

WORLD'S COLUMBIAN EXPOSITION.

On the 11th of January, 1892, I was appointed by Order in Council, Executive Commissioner for Canada in connection with the World's Columbian Exposition, a position which was held until the 21st of November in that year. Over ten months of incessant and heavy labour in the endeavour to discharge this duty, in addition to the work devolving on me as Director of the Experimental Farms, brought about a condition of ill-health and exhaustion which made my resignation a necessity. In the meantime, however, all the preliminary work had been completed. After a number of visits to Chicago, sufficient space was secured in excellent locations in all the buildings, a most important measure towards success, and as a result of much effort, an admirable site was obtained for a Canadian building, to serve as an office building for the Commissioners and a meeting place for visiting Canadians.

The grand dairy exhibit was arranged and provided for. The Governments of all the provinces were interviewed and negotiations conducted, the departments of work which each were to undertake agreed on, and the hearty co-operation of nearly all the provinces secured. With the able assistance of Mr. J. S. Larke (who was subsequently appointed my successor), Mr. Lucien Huot of Montreal, Mr. W. D. Dimmock of Truro, N.S., and Mr. E. A. Charters, of Sussex, N.B., the greater part of the exhibits had been secured, the particulars of which are given in my report of the progress of the work published a few weeks after my resignation.* The way was thus prepared for the brilliant success which has crowned the efforts of our people.

To make the agricultural exhibits from the Experimental Farms as complete as possible, special sowings were made in the spring of 1892, of a very large number of different sorts of grain and seeds, and a lively interest awakened in this undertaking among all the officers connected with these institutions. In this way the finest collection of Canadian agricultural products ever seen was made available, and subsequently clothed the grand trophy which attracted so much attention in the Agricultural court.

Before the time arrived for beginning the work of placing the exhibits, my health was so far restored as to enable me to render further aid in the carrying out of this great undertaking, and at the special request of the Minister of Agriculture, and of my successor in the office of Executive Commissioner, I consented to undertake the designing and arranging of all the exterior decorations of the agricultural court, also the construction of the great central trophy, and to render what help I could by assisting in the arrangement of the products in portions of the interior of the court.

After consultation with Mr. D. Ewart, of the Chief Architect's office, Department of Public Works, he prepared a plan of the woodwork on which the decorations were to be placed which served the purpose admirably, he also supervised its construction. As soon as the preparations for the work were sufficiently advanced, I secured the able assistance of Mr. W. H. Hay, the accountant at the Central Experimental Farm, and Mr. J. Fixter, the Farm foreman, both of whom brought to bear on this undertaking much practical experience, gained at previous provincial and other exhibitions. We were also assisted by Mr. S. A. Bedford, Superintendent of the Experimental Farm at Brandon, and Mr. A. Mackay, the Superintendent of the Experimental Farm at Indian Head. With these competent assistants the work made rapid progress, and in two or three weeks it was so well advanced that all returned to their other duties, excepting Mr. Hay, who remained to complete the work which had been planned, which he did with good judgment and taste and much credit to himself.

The exterior decorations of the court were very much admired, the interior work was equally good, and the Canadian exhibit as a whole was generally conceded to be the finest agricultural display in the building. It was arranged in provincial groups, in which all the provinces, excepting Manitoba and New Brunswick

* Copies of this Report may still be had on application.

were represented. The exhibit of Ontario (which included an excellent selection of samples from the Agricultural College at Guelph), was especially fine; Quebec came next in importance, followed by the North-west Territories, British Columbia, Nova Scotia and Prince Edward Island, all the displays being excellent both in the quality and variety of the articles shown.

The large central trophy was covered entirely with the products of the several Experimental Farms, from which sources were also obtained the materials for the exterior decoration of the court. Since Manitoba was not represented as a province, the front of the trophy was covered with the products of the Branch Farm for Manitoba; the samples from the Central Farm were placed on the side contiguous to the exhibits of Ontario and Quebec; the other sides of the exterior and interior of the trophy being devoted to a display of the productions of the branch farms for the North-west Territories, British Columbia and the Maritime Provinces. The samples of grain and agricultural seeds were relieved by the introduction of a very complete collection of native and cultivated grasses arranged by Mr. James Fletcher, Botanist and Entomologist of the Farms, also by a large number of photographs of different portions of the Experimental Farms, including harvest scenes, cattle, &c., the whole making a grand display, illustrating the manifold character of the work in progress in connection with the Dominion system of Experimental Farms.

Adjacent to the trophy, there was displayed in a prominent position, a collection of Canadian insects, prepared and arranged by Mr. James Fletcher, who devoted much labour to this work. In addition to many beautiful examples of insects of brilliant colour and attractive form, this collection included many species which injure agricultural and horticultural products.

The dairy exhibits which brought into such prominence the high quality of Canadian cheese and butter, were to a large extent the result of the untiring efforts of the Dairy Commissioner, Mr. J. W. Robertson, who, assisted by competent experts from the Dairy Associations and members of his own staff, and aided by practical dairymen all over the Dominion, achieved a success for Canada of which the people everywhere have reason to feel proud.

During my stay in Chicago, I was also able to render assistance to the Dominion Superintendent in charge of the Canadian horticultural products, Mr. L. Woolverton, in planning the arrangements for the display of fruits and vegetables, to which the Experimental Farms were large contributors. Mr. John Craig, horticulturist at the Central Farm, devoted himself assiduously to the collecting and preparing of fruits for this purpose during the summer of 1892, and there was put up in preserving fluids under his supervision an excellent collection representing the progress which has been made in that division of the work which he superintends. The collection embraced an extensive and varied assortment of small fruits, also a number of varieties of cherries, plums and some apples, all grown at the Central Experimental Farm. Subsequently during the period of the exhibition Mr. Craig rendered further assistance by sending forward supplies of fresh vegetables and fruits, among the latter a display of grapes, consisting of 122 different varieties, all ripened in the open air at Ottawa. These attracted much attention, and excited the surprise of visiting fruit growers who reside further south, who did not anticipate that so many sorts of grapes could be ripened so well in the open air so far north as Ottawa.

The branch Experimental Farms also did excellent service, and in addition to their large contributions to the grain exhibits they provided material for the horticultural display. Mr. Wm. M. Blair, the Superintendent of the Experimental Farm for the Maritime Provinces, forwarded from Nappan, Nova Scotia, a large quantity of very excellent roots and other vegetables, partly the growth of the Experimental Farm, and partly contributed by the farmers of Nova Scotia and New Brunswick. Mr. Blair also sent samples of the small fruits grown on the Nappan Experimental Farm. Mr. S. A. Bedford contributed from the Brandon, Manitoba Experimental Farm, a quantity of preserved vegetables, also a number of varieties of small fruits both cultivated and wild. An excellent assortment of a similar character was sent by Mr. A. Mackay from the Experimental Farm at Indian Head, N. W. T., and both these western farms sent frequent contributions of fresh vegetables during the summer season. Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm at

Agassiz, British Columbia, provided a fine assortment of preserved fruits, all grown at the Experimental Farm, and these were followed by consignments of fresh fruit from time to time including gigantic plums, fine cherries, apples and other products.

The following list of awards affords further evidence of the high quality of the products supplied by the Experimental Farms. In Agriculture further awards are expected.

Agriculture. Central Experimental Farm, Ottawa, cereals and grasses. Experimental Farm, Indian Head, cereals and grasses.

Horticulture. Central Experimental Farm, Ottawa, collection of vegetables and collection of grapes, crop of 1893. Experimental Farm, Nappan, N. S., collection of vegetables; Experimental Farm, Brandon Man., vegetables preserved in solutions and collection of fresh vegetables, Experimental Farm, Indian Head, N. W. T., collection of vegetables. Experimental Farm, Agassiz, British Columbia, apples, crop of 1893.

The intimate knowledge of insects and their habits possessed by Mr. James Fletcher, Entomologist and Botanist of the Experimental Farms, enabled him while in Chicago, during the month of October, to render timely aid to the Executive Commissioner by examining and reporting on some injurious insects found feeding on the various grains and seeds exhibited, and which at that time were the cause of some anxiety. Mr. Fletcher was able to show that these invaders were old enemies which Canada had no reason to fear and thus the alarm which had been felt under the impression that they were new foes to agriculture was speedily allayed.

An opportunity was also afforded Mr. F. T. Shutt, Chemist to the Experimental Farms, who has had much experience in the analysis of cereals to use the information he has acquired in this branch of his work to the advantage of the Dominion. He was chosen on this occasion as an expert juror in the Agricultural department and devoted many weeks to the analysis of the finer samples of cereals shown, not only in the Canadian exhibits, but also in all parts of the Agricultural building. The results of these analyses have assisted in demonstrating the high quality of Canadian cereals aud especially of the wheat grown in the Canadian North-west.

Early in the history of the exposition, elaborate plans were laid to secure the presence and services of competent men in every department of knowledge from all parts of the world to deliver addresses before conventions specially called in the interest of various branches of science, art, industry, education, etc. In the early part of the year a series of addresses was delivered under the auspices of the exposition authorities, having special reference to the timber productions of the several countries which exhibited in the building devoted to Forestry. An invitation was sent me by the chief of that department to deliver one of these addresses on 20th June, when I presented a paper on the subject of tree growth and forest distribution in Canada, in which I called attention to the timber resources of the several provinces and territories in the Dominion. Later in the season, I was invited to deliver addresses at several of the special conventions or congresses. Owing to absence on the Pacific coast, I was unable to respond to the invitation to be present at the congress of horticulture, but I returned in time to address the congresses relating to agriculture, to agricultural colleges and experiment stations and to forestry. On the occasion of these gatherings I was enabled to disseminate much information regarding the agricultural and other natural resources of Canada. At the agricultural congress, I addressed the assembly on the agricultural resources of the Dominion, when reference was made to the high character and quality of Canadian agricultural products as demonstrated by the exhibits which Canada had made. Statistics of the United States and Canada were quoted, showing that the average crops realized by the Canadian farmer were higher than those obtained by farmers in the United States, and special reference was made to the large area of fertile country in the North-west available for settlement, with which my frequent visits had made me personally familiar.

At the congress of agricultural colleges and experiment stations I had the pleasure of meeting representatives from Russia, Germany and Japan, as well as a large number from the United States, and addressed the assembly on the good work being accomplished in the several provinces of Canada by agricultural colleges, dairy schools, farmers' institutes and agricultural circles, and gave some particulars regarding the methods by which the Government of Canada was endeavouring to benefit the Canadian farmer through the agency of the experimental farms.

At the Forestry Congress the topic assigned for my address was "Forest Conditions of the Plains and Prairies of Canada." In introducing the subject reference was made to the vast timber resources of the older provinces and to the measures which have been taken to preserve the forests from fire and to make the best use of this great source of national wealth. The great plains from Winnipeg to the Rocky Mountains were described, the distribution of forest growth in the various sections referred to and the efforts made during the past few years through the experimental farms to improve these conditions. Attention was also called to the vast country lying north of present settlement and to the information thus far gained as to the forest resources of that great area.

THE COMING ANTWERP EXHIBITION.

A short time prior to the close of the World's Columbian Exposition it was decided by the Dominion Government that Canada should take part in the Antwerp Exhibition, and I was requested to assist in selecting from the exhibits in Chicago such examples of agricultural products and of fruits as would be suitable for the purpose and best serve to show the character of the Canadian climate and the productiveness of the soil, also such products of the forests as could be secured. In company with the Deputy Minister of Agriculture, Mr. John Lowe, I visited the several Canadian courts and assisted in securing much useful material. On my return to Ottawa I was requested to continue to render all the assistance in my power to the furtherance of this enterprise and sent my assistant, Mr. W. T. Macoun to Chicago who made a careful selection of the best of the agricultural products shown there. A collection of about 1,500 bunches and sheaves of grain in the straw and 720 of the finest samples of cleaned grain were selected by Mr. Macoun who has had much experience in such work. There were also secured from the Manitoba Exhibits for this purpose about 120 bunches of grain in the straw and 80 samples of cleaned grain. These cereals were packed in suitable cases and are now in Ottawa awaiting shipment to Antwerp.

Under the supervision of the Dominion Superintendent of Horticulture, Mr. L. Woolverton, a large number of samples of fruit, including contributions from all the provinces exhibiting, were carefully packed and forwarded. These arrived in Ottawa in fairly good condition and are now being examined, the best specimens are being selected, the bottles filled with fresh fluids such as will withstand frost, and the collection will be repacked in time to be forwarded with the other exhibits from Canada.

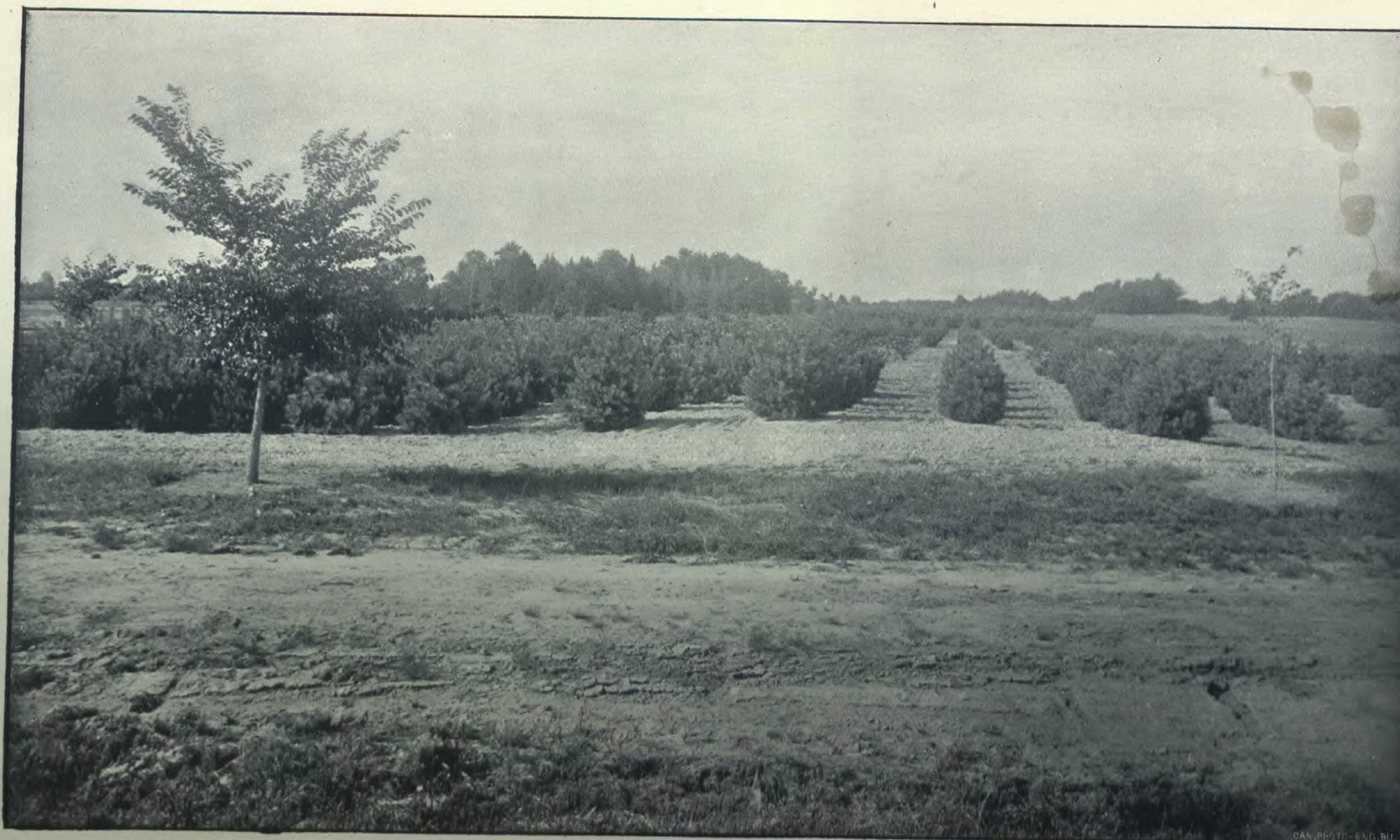
ORNAMENTAL TREES AND SHRUBS.

The ornamental planting on the Central Experimental Farm extending from the main entrance gate to the barn and around the buildings and dwellings consists of thirty-five clumps, some of them closely planted, others open and scattered to suit the several situations. These clumps contain at present 1,789 trees and shrubs, comprising a most instructive, interesting and valuable collection. In their arrangement the individual specimens have been selected and grouped with the view of producing the best effects by combinations of spring and autumnal colours, by placing those together which harmonize in form and habit, or which make pleasing contrasts in these particulars. Due regard has been had to the intermingling of a sufficient number of evergreens with the deciduous trees to lend a charm to the grounds during those periods in the year when the deciduous trees are leafless. Proper attention has also been given to the judicious placing of the several groups in accordance with the principles practised by the best landscape gardeners. There are in these groups 225 named species and varieties and a few other varieties as yet undetermined. The following are all represented, some by one or two specimens only, of others the number is much larger; those marked hardy have stood the climate of Ottawa uninjured, those marked half hardy have commonly had their wood partly killed, while those marked tender are usually killed back to the snow line. Some of these trees and shrubs have been planted for 5 or 6 years, while others have only been under test for two or three seasons. Nearly all have made satisfactory growth, and these plantations are already attracting much attention from visitors.

List of ornamental trees and shrubs in groups and clumps on the Central Experimental Farm.

Abies balsamea.—Balsam fir; hardy.
do concolor.—One-coloured fir; hardy.
do Fraseri.—Fraser's fir; hardy.
do pectinata.—Comb-like fir; tender.
Acer dasycarpum.—Silver-leaved maple; hardy.
do do Wierii.—Wier's cut-leaved maple; hardy.
do Ginnala.—Ginnalian maple; hardy.
do glabrum.—Smooth maple; hardy.
do Pennsylvanicum.—Pennsylvanian or striped maple; hardy.
do platanoides.—Plane-like or Norway maple; hardy.
do do Schwedleri.—Schwedler's maple; half hardy.
do pseudoplatanus.—Sycamore maple; half hardy.
do do albo-marginata.—Variegated sycamore maple; tender.
do rubrum.—Red maple; hardy.
do saccharinum.—Sugar maple; hardy.
Æsculus hippocastanum.—Common horse-chestnut; hardy.
Alnus glutinosa.—Sticky alder; hardy.
do do laciniata.—Imperial cut-leaved alder; hardy.
Amelanchier Canadensis.—June berry; hardy.
do do nana.—Dwarf june berry; hardy.
do vulgaris.—Common June berry; hardy.
Amorpha fruticosa.—False indigo; hardy.
Ampelopsis quinquefolia.—Virginian creeper; hardy.
do tricuspidata (Veitchii).—Three-pointed ampelopsis or Boston ivy; tender.
Amygdalus nana.—Double flowering almond; half hardy.
Artemisia Abrotanum.—Southernwood; hardy.
Berberis Thunbergii.—Thunberg's barberry; hardy.
do vulgaris.—Common barberry; hardy.
do do purpurea.—Purple barberry; hardy.
do Aquifolium.—American holly; half hardy.
Betula alba.—European white birch; hardy.
do do fastigiata.—Pyramidal birch; hardy.
do do laciniata.—Cut-leaved birch; hardy.
do do pendula Youngii.—Young's weeping birch; hardy.
do lutea.—Yellow birch; hardy.
do occidentalis.—Western birch; hardy.
Caragana arborescens.—Siberian pea-tree; hardy.
do do pendula.—Weeping caragana; hardy.
Carya alba.—Shell bark hickory; hardy.
Catalpa Kæmpferi.—Japan catalpa; half hardy.
do speciosa.—Hardy western catalpa; half hardy.
do do variegata.—Variegated western catalpa; tender.
Castanea vulgaris Americana.—American chestnut; half hardy.
Ceanothus Americanus.—New Jersey tea; hardy.
Celtis australis.—European nettle-tree; hardy.
do occidentalis.—American nettle-tree; hardy.
Cephalanthus occidentalis.—Buttonwood; hardy.
Cerasus Padus.—Bird cherry; hardy.

Cerasus serotina.—Wild black cherry; hardy.
Cercidiphyllum Japonicum.—Katsura-tree; hardy.
Chionanthus virginicus.—Fringe-tree; tender.
Cladrastis tinctoria.—Yellow wood; hardy.
Clematis recta.—Erect clematis; hardy.
do Virginiana.—Virginian clematis; hardy.
Cornus mas.—European dogwood; hardy.
do do elegantissima.—Elegant dogwood; hardy.
do do variegata.—Variegated dogwood; hardy.
do sanguinea.—Blood-coloured dogwood; hardy.
Cotoneaster vulgaris.—Common cotoneaster; hardy.
Corylus Avellana.—Filbert; half hardy.
do do laciniata.—Cut-leaved filbert; half hardy.
Cratægus oxyacantha.—English hawthorn; tender.
do do fl. pl.—Double flowering English hawthorn; tender.
Deutzia crenata.—Crenate deutzia; tender.
do do fl. pl.—Double crenate deutzia; tender.
do gracilis.—Slender deutzia; half hardy.
Diervilla (Weigelia) grandiflora alba.—Large flowered white weigelia; half hardy.
do do do variegata.—Variegated weigelia; half hardy.
do do lonerii.—Dark red weigelia; half hardy.
do do rosea.—Rosy weigelia; half hardy.
do do do alba.—White weigelia; half hardy.
Dimorphanthus Mandschuricus.—Manchurian dimorphantus; half hardy.
Elæagnus argentea.—Silvery eleagnus; hardy.
do hortensis augustifolia.—Narrow-leaved eleagnus; half hardy.
do augustifolia Russian olive; hardy.
Exochorda grandiflora.—Large flowered exochorda; tender.
Fagus ferruginea.—American beech; hardy.
do sylvaticus purpurea.—Purple beech; half hardy.
Forsythia suspensa.—Drooping forsythia; half hardy.
do viridissima.—Green forsythia; half hardy.
Fraxinus ornus.—Manna ash: hardy.
do viridis.—Green ash; hardy.
Gleditschia triacanthos.—Honey locust; half hardy.
Gymnocladus Canadensis.—Kentucky coffee-tree; hardy.
Hippophae rhamnoides.—Sea buckthorn; hardy.
Hydrangea paniculata grandiflora.—Large flowered hydrangea; hardy.
Juniperus communis.—Common juniper; hardy.
do do Canadensis.—Canadian juniper; hardy.
do do fastigiata.—Swedish juniper; hardy.
do Sabina.—Common savin; hardy.
do Virginiana.—Red cedar; half hardy; sometimes hardy.
Juglans cinerea.—Butternut; hardy.
do nigra.—Black walnut; hardy.
do Sieboldiana.—Japan walnut; hardy.
Larix Americana.—American larch; hardy.
do Europæa.—European larch: hardy.
Ligustrum vulgare variegatum.—Variegated privet; tender.
Lindera Benzoin.—Spice bush; half hardy.
Lonicera flava.—Yellow honeysuckle; hardy.
do Periclymenum.—English honeysuckle; half hardy.
do sempervirens.—Scarlet trumpet honeysuckle; half hardy.
do Tatarica.—White-flowered bush honeysuckle; hardy.
do do Red do do do
Magnolia acuminata.—Cucumber tree; half hardy.
Negundo aceroides.—Box elder; hardy.
Pæonia moutan.—Moutan or tree peony; hardy.
Pavia flava.—Sweet buckeye; hardy.



VIEW OF FOREST PLANTATION—CENTRAL EXPERIMENTAL FARM, OTTAWA.

Phellodendron Amurense.—Chinese cork-tree; half hardy.
Philadelphus coronarius.—Mock orange or syringa; hardy.
do cordifolia.—Heart-leaved syringa; hardy.
do deutziflora.—Deutzia flowered syringa; hardy.
do Gordonianus.—Gordon's syringa; hardy.
do grandiflora.—Large flowered syringa; hardy.
do nana.—Dwarf syringa; hardy.
Picea alba.—White spruce; hardy.
do Alcoquiana.—Alcock's spruce; hardy.
do excelsa.—Norway spruce; hardy.
do do pygmæa.—Dwarf Norway spruce; half hardy.
do Engelmanni.—Engelmann's spruce; hardy.
do nigra.—Black spruce; hardy.
do pungens.—Rocky Mountain blue spruce; hardy.
Pinus Austriaca.—Austrian pine; hardy.
do Cembra.—Swiss stone pine; hardy.
do contorta Murrayana.—Murray's pine; hardy.
do Mughus.—Mountain pine; hardy.
do do nana.—Dwarf mountain pine; hardy.
do ponderosa.—Heavy wooded or bull pine; hardy.
do Strobus.—White or Weymouth pine; hardy.
do resinosa.—Red pine; hardy.
do sylvestris.—Scotch pine; hardy.
do do Rigaensis.—Riga pine; hardy.
Platanus occidentalis.—Buttonwood; hardy.
Populus alba Bolleana.—Bolle's poplar; hardy.
do certinensis.—Asiatic poplar; hardy.
do grandidentata pendula.—Large-toothed weeping poplar; hardy.
do nigra pyramidalis.—Lombardy poplar; hardy.
do Nolesti.—Riga poplar; hardy.
Pseudotsuga Douglasii.—Douglas spruce; half hardy.
Ptelea trifoliata.—Hop-tree or wafer ash; hardy.
Prunus Pissardii.—Purple plum; half hardy.
Pyrus Americana.—American mountain ash; hardy.
do Aucuparia.—European mountain ash; hardy.
do do quercifolia.—Oak-leaved mountain ash; hardy.
do do furcata.—Hardy.
do Aria.—White beam-tree; hardy.
do baccata auruntiaca.—Siberian pyrus; hardy.
Quercus Robur.—English oak; hardy.
do rubra.—Red oak; hardy.
Retinospora ericoides.—Heath-like retinospora; half hardy.
do filifera.—Thread-like retinospora; hardy.
do obtusa.—Obtuse-leaved retinospora; half hardy.
do plumosa.—Plumose retinospora; half hardy.
do do aurea.—Golden plumose retinospora; half hardy.
do do argentea.—Silver plumose retinospora; half hardy.
do squarrosa.—Squarrose-leaved retinospora; tender.
Rhamnus catharticus.—Cathartic buckthorn; hardy.
do frangula.—Breaking buckthorn; hardy.
Rhodotypus kerrioides.—White kerria; hardy.
Rhus aromatica.—Fragrant sumach; hardy.
do cotinus.—Venetian sumach or mist shrub; hardy.
do glabra laciniata.—Fern-leaved sumach; hardy.
Ribes alpinum.—Mountain currant; hardy.
do sanguineum.—Red flowering currant; tender.
Robinia pseudacacia.—Common locust; hardy.
Rosa rubiginosa.—Sweet briar; hardy.
do rubrifolia.—Red-leaved rose; hardy.

Rosa rugosa.—Japan rose; hardy.
Rubus Nutkanus.—White flowered scented raspberry; hardy.
Salisburia adiantifolia.—Maidenhair-tree; hardy.
Salix Babylonica annularis.—Ringed willow; tender.
do capræa pendula.—Kilmarnock weeping willow; hardy.
do laurifolia.—Laurel-leaved willow; hardy.
do purpurea pendula.—American weeping willow; half hardy.
do rosmarinifolia.—Rosemary-leaved willow; hardy.
Sambucus nigra argentea.—Silver-leaved elder; half hardy.
do do aurea.—Golden-leaved elder; hardy.
do do laciniata.—Cut-leaved elder; half hardy.
Sassafras officinale.—Sassafras-tree; hardy.
Shepherdia argentea.—Buffalo berry; hardy.
Spiræa Californica.—Calfornian spirea; hardy.
do Japonica alba (callosa alba).—White Japan spirea; hardy.
do do rubra (callosa rubra).—Red Japan spirea; hardy.
do do Fortunei.—Fortune's spirea; hardy.
do media rotundifolia.—Round-leaved spirea; hardy.
do opulifolia.—Guelder-rose leaved spirea; hardy.
do do aurea.—Golden-leaved spirea; hardy.
do prunifolia.—Plum-leaved spirea double; tender.
do salicifolia.—Willow-leaved spirea; hardy.
do Van Houttei.—Van Houtte's spirea; hardy.
Symphoricarpus racemosus.—Snow berry; hardy.
Syringa Chinensis rothamagensis.—Chinese lilac; half hardy.
do Japonica.—Japan lilac; hardy.
do Josikæa.—Josika's lilac; hardy.
do vulgaris alba.—White lilac; hardy.
do do Chas. X.—Charles X. lilac; hardy.
do do purpurea.—Purple lilac; hardy.
Tamarix Amurensis.—Russian tamarisk; hardy.
Thuya Lobbii atrovirens.—Dark green arbor-vitæ; half hardy.
do occidentalis.—Common arbor-vitæ; hardy.
do do argentea.—Silver-tipped arbor-vitæ; hardy.
do do aurea.—Golden arbor-vitæ; hardy.
do do Douglas No. 2.—Douglas' No. 2 arbor-vitæ; hardy.
do do Elwangeriana.—Elwanger's arbor-vitæ; hardy.
do do globosa.—Globose arbor-vitæ; hardy.
do do pyramidalis.—Pyramidal arbor-vitæ; hardy.
do do Hoveyi.—Hovey's arbor-vitæ; hardy.
do do Tom Thumb.—Tom Thumb arbor-vitæ; hardy.
do do vervæneana.—Vervaene's arbor-vitæ; half hardy.
do Sibirica.—Siberian arbor-vitæ; hardy.
do Tatarica (Wareana).—Tartarian arbor-vitæ; hardy.
Thuyopsis borealis.—Northern thuyopsis; half hardy.
Tilia argentea.—Silver-leaved linden; tender.
do cordata.—Small-leaved linden; hardy.
do heterophylla.—American basswood; hardy.
do platyphyllos.—Broad-leaved linden; hardy.
do vulgaris.—European linden; hardy.
Tsuga Canadensis.—Hemlock spruce; hardy.
Ulmus Americana.—White elm; hardy.
do campestris.—English elm; half hardy.
do fulva pendula.—Weeping slippery elm; hardy.
do montana fastigiata.—Pyramidal Scotch elm; hardy.
do racemosa.—Rock elm; hardy.
Viburnum Lantana.—Pliant viburnum; hardy.
do opulus.—High bush cranberry; hardy.
do pauciflorum.—few flowered viburnum; hardy.

This list contains but a small proportion of the ornamental trees and shrubs under test at the Central Farm. The larger number are arranged in botanical groups in the arboretum, where under the charge of the Botanist of the Experimental Farms, Mr. James Fletcher, over 600 species and varieties have been accumulated. As soon as sufficient information has been gained as to the hardiness of these in the Ottawa climate it is proposed to publish a full list of the entire collection.

PLANTATIONS OF FOREST TREES.

There were several objects in view in planting the belts of forest trees which line the west and north sides of the farm. One was to test by actual experiment with a number of different species the comparative results in growth and development to be had by planting at different distances apart. Five feet by five, five feet by ten and ten feet by ten were the distances chosen for these tests. Another question on which information was desired was the relative growth to which trees would attain when planted in blocks of single species as compared with those planted in mixed clumps where they are associated with a number of other sorts. Further information was sought as to how far the crops on the farm located near these tree belts will be influenced by the shelter they would afford as growth progressed. In the planting, the grouping was also designed with the object of producing pleasing effects on the landscape by the intermingling and blending of varieties. The main purpose however was to get all the useful data possible with regard to the more important timber trees of economic value so that object lessons in tree growth might be available to any who in future might desire to study this subject or to engage in the enterprise of timber growing.

The work of planting was begun in 1888 and a space laid out on the west boundary 165 feet wide extending the whole width of the farm. This gave room for a line of basswood or linden trees five feet inside the boundary fence and 40 feet apart. Fifteen feet were left for a roadway east of which there were ten rows of trees five feet apart each way followed by another ten rows ten feet apart each way. This area was planned to be filled with blocks of trees of various forms, each group to consist of a single species. Along the north boundary a space was provided 65 feet in width which was to be filled as follows. A row of mixed forest trees 40 feet apart placed five feet inside the boundary fence succeeded by ten rows of mixed trees of 10 to 15 varieties, some of which were to be planted five feet by ten and others five feet by five.

The first planting in 1888 was done under the supervision of Mr. W. W. Hilborn, at that time horticulturist of the Central farm, 1,321 trees were set out that year in the mixed belt and several blocks or clumps of single species in the wider belt, numbering about 1,500 trees in all. The accompanying plate is from a photograph recently taken of a part of the trees then planted, a portion of the 5 x 5 planting is seen to the left and part of the 10 x 10 to the right. In the spring of 1889 the work of planting in blocks of single species was resumed under the charge of Mr. Thos. A. Sharpe, now superintendent of the branch experimental farm at Agassiz, B.C., and about 1,350 were added to the number. In the autumn of the same year with the assistance of the farm foreman, Mr. John Fixter, about 4,000 more were planted in blocks of single species and 560 trees added to the belt of mixed sorts. In 1890-91 and 92 the planting was continued under the supervision of Mr. John Craig, horticulturist of the Central farm and during this period the plantation was much enlarged and the wide belt on the west side completed. Mr. Craig also took charge during these years of the necessary weeding and cultivating. During the past season this work has been continued by Mr. W. T. Macoun, foreman of forestry, and under his care the tree belt on the north boundary has been much extended, and it is hoped that in another year this will be completed. In the following report submitted by by Mr. Macoun, much useful information will be found.

REPORT OF THE FOREMAN OF FORESTRY.

Owing to the very wet season, the work of this department was greatly increased this year, and it was only by much labour with the horse cultivator and hand-hoe, that the weeds could be kept in check. Not only was frequent cultivation necessary for this reason, but the soil became compact again so soon, on account of very frequent rain, that it was extremely difficult to keep it in that porous condition which is essential to best results in tree growth.

Most of the trees and shrubs bordering the avenues in the forest plantations, and on the ornamental grounds, have made rapid growth this year and are fast becoming prominent features of the farm.

Insect enemies have been very numerous, and great vigilance was required to keep them in check. By occasional spraying with a mixture of Paris green and water and much picking off by hand, they were prevented from doing any great injury. A blight on the elms caused the limbs on a considerable number of them to die, and in some cases the whole tree was destroyed by it.

Nearly nineteen acres are now planted with the trees which form the forest belts along the northern and western boundaries of the farm. The belt on the western boundary is completed and contains 9,686 trees now living. The belt along the northern boundary, which is not yet completed, contains 5,840 trees living. Thus there is now a total of 15,526 trees living in both plantations.

FOREST BELT ALONG WESTERN BOUNDARY.

In this belt the trees are grouped in clumps of one species each and for comparison are planted 5 feet apart and 10 feet apart each way to show results of planting at different distances. Where trees have been planted for several years the benefit of close planting is easily discernible, the trees making better growth with a less proportion of broken tops and limbs, and the weeds being prevented from growing by the dense shade long before weeds cease to thrive among the trees planted 10 feet apart.

As large additions have been made to this belt since 1889, when the last list was published, a complete record is now given in the following table. Several clumps composed of species which have not succeeded well have been partly or wholly replaced by others:—

Deciduous Trees.	When planted.	Total number planted.	Number living.	Number dead.
Acer saccharinum—Sugar maple	1889	240	234	6
do do do	1890	60	60	....
do platanoides—Norway maple	1889	110	110	....
do dasycarpum—Silver leaved maple	1889	120	120	....
do rubrum—Red maple	1889	170	170	.....
Alnus glutinosa— Sticky alder	1889	90	90	....
Æsculus hippocastanum—Horse-chestnut	1889	90	86	4
Betula alba—European white birch	1889	90	90	....
do lutea—Yellow birch	1889	150	148	2
do papyracea—Canoe birch	1889	120	118	2
Carya alba—Shell-bark hickory	1888	8	8	....
Catalpa speciosa—Hardy Western catalpa	1889	158	154	4
do Kæmpferi—Japan catalpa	1889	30	30	....
do hybrida—Tea's catalpa	1889	30	30	....
Carpinus betulus—European hornbeam	1890	148	146	2
Cerasus serotina—Wild black cherry	8891	231	224	7
Fraxinus Americana—White ash	1889	476	473	3
do do do	1890	120	120	....
do excelsior—European ash	1889	40	40	....
do pubescens—Red ash	1889	120	120	....
do viridis—Green ash	1889	120	120	....
do sambucifolia—Black ash	1889	120	120	......

Deciduous Trees.	When planted.	Total number planted.	Number living.	Number dead.
Fagus ferruginea—American beech	1889	42	39	3
Gymnocladus Canadensis—Kentucky coffee-tree	1890	120	112	8
Gleditschia triacanthos—Honey locust	1890	92	86	6
Larix Europea—European larch	1888	275	265	10
do do	1890	30	20	10
Juglans nigra—Black walnut	1888	630	624	6
do do	1889	193	193	....
Juglans cinerea—Butternut	1888	290	288	2
do do	1889	240	237	3
Morus hybrida—Russian mulberry	1889	90	90	....
Negundo aceroides—Box elder	1889	261	261	....
Pyrus Americana—American mountain ash	1889	50	50	....
do Aucuparia—European mountain ash	1889	110	106	4
Platanus occidentalis—Button-wood	1889	120	119	1
do —(Nebraska seed) Button-wood	1890	150	134	16
Populus alba Bolleana—Bolle's poplar	1890	150	150	....
do Nolesti—Riga poplar	1892	92	92	....
do Petrovsky Petrovsk poplar	1890	50	49	1
do certinensis—Asiatic poplar	1890	40	40	......
Quercus alba—White oak	1889	41	41	....
do macrocarpa—Burr oak	1893	96	89	7
do rubra, Red oak	1888	21	19	2
do do do	1890	40	36	4
do Robur—English oak	1890	50	50	....
Robinia pseudacacia—Common locust	1889	213	209	4
Salix laurifolia—Laurel-leaved willow	1890	140	138	2
do acutifolia—Sharp-leaved willow	1890	148	146	2
do Voronesh—Voronesh willow	1890	60	60	....
Tilia vulgaris—European linden	1890	125	122	3
Ulmus Americana—White elm	1889	197	197	....
do do —(Manitoba seed) White elm	1889	38	38	....
do do do do	1890	94	94	....
do fulva—Red elm	1889	120	120	....
do racemosa—Rock elm	1889	220	213	7
do montana—Scotch or Wych elm	1890	97	92	5
do species undetermined, a small-leaved sort	1890	48	41	7
Evergreens.				
Tsuga Canadensis—Hemlock spruce	1889	30	13	17
do do	1890	62	61	1
Abies balsamea—Balsam fir	1890	63	63	....
Picea alba—White spruce	1889	180	180	....
do excelsa—Norway spruce	1889	301	301	....
do do do	1893	45	39	6
Pinus Sylvestris—Scotch pine	1888	424	423	1
do do Rigaensis—Riga pine	1889	30	30	....
do do do do	1893	108	102	6
do Austriaca—Austrian pine	1889	214	214	....
do strobus—White pine	1889	301	301	....
do do do	1890	250	247	3
Thuya occidentalis—Arbor-vitæ	1889	198	198	....

TREE PLANTING, 1893.

The spring of 1893, though unfavourable for most field work, was particularly suitable for the planting of trees. Copious rain fell during nearly the whole of May, giving the trees, when planted, good conditions for establishing themselves.

FILLING VACANCIES IN FOREST BELT.

Every spring it is found that a greater or less number of the trees in the forest belts have succumbed either to the severity of the winter, alternate freezing and thawing in fall and spring, or from the effects of water standing on or near the surface of the soil. Last spring 450 trees were needed to fill up the gaps caused in this way during the previous two years.

REPLACING AVENUE TREES AND ADDITION TO AVENUES.

Owing to various causes a certain proportion of the avenue trees also die each year, and this year the following numbers were required to replace those which had died. In some cases, as on the northern boundary, where the row of trees is composed of mixed species, the same kind was not always replanted.

SPECIES.

Acer saccharinum—Sugar maple	24
Acer rubrum—Red maple	21
Fraxinus Americana—White ash	10
Fraxinus viridis—Green ash	9
Fraxinus sambucifolia—Black ash	10
Tilia vulgaris—European linden	8

Last spring another avenue was formed extending from near the farm foreman's house to the northern boundary, by the planting of 46 Norway maple trees. These have all done well, except one, which died. This avenue promises to add much to the appearance of that part of the farm.

ADDITIONS TO MIXED FOREST BELT.

During the spring of 1893 there were 3,511 trees added to the mixed forest belt on the north boundary of the farm. Of these, only 163 have died, and those living seem well fitted, from their appearance at present, to survive the approaching winter.

The following is a list of the species planted, with total number of each, and the numbers which have lived and died:—

List of Species.	No. planted.	No. living.	No. dead.
Deciduous Trees.			
Acer saccharinum— Sugar maple	164	159	5
do rubrum—Red maple	198	193	5
do platanoides—Norway maple	124	124	....
do Pseudoplatanus—Sycamore maple	70	64	6
do Tartaricum—Tartarian maple	32	32	....
do campestre—English maple	31	31	....
Æsculus hippocastanum—Horse-chestnut	60	60	....
Betula alba—European white birch	191	191	....
Celtis australis—European nettle-tree	23	19	4
Catalpa hybrida—Tea's catalpa	66	66	....
Diospyros Virginiana—Persimmon	5	5	....
Fraxinus Americana—White ash	173	172	1
do viridis—Green ash	72	72	....
do sambucifolia—Black ash	61	61	....
Juglans nigra—Black walnut	165	165	....
Negundo aceroides—Box elder	298	297	1
Pyrus Americana—American mountain ash	25	24	1
do Aucuparia—European mountain ash	2	1	1
Populus alba Bolleana—Bolle's poplar	2	2	....
do certinensis—Asiatic poplar	129	129	....
Platanus occidentalis—Button-wood	2	2	....
Quercus alba—White oak	4	4	....
do macrocarpa—Burr oak	155	155	....
do rubra—Red oak	66	64	2
Rhamnus frangula—Breaking buckthorn	51	51	....
Tilia vulgaris—European linden	47	47	....
Ulmus Americana—White elm	199	197	2
do racemosa—Rock elm	69	62	7
do montana—Scotch elm	76	67	9

List of Species.	No planted.	No. living.	No. dead.
Evergreen Trees.			
Picea alba—White spruce	198	197	1
do excelsa—Norway spruce	290	257	33
Pinus strobus—White pine	129	102	27
do sylvestris Rigaensis—Riga pine	228	187	41
do Austriaca—Austrian pine	9	7	2
do Mughus nana—Dwarf mountain pine	78	66	12
Thuya occidentalis—Arbor-vitæ	19	16	3

EVERGREEN CLUMP.

In the year 1888 a large number of young trees was procured and planted in nursery rows to remain until they should be required for the tree belts and clumps, or for other ornamental purposes on the farm.

As several hundreds of Norway spruce, Scotch and Austrian pine had, before they were needed, grown too large for successful transplanting, it was decided to leave a clump of these, as a permanent plantation, on a rising piece of land, in a prominent place near the northern boundary of the farm.

The trees, having been planted close together, had made quite a thicket, and this year it was considered necessary to cut out a large number of them to admit light and air, and give those remaining a better opportunity to develop. The trees when thinned averaged 2½ feet apart in the rows, with the rows 3 feet apart. It is proposed to thin them still further as occasion requires.

The following table shows the average height of the trees, the average circumference, 1 foot from the ground, and the number of trees left of each species after thinning. For the double purpose of increasing the size of the clump and adding to its appearance, the rows of trees were extended to the cross road near by. The additions made this year will be found in the table.

Names of Species.	Average height.	Average circumference 1 foot from ground.	Number planted, 1888.	Number planted, 1893.
Picea excelsa—Norway spruce	7 feet	5 in.	273	168
Pinus sylvestris—Scotch pine	9½ "	5¼ "	636	52
Pinus Austriaca—Austrian pine	7 "	5¾ "	621	106
Total number of trees, 1856	....	....	1,530	326

PLANTING IN POULTRY YARDS.

Although the season was far advanced, and the trees and shrubs nearly in full leaf, during the first week of June, 53 trees and shrubs were planted in the poultry yards, and notwithstanding the advanced state in which they were when planted, not one has died.

SUMMARY OF TREES AND SHRUBS PLANTED, 1893.

Trees replanted in forest belt	450
do do along avenues	82
Addition to avenues	46
do to mixed forest belt	3,511
do to evergreen clump	326
Trees and shrubs in poultry yards	53

Wm. T. Macoun.

VISITS TO THE BRANCH EXPERIMENTAL FARMS.

During 1893 it was found necessary to visit the branch farms in the west twice, the first time in May and again in August. On the first journey I left Ottawa on the 28th of April, and arrived in Chicago a day prior to the opening of the World's Columbian Exposition when an opportunity was afforded of witnessing the completion of the work in connection with the Canadian agricultural and horticultural exhibits which had been planned earlier in the season. The day following the opening ceremonies I proceeded westward.

As one of the main objects in undertaking this early journey was to reach the branch farm at Agassiz, British Columbia, in time for spring planting, only one day was spent at each of the branch farms at Brandon, Man., and Indian Head, N.W.T. on the way out, giving time only to arrange those details of farm work which were most pressing. Agassiz was reached on the 11th of May, where seven days were spent in planning and arranging the work of the year, a large share of attention being given to the planting of trees and shrubs about the Superintendent's house. These have been so grouped as to produce good effects by agreeable combinations of form and colour, and a sufficient area has been provided adjacent to the dwelling to serve the purpose of an arboretum. Over 500 specimens were planted during the period of my visit, the placing of these produced quite a transformation in the appearance of the grounds and prepared the way for giving due prominence to an exceedingly interesting feature of the work in progress there. The orchards were inspected and extensions to these planned, a nut orchard was also planted. The forest tree planting on the mountain sides in rear of the valley land was well advanced before my arrival and by the time the planting season closed over 5,000 hard-wood trees had been set out and arrangements made for the planting of a similar number each year for several years to come. The large young orchard of cherry and plum trees set out three years ago was in full bloom at the time of my visit, and presented a very handsome appearance.

I found as a result of the unusually severe winter that all the peach, apricot and nectarine trees, and most of the other sorts of comparatively tender trees and shrubs, were more or less injured and some of them killed outright. Much of the evergreen foliage of the gigantic native firs looked scorched and brown showing that even the old and long established native trees had been unable to endure without injury this unusually severe visitation, the thermometer having fallen on one occasion for a few hours as much as 12 degrees below zero. The apple, plum and cherry trees did not appear to be injured at all, and the young apple trees later on, bore a very fair crop of fruit, but from the fact of the cherry blossoms not setting and a number of the plums setting very imperfectly, it seems that the very cold weather of the winter had affected even these hardier sorts of trees. The wood of many of the young pear trees was also more or less discoloured within, showing injury which may in some instances be permanent. The spring growth however was pushing rapidly on, and Nature was doing her best to repair the damage which had been done.

The farm buildings were examined and everything found in good order, the animals of all sorts were healthy, the spring work was well advanced, most of the grain sown and much of it up and everything betokened good management and care.

A good supply of water for this farm being very much needed a sum was placed in the estimates for 1893-94 for this purpose, and during my stay I visited the source of the springs on the hillside from which it is proposed that the water should be obtained. I found the supply abundant and the quality to all appearance excellent. Subsequently a sample of this water was forwarded to Ottawa, to be analysed by the chemist of the farms who confirmed in the report of his analysis the good opinion which had been formed regarding it. I submit herewith the report of the chemist.

WATER FROM EXPERIMENTAL FARM, AGASSIZ, B. C.

A careful and thorough chemical examination of this water affords the following data in parts per million:—

ANALYSIS.

Free ammonia	·032
Albuminoid ammonia	·024
Nitrogen in nitrates and nitrites	·046
Chlorine	2·5
Oxygen absorbed in 15 min. at 80° F.	·296
do 4 hours do	·594
Total solids, at 105° C	83·6
do after ignition	60·4
Phosphates	none.

From the above figures, I judge this to be a first class water, free from all contamination—animal and vegetable—and of excellent quality.

FRANK T. SHUTT, M.A.,
Chemist, Dom. Exp. Farms.

As soon as the arrangements were completed at Agassiz, B.C., I left for Indian Head, N.W.T., where two or three days were spent in carefully inspecting the condition of the branch farm located there, inquiring into the progress made and in discussing and planning work for the future. The forest plantations had wintered well, and the benefits arising from the planting of hedges and shelter belts to break the force of the winds, which sometimes injure the crops have been so thoroughly demonstrated, that plans were prepared for bordering nearly all the roads on the farm with such windbreaks and for planting them elsewhere on the grounds where needed. Arrangements were also made for extending the area planted with ornamental and timber trees and shrubs, the collection of which now includes about ninety species and varieties which have proven hardy there. The Austrian Brome grass (*Bromus inermis*) which has been under test at the Indian Head farm for several years, has been grown with so much success, that it was decided to sow a considerable number of acres of this grass for more extended trial for hay and pasture, and a sufficient quantity of seed was procured for this purpose. The cattle and horses had come through the winter in excellent condition, the farm crops were nearly all up and looked well and the land was very clean, giving evidence of great care in its cultivation.

On the 22nd May I arrived at the branch farm at Brandon, where several days were spent in inspecting the work in hand and planning for future progress. A day or two was devoted to the laying out and planting of the grounds around the residence of the superintendent. Quite a large number of trees and shrubs were planted, consisting altogether of varieties which have been thoroughly tested, and proven hardy in that climate. A sufficient area of land has been laid out in this connection to furnish space for all the additional varieties of hardy sorts obtainable. The trees and shrubs which have been thoroughly tested for hardiness at Brandon, include about 100 species and varieties and form a most instructive and attractive group. It is expected that this number will be considerably increased during the coming season.

As the native plum had succeeded well at the experimental farm at Brandon, it was thought desirable to increase the size of the plantation. For this purpose I visited the Brandon Hills in company with the superintendent, where the trees are found growing wild, and we succeeded in obtaining quite a number of young specimens, some of which were planted at Brandon and some sent to the branch farm at Indian Head to be tested there. (When these trees were seen during my later visit to the western farms in the autumn, they were nearly all doing well). Several additional hedges and windbreaks were also planted during this visit, to afford shelter and form dividing lines between the plantations of small and larger fruits, ornamental trees, shrubs and flowers. All the divisions of work on this farm were making good progress, the farm crops all looked well, the land was in good order and the horses and cattle healthy and in fine condition.

A very large number of the farmers of Manitoba visit this farm from year to year, seeking information on all points relating to agriculture and horticulture, and many voluntary testimonies are received from time to time in regard to the usefulness, not only of this institution, but also of all the branch farms and of the efficient manner in which the work is everywhere conducted. I returned to Ottawa on the 28th of May.

SECOND VISIT TO THE WEST.

A second journey to the Pacific Coast was made in August. On the way west I visited Madison, Wisconsin, and attended the meeting of the "Society for the Promotion of Scientific Agriculture" held in connection with that of the "American Association for the Advancement of Science." At this meeting I had the opportunity of explaining the nature of some of the work in progress for the promotion of agriculture at the Experimental Farms, and during the sessions I was honoured by being elected president of the society. I also attended some of the more important sessions of the American Association for the Advancement of Science held at the same place. Journeying westward a day was spent at the North Dakota Experiment Station at Fargo, N. D., where through the kindness of Prof. W. Hays who had charge of the experimental work in agriculture, I was shown through the buildings and over the grounds. As this institution has not been long established there has not been much time yet for tree planting and the grounds in this respect, looked very bare. There was, however, some very interesting work in progress, especially with wheat, with the view of producing new varieties by selection and also to some extent by cross fertilization. Useful experiments were also in hand in regard to a proper rotation of crops for that country.

EXPERIMENTAL FARM, BRANDON.

Two days were spent at the branch farm at Brandon, where the crops were found to be well advanced and many of the early varieties of cereals were cut. The grain which promised an abundant yield early in the season was found to be shrunken and light, owing to the rapid and premature ripening which took place there during the unusual heated term from the 5th to the 12th of August. All sorts of grain had suffered from this cause, but the injury was most apparent in the different sorts of wheat and barley. The quality of the oats was much better and the yield also of most varieties was good. The root crops owing to hot weather and light rains had not made satisfactory progress, but all sorts of small fruits were yielding well. The growth of the avenues, forest tree plantations and ornamental trees and shrubs had been good, and the general appearance and condition of the farm was both attractive and creditable.

EXPERIMENTAL FARM, INDIAN HEAD.

The Indian Head farm was next visited, and similar examinations made. Most of the crops looked remarkably well and did not appear to have suffered much injury from the hot days in August, and the farm was in excellent order. Roots, however, were backward and did not promise well. Austrian Brome grass had given an excellent yield of hay, more than three tons per acre, and the crop of all the small fruits was good. The growth of the trees, shrubs and hedges had not been so luxuriant as on the branch farm at Brandon, owing to less favourable climatic conditions but they had made satisfactory progress and have already become a pleasing feature on this prairie farm.

VISIT TO THE EDMONTON DISTRICT.

At Calgary the branch line of railway to Edmonton was taken which runs through a district I had not visited before. The country for the first fifty miles has much the same appearance as about Calgary, the grass is short and trees and shrubs are almost or entirely wanting, excepting along the margins of streams or watercourses where the moisture is sufficient to sustain them. North of this changes begin to occur, the grasses gradually increase in length and in luxuriance, clumps of shrubs and dwarfed specimens of trees are occasionally seen, and after a time these are succeeded by patches of woodland of stronger growth with stretches of open prairie adorned with clumps and occasional larger areas of timbered land. Streams and rivers also are oftener seen and by the time that half the distance between Calgary and Edmonton has been covered, the country is found to be well wooded and watered, grasses and pea-vines are luxuriant and abundant and the soil is a dark rich fertile loam. The woods afford shelter and the luxuriant herbage furnishes unlimited quantities of food for stock, making this part of the territories specially suitable for mixed farming. During the five days spent at Edmonton many of the farming settlements in the neighbourhood were visited which involved about 130 miles of driving. All through this district the grain crops looked remarkably well. The harvest was in progress during the time of my visit, and the heads of grain were plump and well-filled. For about sixty miles north of Edmonton until the height of land is crossed, the agricultural capabilities of the country appear to be much the same as those about Edmonton, but in the next forty miles which drain into the Athabasca River, the soil is said to be less fertile although this district is believed to include much excellent land. This belt of fertile country 200 miles or more in width, is said to extend westward from Edmonton more than 200 miles towards the Yellowhead Pass in the Rocky Mountains and eastward, varying in width, for several hundred miles to the shores of Lake Manitoba. At many points in this immense fertile area settlement is progressing satisfactorily, but the capacities of the district are such that millions will eventually find comfortable homes and abundant sustenance there.

EXPERIMENTAL FARM, AGASSIZ.

Returning to the main line of railway and proceeding westward a journey of about 35 hours across the mountains brought me to Agassiz, where several days were spent in examining the results of the season's growth, not only on the experimental farm, but also on the lands of the neighbouring farmers. At the time of my arrival, a drought had prevailed in this part of the country for five or six weeks and crops of all sorts were suffering for want of rain. Most of the grain was short in straw, but with heads moderately well filled, the yield however was turning out considerably under the average. The root crops were then very backward, but subsequent rains improved these considerably. In the orchards many of the young plum trees were laden with fair crops of fruit of excellent quality, a collection of which was made and forwarded to the World's Fair in Chicago, but the results with most other fruits were disappointing and the apple crop was unusually light. On the experimental farm at Agassiz, there are now more than 1,100 varieties of fruits under test, about 800 of which are large fruits and most of the trees are doing well. Some of the orchards have been planted on the valley land, others on the fertile benches at different heights on the face of the mountains varying from 100 to 800 feet. The orchards located at the highest of these points have thus far been found to have the healthiest trees and are the first to leaf out in the spring. A comparison of these with the trees planted in the valley land for a series of years will be most useful and instructive.

INQUIRIES INTO HOP GROWING AND IRRIGATION.

The subject of hop growing is now attracting much attention in some parts of British Columbia, especially in the neighbourhood of the experimental farm, where there are several large hop yards, which have given excellent crops during the past season. In order to gain all the information possible for the benefit of the growers there, it was arranged that the superintendent of the farm at Agassiz should join me in visiting the hop yards which had been established in the Fraser River Valley and also some of the more important hop districts in the State of Washington, both in the coast and dry climates of that state, so that opportunity might be afforded of comparing the hops grown there with those produced in the corresponding climates in British Columbia. After visiting the noted hop districts about Puyallup and the White River Valley a trip was made to Yakima in the dry interior of the state, where nothing can be grown without irrigation. A careful comparison seemed to leave no doubt that hops can be produced in British Columbia as good in every respect as those grown in Washington.

Returning eastward a day was spent at Spence's Bridge where some magnificent apples grown by means of irrigation were obtained and forwarded to the Canadian horticultural department at the World's Fair. One of these grown by Mr. A. Clemis was an extraordinary specimen of the variety known as Red Beitegheimer, of beautiful form and colour, which measured 15½ inches in circumference and weighed 25 ounces.

At Calgary a visit was made to the farm of Mr. Hull, a few miles from the town, where excellent crops of oats, wheat and barley had been grown during the past season by means of irrigation. Extensive works have been begun in that neighbourhood which when completed will result in the irrigation of thousands of acres of land by utilizing portions of the water in the Bow and Elbow Rivers. With a sufficient supply of moisture in the soil there is no doubt that abundant crops of grain and fodder can be grown on the fertile lands of that district. Returning homewards Ottawa was reached on the 26th of September after an absence of more than six weeks.

EXPERIMENTAL FARM, NAPPAN.

Later in the autumn the branch farm at Nappan, Nova Scotia, was visited the results of the year ascertained and arrangements made for future experimental work. This farm has been greatly improved during the past five years by a gradual extension of under-draining. A few acres have been drained each year, until now 78 acres have been so treated with manifestly beneficial results in quantity and quality of crops. Land so drained may be seeded much earlier in the spring, and the soil being kept more open and porous admits of a much better tilth, while the conditions for healthy plant growth are greatly improved. Many promising varieties of grain, roots and potatoes, have been tested, the results of early and late sowing compared, the influence of fertilizers on different crops noted and many other useful lines of experimental work conducted. The fruit plantations contain many varieties both of large and small fruits, most of which have made satisfactory progress and some of the young trees have borne fruit. The number of ornamental trees, shrubs and plants under test has been increased and useful information gained in this branch of the work. The cattle kept at this farm are almost wholly composed of dairy breeds, and the recent establishment of a cheese and butter factory, at Nappan, under charge of the Dominion Dairy Commissioner, has awakened a general interest in dairying in that part of the country and brought the experimental work carried on at the farm on dairy stock prominently into notice. Since the erection of the piggery several useful breeds of swine have been introduced which are having a good influence in improving the character of the hogs bred in this district. All the animals appeared to be healthy and the general condition of the farm was good, giving evidence everywhere of careful management.

BEE KEEPING.

For the past two years experiments have been conducted with bees at the branch farm in Brandon, Manitoba, and recently the initial steps in the direction of investigations on this important subject have been taken at the central farm and a supply of suitable material obtained. The supervision of this work will be undertaken by the entomologist of the experimental farms, Mr. James Fletcher, who will, it is expected be able to give particulars of the progress made in this department in the next annual report.

SUMMARY OF CROPS AT THE CENTRAL EXPERIMENTAL FARM.

The following are the results of the harvest of 1893:—

	Bushels.
Wheat	206
Barley	251
Oats	736
Pease	191
Rye	370
Mixed grain for feed	212
Total No. of bushels	1,966

	Tons.	Lbs.
Indian corn for ensilage	440	......
Sunflower heads for ensilage	25	1,651
Horse beans "	15	273
Carrots	131	1,332
Mangels	56	1,388
Turnips	11	1,174
Potatoes	34	.....
Hay	104	......
Total No. of tons	828	1,818

CORRESPONDENCE.

The following is a summary of the letters received and despatched at the Central Experimental Farm for the first eleven months of 1893, ending November 30th, also of the bulletins and reports distributed by mail during the same period:—

——	Letters Received.	Letters Sent.
Director, (including in "letters received" reports on seed grain and in "letters sent" circulars of instruction and acknowledgment of reports received relating to distribution of seed grain)	13,733	18,213
Agriculturist	4,663	
Horticulturist (including in "letters sent" circulars regarding diseases of fruits, and varieties of fruits suitable for Quebec)	1,863	3,756 2,180
Chemist	850	746
Entomologist and Botanist	1,735	1,261
Poultry manager	727	770
	23,571	26,926

Number of Reports and Bulletins mailed 227,899

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm Ottawa, 1893; maximum, minimum, and mean temperatnre for each month, with date of occurrence; also rainfall and snowfall:

——	Maximum.	Date.	Minimum.	Date.	Mean.	Rainfall. — Inches.	Snowfall. — Inches.
January	40°·2	29th	—26·2	4th	3°·6	....	30·00
February	38·8	10th	—23·1	5th	9·8	0·07	29·00
March	45°·0	9th	—5·2	6th	23·2	1·04	2·50
April	65·2	13th	9·0	2nd	36.5	2·47	5·00
May	87·5	12th	33·8	26th	53·3	4·69	
June	91·5	20th	49·5	7th	68·3	4·36	
July	88·3	1st	49·0	9th	66·1	5·01	
August	94·8	10th	45·5	30th	66·8	8·68	
September	76·3	13th and 15th	34·9	26th	53·6	3·22	
October	72·9	13th	21.5	31st	48·6	1·18	
November	54·2	2nd	7·5	25th	32·6	1·07	6·00
						31 79	72·50

Rain or snow fell on 158 days during the 11 months.
Heaviest rainfall in 24 hours 1·97 in., on September 29th.
Heaviest snowfall in 24 hours 8·00 in., on January 2nd.
During May rain fell on 17 days.
October shows the lowest number of days on which rain fell during the summer months, viz., 9.

WILLIAM T. ELLIS,
In charge of Observations.

ACKNOWLEDGMENTS.

In closing this section of the report, I desire to express my obligations to all the officers composing the working staff of the several experimental farms for their ready and hearty co-operation in all departments of the work which have been planned and for the successful carrying ont of the measures devised, also to the workmen for the interest they have taken in doing their part well. The success of the work has exceeded all anticipations and has gained multitudes of friends and advocates for the farms among the agricultnrists and horticulturists of Canada and the most favourable comments from those best able to judge of the valne of the work in other countries. The resnlts reflect credit on all. A personal acknowledgment is specially due to those members of the Central Experimental Farm staff, who have so ably assisted me in those sections of the work of which from the beginning I have assnmed the personal charge. I allude to portions of the agricnltnral work (by special arrangement with the agricnlturist) to the forest plantations and the planting of ornamental groups of trees and shrubs, the care of the seed testing and propagating houses, and the distribution of seed grain for test. To the farm foreman, Mr. John Fixter; to the foreman in forestry, Mr. W. T. Maconn; who has also acted as my assistant in the experimental field work, to Mr. W. T. Ellis, who has had the charge of the testing and propagating houses, and to Mr. J. Kirkpatrick, who has carried on the work connected with the seed distribution, my grateful acknowledgments are due for the care and vigilance which they have shown in the management of these several divisions of the work and in collecting and preserving the data on which much of the information in this part of the report is based.

WM. SAUNDERS,
Director Dominion Experimental Farms.

REPORT OF THE AGRICULTURIST.

(JAS. W. ROBERTSON.)

To WM. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to present reports on, (1) experiments in the fattening of cattle, (2) experiments in the feeding of swine, and (3) the Robertson mixture for ensilage.

The brevity of this report is due to two causes.

(1) The discovery that the disease of tuberculosis was widespread in our herd of cattle, led to the stoppage, for a time, of experiments in the feeding of milking cows, also to a postponement of the investigations in the Experimental Dairy. The presence of the disease of tuberculosis in a few of the cattle, had been suspected for some time; but until recently the disease was not known to be of an actively contagious nature. After it had been established that, by means of tests made by the injection of a small quantity of Koch's lymph or tuberculin, the presence of the disease in even its incipient stages could be detected, several of the animals were tested. By the steps which were taken to stamp out the disease from the herd, it became impraticable to continue the feeding of a number of cows on the crops of the 40-acre lot, which were reported on last year. A complete record of the crops of the 40-acre lot for 1893 has been taken; and it is intended that the feeding of as many cattle as can be kept on the product of it, will be resumed in 1894. For the reason mentioned, I do not consider the information available in regard to it, for the season of 1893, to be of sufficient importance to be published in its incomplete state.

(2) As in former years my duties and opportunities as Dairy Commissioner have absorbed the greater part of my time. Executive work which has arisen from the establishment and management of the Branch Experimental Dairy Stations —(there have been 19 different dairy stations under my control during the year)— has absorbed a large share of my time; the management of the exhibition of Canadian dairy products at the World's Fair claimed no few hours and days; meetings of farmers, correspondence, &c., &c., had to go sparingly served by what could be taken of it; and the planning and supervising of investigations into the feeding and management of cattle and swine and the other branches of work undertaken by me, at the Central Experimental Farm, in my capacity as Agriculturist, occupied the remainder of it. The supervision of the grain and root crops was taken by yourself, as heretofore.

For the faithful and painstaking discharge of their duties, I desire to mention with special commendation, Mr. John Fixter, farm foreman, and Mr. Robert R. Elliott, herdsman.

I have the honour to be, sir,
Your obedient servant,
JAS. W. ROBERTSON,
Agriculturist.

PART I.—THE FATTENING OF CATTLE.

Experimental tests in the fattening of steers were commenced at the Central Experimental Farm in December, 1890. The main object of the experiments was to obtain information on the comparative cost of fattening steers:—

(1.) Upon a ration of which the bulky-fodder portion was mainly corn ensilage, hay and roots;

(2.) Upon a ration of which the bulky-fodder portion was mainly hay and roots; and

(3.) Upon a ration of which the bulky-fodder portion was mainly corn ensilage.

For the purpose of arranging such data as would be obtained from the tests, in a manner which would be clear to the farmers and useful to them in making a comparison between the cost of feeding steers on the three different classes of rations, a cash value was estimated for the component fodders in each. The prices at which the several fodders were valued for the purposes of these comparisons, are higher than the cost of production to the ordinary farmers, and may be higher or lower than the prices which could be realized from their sale as fodders.

The values at which the calculations for the different years were made, are as follows:—

TABLE I.

——		1890-91.	1891-92.	1892-93.
		$ cts.	$ cts.	$ cts.
Corn ensilage	Per ton.	1 40	2 00	2 00
Hay	"	8 00	8 00	8 00
Roots (turnips, mangels and carrots)	"	4 00	4 00	4 00
Straw	"	4 00	4 00	4 00
Oil-cake and cotton-seed meal	"	30 00	30 00	....
Mixed grain (pease and barley)	"	20 00	20 00	20 00
Frosted wheat	"	....	12 00	12 00

The following table shows the rations which were fed in 1891-92. In 1890-91, instead of 2 lbs. of oil-cake in each ration, there were 1 lb. each of oil-cake and cotton-seed meal. Otherwise the rations were the same for the two years.

TABLE II.

Ration No. 1.	Lbs.	Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Corn ensilage	20			Corn ensilage	50
Hay (cut)	10	Hay (cut)	20		
Roots	20	Roots	40		
Straw (cut)	5	Straw (cut)	5	Straw (cut)	5
Oil-cake	2	Oil-cake	2	Oil-cake	2
Pease (ground)	2	Pease (ground)	2	Pease (ground)	2
Barley (ground)	2	Barley (ground)	2	Barley (ground)	2
	61		71		61

Feeding tests were continued during 1892-93 to obtain further data for a comparison of the economy of using the bulky-fodder portions of rations, No. 2 (hay, roots and straw), and No. 3 (corn ensilage and straw). Instead of equal

INDIAN CORN FOR FODDER AND ENSILAGE, GROWN AT THE CENTRAL EXPERIMENTAL FARM—OTTAWA.

quantities of meal being added to the different rations, an equal quantity of meal per head per day, was fed to the animals which were classed for comparison in the two groups.

Four steers (two of them 2-year-olds and two of them 1-year-olds) were arranged into Group I. and were fed on ration No. 2, as under; and four steers of similar age, quality and breeding, were put into Group II. and fed on ration No. 3, as under.

TABLE III.

Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Hay (cut)	20	Corn ensilage	50
Roots (turnips)	40		
Straw (cut)	5	Straw (cut)	5
	65		55

The animals were allowed as much of the mixture as they would eat. The meal, which was fed in addition, was a mixture of equal parts by weight of ground barley, pease and frosted wheat. The two-year-old steers in both groups were given 5 lbs. per head per day of the meal; and the one-year-old steers in both groups were given 4 lbs. per head per day of the meal. Occasionally, when the animals "were off their feed," the meal was reduced for a few days.

The two-year-old steers in both groups were fed for comparison in a test in 1891-92; and the following table of the rate of gain during the feeding period of 18 weeks at that time, shows that the animals were nearly evenly classed. In that test they were all fed on ration No. 3 (corn ensilage, straw and meal):—

TABLE IV.

——	Increase in Weight.	Feed consumed per head per day.	Cost per head per day.
	Lbs.	Lbs.	Cents.
Group I., steer No. 177	163	45·25	9·64
do do 178	173		
Group II. do 175	129	43·94	9·36
do do 176	172		

During the preparatory period, for the feeding test of 1892-93, from Oct. 6 to Nov. 22, these four steers were fed on the ordinary maintenance ration. The following table shows the gain in weight during that period.

TABLE V.

——	Weight, Oct. 6.	Weight, Nov. 22.	Gain.
	Lbs.	Lbs.	Lbs.
Group I., steer No. 177	1,105	1,105	......
do do 178	1,125	1,235	110
Group II. do 175	1,050	1,140	90
do do 176	1,050	1,180	130

The following table shows (1) the increase in weight of each steer during the first 11 weeks (from Nov. 22 to Feb. 7), (2) the quantity of the ration consumed per head per day, (3) the quantity of the meal mixture consumed per head per day, and (4) the average cost per head per day for feed consumed:—

TABLE VI.

Rations.	Increase in Weight.	Bulky-fodder per head, per day.	Meal per head, per day.	Cost per head, per day.
	Lbs.	Lbs.	Lbs.	Cents.
Hay, roots and straw, steer No. 177	127	38·29	5·01	14·35
do do 178	59	37·75	5·01	14·20
Corn ensilage and straw, steer No. 175	107	53·54	5·01	10·17
do do 176	130	55·94	5·01	10·42

The steers on the hay, roots and straw ration were not showing a good appetite, and for the remainder of the feeding period (from February 7 to May 9) ration No. 2 was made up to contain 80 lbs. of roots instead of 40 lbs.

The two rations were then as follows:—

TABLE VII.

Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Hay (cut)	20	Corn ensilage	50
Roots (turnips and carrots)	80		
Straw (cut)	5	Straw (cut)	5
	105		55

The following table shows (1) the increase in weight of each steer during the 13 weeks (from February 7 to May 9), (2) the quantity of the ration consumed per head per day, (3) the quantity of the meal mixture consumed per head per day, and (4) the average cost per head per day for feed consumed.

TABLE VIII.

Rations.	Increase in Weight.	Bulky-fodder per head, per day.	Meal per head, per day.	Cost per head, per day.
	Lbs.	Lbs.	Lbs.	Cents.
Hay, roots and straw, steer No. 177	89	48·00	4·87	15·64
do do 178	116	48·53	4·86	15·75
Corn ensilage and straw do 175	92	48·40	4·82	9·45
do do 176	100	52·41	4·90	9·95

The following table shows (1) the increase in weight of each steer for the whole feeding period of 24 weeks, (2) the increase in weight per head per day, (3) the cost per head per day, and (4) the cost per 100 lbs. of increase in weight for feed consumed.

TABLE IX.

Rations.	Meal per head per day.	Increase in Weight.	Increase per head per day.	Cost per head per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Cents.	$
Hay, roots and straw, steer No. 177	4·94	216	1·28	15·05	11·70
do do 178	4·93	175	1·04	15·04	14·40
Corn ensilage and straw do 175	4·91	199	1·18	9·79	8·26
do do 176	4·95	230	1·36	10·18	7·43

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 24 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 19 lbs. per head MORE, and COST 5·06 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) The cost for feed consumed per 100 lbs. of increase in live weight, was 66·34 per cent greater on ration No. 2 (hay, roots, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal).

The following is a summary of the results from the feeding tests for three years with two-year old steers.

Conclusions. From the tests in 1890-91 it appears that:—

(1.) During the feeding period of 20 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal), GAINED in weight, on the average, 33 lbs. per head MORE, and COST 7·33 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) During the feeding period of 20 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal), GAINED in weight, on the average, 61½ lbs. per head MORE, and COST 3·68 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 1 (hay, roots, corn ensilage, straw and meal);

(3.) When the experiment was ended, the steers which were fed upon ration No. 2 (corn ensilage, straw and meal) were in the most attractive condition of the three lots for handling and selling.

Conclusions. From the tests in 1891-92 it appears that:—

(1.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal), GAINED in weight on the average 55½ lbs. per head MORE, and COST 3·75 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal), GAINED in weight on the average 36 lbs. per head MORE, and COST 3·81 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 1 (hay, roots, corn ensilage, straw and meal);

(3.) The cost for feed consumed per 100 lbs. of increase in live weight, was 62·95 per cent greater on ration No. 2 (hay, roots, straw and meal, and 48·32 per cent greater on ration No. 1 (hay, roots, corn ensilage, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal).

Conclusions. From these tests for three years it appears that:—

(1.) On the average, the steers which were fed on ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 35·8 lbs. per head MORE, and COST 5·38 cents LESS per head per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal).

(2.) On the average of two years, the cost for feed consumed per 100 lbs. of increase in live weight, was 64·64 per cent greater on ration No. 2 (hay, roots, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal).

Feeding tests on the same two rations were carried on during the same time with four one-year old steers. These four steers, like the four two-year old steers, had been on a feeding experiment during the winter of 1891-92. The following tables show the rates of gain, etc., during that test.

TABLE X.

Breed.	Weight Dec. 1.	Weight April 5.	Increase.
	Lbs.	Lbs.	Lbs.
Shorthorn No. 174	595	850	255
Quebec " 173	480	644	164
Shorthorn " 172	600	812	212
Quebec " 171	430	605	175

TABLE XI.

Rations.	Breed.	Increase in weight per day.	Feed consumed per day.	Cost per head per day.	Cost per 100 lbs. of increase in weight.
		lbs.	lbs.	cents.	$
Hay, roots, straw and meal	Shorthorn No. 174.	2·02	35·85	12·11	5·99
do	Quebec " 173.	1·30	25·65	8·67	6·66
Corn ensilage, straw and meal	Shorthorn " 172.	1·68	39·00	8·31	4·94
do	Quebec " 171.	1·38	31·50	6·71	4·83

Conclusions. From these tests with calf steers it appears that:—

(1.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 16 lbs. per head LESS and COST 2·87 cents per head LESS per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) The *cost* of feed consumed per 100 lbs. of increase in live weight, was 27·6 *per cent greater*, on ration No. 2 (hay, roots, straw and meal), than it was on ration No. 3 (corn ensilage, straw and meal).

(3.) The *cost* of feed consumed per 100 lbs. of increase in weight was *lowest* in the case of a calf steer of "French Canadian" or "Quebec Jersey" breed, fed upon ration No. 3 (corn ensilage, straw and meal).

In the test of 1892-93, the two steers which had been on ration No. 2 (hay, roots, straw and meal) in 1891-92, were again put on that ration; and the other two steers were put as in the former test, on ration No. 3 (corn ensilage, straw and meal).

They were allowed as much of the bulky-fodder part of the rations as they would eat; and each steer was given 4 lbs. of the mixed meal (barley, pease and frosted wheat) per day.

Ration No. 2 was altered for them also after February 7th by the addition of 40 lbs. of roots as in table VII.

The following tables show (1) the increase in weight of each steer for the whole feeding period of 24 weeks, (2) the increase in weight per head per day, (3) the quantity of the ration consumed per head per day, (4) the quantity of the meal mixture consumed per head per day, (5) the cost per head per day, and (6) the cost per 100 lbs. of increase in weight, for feed consumed.

TABLE XII.

Rations.	Breed.	Weight Nov. 22.	Weight May 9.	Increase in weight.	Increase per head per day.
		lbs.	lbs.	lbs.	lbs.
Hay, roots and straw............	Shorthorn No. 174.	1,060	1,221	161	·95
do	Quebec " 173.	830	955	125	·74
Corn ensilage and straw..........	Shorthorn " 172.	1,015	1,225	210	1·25
do	Quebec " 171.	795	986	191	1·13

TABLE XIII.

Rations.	Breed.	Bulky-fodder per head per day.	Meal per head per day.	Cost per head per day.	Cost per 100 lbs. of increase.
		lbs.	lbs.	cents.	$
Hay, roots and straw............	Shorthorn No. 174.	42·30	3·95	13·89	14·50
do	Quebec " 173.	30·74	3·79	10·91	14·66
Corn ensilage and straw..........	Shorthorn " 172.	48·19	3·95	8·67	6·94
do	Quebec " 171.	40·80	3·95	7·87	6·92

Conclusions. From these tests, it appears that:—

(1.) During the feeding period of 24 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 57·5 lbs. per head MORE and COST 4·13 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal).

(2.) The cost of feed consumed per 100 lbs. of increase in live weight, was 110·39 per cent greater on ration No. 2 (hay, roots, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal);

(3.) The cost of feed consumed per 100 lbs. of increase in weight was lowest in the case of a Shorthorn steer; but taking the tests for the two years (1891-92 and 1892-93), the cost of feed consumed per 100 lbs. of increase in weight, was slightly lowest in the case of a steer of the "French Canadian" or "Quebec" breed, fed upon corn ensilage, straw and meal.

THE FEEDING OF HEIFERS.

Two grade Shorthorn heifers were also fed on ration No. 2 (hay, roots and straw) and one grade Shorthorn and one Holstein heifer, of about similar age and quality, were fed on ration No. 3 (corn ensilage and straw). A grade Holstein steer was also fed with these two heifers on ration No. 3.

They were allowed as much of the bulky-fodder part of the ration as they would eat; and each animal was given 4 or 5 lbs. of the mixed meal (barley, pease and frosted wheat) per day. Ration No. 2. was altered for them also after February 7th by the addition of 40 lbs. of roots, as in Table VII.

The following tables show (1) the increase in weight of each animal for the whole feeding period of 24 weeks, (2) the increase in weight per head per day, (3) the quantity of the ration consumed per head per day, (4) the quantity of the meal mixture consumed per head per day, (5) the cost per head per day, and (6) the cost per 100 lbs. of increase in weight, for feed consumed.

TABLE XIV.

Ration.	Name of steer.	Weight, — Nov. 22.	Weight — May 9.	Increase in weight.	Increase per head per day.
		Lbs.	Lbs.	Lbs.	Lbs.
Hay, roots and straw...........	Ida.	850	1,021	171	1·01
do do	Rose.	1,065	1,280	215	1·28
Corn ensilage and straw.........	Queen.	900	1,183	283	1·68
do do	Ethel.	1,065	1,272	207	1·23
do do	Baron.	885	1,163	278	1 65

TABLE XV.

Ration.	Name of steer.	Bulky fodder per head per day.	Meal per head per day.	Cost per head per day.	Cost per 100 lbs. of increase.
		Lbs.	Lbs.	cents.	$
Hay, roots and straw.............	Ida.	40·16	3·92	13·32	13·09
do do	Rose.	43·34	4·94	15·01	11·73
Corn ensilage and straw....... ..	Queen.	52·22	3·94	9·11	5·41
do do	Ethel.	53·20	4·88	10·03	8·14
do do	Baron.	52·98	3·95	9·20	5·56

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 24 weeks, the animals which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 63 lbs. per head MORE and COST 4·72 cents per head LESS, per day, for feed consumed, than the animals which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) The cost for feed consumed per 100 lbs. of increase in live weight, was 94·82 per cent greater on ration No. 2 (hay, roots, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal).

The following tables show the average of the results from the six animals fed upon ration No. 2 (hay, roots, straw and meal) and from the seven animals fed upon ration No. 3 (corn ensilage, straw and meal) for the whole feeding period of 24 weeks:—

TABLE XVI.

Ration.	——	Weight, Nov. 22.	Weight, May 9.	Increase in weight.	Increase per head per day.
		Lbs.	Lbs.	Lbs.	Lbs.
Hay, roots and straw....	Average of six animals....	1,024	1,201	177	1·05
Corn ensilage and straw.	Average of seven animals.........	997	1,225	228	1·35

TABLE XVII.

Ration.	——	Bulky-fodder per head per day.	Meal per head per day.	Cost per head per day.	Cost per 100 lbs. of increase.
		Lbs.	Lbs.	cents.	$
Hay, roots and straw....	Average of six animals............	44·00	4·41	13·87	13·35
Corn ensilage and straw.	Average of seven animals.........	50·31	4·36	9·26	6·95

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 24 weeks, the animals which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 51 lbs. per head MORE, and COST 4·61 cents per head LESS per day for feed consumed, than the animals which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) The cost for feed consumed per 100 lbs. of increase in live weight, was 92·08 per cent greater on ration No. 2 (hay, roots, straw and meal), than it was on ration No. 3 (corn ensilage, straw and meal);

(3.) The *cost* of feed consumed per 100 lbs. of increase in weight was *lowest* in the case of a grade Shorthorn heifer (viz., $5.44 per 100 lbs. of increase in weight), fed upon ration No. 3 (corn ensilage, straw and meal).

PART II.—THE FEEDING OF SWINE.

The experiments in the feeding of swine during 1893 were mainly directed towards gaining information on the quantities of grain consumed per pound of increase in live weight by swine of different breeds or breeding. Incidentally, tests with the use of frosted wheat as the whole or part of the ration were continued.

First Series.

A series of experiments was commenced with four pens of swine of different breeding, by feeding them on frozen or frosted wheat, ground and soaked in cold water for an average of 18 hours. The swine in every pen were weighed once a week.

TABLE I.

Pen No. 1 contained 3 swine, crossbred by *Berkshire* sire and *Poland-China* dam

——	Oct. 3.	Oct. 31.	Nov. 28.	Dec. 26.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight..............................	329	469	589	630	....
Increase in weight......................	....	140	120	41	301
Feed consumed...........................	....	585½	565½	364	1,515
do per lb. of increase in live weight...........	....	4·17	4·71	8·87	5·03

TABLE II.

Pen No. 2 contained 4 swine, grades by *Improved Large Yorkshire* sire and *Berkshire Grade* dam.

——	Oct. 3.	Oct. 31.	Nov. 28.	Dec. 26.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	376	499	642	746	....
Increase in weight	....	123	143	104	370
Feed consumed	....	624	631	608	1,863
do per lb. of increase in live weight	....	5·07	4·41	5·84	5·03

TABLE III.

Pen No. 3 contained 2 swine, crossbred by *Improved Large Yorkshire* sire and *Berkshire* dam.

——	Oct. 3.	Oct. 31.	Nov. 28.	Dec. 26.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	256	331	398	426	....
Increase in weight	....	75	67	28	170
Feed consumed	....	371½	342	232	945½
do per lb. of increase in live weight	....	4·93	5·10	8·28	5·56

TABLE IV.

Pen No. 4 contained 3 swine, purebred *Improved Large Yorkshires.*

——	Oct. 3.	Oct. 31.	Nov. 28.	Dec 26.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	275	338	405	314*	....
Increase in weight	....	63	67	42	172
Feed consumed	....	370	364	276	1,010
do per lb. of increase in live weight	....	5·87	5·43	6·57	5·87

* 2 swine only.

Conclusions. From these tests with 12 swine, which were continued 12 weeks, it appears that:—

(1.) On the average 5·26 lbs. of frosted wheat were consumed per pound of increase in the live weight.

Second Series.

A series of experiments was commenced with five pens of swine of different breeds or breeding, by feeding them all on the same ration,—a mixture of equal parts by weight of barley and frosted wheat, both ground and soaked in cold water for an average of 30 hours. After the first week a quantity of pulped carrots, equal to one-fifth of the weight of grain consumed, was given.

TABLE V.

PEN No. 1 contained 4 swine, purebred *Improved Large Yorkshires.*

—		Feb. 7.	Mch. 7.	Apl. 4.	May 2.	Totals.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight		756	793	825	944	....
Increase in weight		....	37	32	119	188
Feed consumed	grain	....	322	325	450	1,097
	carrots	....	45	65	90	200
do per lb. of increase in live weight	grain	....	9·91	12·18	4·53	5·83
	carrots	....	....	....	....	1·06

TABLE VI.

PEN No. 2 contained 4 swine, purebred *Tamworths.*

—		Feb. 7.	Mch. 7.	Apl. 4.	May 2.	Totals.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight		457	524	593	691	....
Increase in weight		....	67	69	98	234
Feed consumed	grain	....	394	315	400	1,109
	carrots	....	58	63	80	201
do per lb. of increase in live weight	grain	....	6·74	5·47	4·89	4·74
	carrots	....	....	....	....	·86

TABLE VII.

PEN No. 3 contained 3 swine, purebred *Berkshires.*

—		Feb. 7.	Mch. 7.	April 4.	May 2.	Totals.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight		351	420	469	558	....
Increase in weight		....	69	49	89	207
Feed consumed	grain	....	299	245	320	864
	carrots	....	45	49	64	158
do per lb. of increase in live weight	grain	....	4·98	6·00	4·31	4·17
	carrots	....	....	....	....	·76

TABLE VIII.

PEN No. 4 contained 4 swine, crossbred by *Improved Large Yorkshire* sire and *Poland China* dam.

—		Feb. 14.	Mch 14.	Apl. 11.	May 9.	Totals.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight		479	571	654	757	....
Increase in weight		....	92	83	103	278
Feed consumed	grain	....	450	335	445	1,230
	carrots	....	90	67	89	246
do per lb. of increase in live weight	grain	....	5·86	4·84	5·18	4·42
	carrots	....	....	....	....	·89

TABLE IX.

PEN No. 5 contained 6 swine, crossbred by *Improved Large Yorkshire* sire and *Essex* dam.

—		Feb. 14.	Mch. 14.	Apl. 11.	May 9.	Totals.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight		420	505	633	809	....
Increase in weight		....	85	128	176	389
Feed consumed	grain	....	475	395	600	1,470
	carrots	....	95	79	120	294
do per lb. of increase in live weight	grain	....	6·70	3·70	4·09	3·77
	carrots	....	....	....	....	·76

Conclusions. From these tests with 21 swine, which were continued for 12 weeks, it appears that:—

(1.) On the average, 4·45 lbs. of barley and frosted wheat, both ground and soaked, plus ·85 lbs. of pulped carrots, were consumed per pound of increase in the live weight.

Third Series.

A series of experiments was commenced with eight pens of swine of different breeds or breeding by feeding them all on the same ration—a mixture of equal parts (by measure) of ground barley, rye, frosted wheat and bran. All the grain was ground and soaked in cold water for an average of 8 hours from August 23 to November 8 and for an average of 18 hours thereafter.

TABLE X.

PEN No. 1 contained 5 swine, crossbred by *Berkshire* sire and *Poland China* dam.

—	Aug. 23.	Sep. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	418	534	643	742	807	....
Increase in weight	....	116	109	99	65	389
Feed consumed	....	446	460	396	297	1,599
do per lb. of increase in live weight	....	3·84	4·22	4·00	4·57	4·11

TABLE XI.

PEN No. 2 contained 2 swine, crossbred by *Berkshire* sire and *Tamworth* dam.

—	Aug. 23.	Sep. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	188	224	276	320	346	....
Increase in weight	....	36	52	44	26	158
Feed consumed	....	171	163	171	133	638
do per lb. of increase in live weight	....	4·75	3·13	3·88	5·11	4·03

TABLE XII.

PEN No. 3 contained 5 swine, crossbred by *Berkshire* sire and *Improved Large Yorkshire* dam.

—	Aug. 23.	Sep. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	248	319	394	482	544	....
Increase in weight	....	71	75	88	62	296
Feed consumed	....	252	280	304	266	1,102
do per lb. of increase in live weight	....	3·54	3·73	3·45	4·29	3·72

TABLE XIII.

PEN No. 4 contained 5 swine, crossbred by *Improved Large Yorkshire* sire and *Berkshire* dam.

——	Aug. 23.	Sept. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	210	281	345	394	430	....
Increase in weight	....	71	64	49	36	220
Feed consumed	....	210	206	200	181	797
do per lb. of increase in live weight	....	2·95	3·21	4·08	5·02	3·62

TABLE XIV.

PEN No. 5 contained 5 swine, crossbred by *Essex* sire and *Improved Large Yorkshire* dam.

——	Aug. 23.	Sept. 20.	Oct. 18.	Nov 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	205	256	310	373	417	....
Increase in weight	....	51	54	63	44	212
Feed consumed	....	221	235	245	205	906
do per lb. of increase in live weight	....	4·33	4·35	3·88	4·63	4·27

TABLE XV.

PEN No. 6 contained 5 swine, crossbred by *Essex* sire and *Improved Large Yorkshire* dam.

——	Aug. 23.	Sep. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	225	295	363	431	490	....
Increase in weight	....	70	68	68	59	265
Feed consumed	....	256	256	258	220	990
do per lb. of increase in live weight	....	3·65	3·76	3·79	3·70	3·73

TABLE XVI.

PEN No. 7 contained 4 swine, grades by *Tamworth* sire and *Berkshire Grade* dam.

——	Sep. 6.	Oct. 4.	Nov. 1.	Nov. 29.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	210	270	352	452	....
Increase in weight	....	60	82	100	242
Feed consumed	....	209	230	346	785
do per lb. of increase in live weight	....	3·48	2·80	3·46	3·24

TABLE XVII.

PEN No. 8 contained 5 swine purebred, *ImprovedLarge Yorkshires.*

——	Sep. 6.	Oct. 4.	Nov. 1.	Nov. 29.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	241	293	348	411	....
Increase in weight	....	52	55	63	170
Feed consumed	....	241	181	242	664
do per lb. of increase in live weight	....	4·63	3·29	3·84	3·90

Conclusions. From these tests with 36 swine, which were continued 15 weeks and 12 weeks, it appears that:—

(1.) On the average, 3·83 lbs. of a mixture of barley, rye, frosted wheat (all ground), and bran were consumed per pound of increase in the live weight.

The tests are being continued with the swine in these pens.

PART III.—THE ROBERTSON MIXTURE FOR ENSILAGE.

For a few years I have been seeking to find and put into the silo with Indian corn, some other fodder plant or plants, which would furnish the quantity of albuminoids necessary to make a well-balanced ration in a form which would cost much less than ripened cereals or concentrated by-products, such as oil-meal, cotton-seed meal or bran. Clovers and pease were tried with indifferent success, and the climbing or pole beans have been grown with cornstalks for trellis without appreciable advantage. It is desirable that ensilage should contain, besides the albuminoids and carbo-hydrates such as may be found in Indian corn and horse beans, a larger quantity of fat than these plants contain. In a country with such a climate as prevails in Canada during the winter, it seems advisable to provide a winter ration for cattle containing a fairly large proportion of fat, as a bland, heat-producing part of a ration in a cheap and palatable form. I venture to believe that we have now secured that in the heads of sunflowers.

The horse bean or small field bean (*Faba vulgaris*, variety *equina*) seems to meet the case, so far as the albuminoids are concerned. This plant grows with a stiff, erect stem of a quadrangular shape. It attains in Canada a height of from 3 feet to 6 feet. It bears pods from within 6 or 8 inches from the base of the stalk to near its top. The beans when ripened are of a grayish-brown colour, and of oblong round shape, about ½-inch in long diameter and from ⅜ to a ¼-inch in short diameters. Plants have carried ripened beans in the lower pods, while the topmost ones on the same stalks were hardly out of bloom.

The sunflower (*Helianthus annuus*) grows luxuriantly over the whole of the temperate zone on this continent, and the seeds contain a large percentage of fat. The variety known as *Mammoth Russian* has been grown in rows 3 feet apart, and it appears to do best when the plants are from 12 to 18 inches apart in the rows. The following table shows the constituents of the horse beans and sunflower heads, as analysed by Mr. Frank T. Shutt, Chemist, Dominion Experimental Farms:—

ANALYSES IN 1892.

——	Water.	Albuminoids.	Fat.	Carbo-hydrates.	Fibre.	Ash.	Dry matter.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Horse beans.	89·24	2·75	·73	2·26	3·71	1·09	10·76
do	86·15	2·69	·66	4·17	4·98	1·35	13·85
Sunflower heads with seeds	75·62	2·35	4·86	7·88	7·94	1·35	24·38
	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.
Horse beans	1784·8	55·0	14·6	45·2	74·2	21·8	215·2
do	1723·0	53·8	13·2	83·4	99·6	27·0	277·0
Sunflower heads with seeds	1512·4	47·0	97·2	157·6	158·8	27·0	487·6

A brief test of the feeding of a group of cows, for 70 days during the early part of the year, was made on a ration composed of:—

	Pounds.
Corn ensilage	40
Roots	50
Straw	8
Mixed meal	4

A similar group of cows was fed on the following ration, wherein the ensilage contained Indian corn at the rate of 12 parts to 1 part of sunflower heads:—

	Pounds.
Corn ensilage and sunflower heads	40
Roots	50
Straw	8
Meal	2

No appreciable difference in the quantity or quality of the milk, as to its percentage of solids from the different groups of cows, could be traced or attributed to the different rations upon which they were fed. After both groups of cows had been fed for two weeks on the different mixtures, tests were made to discover if any difference appeared in the quality of the milk from the different groups, in regard to the readiness with which the cream could be separated by the setting method, or in the quality of the butter which was obtained from it.

The following table shows the average of the tests of nine days' milk from the two groups of cows. The test was commenced on 20th February. The milk from both groups was treated exactly alike. The setting was in deep pails in ice water for 22 hours.

—	With corn ensilage.	With corn ensilage and sunflower heads.
Lbs. of milk	122	121
Per cent of butter-fat	3·79	3·54
Lbs. of butter-fat	4·62	4·28
Lbs. of skim-milk	97	96
Per cent of butter-fat in skim-milk	·50	·35
Lbs. of butter-fat in skim-milk	·49	·34
Lbs. of cream	25	25
Per cent of butter-fat in cream	16·52	15·76
Lbs. of butter-fat in cream	4·13	3·94
Lbs. of butter-milk	21·50	22·50
Per cent of butter-fat in butter-milk	·40	·30
Lbs. of butter-fat in butter-milk	·09	·07
Lbs. of marketable butter	5·00	4·75
Lbs. of milk per lb. of butter	24·40	25.47
Lbs. of butter per 100 lbs. of milk	4·10	3·93
Per cent of butter-fat unrecovered	12·34	9·58
Lbs. of butter per lb. of butter-fat in milk	1·08	1·11

Butter from both groups was examined on 15th March, when it was found that the butter from the sunflower lot, was of richer flavour and a little higher colour than the other.

In order to obtain reliable information upon the methods of growing these three plants, Indian corn, horse beans and sunflowers, in the most advantageous manner in different parts of the Dominion, arrangements were made for distributing a small quantity of seeds, at cost price, to a number of farmers in different localities. Our experience in 1892 had pointed in the direction of planting the horse beans and corn mixed in the same rows, and the following circular of directions was sent to the farmers to whom seed was supplied:—

CENTRAL EXPERIMENTAL FARM,

OTTAWA, 20th April, 1893.

CIRCULAR OF DIRECTIONS FOR THE ROBERTSON MIXTURE FOR ENSILAGE.

Soil.

If a field with a drained, warm, loamy soil be convenient to the silo, and can be used, it should be selected in preference to a heavy clay or wet soil. In all cases, the land should receive a liberal dressing of manure, be ploughed in the spring, and be harrowed to a state of fine tilth before the seeds are planted.

Time to Plant.

The time at which Indian corn for fodder may be planted with the best results, is the best time at which to plant or sow these seeds also. In most districts that period is during the last ten days of May, or late enough in the season to escape frosts at night, and early enough to give the plants the advantage of as long a season for growing as is practicable. The horse beans and sunflowers are less liable to injury from frost than Indian corn.

How to Plant.

The Indian corn and horse beans (which have been mixed) are to be planted in rows 3 feet apart, with from 2 to 4 grains per lineal foot in every row. A horse-power corn-planter or seed drill may be used for that purpose. Or they may be planted in hills 3 feet apart both ways, with from 6 to 10 grains in every hill. A horse-power or hand corn-planter may be used. If none of these implements and no other suitable planter be available, furrows 3 inches deep may be ploughed 3 feet apart. The seeds may be put in them and covered, after which the field should be rolled.

The sunflower seeds are to be planted by themselves, in rows 3 feet apart with not more than 3 or 4 seeds per foot in the row. They may be planted with a small hand planter, or by a method similar to the one which is used with the Indian corn and horse beans.

Depth of Planting.

All the seeds should be planted to a depth of from 2 to 3 inches.

Cultivation.

Only in cases where a crust forms on the land, before or immediately after the plants come up, a light harrowing will prove helpful to the crop. The cultivation between the rows, when the plants are small, should be close to them; when the plants have grown to a height of 2 feet, it should be more distant and shallow, in order not to injure the side roots.

Cutting in the Field.

The crop is to be cut when the Indian corn reaches the "glazing" stage of growth, that is when the ears are just past the best condition for table use.

The corn and beans may be cut by hand or by any of the devices in use for cutting fodder corn in the field.

The heads only of the sunflowers are to be used. They may be cut by a common reaping hook or other knife. They may be put directly into a wagon or cart, or into a basket or into heaps, from which they may be loaded afterwards.

Putting into the Silo.

When the Indian corn has reached the "glazing" stage of growth, the crop is to be put into the silo without wilting or drying; but if and when it has not reached the "glazing" stage before frost comes, it is to be cut and left to wilt or dry in the field for about one day.

The corn and beans (from two acres) are to be cut in lengths of from ½-inch to 1-inch and put into the silo; and the heads only (from half an acre) of sunflowers are to be cut with them. They may be fed through the cutting-box on and with the corn and beans.

A fairly even distribution of the mixture should be made in the silo, while it is being filled. If the leaves and lighter parts are permitted to flutter into one place, and the stalks, ears and heavier portions are allowed to settle by themselves, the ensilage will not keep well.

The mixture is to be tramped thoroughly around the sides and in the corners of the silo.

A thin layer of uncut cornstalks should be put between the "ROBERTSON MIXTURE" and the other contents (if any) of the silo, in order to mark the exact place in the ensilage.

After the silo is filled, the surface should be levelled and thoroughly tramped; and after the lapse of not more than one day, it should be covered to a depth of 6 inches with cut straw or cheap fodder. If this be tramped occasionally, and a foot of cut straw be put on top of that a few days later, probably no waste ensilage will be found on the opening of the silo for feeding.

Feeding the Ensilage.

The "ROBERTSON MIXTURE" is to be fed with 4 lbs. less meal or grain per 50 lbs. of ensilage, than has been required with ordinary Indian corn ensilage, to make an economical ration for feeding milking cows and fattening cattle.

Silo.

Ensilage has come to mean any kind of fodder which is cured and preserved in a succulent state for the feeding of domestic animals. The silo has no power to add any nutrient to the fodder which is put into it for preservation. Its contents may become more digestible and palatable by the changes which proceed slowly under the action of ferments, or they may become less pleasant and wholesome, if fermentation goes too far.

Fodder which is deficient in nutrients before it is put into a silo, will experience no regeneration there. Degeneration into offensive material is the only and constant tendency.

To prevent deterioration and decay is the function of the silo; and to that end it should be constructed to exclude the atmosphere. To do so requires the use of building material of adequate strength. The fastening of the parts, at the foundation and at the corners of the silo, should be secure. I have found one ply of sound, 1-inch lumber, tongued and grooved, and nailed horizontally on the inside of studs 2 inches by 10 inches or 2 inches by 12 inches, to be sufficient.

A clay or earthen floor is most economical and is as good as any that can be put in.

Report on results.

Please keep a record of:—

(1) How the soil was prepared;
(2) How the seeds were planted;
(3) The date of planting;
(4) The date of cutting;
(5) The stage of growth attained by the different plants of the mixture;
(6) The yield per acre of Indian corn and horse beans;
(7) The yield per acre of sunflower heads;
(8) Any unusual condition of weather such as heavy storm, frost, etc.;
(9) Any other occurrence or condition which may affect the crop.

A form upon which to report, will be sent to you in due season. Please fill it up carefully and return it here.

Letters on official business can be sent free of postage.

WM. SAUNDERS, *Director.* JAS. W. ROBERTSON, *Agriculturist.*

On the Experimental Farm here, the mixture was planted in accordance with these directions, and tests were also made by the planting of the corn and horse beans in alternate rows, and by the growing of the horse beans in rows, by themselves. The following shows the results obtained from the different methods of planting:—

A plot of nearly 3 acres was planted on June 3rd with *Thoroughbred White Flint* corn and horse beans of the *Granton* variety. The soil on one quarter of the plot was light sandy loam and on the remaining three quarters was heavy sandy loam. A dressing of cattle-stable manure was applied at the rate of 10 or 12 tons per acre, and was ploughed in. 18½ lbs. of corn and 30 lbs. of horse beans were mixed, and pnt on per acre in rows three feet apart. The crop came np irregularly, and on June 10th it was harrowed with light harrows. The cultivation was similar to that for an ordinary Indian corn crop.

On October 2nd the corn plants had reached the late milk stage; and the bean stalks were fairly well podded althongh the crop of them was thin. Three representative rows of 100 feet each were cut, and the corn and bean plants were weighed separately. The beans weighed 9·31 per cent of the whole crop. When the crop was cnt for the silo on 12th October, it was found that the yield was 40 tons 1,434 lbs. from 2·827 acres. That was at the rate of 14 tons 806 lbs. per acre; or 12 tons 144 lbs. of Indian corn and 1 ton 662 lbs. of horse beans.

A plot of 5 acres was planted on 1st June with *Longfellow* corn and horse beans of the *Granton* variety. The soil of the plot was clay loam and sandy loam. No manure was applied. 18½ lbs. of corn and 30 lbs. of horse beans were mixed, and pnt on per acre in rows three feet apart. The crop came np on 9th and 10th June and was harrowed on 9th June with light harrows.

On 2nd October the corn plants had reached the glazing or almost ripe stage; and the beans were nearly all ripe. Three representative rows of 100 feet each were cut and the corn and bean plants were weighed separately. The beans weighed 6·3 per cent of the whole crop. When the crop was cut on 10th October, it was found that the yield was 67 tons 1,905 lbs. from 5 acres. That was at the rate of 13 tons 1,181 lbs. per acre; or 12 tons 1,469 lbs. of Indian corn and 1,712 lbs. of horse beans.

A plot of 4 acres was planted on 6th Jnly, with *Compton's Early* corn and horse beans of the *Granton* variety. The soil was a light sandy loam. A light dressing of cattle-stable manure—abont 8 tons per acre—had been applied in the fall. The plot was then sown on 3rd September with fall rye of the *Reading Giant* variety. The rye was cnt on 19th June, a light dressing of manure was ploughed in, and corn and beans were planted on 26th June. The crows pulled up most of the corn and the plot was replanted on 6th Jnly, at the rate of 18½ lbs. of corn and 30 lbs. of horse beans, per acre, mixed in the same rows, which were three feet apart.

On 2nd October, the corn plants had reached the early milk stage; and the beans were mostly in flower with a few pods at the lower ends. Three representative rows of 100 feet each were cut and the corn and bean plants were weighed separately. The beans weighed 19·78 per cent of the whole crop. When the crop was cut on 14th to 16th October, it was found that the yield was 39 tons 1,335 lbs. from 4 acres. That was at the rate of 9 tons 1,834 lbs. per acre; or 7 tons 1,912 lbs. of Indian corn and 1 ton 1,922 lbs. of horse beans.

In plots where the horse beans were grown in alternate rows with Indian corn, the beans were a comparative failure. That appeared to be attributable mainly to the nnfavourable weather which prevailed.

A plot of 2 acres was planted on 1st June, with several varieties of horse beans, in rows three feet apart. The soil was a clay loam which had been cropped with barley in 1892. No mannre was applied. The beans were planted with a force feed seed drill, with only two spouts running, and at the rate of two-thirds of a bushel per acre. They were planted 1st June, and came up 11th June. They were cut 16th October, and left to wilt in the field for two days before they were weighed and put into the silo. The lower pods on the stalks were filled and ripened, and the upper pods were green, with the beans not qnite firm.

The following are the yields per acre of the differeut varieties, weighed after being wilted for two days:

Horse Beans.

Granton variety	9	tons	1,717	lbs. per acre.
Tick do	9	do	1,252	do
Carse do	7	do	1,631	do
Kilbride do	7	do	1,057	do
Mazagan do	7	do	979	do
Average	8	tons	927	lbs. per acre.

The cost of labour for growing 2 acres of horse beans was as follows:—

Rent of land, @ $3 per acre	$ 6 00
Ploughing, @ $2 per acre	4 00
Harrowing 3 times, rolling once	1 60
Seed, $1\frac{1}{3}$ bushels	2 00
Sowing, 3 hours of team	0 75
Cultivating, single horse, 2 days @ $1.50	3 00
Hoeing, 10 days	12 50
Cutting with scythe, 2 days	2 50
Loading, 3 days	3 75
Drawing to silo, $1\frac{2}{10}$ days of team	3 00
Proportion of time of farm foreman	4 00
Total	$ 43 10

These figures do not include any allowance for the use of farm machinery, nor do they include any amount as an equivalent for the exhaustion of soil. The cost for labour was $21.55 per acre. The average yield of the horse beans was 8 tons 927 lbs. per acre, which gives an average cost of $2.55 per ton for labour of growing, including cost of seed and rent of land.

The season in point of weather was a most unusual one over the western part of the province of Quebec and over nearly the whole of the province of Ontario. While many sections were parched with drought from June until August, the rains on the Experimental Farm here were frequent and unusually heavy. Two very severe storms swept over the farm, breaking down the cornstalks and levelling to the ground four-fifths of the sunflower stalks on the different areas on which they were planted. For that reason, the results in our trial of sunflowers during the past season cannot be taken as what might be expected in the average of years. The sunflowers in 1892 were such an average crop, as might be obtained where it was not injured by any unusual occurrence. The yield in 1892 was $7\frac{1}{2}$ tons of sunflower heads per acre.

As yet, reports have been received from only some 60 farmers, who gave the mixture a trial during the last summer. On account of the unusual weather, the bean crop appears to have been a total or almost total failure in most places in the province of Ontario. In the Maritime Provinces, where the rainfall and temperature were nearer the normal, the reports are favourable and indicate what might be expected in other parts of Canada, when regard is had to the time of planting which is most suitable for the different localities. I quote the following from reports received from some farmers in the provinces of New Brunswick and Quebec:—

In all these cases, the mixture was planted according to the directions in the circular which accompanied the seeds, with the corn and beans mixed in the same rows, and the sunflowers grown in rows by themselves.

From Mr. Z. R. Estey, Lower French Village, York Co., N.B.

"Q. Beans: Were the pods formed, filled or ripened?—A. Mostly filled and ripened, and shelling considerably.

Average height of plants? Four feet.

Yield per acre? Eleven tons of corn with four tons of beans.

Yield per acre of sunflower heads? Five or six tons.

General Remarks:—The beans I am convinced should be planted later than the *Longfellow* corn."

From Mr. Abram Alward, Butternut Ridge, Westmoreland Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened?—A. Some stalks contained a large number of pods, some ripened at bottom, other stalks contained no pods, blossoms seemed to be blighted.

Average height of plants? Three feet six inches.

Yield per acre? Of sunflower heads, about 200 bushels; of corn and beans, about eight tons, green weight, of which there were five tons of corn and three tons of beans.

General Remarks: I am fully convinced that by planting the horse beans *early* with the corn, one can increase the yield per acre from 3 to 4 tons without injury to the corn in any way, and the beans seem to grow better and fill fully as well among the corn, as they do planted separate."

From Mr. E. C. Cole, Moncton, Westmoreland Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened?—A. Pods formed very well along whole length of stalk, ripened near butt, and fairly well filled half way up.

Average height of plants? Three feet.

Yield per acre? Of sunflower heads, seven tons; of corn and beans, about twelve tons; of which three-fourths for corn and one-fourth for beans."

From Mr. Joseph R. Taylor, Taylor Village, Westmoreland Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened?—A. About one-half of the beans were ripe, the rest well filled.

Average height of plants? Five feet six inches; some of the stalks measured as high as seven feet.

Yield per acre?—Of corn and beans, 16 tons 130 lbs.; of which, estimate about two-thirds for corn and about one-third for beans."

In this case the sunflowers were almost a total failure on account of the storm.

From Mr. Percy G. Mills, Rockville, King's Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened?—A. The lower ones were ripened.

Average height of plants? Three feet.

Yield per acre?—Of sunflower heads, four tons; of corn and beans, fifteen tons; of which, estimate, ten tons for corn and five tons for beans."

From Mr. F. G. Goodenough, Robinson, Compton Co., Que.

"Q. Beans: Were the pods formed, filled or ripened?—A. Some were ripe.

Average height of plants? About three feet.

Yield per acre:—Of sunflower heads?—four or five tons. Of corn and beans? About twelve tons; of which, estimate eight tons for corn, and four tons for beans.

General Remarks:—I think the beans are a fine thing. I will plant them with all my corn next year, if I can get them."

From Mr. Fred. Burns, Island Brook P. O., Compton Co., Que.

"Q. Beans: Were the pods formed, filled or ripened?—A. Well filled and some of them ripe.

Average height of plants? Four feet.

Yield per acre:—Of sunflower heads?—seven tons. Of corn and beans?—twenty-two tons; of which, estimate sixteen tons for corn, and six tons for beans."

From Mr. Cecil A. Barton, Frelighsburgh, Missisquoi Co., Que.

"Q. Beans: Were the pods formed, filled or ripened?—A. Ripened.

Average height of plants? Four feet.

Yield per acre:—Of sunflower heads?—About six tons. Of corn and beans? —About twelve tons; of which, estimate eleven tons for corn, and one for beans.

General remarks:—I found some beans six feet high, and containing 40 pods. The beans were ripe, and a good many of the stalks of them dry when harvested. For that reason, they did not weigh as they would have done had they been cut earlier. I had one sunflower head, 13 inches in diameter, which contained one quart of seed when shelled. I prefer one large head of sunflower to many little ones, as the seeds in the small ones are seldom well filled, and they are very much harder to harvest."

Very much valuable information on several aspects of the growing and cultivating of corn, horse beans and sunflowers, has been gained from the full reports which were sent in by the different farmers who gave the mixture a trial. From that source and the results of our own experience, I offer the following recommendations for the growing of this mixture for the coming year:—

The horse beans and sunflowers can be obtained from almost any of the dealers in seeds. It is not considered necessary or desirable that seeds should be furnished by the Experimental Farm, after information is available on the desirable methods of cultivation, and when they can be obtained from the seed merchants.

Soil.—If a field with a drained, warm, loamy soil be convenient to the silo, and can be used, it should be selected in preference to a heavy clay or wet soil for Indian corn. The horse beans do well in clay soils. In all cases the land will be the better for receiving a liberal dressing of manure. It should be ploughed in the spring, and be harrowed to a state of fine tilth before the seeds are planted.

Time to plant.—The time at which Indian corn for fodder may be planted with the best results, in most districts, is during the last ten days of May, or late enough in the season to escape frosts at night, and early enough to give the plants the advantage of as long a season for growing as is practicable. The horse beans and sunflowers are less liable to injury from frost than Indian corn.

Throughout the province of Ontario and the western portion of the province of Quebec, the horse beans may be planted with advantage from two to three weeks later than the Indian corn.

The sunflowers should be planted as early in the spring as is practicable,—otherwise the heads may not ripen in time to be put into the silo.

Proportion.—The mixture should contain about 10 tons of Indian corn fodder, to about 2½ or 3 tons of horse beans and about 1 or 1½ tons of sunflower heads. To obtain it in these proportions, it should be grown at the rate of one quarter of an acre of sunflowers, and half an acre of horse beans, to every acre of Indian corn.

How to plant.—Throughout the Maritime Provinces and in the eastern part of the province of Quebec, the Indian corn and horse beans may be mixed together and planted in rows 3 feet apart, with from 2 to 4 grains per lineal foot in every row. Elsewhere a larger crop of bean plants, not too ripe and dry for the silo, may be ensured by planting them separate from the Indian corn.

The Indian corn may be planted in rows 3 feet apart, with from 2 to 3 grains per lineal foot in every row. A horse power corn planter or seed-drill may be used for that purpose. Or it may be planted in hills 3 feet apart both ways, with from 4 to 6 grains in every hill. A horse power or hand corn-planter may be used. If neither of these implements and no other suitable planter be available, furrows 3 inches deep may be ploughed 3 feet apart. The seeds may be put in them and covered, after which the field should be rolled.

The horse beans may be planted in rows 3 feet apart, with from 3 to 6 grains per lineal foot in every row. The same machinery or method may be used as for the sowing or planting of the Indian corn.

The sunflower seeds are to be planted by themselves, in rows 3 feet apart. Not more than one plant per lineal foot in the rows should be left to grow. If they come up thicker, they should be thinned out to one plant for every 12 or 18 inches in the rows.

REPORT OF THE HORTICULTURIST.

(JOHN CRAIG.)

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit a report of some of the work carried on in the Horticultural Department of the Experimental Farm for the year 1893.

The fruit year as a whole was characterized by a very light crop in the fruit-growing sections of the provinces of Quebec and Ontario. The excessive drought and unusual amount of summer heat prevailing in Ontario between June first and September first, hastened the period of maturity of autumn and winter fruits, and this, together with the presence of apple insects in unusual numbers, caused the fruit to drop from the trees at an earlier period than usual.

The price of autumn and early winter apples in Britain did not rise in proportion to the shortage of the American crop, owing to the excessively large yield of apples in Great Britain which, coming on the London market in competition with the earlier shipments of Canadian apples, had the effect of keeping the price quite low.

At this date the English product, according to reports received, is exhausted, and it would appear that an excellent market for Canadian apples will be available during the remainder of the season.

In Nova Scotia a moderate crop of Gravensteins and Kings, and other standard apples, was harvested and excellent prices obtained.

Increased interest is noticed in the work of spraying for the prevention of fungous diseases and noxious insects. While in every instance spraying for the prevention of fungous diseases, has not rewarded the efforts of the experimenters with complete success, yet there has generally been some particular cause why better results were not obtained, and indeed it is not always wise to quote individual experiments which may have been influenced by local circumstances that do not generally prevail, and so are not applicable to ordinary conditions.

A great variety of spraying pumps are now manufactured and offered for sale in the Dominion. The principal drawback in connection with these implements is that many of them are manufactured with the idea of giving a cheap article to the public. The parts are not sufficiently well constructed to bear the strain of continued use during the spraying season, and consequently break down. This frequent stopping for repairs is one of the most annoying incidents connected with the operation of spraying, and often has the affect of discouraging the fruit-grower to such an extent as to prevent his carrying on the work effectually.

In the report of Mr. Tweddle, which is referred to in the text, special mention is made of this defect in connection with the machine he used.

LARGE FRUITS ON THE FARM.

The standard orchard has, on the whole, made satisfactory progress during the year. Very few varieties which went into winter in good condition were found to be injured in the spring, although the season was very severe.

None of the Russian apples suffered injury from the winter, but, as noted in the article on "Blight," large numbers have been severely attacked by this disease.

This is also true of a few varieties of American origin, notably "Wealthy" and "Wagener."

A considerable number of varieties of Russian apples blossomed, and bore fruit this season, but it was impossible to secure the specimens at maturity owing to the large number of visitors and the numerous small boys frequenting the orchard on Saturday and Sunday of each week. The orchard has since been inclosed by a barbed wire fence which will, it is hoped, obviate this difficulty another year.

The crop of cherries was light this year. A few trees blossomed but did not set fruit.

Nearly all the varieties of American plums blossomed and fruited abundantly, but none of the foreign sorts bore any fruit. Special mention should be made of "De Soto," "Weaver," and "Wyant." The two former having fruited very heavily for three years in succession. "Weaver" was so heavily laden that it was found necessary to remove at least one-half of the fruit, in order to prevent the branches from being broken by the weight of the crop.

Vegetables and Tobacco.

Experiments other than those contained in the report have been carried on with vegetables, including fertilizer tests, methods of cultivation, and trial of new varieties. As is well known the results of fertilizer tests, are only reliable after being carried on for a series of years, and for this reason no report is made for the present.

At the request of the Honourable the Minister of Agriculture, some experiments in the cultivation of tobacco were begun at the farm and the results will be found in the body of the report. Arrangements have been made with a tobacco manufacturer in Montreal, whereby samples of the different varieties tested at the farm, will be made up in the form of the article for which they seem best fitted, and a report will be afterwards made upon their relative excellence.

World's Fair.

It was my privilege, by permission of the Honourable the Minister of Agriculture, to visit the World's Columbian Exposition at Chicago. There, in October, I had the opportunity of seeing the display of samples of the standard fruits of America, and as much time as possible was given to studying the same varieties of fruit grown under different climatic conditions, as well as other interesting questions. New fruits and new horticultural implements were also investigated with much advantage.

The display from Canada, especially from the province of Ontario, was excellent, both from an educational and from an advertising and commercial standpoint.

A great deal of credit is due to the Dominion and Provincial superintendents for the effective manner in which the horticultural resources of the Dominion were brought before the public. In this connection it may be stated that displays of fresh vegetables from the Central Experimental Farm were sent forward at intervals during the summer season. This exhibit was supplemented in the autumn by a consignment of 133 varieties of grapes which arrived in Chicago in very good condition and made an instructive and interesting exhibit, showing as it did the possibilities of this northern latitude in maturing fruit which requires as much summer heat as does the grape. This collection received a diploma from the committee on awards.

Prior to this collections of the fruit of 1892, including grapes, currants, raspberries and goose-berries were put up with preservative liquids in glass jars. These were forwarded in April, 1893, and materially assisted in keeping up the attractions of the exhibit, before the fresh fruits appeared.

Meetings Attended.

I attended officially during the year the annual meetings of the Ontario and of the Nova Scotia Fruit Growers' Associations, also the autumn exhibitions at Montreal and Sherbrooke, P.Q.

ACKNOWLEDGMENTS.

I beg gratefully to acknowledge the following donations :—

Mr. John Pitcairn, Point Fortune, Que.—Scions of Pitcairn apples.

J. M. Waters, Esq., Fernhill, Ont.—Seedling raspberry and rose plants.

W. M. Jones, Esq., Gartmore, Man.—Cuttings of native currant and gooseberry.

Mrs. S. Foster, Knowlton, Que.—Two trees each of Hardy and Davis's seedling apples.

Charles E. Brown, Esq.. Yarmouth, N.S.—Apple scions.

Mr. R. W. Starr, Wolfville, N.S.—Apple and pear scions.

Mr. T. H. Race, Mitchell, Ont.—Scions of Oliver seedling.

Mr. A. Reeve, Highland Creek, Ont.—Gooseberry plants.

Mr. W. C. Reid, Belleville, Ont.—Apple and pear trees.

Mr. L. S. Gamache, Cap St. Ignace, Que.—Two trees of Montmagny beauty plum.

Mr. Lachlan Gibb, Montreal, Que.—Roots of Helianthus.

Mr. Auguste Dupuis, Village des Aulnaies, Que.—Horse chestnut seedlings, seed of *Larix Siberica.*

Mr. R. B. Whyte, Ottawa, Ont.—Seedling raspberries.

Mr. Robert Snelling, New Edinburgh, Ottawa.—One Snelling plum tree.

W. M. Pattison, Esq., Clarenceville, Que.—Grape cuttings.

Mr. W. H. Murphy, Ottawa.—Scions of Calumet apple.

I am much indebted to a number of Canadian enthusiasts in horticulture for information of various kinds, embodied in my report and to Mr. Wm. Taylor, foreman in the Horticultural Department, for the zeal and faithfulness with which he carried out the experiments committed to his care.

I have the honour to be, Sir,

Your obedient servant,

JOHN CRAIG,

Horticulturist.

December 15th, 1893.

PEAR AND APPLE BLIGHT.

The disease variously known as "Apple blight," "Pear blight," "Twig blight" and "Fire blight" has wrought a serious amount of injury to trees in the Ottawa Valley during the past season.

The presence of this disease has been noticed in America for 100 years past; one of the first observers being W. Denning, of Massachusetts, who published an article on the "Decay of apple trees' which appeared in the Transactions of the Society for the Promotion of Agriculture, for 1794. In this article he describes the disease as attacking pears and quinces, and thinks that it was caused by a borer in the trunks of the trees. Later we find mention of it in the writings of that pioneer in fruit culture, Wm. Cox, in his work entitled, "The Cultivation of Fruit Trees," written in 1817. Here it is called "Fire Blight," and is minutely described. He says: "I have in twenty years lost upwards of fifty trees in the fulness of vigour; sometimes in the most open and airy situations, and in every kind of soil."

In horticultural writings numerous references can be found with regard to this disease, without absolutely divining or assigning the cause of it up to 1868, when Dr. Hull, of Illinois, first attributed the disease to fungi.

In 1877 the presence of bacteria in affected limbs was discovered by Prof. T. J. Burrill, and in 1880 Prof. Burrill published the first authoritative account of the bacterial origin of this disease, and cited in proof of his observations a large number of experiments in transmitting the disease in various ways from one tree to another by inoculation. A pertinent question at this time was whether bacteria themselves caused the death of the affected portion, or whether these followed as a natural consequence in the track of the life destroyer.

The experiments of Prof. Burrill went largely to show that the bacteria themselves were the actual cause of death, and this point was satisfactorily demonstrated by Prof. Arthur, then of the New York Experiment Station, in 1886, who proved by careful experiments that the disease could only be transmitted by using the juices of branches which contained the characteristic bacteria. In support of this position Prof. Arthur makes the following statements:—

A. "Bacteria are found in great abundance in actively blighting tissues, so as to be demonstrable to the naked eye, and occur in less abundance in proportion as the disease is less active."

B. "The disease may be introduced into healthy tissues by inoculation with germs from diseased tissues."

C. "It is communicated with equal certainty when the germs are separated from all accompanying juices of the diseased tissue, by a series of fractional cultures.

D. "*Per contra*, it is not communicated by the juices of the disease after the germs are removed by filtration.

E. "Germs connected with the disease constitute a single species, which is essential to successful inoculation.

F. "*Per contra*, the numerous species of earth, air, and water are found to a noticeable extent in connection with the disease, and cannot be made to originate it by inocnlation or otherwise."

Prof. Arthur further states as the result of his investigations that "A constant ratio is found between the percentage of water in the branches of the several kinds of pomaceous fruits, corresponding to some extent with their liability to blight. The popular opinion that the more rapid growth of the shoots, the more succulent their tissues, and therefore the more liable to blight, is thus confirmed by trial."

The bacteria may keep alive in branches cut from the tree, and remaining in water or moist ground till the following season, and they may also be cultivated in solutions of garden soil, indicating the desirability of promptly destroying all blighted limbs.

With a view of obtaining information with regard to the spread and extent of this disease in the Dominion, a circular was sent to the leading fruit growers in the various provinces. The information obtained from these replies is contained in the tables annexed.

The following tabular statements were arranged with a view of showing the distribution of the disease principally in the provinces of Ontario and Quebec, and to bring out the opinions of practical growers with regard to those methods of cultivation which seem to favour its appearance. It is plainly indicated that without a systematic and very lengthy course of experiments, it is impossible to arrive at satisfactory conclusions regarding any line of remedial treatment; varying conditions of soil and environment lead to results at one point, which are contradicted by the experience of a grower in another section. It is interesting to note that of the replies from Ontario, while 44 per cent had observed no difference in the relative prevalence of "blight" on cultivated ground, and in orchards in sod, 38 per cent were in favour of growing in sod and 17 per cent in favour of giving high cultivation.

There seems to be no doubt that any system of cultivation conducive to rapid succulent growth which is not well ripened in the autumn, furnishes a favourable condition for the development and spread of the disease. Prof. Arthur has clearly demonstrated the truth of this statement.

In Quebec blight appeared during the year, in several of the fruit growing sections, notably in the Counties of Shefford, Argenteuil and Rouville. The soil in the portions most affected, is of a loamy or gravelly nature and frequently strongly impregnated with limestone. As pears are not grown to any extent outside of the Island of Montreal, the disease has principally been restricted to apples. Russian pears at Abbotsford 10 years planted, were very much injured this season. These have been grown in sod since planting.

TABLE I.—PEAR AND APPLE

TABULATED Information gathered from

County.	Observer.	Appearance Previous to 1893.	Character of Injury.	Injury During 1893.
Brant	J. R. Howell	1888	Severe	None.
do	David Greig	1887		do
Essex	N. J. Clinton	1875-76-88	Severe on pear trees	do
do	W. W. Hilborn	None.		do
Frontenac	D. Nicol	1889	On apples	
Grey	R. Trotter		Slight on apples and pears.	do
Huron	Alex. McD. Allen	For many years more or less.	Not destructive on apples and pears.	Slight
Halton	Geo. E. Fisher	Occasionally	On pears; branches killed.	Severe on apple.
Hastings	W. H. Dempsey	For several years in June.	On pears	None.
do	W. C. Reid			
Lanark	W. B. Munro	1892	Apples slightly	Slight
do	John Hart	1878	Apples severely	Considerable
Lambton	T. C. Wheatly	Quite frequently	Severe on crabs	None
Leeds	W. G. Kerr	1892	Many apple trees killed	Considerable
Norfolk	J. McMichael	During the past 20 years.	Twigs of apples; branches of pears.	Very slight in June.
Oxford	S. Hunter	For 25 years past	Pears	Very slight.
Perth	T. H. Race	1892	On young shoots of apple and pear.	Considerable on apple.
do	J. D. Stewart	...	do do	Slight
Prince Edward	J. Wellington Boulter	1888-89	Slight injury on twigs	do
Renfrew	W. R. White	1892		Slight on apples.
do	A. A. Wright	For several years past	Severe on apples	Very severe
Simcoe	G. C. Caston	Slightly		None
do	J. P. Cockburn.	None		do
Toronto	Stone & Wellington	Slight	On pears	
do	D. W. Beadle			
Victoria	Thos. Beall	Slight in past years.	On pears	Slight
Wentworth	E. D. Smith	25 years ago		None
Welland	E. Morden	1889	On pears and apple twigs.	
do	Stone & Wellington	25 years	On pears	Slight
Middlesex	B. Gott	For many years past in varying degree.		None

BLIGHT IN ONTARIO.

Fruit Growers throughout the Province.

Varieties of Pears affected.	Varieties of Apples affected.	Does High Cultivation Favour Blight?	Remarks.
Clapp's, Flemish Beauty.		Evidence conflicting	Sometimes prevented by cutting off affected portion.
Clapp's, Bartlett	Cayuga R. Streak	Trees in sod free from blight.	Good results obtained by washing with 1 peck stone lime, 10 lbs. sulphur, 2 oz. crude carbolic acid, mixed with water and applied as a paint.
Bartlett, Flemish Beauty.		No difference noted	Injury most common on south side of tree.
....	....	....	
	Red Astrachan, Transcendent.		No difference noticed.
Louise Bonne, Duchess.			Ground cultivated; no difference noticed.
Clapp's, Osband's Summer, Bartlett.			Finds regular cultivation and manuring productive of good results. Occasional cultivation with heavy manuring injurious.
Vicar of Winkfield, Duchess, Bartlett.	Nearly all varieties; Cranberry Pippin & Golden Russet.	No difference noted	Has had good results from splitting the bark, which hardens after the tree is attacked.
Clapp's	Greening	Rich ground developed more blight than poorer land.	Gives an instance of trees in rich ground being attacked, while those in sod escaped.
....	....	....	
	Early varieties		Cutting off affected portions apparently checked spread of disease.
	Fameuse Alexander, Yellow Transparent.	Apparently it does	
Bartlett, B. d'Anjou.	Siberian crabs	Alluvial soils favour blight.	Does not believe in growing pears in sod. Affected branches should be removed.
	Seedling trees	Worst in old orchards seeded down.	Recommends cutting off diseased portions.
Clapp's, Flemish and most popular varieties.	Greening, Fall Pippin.	Worst on cultivated ground.	Recommends cutting off diseased branches and mulching trees with coal ashes; uses no barnyard manure.
Rapid-growing varieties.		Yes; trees in sod are less injured by the disease.	
	Nursery stock growing rapidly.	No difference	Reports good results from the use of Bordeaux mixture.
Clapp's, Ananas d'été	Early varieties; Early harvest; Snow.	Less blight noticed on trees in sod.	
			Believes in seeding down the pear orchard after three or four years and manuring annually.
	On crabs and early varieties.	Has not noticed	
	Yellow Transparent, Wealthy.	No difference noted	Recommends cutting off affected branches.
Flemish Beauty		Has made no observations.	
....	....	....	
			Generally worst on low, damp, cultivated ground.
....	....	....	See letter.
Clapp's, Flemish			Branches cut off and destroyed.
Nearly all varieties of early pears.		Probably	
Bartlett, Flemish Beauty.		No difference noticed	Clean cultivation given and advocated.
All varieties, more or less.	Russian apples	Yes, on moist soils	Believes in growing on dry, airy situations and fertilizing with wood ashes.
All varieties			Thinks neglected trees are most liable.

PEAR AND APPLE

TABULATED Information gathered from

County.	Observer.	Appearance previous to 1893.	Character of Injury.	Injury during 1893.
Brome.........	Sec. Fruit Growers' Association.	None..............	....	....
Hochelaga......	R. Brodie	For 12 or 13 years...	On apples during July...	Slight this year......
Huntingdon	W. H. Robinson..	....	Slight..................	On apples in June...
Kamouraska....	J. C. Chapais.....	None..............	....	....
Huntingdon	Jas. Fulton.	Slight..............	On pears...............	....
Lotbinière......	H. G. Joly de Lotbinière.	None.	....	....
Missisquoi......	David Westover ..	....	Slight twig blight......	....
Montreal	E. B. Meyer....	1892..	Twig blight severe in 1892	Slight ....
do	Wm. Evans.	....	....	....
Argenteuil......	R. Hamilton......	20 years or more	Twigs and branches on apples.	Apples much injured.
.. ..	....	1893 only..........	Twigs of apples, branches of pears.	Severe on pears......
Rouville.... ..	J. M. Fisk	1893 only..........	do do ...	do ......
Stanstead.......	J. Fraser.........	For several years....	Twigs of apples.........	Slight ....
Shefford........	Wm. Gill.	....	....	Very severe on apples.

BLIGHT IN QUEBEC.

Fruit Growers throughout the Province.

Varieties of Pears affected.	Varieties of Apples affected.	Does High Cultivation favour Blight?	Remarks.
			Blight not noticed.
	Alexander, Bethel	Has made no observation	Top-dresses with manure and wood ashes.
	Crab apples.	This point not noticed	
			Blight unknown in Kamouraska.
			Believes firmly in the value of cultivation and regular manuring.
			Blight unknown in this county.
	Early varieties	This point not noticed	
Flemish Beauty.	Waxen crab, Transcendent, Ben Davis, Alexander.		Ground highly cultivated.
	Transcendent, Alexander, Fameuse and Russians, Switzer.	Evidence not conclusive.	Dry, airy positions seem to be less affected than moist, sheltered ones.
Russian varieties	Alexander, St. Lawrence, Arabka.	Much worse on rich cultivated ground.	Orchards with western aspects are affected more than those with southern aspects.
	Duchess and peach	More blight on uncultivated ground.	
	All varieties		

The following sketch of the history of the disease in Ontario, by Dr. Beadle, will be read with much interest:—

"In the early days of fruit-growing in the Niagara District, we had no pear-tree blight, nor apple-tree blight. * * * * * * With the advent of what people termed grafted fruit, came after a few years 'blight' on the pear tree, and not until several years after it had become a serious plague of the pear, did it affect the apple tree, to any appreciable extent. The first pear trees that bore fruit in my father's garden were of the Summer Bonchretien variety. These did not blight for some time after they began to bear, and I am unable to give you the exact date of its first appearance, but by the year 1840 it had begun to appear in those, and other pear trees in the garden. In 1847, A. J. Downing complained that the 'blight' of the pear was a serious drawback to the extensive cultivation of the tree. In 1845 it was severe in the west, that is as far west as Indiana, and apparently was but little known in that region before that summer. About 1827 to 30 it was said to have been very destructive to pear trees at Schenectady, N.Y., but no mention was made of any injury to apple trees from this cause; it then disappeared for some twenty years. There was a similar apparent periodicity in the Niagara district. My father having learned that some had applied blacksmith's cinders with beneficial results, tried them upon his pear trees, digging them into the ground over the roots as far as they probably extended. After this some ten years elapsed without any blight in his trees, but it broke out again, and I think there has never been as long a period of exemption since.

"I have no data that enable me to say when it appeared in the apple trees. Its first serious work on apple trees was upon the crab-apple trees, such as Red and Yellow Siberian, Montreal Beauty, &c., not unfrequently killing the whole tree. Its effects on other apple trees are confined for the most part, if not wholly, to the young shoots of the summer's growth. I cannot now recall one instance of even a whole branch having been killed by it, and am confident that I have never known an apple tree, other than the crabs, to be ruined by the 'blight.' As to the time when the blight appears, there is no time after the beginning of June when it has not appeared, but usually its presence is more abundantly manifested from the middle of July to the end of August.

"With regard to varieties of pears, the Duchess d'Angouleme, Rutter and Seckel are the least subject to the 'blight' of the varieties with which I am acquainted. Of the rest, in some seasons one would seem to be the most subject to the 'blight,' in the next year some other variety would take the lead.

"Fifth inquiry, trees in sod *versus* trees in cultivated ground. No opportunity has been presented to me of making such a comparison. In 1885 I copied into the Can. Horticulturist, vol. viii., an editorial from the Philadelphia *Record* giving an account of two orchards adjoining each other, and in soil and varieties alike, situate at Newfield, New Jersey, the one cultivated to garden crops and liberally manured, the other kept in grass, ploughed occasionally and re-seeded. The first was at that time nearly destroyed by blight, the second as sound as when first set out, though the trees were only about half the size of the cultivated, had never borne as well, nor equalled them in appearance. Query:—Are the bacteria the cause, or is the diseased tree or branch favourable to the multiplication?

"Very truly yours,

"D. W. BEADLE,

"Toronto."

BLIGHT AT THE EXPERIMENTAL FARM.

The experimental pear and apple orchard are on sandy loam underlaid with a stiff gravelly subsoil much too near the surface for the ideal orchard soil.

The ground has been cultivated annually, since planting the trees five years ago, and has been manured on alternate years since that time. Blight appeared about the middle of June, 1892, in the pear orchard; although every blighted branch (or in bad cases the whole tree) was removed without delay, it continued to spread during the entire growing period and late into autumn.

None of the Russian varieties escaped injury, some twenty-five being killed to the ground. During the third week of June the disease appeared simultaneously in a block of Wealthy trees planted at some distance, and in the Russian apple orchard, which is contiguous. The injury in both cases amounted to the loss of branches, in some cases a few, in others sufficient to injure the symmetry of the tree.

In 1893 it appeared earlier than in the preceding season and simultaneously on Wealthy, the Russian apples, and pears. The injury was much more severe. One tree of Wealthy was killed, and many specimens of Russian varieties cut down to mere stumps. The injury to the Russian pears was of the same character as the year previous and quite as severe. "Flemish Beauty" and "Beurre d'Anjou" in the same orchard suffered only to a slight extent.

As soon as a branch was removed the remaining stump was painted with linseed oil. Although in every case the cutting was made 15 to 18 inches below any discoloured bark, yet in fully 50 per cent of the cases the disease appeared subsequently at a lower point in the affected branch. This feature in the course of the malady was specially noticeable in the case of the pears, as the blighting of both Russian apples and pears was so general. A report on the relative immunity of the different varieties is withheld till the experience of another season is added.

This brief review of the subject has been undertaken with the object of bringing together as much experience as it was possible to collect from the practical grower, and if feasible to make such deductions as would lead to useful practices in controlling the disease.

While the majority of the replies point to the fact that trees grown in sod have been injured less on the whole than others which were cultivated, it is not proper to conclude that this therefore is the most approved method of growing apples or pears. The nature and character of the soil should, in all cases be duly studied and a treatment given calculated to produce a fair amount of well ripened wood each year. On moist rich alluvial soil it is quite probable that clean cultivation in the long run, will not give as good results as growing the trees in sod, which should receive annually a dressing with a fertilizer in which potash and phosphoric acid form the greater proportion. On the other hand it is idle to suppose that apple or pear trees can be successfully grown on light soils without systematic cultivation and annual enrichment of the soil. Situations having subsoils which are cold and wet should be avoided. Where such conditions prevail, tile-training will mitigate to some extent the injurious effect of such unfavourable conditions.

NEW FRUITS.

GRAPES.

The following new varieties fruited this season:—

ALEXANDER'S WINTER.—Received spring of 1891 from S. D. Alexander, Bellefontaine, Ohio. Vine a fair grower, with foliage characteristic of the Labrusca type.

Bunch loose, straggling, berry large, round and very slightly oval; very dark amber in colour; skin thick; fairly tender; very little juice; pulp, meaty acid. Seeds large; quality only fair. Ripens with Salem. Not likely to be valuable here.

BRILLIANT.—Mr. T. V. Munson, Denison, Texas, produced this variety by pollinating Lindley with Delaware in 1883. The vine is moderately vigorous. Bunch long, shouldered, berry medium size, almost round, colour deep garnet; skin thin, juicy; pulp tender; seeds large, usually two to three; quality good. Berries do not drop easily. The first fruit of this variety did not ripen this season, although claimed to be as early as Delaware by the introducer.

CHASE BROS.—A single vine of a variety received from Chase Bros. & Co., Rochester, N. Y., in 1887, and entered in the vineyard records under the above name has fruited for the past three seasons. The introducers write that "the variety originated with Mr. Jacob Moore, formerly of Brighton, N. Y." They further say "that the fruit is most excellent in quality, but it proved to be a very shy bearer here so much so that we did not feel justified in putting it on the market."

As fruited here the bunch is of medium size shouldered, fairly compact; berry medium size, round; colour rich bright wine, skin fairly thin, juicy, very sweet; pulp tender, melting, seeds medium size, usually two, quality good, ripens with Delaware. Berries drop somewhat after picking. While recommending this variety to growers I would have them bear in mind the experience of the New York introducers.

ECLIPSE.—Originated by John Burr, of Leavenworth, Kansas, and introduced by Stayman & Black, nurserymen of the same place.

Vine a weak grower; bunch medium to small, shouldered; berry large, round, vivid green in colour; skin fairly thick, small amount of juice; pulp tender, brisk acid, fair quality. Berries hold on well. Ripens a week later than Concord. Too late for this locality.

FARRELL.—Origin the same as the last.

Vine a moderate grower. Bunch large, tapering, shouldered; berry medium to small, round, yellowish white; skin thin, pulp rather tough; juice vinous sweet. Seeds small, numerous. Too late for this locality taking this season as a criterion.

HERMANN JAEGER.—Originator, T. V. Munson, Denison, Texas. Produced by pollinating *Vitus Lincecumii*, the Post Oak grape of Texas—with Herbemont—an old Texas variety.

This did not fruit in sufficient quantity to give a correct impression of the size and form of the bunch which is said to be large and shouldered. Berry was small, round, black with purplish bloom; firmly attached to peduncle; juice and pulp sprightly acid. Seeds small. Not ripe when picked October 10th. Later than Concord. Not promising for this vicinity.

IDEAL.—A seedling produced by John Burr, and introduced by Stayman & Black, of Leavenworth, Kansas.

Bunch medium size; berry large, round, purplish amber; skin thick; juice abundant; vinous sweet; pulp tender. Seeds large and numerous; quality fair to good, ripens with Concord.

ONEIDA.—Said to be a seedling of Merrimack which it does not resemble in a single characteristic. Vine a short jointed, weak grower. Bunch medium size, slightly shouldered; berry small oval, amber coloured; skin thick, tough; juice rich and sweet; pulp meaty, and acid, seeds large. This variety keeps well, which seems to be its only point of merit.

PARAGON.—A seedling produced by John Burr and introduced by Stayman & Black. Bunch medium size, cylindrical, compact. Berry medium size, round, black with purplish bloom. Skin thin; very juicy with a tender dissolving pulp; seeds small; quality medium. Berry does not drop readily. Ripe, 5th September. Keeps till December. Berries resemble Early Victor quite closely.

STANDARD.—Origin the same as the last. Bunch and berry medium size, black. Skin thin: small amount of juice; pulp tough and acid. Ripens a little in advance of Concord. Loses flavour rapidly. Not promising.

CAMPBELL.—Produced from seed of Triumph by T. V. Munson, Denison, Texas. The first fruiting of this variety has given a small compact bunch. Berry medium to small, round; skin thin, translucent; very juicy; pulp melting. Seeds small; quality good. Ripens with Concord.

WHITE BEAUTY.—A seedling produced by John Burr and introduced by Stayman & Black, Leavenworth, Kansas. Bunch medium size, compact, shouldered. Berry round, clear white, covered with light lilac bloom. Skin thin, very juicy; pulp moderately tender. Seeds numerous; quite foxy; medium quality. Late.

RASPBERRIES.

Black.

OLDER.—This variety originated with and has been introduced by R. D. McGeehon, Atlantic City, Iowa, from whom plants were received which were set out in the spring of 1892. These bore some fruit the same season and an abundant crop this year. The plant is exceedingly vigorous and roots from the tips very readily.

Berry large, round, deep black, with very large drupes. The seeds are not prominent, and the berries are borne in good sized clusters, very juicy and of good quality. It also has the habit of fruiting heavily on the young wood. This year the first fruit ripened with Hilborn, while it continued bearing till the season of Gregg had closed. (See Figure 1). So far this seems to be a profitable variety.

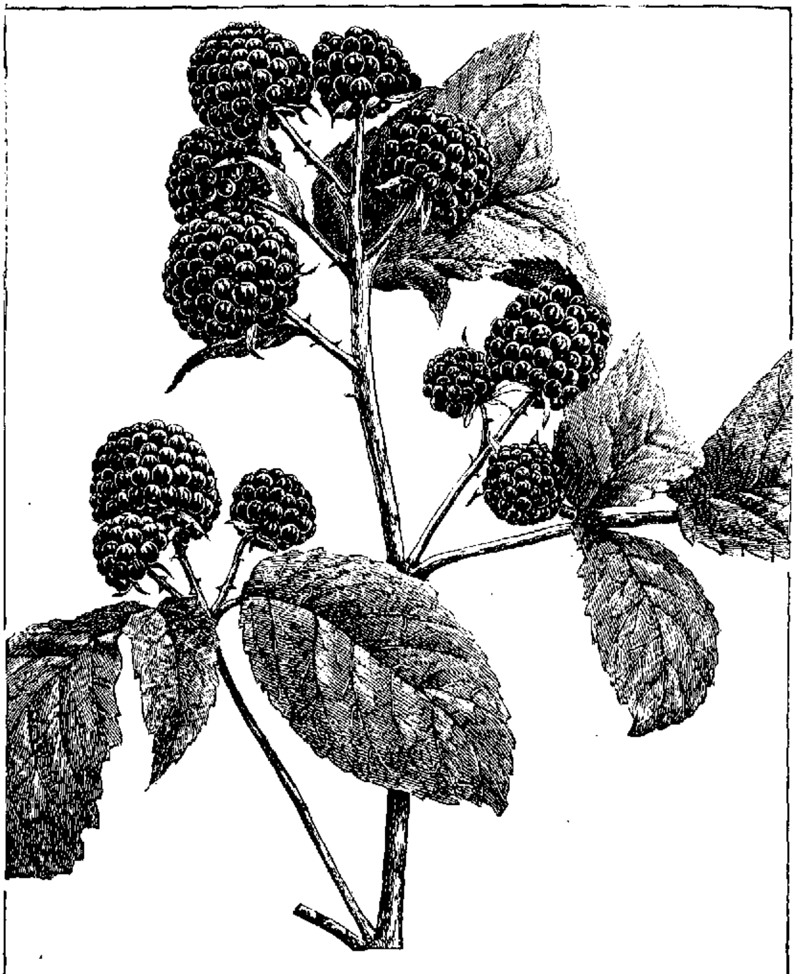


Fig. 1. OLDER.

A number of the newer black caps are being tested, but the above is the only one which so far stands out prominently as a variety worthy of careful trial.

SEEDLING RASPBERRIES.

The seedling raspberries so favourably mentioned by a joint committee of the fruit-growers of Ontario and Quebec, in the annual report for 1890, have been undergoing further trial. Transplanted and subjected to ordinary field culture, some have not sustained their early reputation, while others at first not deemed very promising have done remarkably well.

Fig. 2. SARAH.

One variety not mentioned by the committee in this report for the reason that being very late, it was not at its best during the time of their visit, has since shown so many points of excellence that it has been named and is now being propagated for distribution. It may be described as follows:—

SARAH.—(Record number 4–38.) Produced in London, Ont., by Prof. Saunders, from seed of Shaffer's Colossal. Plant a moderate grower, suckering freely, and propagating naturally only in this way. The foliage seems to be intermediate between the European raspberry *Rubus Idaeus* and the American *Rubus Strigosus*. The canes have been affected to some extent by anthracnose, but not more than Cuthbert or Marlboro growing along side. Fruit large, round; drupes large, deep garnet, firm, very juicy, pleasantly acid and exceptionally rich. See Fig. 2. A few ripe berries were found last year, and this year, at the time of the first picking of Cuthbert, but the main crop did not ripen till the season of Cuthbert was over, the last picking taking place each year from the 8th to 12th August.

A striking characteristic of this variety is its habit of ripening the fruit in consecutive order and much regularity, beginning with the terminal clusters of each branch. Of course this is in a measure true of all red raspberries, but none that I know of carry the peculiarity to the same extent.

SEEDLING APPLES.

A large number of samples of apples, mainly seedling varieties, have been received during the past three years. The two following seem to merit propagation and careful trial:—

DERY.—(*Syns, Alexis Baldwin, Dery's seedling, Pomme de Fer.*) Received from F. L. Dery, of Mont St. Hilaire, Quebec, October 7th, 1891. The original tree was examined October 23rd, 1892, and samples were again received from Mr. Dery this autumn. Mr. Dery says this tree was raised from the seed of American Baldwin, planted by his father about seventy years ago. Since fruiting age it has borne moderate annual crops. It is still fairly healthy and with good care should live for many years.

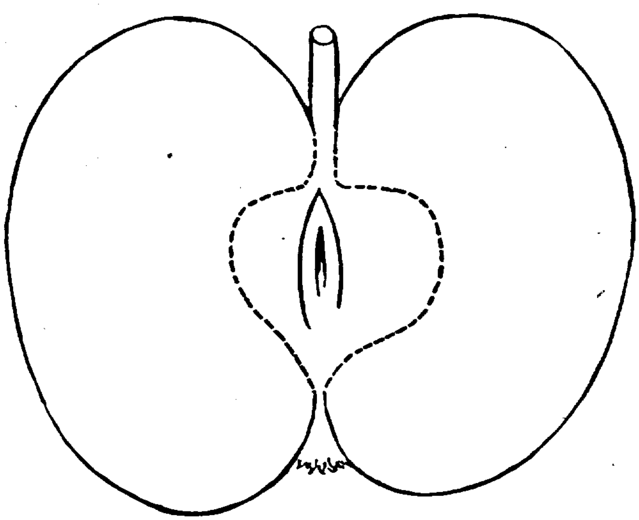


Fig. 3.—DERY.

Fruit medium to large, oblate, 3¼ x 2½ inches, slightly ribbed. Skin green and almost entirely covered with dark red, which is specked with numerous white dots, resembling Canada Baldwin, closely in this respect. Stem short usually about half an inch. Cavity moderately shallow, regular and slightly russetted. Basin, small wrinkled. Flesh, greenish white, firm, lacking juiciness, sub-acid, quality good. See Fig. 3. The best condition is reached during March and April. The apple known and cultivated in the Eastern Townships as "Pomme de Fer" resembles the above closely and is evidently from the same stock.

CALUMET.—Received from Mr. W. H. Murphy, of Ottawa, who described the tree as growing on his farm on Calumet Island supposed to be of seedling origin, apparently about thirty years of age.

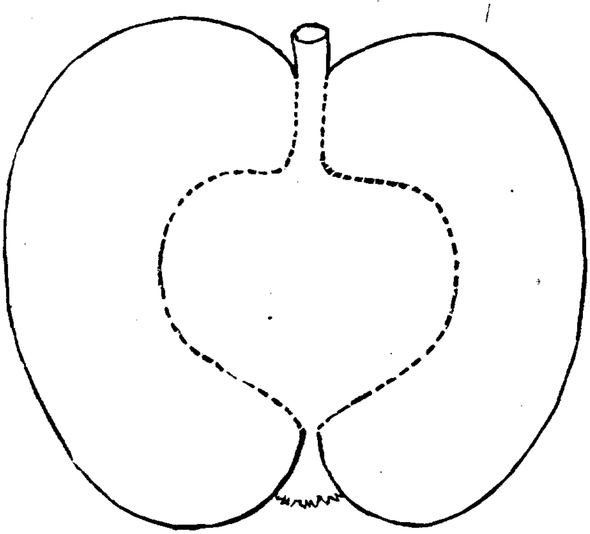


Fig. 4.—CALUMET.

Fruit medium to large, round, or approaching oblong, very regular. Skin green, when fully ripe, yellow, partly covered with streaks and splashes of light red. Stem short; cavity almost wanting: calyx open; basin small and shallow; flesh firm, white, very juicy, sub-acid, good. See Fig. 4.

Mr. Murphy says it keeps through the winter with ordinary care. Specimens kept in my office were in good eating condition on the first of last June. The skin of this variety is not of the kind that is usually affected by the "spot" disease *Fusicladium.*

SPRAYING EXPERIMENTS.

An extended series of spraying experiments were undertaken and carefully carried out by Mr. Joseph Tweddle, of Stoney Creek, Ont., under my direction. Mr. Tweddle has furnished a report of much interest, on the work of the season, which I wish to acknowledge very gratefully. The season in the Niagara district was an abnormal one in many respects however, and no doubt had an important effect upon the results of the experiments which in many instances were quite contrary to previous experience. Mr. Tweddle reports little protection against codling moth and "apple spot" from the use of Bordeaux mixture or ammoniacal copper carbonate, but says that some few specimens of apples could be found, showing where the disease had attacked the fruit, and apparently had been destroyed by the fungicide, leaving a russetted spot on the affected portion, the remainder of the apple being healthy. Mr. Tweddle is also of the opinion that the "codling moth" developed most and caused most destruction after the spraying season closed, although quite a percentage of the fruit was attacked before spraying was finished. One of the most important features in connection with the work is the relative efficacy of Paris green in combination with Bordeaux mixture, and when applied alone. Mr. Tweddle writing of this says: "It is apparent to me that the poisonous action of Paris green was lessened when used in combination with the Bordeaux mixture, and the effect was plainly visible in the apple and plum orchard, particularly in the plums. Where Paris green was used by itself on these, they were much more free from curculio than when it was applied with Bordeaux mixture." This raises an interesting question. My report of 1891 on spraying shows the value of adding Paris green to the solutions of ammoniacal copper, but no exact figures have been gathered showing the effect of adding lime. Exact data will be obtained on this point as soon as possible. With regard to small fruits, Mr. Tweddle says "some encouraging results came from the use of Bordeaux mixture and Paris green for the destruction of the currant worm, and for the prevention of mildew on gooseberries—some of them English varieties. The first brood of the larvæ appeared in myriads on the currant bushes shortly after fruit set. A single application of the above was made soon after the worms were hatched when ⅛ inch in length, but not all were destroyed. When in two or three days, but before the worms were large enough to devour the foliage rapidly, two more applications were made on the same day, going opposite directions on the rows and completely covering the foliage. This was entirely successful in destroying the first brood, and also the second, for the lime in the Bordeaux mixture stuck the whole thing to the foliage so well that it remained all season, and if any of the second brood were hatched, they immediately received their dose and vanished." He says further: "No mildew or sunscald appeared on the English gooseberries (although none even were left unsprayed as checks on my place), yet both mildew and sunscald affected my neighbour's plantation alongside under similar conditions, where no fungicide was applied." It is hoped that the experience gained as the result of another season's work will clear up some points which at present appear contradictory and unsatisfactory.

EFFECTS OF DILUTE SULPHURIC ACID ON FOLIAGE.

The use of sulphuric acid has been suggested by prominent horticulturists on the grounds that it contains the essential elements of a fungicide, and being prepared by simple dilution would therefore be more easily applied than the copper salts.

Some preliminary experiments were inaugurated this season in order to ascertain the maximum strength at which it could be safely applied to the foliage of various plants.

The information obtained is embodied in the following tabular statement:—

	Plants Treated.	Date of Application.	Strength by Weight.				Remarks.
			¼ per cent.	½ per cent.	1 per cent.	1½ per cent.	
	Grapes	June 5.	Injured.				Badly burned and shrivelled.
	Plums	do 5.	do	Badly injured.			Injury severe.
	Apples	do 5.	do				Burned in spots.
In Greenhouse.	Rose foliage, mature.	Mar. 14.	No injury	Injured.	Consid'rably injured.	Badly injured.	Injury gradually increased.
In Greenhouse.	Rose foliage, young.	do 4.	do	No injury	Slightly injured.	Considerably injured.	Half-grown leaves uninjured.
In Greenhouse.	Strawberry	do 4.	do	Slightly injured.		Badly injured.	Young as well as old leaves injured.
In Greenhouse.	Geranium	do 4.	do	do			
In Greenhouse.	Hibiscus	do 4.	Slight injury.	Injured.	Badly injured.	Badly injured.	Scorched in spots.

The injury to the foliage in every case appeared to be due to the concentration of the sulphuric acid by the evaporation of the water used as the dilutent.

The rate of evaporation would of course be largely governed by the humidity of the atmosphere and would be relatively slower under greenhouse conditions than out of doors. This concentration of the acid into small globules over the surface of the leaf has the effect of scorching a small circular spot wherever the residue is collected. The injury was more severe and more readily detected on the foliage treated out of doors than that in the greenhouse.

Applied to roses at the rate of 1½ per cent by weight, while severely scorching the leaves it had no apparent effect on green and black aphis infesting the plants.

While the above experiment may be looked upon as preliminary, yet the outlook considering the dangerous character of this substance as a spraying material, is not encouraging.

A DISTRICT FRUIT LIST ADAPTED TO THE PROVINCE OF QUEBEC.

There is a peculiar interest and fascination connected with the testing of new varieties of fruits, which often leads orchardists into the serious mistake of planting too many kinds from a commercial standpoint. There is also a lack of knowledge in many portions of the country, new to fruit growing, with regard to the natural characteristics of the leading varieties of fruits, and their probabilities of success under given conditions. This uncertainty of course often leads to unnecessary expenditure of time and money. The following rough subdivision of the province into horticultural districts, with a list of fruits suitable for cultivation in each has been made, with the hope that it will serve as a guide to the inexperienced but intending fruit grower.

It should be remembered, however, that it will often pay better to cultivate a local variety which is well adapted to the soil and climate of the vicinity, than to import a foreign variety on the strength of a reputation built up abroad. On the other hand, certain varieties have been largely grown and exported, and are now looked upon as standards by the shipping trade; where these succeed, it is of much pecuniary advantage to the orchardist to grow them. Unfortunately there are few sections in the province of Quebec where the varieties of apples best known to the export trade can be successfully grown.

By top-grafting on hardy stocks, for which purpose Haas, and some of the hardy Russians are useful, there is no doubt that Northern Spy, Jonathan and Ontario varieties well known to the British markets, could be profitably grown in the counties of Missisquoi, Huntingdon, Beauharnois, and on the Island of Montreal. Other regions in the Valley of the St. Lawrence possess a suitable climate, but are not equally favoured in the matter of soil; the heavy clays being better adapted to raising farm crops than to the growth of fruit trees. But there is no region in this province where a large and varied collection of tree and small fruits, cannot be grown with profit and pleasure to the cultivator.

For arranging the district lists, I take occasion to acknowledge a large amount of valuable data given me by the leading fruit growers of the province.

The allotment of varieties to the different districts, was made on a two fold basis. First, to recommend only those varieties presumably well adapted and sufficiently hardy; and second, to reduce to a minimum the total number of varieties recommended in each class. Following these rules, therefore, where varieties of equal merit came into competition, the one previously inserted was again chosen; those of proved health and vigour being first selected.

It may be noticed that the same apple, Wealthy for example, appears as an autumn variety in one district, and as a winter variety in another. This is an effect produced by the amount of summer heat and the length of the growing season, charactistic of the climate in which it has been grown. In Gaspé, Duchess becomes early winter, while Wealthy sometimes ripens with difficulty, and keeps till late winter under ordinary circumstances.

The grouping of the counties was made principally on the basis of similarity of climatic conditions, and contiguity of position. The list should be looked upon as an elementary guide to amateurs and beginners in fruit growing, and it is hoped that it will form a starting point for a more complete and accurate classification which should be arranged by the Provincial Horticultural Society.

Alphabetical Arrangement of Counties with District Number.

County.	District No.	County.	District No.
Argenteuil	9	Mégantic	4
Arthabaska	4	Missisquoi	1
Bagot	2	Montcalm	8
Beauce	4	Montmagny	6
Beauharnois	1	Montmorency	12
Bellechasse	6	Montreal	10
Berthier	11	Napierville	1
Bonaventure	7	Nicolet	5
Brome	2	Ottawa	8
Chambly	2	Pontiac	8
Champlain	12	Portneuf	12
Charlevoix	12	Quebec	12
Châteauguay	1	Richelieu	5
Chicoutimi	13	Richmond	3
Compton	3	Rimouski	7
Dorchester	6	Rouville	2
Drummond	4	St. Hyacinthe	2
Gaspé	7	St. John	1
Hochelaga	10	St. Maurice	11
Huntingdon	1	Saguenay	13
Iberville	1	Shefford	2
Jacques Cartier	10	Sherbrooke	3
Joliette	11	Soulanges	10
Kamouraska	6	Stanstead	3
Laprairie	10	Temiscouata	7
L'Assomption	9	Terrebonne	9
Laval	10	Two Mountains	9
Lévis	5	Vaudreuil	10
L'Islet	6	Verchères	5
Lotbinière	5	Wolfe	4
Maskinongé	11	Yamaska	5

DISTRICT No. 1.—HUNTINGDON, CHATEAUGUAY, BEAUHARNOIS, MISSISQUOI, IBERVILLE, NAPIERVILLE.

Apples	Summer—Yellow Transparent, Red Astrachan, Duchess. Autumn—Wealthy, Foundling, Alexander. Winter—Golden Russett, Ben Davis, Scotts' Winter.
Pears	Flemish Beauty, Beurre d'Anjou, Kurskaya.
Plums	Blue—Glass Seedling, Blue Damson. Red—De Soto, Wolf, Weaver.
Cherries	Kentish, or Common Red, Early Morello, Späte Amarelle.
Grapes	White—Lady, Winchell, Moore's Diamond. Red—Moyer, Delaware, Vergennes. Black—Moore's Early, Rogers' 17, Peabody.
Raspberries	White—Golden Queen. Red—Heebner. Marlboro, Cuthbert. Black—Hilborn, Gregg, Shaffer (purple).
Gooseberries	Houghton, Downing, Pearl, Industry.
Currants	White—White Grape. Red—Red Grape, Versaillaise, Moore's Ruby. Black—Lee's Prolific, Prince of Wales.
Blackberries	Snyder, Agawam.
Strawberries	Bubach, Beder Wood, Warfield.

DISTRICT No. 2.—ROUVILLE, CHAMBLY, BAGOT, SHEFFORD, BROME.

APPLES........	Summer—Yellow Transparent, Duchess, Summer Arabka. Autumn—St. Lawrence, Wealthy, Fameuse, Antonovka. Winter—Golden Russet, Scott's Winter, Ben Davis, Canada Baldwin.
PEARS...........	Flemish Beauty, Kurskaya, Bessemianka.
PLUMS	Foreign—Lombard, Glass Seedling, Early Red. Native—De Soto, Wyant, Wolf.
CHERRIES	Early Richmond, Early Morello, Späte Amarelle.
GRAPES..........	White—Lady, Duchess, Moore's Diamond. Red—Delaware, Moyer, Lindley, Brighton. Black—Moore's Early, Worden, Peabody, Gibb.
RASPBERRIES....	White—Golden Queen. Red—Hansel, Heebner, Cuthbert. Black—Ohio, Gregg, Shaffer (purple).
BLACKBERRIES.	Taylor Prolific, Agawam.
GOOSEBERRIES..	Houghton, Pearl, Industry, Smith's Improved.
CURRANTS.......	White—White Grape. Red—Fays' Prolific, Victoria. Black—Black Champion.
STRAWBERRIES.	Bubach, Manchester, Warfield, Beder Wood.

DISTRICT No. 3.—STANSTEAD, COMPTON, SHERBROOKE, RICHMOND.

APPLES..........	Summer—Yellow Transparent, Tetofsky, Duchess. Autumn—Peach, Gideon, St. Lawrence. Winter—Arabka, Wealthy, Ben Davis, Canada Baldwin.
PEARS...........	Bessemianka, Kurskaya.
PLUMS	Foreign—Blue Damson, Glass seedling. Native—De Soto, Wyant, Rollingston.
CHERRIES........	Early Richmond, Large Montmorency, Early Morello.
GRAPES	White—Lady, Winchell. Red—Moyer, Delware, Vergennes, Lindley. Black—Early Victor, Moore's Early, Worden.
RASPBERRIES ...	White—Golden Queen. Red—Turner, Heebner, Marlboro', Cuthbert. Black—Doolittle, Hilborn, Shaffer (purple).
BLACKBERRIES.	Snyder, Ancient Briton.
GOOSEBERRIES..	Houghton, Pearl, Red Jacket.
CURRANTS........	White—White Grape. Red—Victoria, Versaillaise. Black—Black Champion.
STRAWBERRIES.	Crescent, Bubach, Windsor Chief.

DISTRICT No. 4.—MEGANTIC, WOLFE, ARTHABASKA, BEAUCE, DRUMMOND.

APPLES	Summer—Tetofsky, Red Astrachan. Autumn—Duchess, White Pigeon, Switzer. Winter—Arabka, Scott's Winter, Hibernal.
PEARS	Bessemianka, Sapieganka.
PLUMS	Blue Damson, De Soto.
CHERRIES	Early Morello, Bessarabian, Richmond.
GRAPES	White—Lady. Red—Moyer, Delaware. Black—Hartford, Early Victor, Moore's Early.
RASPBERRIES	White—Caroline. Red—Hansel, Turner, Cuthbert. Black—Hilborn, Mammoth Cluster.
BLACKBERRIES	Snyder, Ancient Briton.
GOOSEBERRIES	Houghton, Pearl, Red Jacket.
CURRANTS	White—White Dutch. Red—Victoria, Red Dutch Black—Lee's Prolific.
STRAWBERRIES	Crescent, Capt. Jack, Manchester, Windsor Chief.

DISTRICT No. 5.—VERCHÈRES, RICHELIEU, YAMASKA, NICOLET, LOTBINIÈRE, LÉVIS.

APPLES	Summer—Tetofsky, Blushed Calville. Autumn—Duchess, White Pigeon, Switzer. Winter—Arabka, Wealthy, Hibernal, Ostrekoff.
PEARS	Bessemianka, Gakovka.
PLUMS	Blue Damson, Rollingston, De Soto.
CHERRIES	Kentish or Native Red, Early Morello, Bessarabian.
GRAPES	White—Lady, Martha. Red—Moyer, Delaware. Black—Florence, Early Victor, Moore's Early.
RASPBERRIES	White—Yellow Antwerp. Red—Heebner, Turner, Cuthbert. Black—Mammoth Cluster, Shaffer (purple.)
BLACKBERRIES	Snyder, Agawam.
GOOSEBERRIES	Pearl, Industry.
CURRANTS	White—White Grape. Red—Victoria, Red Grape. Black—Black Champion.
STRAWBERRIES	Crescent, Capt. Jack, Manchester.

DISTRICT No. 6.—DORCHESTER, BELLECHASSE, MONTMAGNY, KAMOURASKA, L'ISLET.

APPLES	Summer—Yellow Transparent, Red Astrachan, Blushed Calville. Autumn—Duchess, Lubsk Reinette, White Pigeon. Winter—Wealthy, Golden Russet, Switzer, Arabka, Longfield.
PEARS	Flemish Beauty, Bessemianka, Gakovka.
PLUMS	Foreign—Blue Orleans (Damas), Reine Claude, Lombard. Native—Rollingston, Wolf.
CHERRIES	Montmorency Ordinaire, Kentish (Cerise de France), Bessarabian, Orel 25.
GRAPES	White—Lady; Red :—Moyer. Black—Florence, Early Victor, Moore's Early, Hartford.
RASPBERRIES	White—Framboise Blanche. Red—Antwerp, Heebner, Cuthbert. Black—Mammoth Cluster, Gregg.
BLACKBERRIES	Snyder, Agawam.
GOOSEBERRIES	Houghton, Pearl, Industry, "Grossellier de France."
CURRANTS	White—White Dutch. Red—Victoria, Versaillaise. Black—Black Champion.
STRAWBERRIES	Alpine, Bubach, Warfield, Windsor Chief.

DISTRICT No. 7—TEMISCOUATA, RIMOUSKI, BONAVENTURE, GASPÉ.

APPLES	Summer—Tetofsky, Whitney, No. 20 (Crab.) Autumn—Duchess, White Pigeon. Charlamoff. Winter—Wealthy, Longfield, Fameuse, Antonovka.
PEARS	Gakovka, Bessemianka.
PLUMS	Blue Damson, De Soto, Blue Orleans.
CHERRIES	Early Morello, Bessarabian, Orel 25.
GRAPES	Black—Florence, Cottage, Early Victor.
RASPBERRIES	White—Yellow Antwerp. Red—Heebner, Turner, Cuthbert. Black—Hilborn, Gregg.
BLACKBERRIES	Snyder, Ancient Briton.
GOOSEBERRIES	Houghton, Downing, Industry.
CURRANTS	White—White Grape. Red—Versaillaise, Victoria. Black—Black Champion.
STRAWBERRIES	Alpine White, Crescent, Bubach, Captain Jack.

DISTRICT No. 8.—PONTIAC, OTTAWA, MONTCALM.

APPLES	Summer—Yellow Transparent, Duchess. Autumn—Wealthy, Peach, Haas, White Pigeon. Winter—Golden Russet, Pewaukee, La Rue, Arabka, Hibernal.
PEARS............	Bessemianka, Flemish Beauty.
PLUMS	Foreign--Blue Orleans, Shropshire Damson, Glass Seedling. American—De Soto, Wolf and Local Seedlings.
CHERRIES........	Montmorency, Early Morello, Orel 25, Bessarabian.
GRAPES	White—Lady, Winchell, Moore's Diamond. Red—Moyer, Delaware, Mary, Vergennes. Black—Early Victor, Moore's Early, Peabody, Roger's 17.
RASPBERRIES....	White—Golden Queen. Red—Hansel, Turner, Cuthbert. Black—Hilborn, Mammoth Cluster.
BLACKBERRIES.	Snyder, Agawam.
GOOSEBERRIES..	Houghton, Pearl, Industry.
CURRANTS	White—White Grape. Red—Victoria, Versaillaise, Prince Albert. Black—Lee's Prolific.
STRAWBERRIES.	Crescent, Sharpless, Bubach, Capt. Jack.

DISTRICT No. 9.—ARGENTEUIL, TERREBONNE, L'ASSOMPTION, TWO MOUNTAINS.

APPLES	Summer—Yellow Transparent, Duchess. Autumn—White Pigeon, Switzer, Gipsy Girl, Wealthy. Winter—Golden Russet, Scotts Winter, Fameuse, La Rue, Arabka.
PEARS	Bessemianka, Gakovka.
PLUMS......	Foreign—Shropshire Damson, Glass Seedling. American—De Soto, Wolf, Wyant.
CHERRIES........	Early Morello, Montmorency, Wragg, Orel 25.
GRAPES	White—Lady, Winchell, Duchess. Red—Lindley, Vergennes, Delaware. Black—Moore's Early, Peabody, Aminia, Gibb.
RASPBERRIES....	White—Golden Queen. Red—Hansel, Marlboro, Cuthbert. Black—Ohio, Hilborn.
BLACKBERRIES..	Agawam, Snyder.
GOOSEBERRIES..	Houghton, Pearl, Industry.
CURRANTS	White—White Grape. Red—Victoria, Versaillaise, Red Grape. Black—Lee's Prolific.
STRAWBERRIES.	Bubach, Sharpless, Warfield.

DISTRICT No. 10.—VAUDREUIL, SOULANGES, ISLAND OF MONTREAL, LAVAL, JACQUES CARTIER, HOCHELAGA, LAPRAIRIE.

APPLES	Summer—Yellow transparent, Red Astrachan, Duchess. Autumn—St. Lawrence, Golden White, Alexander, Brockville Beauty. Winter—Wealthy, McIntosh Red, Ben Davis, Golden Russet, Winter, St. Lawrence.
PEARS	Flemish Beauty, Beurré d'Anjou, Kurskaya.
PLUMS	Foreign—Quackenboss, Seedling Blue of Montreal. American—De Soto, Wolf, Wyant, Weaver.
CHERRIES	English Red, (Ey. Richmond) Montmorency, Wragg, Griotte Imperiale.
GRAPES	White—Lady Winchell, Moore's Diamond. Red—Delaware, Lindley, Vergennes, Salem. Black—Moore's Early, Worden, Aminia, Peabody, Gibb.
RASPBERRIES....	White—Golden Queen. Red—Hornet, Heebner, Marlboro', Cuthbert. Black—Hilborn, Older.
BACKBERRIES...	Agawam, Ancient Briton.
GOOSEBERRIES..	Foreign—Whitesmith, Industry, Rifleman. American—Pearl, Houghton. Smith's Improved.
CURRANTS	White—White Grape. Red—Victoria, Versaillaise, Moore's Ruby. Black—Black Champion.
STRAWBERRIES..	Bubach, Warfield, Beder Wood, Parker Earle, Manchester.

DISTRICT No. 11.—JOLIETTE, BERTHIER, MASKINONGÉ, ST. MAURICE,

APPLES	Summer—Yellow Transparent, Duchess. Autumn—Autumn Strawberry, White Pigeon, Golden White. Winter—Wealthy, Golden Russet, Pewaukee, Arabka.
PEARS............	Bessemianka, Gakovka.
PLUMS............	Foreign—Seedling Blue, Quackenboss, Blue Orleans. American—De Soto, Rollingston.
CHERRIES	Montmorency, Orel 25, Wragg, Bessarabian.
GRAPES	White—Lady, Winchell. Red—Moyer, Delaware. Black—Early Victor, Moore's Early, Worden.
RASPBERRIES....	White—Caroline. Red—Hansel, Heebner, Cuthbert. Black—Hilborn, Ohio.
BLACKBERRIES..	Agawam, Ancient Briton.
GOOSEBERRIES..	Foreign—Industry, Whitesmith. American—Houghton. Pearl.
CURRANTS	White—White Grape. Red—Victoria, Red grape. Black—Black Champion or Naples.
STRAWBERRIES..	Crescent, Capt. Jack, Bubach, Parker Earle.

DISTRICT No. 12.—CHAMPLAIN, PORTNEUF, QUEBEC, MONTMORENCY, CHARLEVOIX.

APPLES	Summer—Tetofsky, Red Astrachan. Autumn—Duchess, White Pigeon, Livland Raspberry. Winter—Golden Russet, Wealthy, Canada Baldwin, Longfield.
PEARS	Bessemianka, Kurskaya.
PLUMS	Foreign—Blue Orleans, Damson, Quackenboss. American—Rollingston, Wyant.
CHERRIES	Montmorency, Bessarabian, Orel 25, Minnesota Ostheim.
GRAPES	Black—Florence, Early Victor, Hartford, Gibb. Red—Moyer.
RASPBERRIES	White—Golden Queen. Red—Hansel, Heebner, Cuthbert. Black—Hilborn, Ohio.
BLACKBERRIES	Agawam, Ancient Briton.
GOOSEBERRIES	Foreign—Rifleman, Industry. American—Houghton, Pearl.
CURRANTS	White—White grape. Red—Red grape, Victoria, Versaillaise. Black—Black Naples.
STRAWBERRIES	Crescent, Sharpless, Bubach, Capt. Jack.

DISTRICT No. 13.—CHICOUTIMI, SAGUENAY.

APPLES	Summer—Tetofsky, Whitney No. 20. Autumn—Duchess, Summer Arabka, White Pigeon. Winter—Antonovka, Ostrekoff, Longfield, Hibernal.
PEARS	Bessemianka, Gakovka.
PLUMS	De Soto, Rollingston, Wyant.
CHERRIES	Vladimir, Bessarabian, Riga 18.
GRAPES	Black—Florence, Gibb.
RASPBERRIES	White—Golden Queen or Caroline. Red—Hansel, Turner, Marlboro'. Black—Mammoth Cluster, Hilborn.
BLACKBERRIES	Snyder, Ancient Briton.
GOOSEBERRIES	American—Houghton, Pearl, Downing.
CURRANTS	White—White Dutch. Red—Red Dutch, Victoria, Prince Albert. Black—Black Naples.
STRAWBERRIES	White Alpine, Manchester, Crescent, Capt. Jack.

YIELD OF VINES PLANTED 3 x 4 FEET APART AND TRAINED TO POSTS.

At the time of planting the vines which now make up the vineyard it was thought advisable to make a comparative test of the single stake method, or what is commonly known in France or Germany as the renewal system. For this purpose 325 vines were set out three by four feet apart. Twenty-five plants each of the Early Victor, Brighton, Champion, Merrimack, Wilder, Niagara and Bacchus were set out, and fifty each of Delaware, Concord and Clinton. Each vine was provided with a four and a half foot stake for the support of the three canes, which were allowed to every vine. As far as practicable these canes were renewed every year by young shoots preserved for the purpose from wood of the previous year. It was not always possible to do this but in most instances the plan was carried out. By this system the wood falls into two classes, viz.:—the fruit bearing wood produced last year, and the young canes of this year's growth, which are designed to replace the first set out and become fruit producers next year.

It will be seen by the following tabular statement of returns for the last three seasons, that the pole system is not adapted to the conditions that prevail in the greater portions of Canada, where the most complete utilization of all the available summer heat is a prime requisite to the successful cultivation of the grape.

YIELD OF VINES TRAINED TO STAKES AS AGAINST THE SAME VARIETIES ON TRELLISES.

No. of Vines.	Variety.	Year.	How Trained.	Date of Colouring.	Date of Gathering	Total Yield.	Average per Vine.		Yield per Acre.		Average Yield for three years.
						Lbs.	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.
20	Bacchus......	1891	Stakes.....	Sept. 20..	Oct. 8..	14½		11	2,495	10	3,251
	do	1892	do	do 10..	do 10..	27	1	5	4,764	6	
	do	1893	do	do 8..	do 15..	14¼	0	11	2,495	10	
3	do	1891	Trellis.....	do 22..	do 5..	1½	0	8	272	0	6,346
	do	1892	do	do 7..	do 7..	63	21	0	11,424	0	
	do	1893	do	do 9..	do 11..	40½	13	8	7,344	0	
22	Brighton	1891	Stakes.....	do 11..	do 10..	52	2	6	8,621	4	4,915
	do	1892	do	do 18..	do 12..	30	1	6	4,991	4	
	do	1893	do	do 14 .	do 18..	7	0	5	1,134	6	
3	do	1891	Trellis.....	do 12..	do 6..	25	8	5	4,522	0	3,921
	do	1892	do	do 10..	do 6..	22	7	5	3,978	0	
	do	1893	do	do 8..	do 10..	18	6	0	3,264	0	
22	Champion.....	1891	Stakes.....	do 4..	Sept. 18..	4	0	3	680	10	9,982
	do	1892	do	do 27..	do 5..	77	3	8	12,705	0	
	do	1893	do	do 26..	do 28..	100	4	9	16,561	14	
3	do	1891	Trellis.....	....	....	....	....		....		11,968
	do	1892	do	Aug. 27..	Sept. 9..	42	14	0	7,616	0	
	do	1893	do	do 20..	do 1..	90	30	0	16,320	0	
48	Clinton.	1891	Stakes.....	Sept. 8..	Oct. 1..	25½	0	8½	1,928	7	3,289
	do	1892	do	do 13..	do 14..	73	1	8½	5,558	7	
	do	1893	do	do 12..	do 18..	32	0	10½	2,382	3	
3	do	1891	Trellis.....	do 8..	do 5..	33½	11	5	6,264	0	6,488
	do	1892	do	do 7..	do 10..	33	11	0	6,094	0	
	do	1893	do	do 6..	do 11..	39¼	13	1	7,106	0	

YIELD OF VINES TRAINED TO STAKES, &c.—*Concluded.*

No. of Vines.	Variety.	Year.	How Trained.	Date of Colouring.	Date of Gathering	Total Yield.	Average per Vine.		Yield per Acre.		Average Yield for three years.
						Lbs.	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.
48	Concord......	1891	Stakes......	Sept. 8..	Oct. 5..	201	4	3	15,200	10	11,041
	do	1892	do	do 3..	do 10..	196	4	1	14,746	14	
	do	1893	do	do 14..	do 18..	42	0	14	3,176	4	
3	do	1891	Trellis......	do 20..	do 5..	25½	8	8	4,624	0	6,494
	do	1892	do	do 7..	do 6..	30	10	0	5,440	0	
	do	1893	do	do 12..	do 11..	52	17	5	9,418	0	
45	Delaware....	1891	Stakes......	do 4..	do 1..	74	1	10	5,898	12	4,650
	do	1892	do	do 7..	do 10..	88	1	15	7,033	2	
	do	1893	do	do 8..	do 16..	13	0	4½	1,020	15	
3	do	1891	Trellis......	do 5..	do 1..	21	7	0	3,808	0	7,684
	do	1892	do	Aug. 30..	do 4..	18½	6	2	3,332	0	
	do	1893	do	do 28..	do 7..	87¾	29	4	15,912	0	
23	Early Victor..	1891	Stakes......	Sept. 4..	Sept. 22.	32	1	6	4,991	4	3,974
	do ..	1892	do	Aug. 30..	do 25..	54	2	5	8 394	6	
	do ..	1893	do	do 28..	do 28..	30	1	4	4,537	8	
3	do ..	1891	Trellis......	Sept. 4..	do 21 .	5½	1	13	657	14	4,258
	do ..	1892	do	do 7..	do 26 .	20¾	6	14	3,808	22	
	do ..	1893	do	Aug. 28..	do 26..	45	15	0	8,310	0	
22	Merrimack ...	1891	Stakes.....	Sept. 4..	Oct. 1..	75	3	6	12,251	4	8,621
	do	1892	do	do 7..	do 3 .	63	2	14	10,436	4	
	do	1893	do	do 12..	do 10..	19	0	14	3,176	4	
3	do	1891	Trellis......	do 4..	do 1..	21½	7	3	3,910	0	7,650
	do	1892	do	do 3..	do 6..	30	10	0	5,440	0	
	do	1893	do	Aug. 28..	do 11..	75	25	0	13,600	0	
20	Niagara......	1891	Stakes......	....	do 1..	11½	0	9	2,041	14	4,386
	do	1892	do	Sept 7..	do 10..	44	2	3	7,940	10	
	do	1893	do	....	do 15..	17¼	0	14	3,176	4	
3	do	1891	Trellis......	Sept. 15..	do 15..	31½	10	8	5,712	0	8,432
	do	1892	do	do 10..	do 6..	36	12	0	6,528	0	
	do	1893	do	do 9..	do 10..	72	24	0	13,056	0	
22	Wilder......	1891	Stakes......	do 8..	do 1..	77½	3	8	12,705	0	7,373
	do	1892	do	do 8..	Did not mature.						
	do	1893	do	do 14..	Oct. 10..	11¾	0	9	2,041	14	
3	do	1891	Trellis......	do 14..	do 1..	16½	5	8	2,992	0	5,451
	do	1892	do	do 10..	do 4..	15¼	5	1	2,754	0	
	do	1893	do	do 6..	do 7..	58½	19	8	10,608	0	

When we consider that by the single stake plan over 3,000 vines are planted on each acre, a glance at the comparative returns shows that they do not justify the greater amount of labour involved in growing them under this system.

Effect of Summer Pruning of Vines Trained on the Renewal of French System.

The following table shows very conclusively the benefits of summer pruning when applied to the stake or renewal system. Those unpruned were allowed to grow unrestrained after being tied to the stakes in the spring. They soon formed a dense canopy of foliage over each stake, and set little fruit which ripened very unevenly. The amount of fruit set in the case of varieties like Brighton, which are in the matter of fertilization, dependant in a measure upon pollen from other varieties, was very small, owing no doubt to the leafy covering surrounding the blossoms. It will be noticed that while the yields of both pruned and unpruned vines are in a decreasing ratio, for in 1892 and 1893 this feature is much more prominent in the case of the unpruned vines.

YIELD of Pruned and Unpruned Grape Vines.

Number of vines.	Variety.	Trained to Stakes.	1882. — Yield.		1893. — Yield.		Two year average per vine.
			Lbs.	ozs.	Lbs.	ozs.	Pounds.
3	Bacchus	Unpruned	4	8	1	0	91
3	"	Pruned	3	15	2	1	1·00
3	Brighton	Unpruned	7	4	none.		1·83
3	"	Pruned	4	2	0	15	·84
2	Champion	Unpruned	3	4	7	4	2·62
3	"	Pruned	10	8	13	11	6·04
3	Clinton	Unpruned	4	8	2	0	1·08
3	"	Pruned	4	9	1	15	1·08
3	Concord	Unpruned	5	12	0	12	1·08
3	"	Pruned	12	3	2	10	2·46
3	Delaware	Unpruned	5	0	0	12	·91
3	"	Pruned	5	13	0	12	1·09
3	Early Victor	Unpruned	3	8	0	8	·81
3	"	Pruned	6	15	3	12	1·78
3	Merrimack	Unpruned	9	4	2	0	1·87
3	"	Pruned	8	10	2	10	1·87
3	Niagara	Unpruned	8	8	0	8	1·25
3	"	Pruned	6	9	2	10	1·53

EXPERIMENTS IN FALL AND SPRING TRANSPLANTING.

Opinions vary much with regard to the relative success and advantage of transplanting trees in the fall or in the spring. Some advocate fall planting, while others favour setting in spring. The effect of transplanting apple trees in the autumn in this locality has already been recorded in the report of the Horticulturist for the year 1888, p. 78.

In this connection Mr. Hilborn says: "216 apple trees were transplanted from the nursery rows in the autumn of 1887, to an orchard, with a view of testing the relative merits of fall and spring planting."

"When the snow disappeared in spring it was found that nearly all these autumn planted trees were more or less injured, many of them killed to the snow line. The fact that such varieties as Duchess of Oldenburg, Tetofsky and Fameuse,—of which there are healthy bearing trees growing unharmed within a short distance of the farm—suffered equally with the tender sorts, showed clearly that these failures were due to the unfavourable season for planting, rather than the lack of hardiness of some of the sorts tested."

In this instance it is reasonable to suppose that the injury would not have been so severe but for the unusually cold weather of the previous winter; it is right to conclude, however, that fall planting of fruit trees cannot be safely practised in this locality and in other places with similar climatic conditions.

With the object in securing data on the same subject, with regard to forest trees, the following experiment was carried out. Thirty trees each of Green Ash (*Fraxinus viridis*), Black Walnut (*Juglans nigra*), Red Oak (*Quercus rubra*) and European Mountain Ash (*Pyrus aucuparia*), were selected in the autumn of 1892. These had for three years been in nursery rows under good cultivation and were thrifty trees eight to ten feet high. Each variety was separated into three lots of ten trees each; the first assortment being planted without pruning; the second having three-quarters of the last season's growth removed, while the tops of the trees in the third lot were cut back to the main stems. They were then carefully set in rows four feet apart, and three feet apart in the row.

In the spring of 1893, on the approach of the planting season, a duplicate collection of the same varieties was made and treated in a manner similar to those which had been set out the fall previous.

The following tabular data gives the results in detail:—

SHOWING the Average growth and condition of the same Varieties of Forest Trees planted in the Fall and in the Spring.

Variety.	When Transplanted.	How Pruned.	Number Transplanted.	Number Growing.	Average Growth.	Condition.	Remarks.
					Inches.		
Green Ash	Fall	Not pruned	10	10	8	Healthy	
do	Spring	do	10	10	7½	do	
do	Fall	Branches cut back	10	10	10	do	Some dead points.
do	Spring	do	10	10	18	do	
do	Fall	Cut back to main stem	10	10	18	do	Some dead wood.
do	Spring	do	10	10	16	do	Not as strong as last.
Black Walnut	Fall	Not pruned	10	10	4	Injured	Killed back 6 to 12 inches.
do	Spring	do	10	10	4½	Healthy	Few dead points.
do	Fall	Branches cut back	10	10	9	Injured	Killed back 3 to 6 inches; sunscalded.
do	Spring	do	10	10	8	Fair	Some dead points.
do	Fall	Cut back to main stem	10	10	10	Injured	Badly killed back.
do	Spring	do	10	10	12	Healthy	No dead points.
Red Oak	Fall	Not pruned	10	8	5	Injured	Sunscalded.
do	Spring	do	10	10	5½	Healthy	Even growth.
do	Fall	Branches cut back	10	10	5½	Injured	Weak tufty growth.
do	Spring	do	10	9	4	Weak	do
do	Fall	Cut back to main stem	10	10	12	Injured	Dead points 3 to 6 inches.
do	Spring	do	10	10	10	Weak	Growth uneven.
European Mountain Ash	Fall	Not pruned	10	7	8	do	Killed back and sunscalded.
do do	Spring	do	10	10	8	Healthy	Even growth.
do do	Fall	Main branches cut back	10	10	10	Fair	Sunscalded.
do do	Spring	do	10	10	10	Healthy	Even growth.
do do	Fall	Cut back to main stem	10	8	15	Fair	Uneven growth.
do do	Spring	do	10	10	15	Healthy	Even growth.

Some of the effects not clearly shown in the table were the much greater amount of dead wood, the more frequency of the sun scalds, and the unevenness of the growth of the fall planted trees, as compared to those set out in the spring.

These results are more marked in the case of the tenderer varieties and those most difficult to transplant, such as Black Walnut, Red Oak and Mountain Ash. In the case of Green Ash, which is very hardy, and one of the easiest trees to transplant, slightly greater growth was made by those transplanted in the spring; otherwise there was no difference between the two sets. On the whole it is safe to conclude that in the case of trees which do not transplant easily and which are not strictly hardy, spring planting is attended with better results than autumn planting.

PRUNING OAKS IN MID-SUMMER.

The following experiment was suggested incidentally in connection with the too severe summer pruning of a number of oaks standing in nursery rows. These had been trimmed higher than desired, and in order to learn if it was possible to form a new head the same season, they were cut back in July with the results delineated below:—

A. Three trees cut back to one year old wood.—These made a feeble start the same year, and produced a growth of a few inches which was winter killed.

Their condition in the fall of 1893, was as follows:—

No. 1.—Dead.

No. 2.—To the ground.

No. 3.—Sprouting feebly at two feet from the ground.

B. Three trees cut back to two year old wood.—No. 1, grew six inches the same season and eighteen inches the following summer. Fairly healthy but slightly sun scalded.

No. 2 and 3 made a slight growth the same summer, and a growth of fourteen to sixteen inches in 1893. Numerous dead points on all three.

C. Three trees cut back to three year old wood.—Each made a growth of from six to twelve inches the same season. During 1893 a growth of fifteen to twenty inches was made of well ripened wood. All fairly vigorous and healthy. Dead points not prominent.

D. Three trees cut back to four year old wood.—No. 1, made a growth of ten inches which was slightly killed back the first year; 1893 a strong growth was made, but the tree was ill-shapen and spreading.

No. 2, made a weak growth which was mostly killed back the following winter.

No. 3, was killed to the ground last winter.

We can readily gather from the above that trees, however hardy and vigorous should not be heavily pruned during the season of active growth, and also that in the case of Red Oak, adventitious buds (by whose agency foliage is renewed) are most easily developed on three year old branches; so that if severe pruning is necessary during summer, it is best to cut back at once to this point.

PROPAGATION OF ORNAMENTAL SHRUBS AND CONIFERS.

The ease with which many of our most valued ornamental shrubs may be propagated is not generally understood and appreciated. The methods employed in multiplying such fruits as grapes, currants and gooseberries, which may or should be classed among the necessities of life, are universally understood, and there is little excuse for any one—no matter how small the number of plants he starts with—if he does not increase the number sufficiently to meet the home demand.

With ornamental shrubs a more general knowledge of simple methods of propagation by the farmer, would give an increased interest and would redound to the benefit of the planter as well as the nurseryman.

The following methods have been employed here in multiplying varieties desired for lawn or decoration on this and the Branch Farms :

1. Propagating from cuttings of the ripened wood.—This method is attended with such slight inconvenience and difficulty as to render it practicable to every one having a small area of cultivated ground available.

In October, select a warm and well drained situation, stretch a garden line and open a trench eight or ten inches deep and the width of a spade. It will be an advantage to have one side of the trench slanting instead of perpendicular, against which to lay the cuttings. The soil at the bottom of the trench should be mellowedby digging.

Cuttings of the ripened wood of the current year's growth are then made by cutting it into nine inch lengths. These are stuck in the soil on the slanting side of the trench at regular distances of six inches apart. The earth is then filled in and carefully packed about the cuttings till level with the surface, leaving only the npper bud of each cutting in sight. They may remain in this condition till freezing weather, when the rows should be covered with a mulch of leaves or coarse manure.

The mulch should be removed the following spring and the cuttings be given good cultivation. At the end of the season a large proportion of the varieties mentioned below, will have become well rooted and have made a considerable growth; being large enough in some instances to transplant to the lawn or border.

The following classes of flowering shrubs are easily propagated in this way:—

Honeysuckle (*Lonicera*) erect and trailing.
Spiræa including bridal wreath, and nine bark.
Barberry (*Berberis*) also easily grown from seed.
Siberian Pea tree (*Caragana*) beautiful in spring.
Weigelia (*Diervilla*) Spring and summer flowering shrubs.
Japan Rose (*Rosa Rugosa*) summer blooming.
Tamarisk (*Tamarix*) Foliage beautiful.
Snowball (*Viburnum opulus*) grows most readily from layers.
Cytisus, closely allied to the laburnums.
Shrubby Five-finger (*Potentilla*) summer flowering.
Sea Buck-thorn (*Hippophae rhamnoides*).
Siberian dog wood (*Cornus Siberica*) propagates best by layering.
Syringa (*Philadelphus*) the common mock orange.
Deutzia (*Deutzia*) White flowers in early spring.
Carolina Allspice (*Calycanthus Floridus*) Spring flowering.
Smoke tree (*Rhus cotinus*) Autumn flowering.
Southern wood (*Artemisia*).

This list includes a large proportion of the most desirable plants of deciduous habit suitable for lawn decoration in this vicinity

2. Propagating from green wood.—By this method cuttings are taken early in August from the unripened tips of the current year's growth. They should be four to six inches in length and be prepared by removing all the leaves except three or four of those last developed. They are then planted three inches deep in rows in a frame supplied with soil of equal parts of sand and loam. The frame is then covered with hot-bed sash, which is carefully shaded till the plants become rooted. The cuttings should be carefully watered and aired during this period.

On the approach of winter the rooted plants may be either taken up and stored in a cold cellar or be protected with a mulch in the frame.

Nearly all the plants mentioned in the preceding list may be propagated in this way, but it is specially useful for striking plants of the beautiful large flowered Hydrangea (*H. Paniculata grandiflora*) which can be multiplied in this manner with as much ease as the geranium.

Propagating Retinosporas and Thujas by Cuttings.

There is no class of evergreen plants so useful for house culture in winter as potted plants, or for lawn decoration, as the various species belonging to the genus *Retinospora*, commonly called Japan Cypress, and to those may be added numerous forms of dwarf cedar (*Thuja*). It is a matter of regret that florists do not grow them more frequently as potted plants, when they may be rooted so easily.

The following method has been adopted here with excellent results:—

The cuttings are made in October by selecting side shoots, which are separated from the stem with the "heel" attached. A heel cutting is one provided with the thickened knot or joint found at the base of each branch. The lower branchlets are trimmed off and the cuttings inserted in boxes of sandy soil, which are kept in a cool part of the green-house, where the temperature does not exceed 50 degrees. The soil should be kept uniformly moist. In February they will have calloused, which is the preparatory stage of rooting. They should then be given more heat, when they will root freely and will be ready for setting in nursery rows or potting by the time spring opens.

During the winter of 1891 twenty varieties of *Thuja* were propagated in this way, over 40 per cent of the cuttings of each kind rooting. With *Retinosporas* the returns are much better.

EXPERIMENTS IN PROPAGATING CHERRIES.

Root Grafting.

A comparative test was made in 1892 with the object of showing the relative success which might be looked for, in grafting Morello cherries upon the common commercial stocks.

The work of root grafting was performed according to the method outlined in Bulletin No. 17, reasonable precautions being taken to secure a good stand. The grafts were set in nursery rows early in May, 1892, and given clean cultivation. The results are given below:—

Variety.	Stock.	No. Grafted.	No. which grew.	Per cent
Orel 23	Mazzard	50	13	26
Orel 23	Mahaleb	41	None.	
Lutovka	Mazzard	50	19	38
Lutovka	Mahaleb	50	8	16
Bessarabian	Mazzard	50	14	28
Bessarabian	Mahaleb	50	None.	
Vladimir	American Plum	50	3	6
Vladimir whip graft	do	25	6	24
Spate Amarelle	do	50	2	4
Shadow Amarelle	do	50	5	10

The above results are so poor as to render impossible the profitable propagation of cherries by these methods. It is true, however, that they may be much below the returns of professional propagators. Mazzard makes much the best showing. Success varies from year to year, according to the season, the care of the graft exercised in carrying out the details connected with the operation of grafting. Much also depends upon the condition of the soil and weather at the time of setting out the grafts. On the whole it is safer for the amateur to crown graft in the spring upon stocks planted the year previous.

The following results have been obtained in propagating cherries by crown grafting.

Variety.	Stock.	No. Grafted.	No. Grown.	Per cent
Vladimir	Mahaleb	100	92	92
Lutovka	do	100	88	88
Bessarabian	do	100	95	95
Shadow Amarelle	do	19	16	84
Gruner Glas	do	62	35	56
Orel 24	do	68	42	61
Wragg	do	15	12	80

Bird Cherry Stocks (*Prunus Pennsylvanica.*)

This native cherry has much to commend it as a propagating stock, but also possesses a few serious defects.

It is hardy and easily grown from seed. On the other hand, its growing season is so extended, and growth so rapid and succulent during that period, that it is often difficult to hit upon the most favourable time for budding. Several hundred were budded late in August of 1892, but with poor success, owing to the large amount of sap in the stocks at the time of budding, which prevented the immediate union of the buds. Growth continued till arrested by frost late in September. In order to prevent the stocks from being girdled by the fibre used in tying, it was necessary to loosen and re-tie, twice after the buds were inserted.

This year the stocks were not budded until the first week in September, and less difficulty from over-growth was experienced, and better results are looked for.

VEGETABLES.

Experiments with Cauliflowers.

A varietal test of cauliflowers was carried on this season. Twenty plants each of twenty-eight varieties were set out on 3rd June. The seed from which these were grown was sown in hot bed 4th April, and pricked into a cold frame, 28th April. The ground was prepared by deep fall ploughing and dressing with barnyard manure at the rate of 75 tons to the acre. The plants were set in rows, three by two feet apart and cultivated with a Planet jr. horse cultivator. As the heads matured they were weighed and the weights recorded with dates of cutting. The results are embodied in the subjoined table. Some of the late varieties were injured by root maggots which were not detected soon enough to be successfully treated with hellebore. The season on the whole was favourable for the development of firm crisp heads of good size.

Cauliflowers.

Variety.	Seedsman.	Per cent germinated.	Transplanted.	Date of 1st cutting.	Date of last cutting.	Percentage of Plants headed.	Total Weight.	Average Weight.	
							Lbs.	Lbs.	ozs.
Autumn Giant	Thorburn	61·	June 3.	Sept. 30	Oct. 30	85·	56¾	3	5
Early Asiatic	Landreth	79·	do 3.	Aug. 13	do 20	85·	63	3	11
Early Boston	Faxon	78·	do 5.	July 20	Sept. 9	60·	34	2	13
Earliest Dwarf Erfurt	March	79·	do 5.	do 17	do 19	70·	54¼	3	14
Early Dwarf Erfurt	Thorburn	91·	do 3.	do 29	do 19	85·	43¾	2	9
Early Perfection	March	57·	do 5.	do 17	do 6	94·4	41	2	6
Early Long Island Beauty	do	93·	do 5.	Aug. 8	do 6	80·	38½	2	6
Early Paris	Thorburn	79·	do 3.	do 5	do 6	65·	19½	1	8
Early Snowball	March	88	do 3.	July 18	do 19	86·6	44¾	3	7
Early Walcheren	Thorburn	74·	do 3.	Sept. 19	Oct. 20	80·	42	2	10
Extra Early Dwarf Erfurt	do	29·	do 3.	Aug. 5	Sept. 19	85·	41	2	6
Extra Early Whitehead	Steele	......	do 5.	July 17	Aug. 20	70·	18	1	4

CAULIFLOWERS.—*Con.*

Variety.	Seedsman.	Per cent germinated.	Transplanted.	Date of 1st cutting.	Date of last cutting.	Percentage of Plants headed.	Total Weight.	Average Weight.
							Lbs.	Lbs.
Giant Purple early..........	Childs......	94·	June 3.	Sept. 6..	Oct. 28..	60·	76½	5 7
Giant Purple late...........	do . ..	95·	do 3.	do 6..	do 20..	35·	68	9 0
Giant White Pearl......	Pearce......	82·	do 3.	July 26..	Sept. 11..	85·	68	4 0
Gilt Edge Snowball..........	Thorburn . .	86·	do 3.	do 29..	do 19 .	100·	50¼	2 8
Half Early Dwarf French....	do ...	92·	do 3.	do 29..	do 6..	80·	22½	1 6
Imperial Novelty........ ...	Landreth. ..	45·	do 3.	do 17..	Oct. 20..	88·8	14¼	1 12
Italian Taranto.............	Thorburn . .	58·	do 3.	Oct. 2..	do 20..	35·	32	4 9
Landreth's 1st..............	Landreth. ..	67·	do 3.	July 26..	Sept. 11..	42·8	12	2 0
Large Algiers..	Thorburn . .	72·	do 3.	Sept. 6..	do 26..	70·	44½	3 2
Large Early London	do ...	70·	do 3.	Aug. 14..	Oct. 20..	95·	46¾	2 7
Large Early Dwarf Erfurt. ..	do ...	58·	do 3.	July 17..	do 2..	92·3	27½	2 4
Le Normand Short Stem.....	do ...	77·	do 3.	Aug. 8..	Aug. 23..	70·	16	1 2
Non Pariel..	do ...	76·	do 3.	do 20..	Sept. 6..	45·	7	0 12
Snowball...................	March . . .	92·	do 5.	do 2..	do 6..	85·	41¼	2 6
Stadtholder.................	Thorburn...	60·	do 3.	Sept. 6..	Oct. 4..	45·	34¾	3 13
Veitch's Autumn Giant......	Steele Bros..	85·	do 5.	do 6..	do 20..	15·	9¾	3 4

Results :

Gilt-edge Snow-ball (Thorburn) gave the highest number of matured heads, averaging 2½ lbs. each. This was the most satisfactory early sort.

Giant White Pearl (Pearce). A medium early variety of good size, headed evenly and yielded 85 per cent of solid heads, with an average weight of 4 lbs. each.

EARLY SNOWBALL (March), This from American grown seed proved one of the best early kinds. Its maturing season covered two months, beginning July 18th, which would be an advantage to the amateur, but a drawback to the market gardener; 86 per cent matured with an average weight of 3½ pounds per head.

American grown seed gave very satisfactory returns with regard to vitality.

Among the late varieties, *Large Algiers*, *Autumn Giant* and *Giant Purple Early* were the most satisfactory.

TREES, CUTTINGS, SEEDS, AND SCIONS DISTRIBUTED.

In order to assist the Quebec Government in furthering the very useful line of experimental work in horticulture inaugurated last year—that of establishing trial fruit stations in each county—the following varieties of apples were supplied by the Central Farm :—

Variety.	No. of Trees.	Season of Fruit.
Sweet Stripe..........	50	Fall.
Bogdanoff	25	Winter.
Charlamoff..........	75	Summer.

Variety.	No. of Trees.	Season of Fruit.
Cross, 15 m	75	Early winter.
Flat Voronesh	40	Fall.
Gipsy Girl	25	Early winter.
Arabka	40	Late winter.
Kara Synap	15	Winter.
Rosy Repka	100	Summer.
Simbirsk No. 4	25	Early winter.
Borovinka	100	Autumn.
Cross, Dept	50	Winter.
Antonovka	60	Early winter.
Orel, No. 5	100	Autumn.
Sklanka, Bog	75	Winter.
Voronesh Glass	50	Winter.
Good Peasant	75	Winter.
Early Sweet	75	Summer.
Osimoe	50	Winter.
Grandmother	25	Autumn.
Simbirsk No 1	100	Early winter.

Through the Ontario Fruit Growers' Association, a number of new seedling black currants have been sent out for trial to different parts of the province. In addition to these, 100 *Rosa rubrifolia* (red-leaved rose), 75 *Spiræa rotundifolia* (round-leaved spiræa), were distributed through the same medium, together with 500 plants each of Colorado blue spruce (*Picea pungens*), yellow pine (*Pinus ponderosa*), and Douglas fir (*Pseudotsuga Douglasii*).

Cherry Scions.

In response to the offer of cherry scions for propagating purposes, of the varieties described in Bulletin No. 17, a large number of applications were received. Many of the applicants were labouring under the erroneous impression that trees instead of scions, would be sent them. One hundred and twenty-eight packages were distributed, covering every province in the Dominion, a large proportion going to the Maritime Provinces. Very satisfactory reports have been received from many who were successful in propagating them.

Manitoba and North-west Territories.

Another distribution of seeds and cuttings of hardy forest trees was made to the Western Provinces. The details are contained in the following table:—

Packages of Plants, Cuttings, &c., Distributed.	Manitoba. — No. of Packages.	North-west Territories. — No. of Packages.
Forest trees	449	381
Cuttings	501	297
Cuttings and trees	177	27
Cherry scions	30	13
Fruits	128	52
Box elder seed	796	533
Ash seed	142	52
Asparagus seed	936	582

The following varieties of Russian apples were used in making up the packages of fruits, in addition to plants of the leading varieties of currants:—

Antonovka,	Karabovka,
Aport, 252,	Ledenetz,
Arkad, Vor.,	Orel, No. 6,
Anisovka,	Orel, 27,
Borovinka,	Rosy Voronesh,
Blushed Calville,	Repka Aport,
Cross, Vor.,	Red Streak,
Cinnamon, Vor.,	Simbirsk, No. 1,
Cinnamon Pine,	Simbirsk, No..2,
Gipsy Girl,	Simbirsk, No. 3,
Golden Reinette,	Simbirsk, No. 5,
Knievskoe,	Vargul.
Kruder,	

EXPERIMENTS WITH TOBACCO.

Some preliminary experiments were undertaken in the cultivation of tobacco, with a view of obtaining information with regard to the varieties best suited to the climate of Eastern Ontario and the province of Quebec; and the most approved methods of handling the young plants previous to setting out.

Seed of thirty-one varieties was sown in a mild hotbed on April 24th, 1893, in rows six inches apart. Germination took place very uniformly in ten days. On May 30th, half the number of plants of each variety were transplanted, pricking them out in a cold frame in rows eight inches apart and three inches apart in the row. On June 6th they were transplanted to the field, which was a thoroughly tilled piece of gravelly loam, that was cropped with beans the previous season, ploughed in the autumn and dressed in the spring with barn-yard manure at the rate of 50 tons per acre.

The ground was cultivated sufficiently with a Planet Jr. horse cultivator to keep down all weeds, and as long as the cultivator could pass between the rows without injuring the plants, which were set three and a half feet apart each way. This distance was found to be sufficient for the smaller and more upright varieties such as "Canadian" and "Cannelle," but did not afford enough space for large leaved vigorous kinds like "Conqueror" and "Pennsylvania Seed Leaf."

A striking difference was noted in the relative rapidity of growth of plants, which had been transplanted in hotbed, and those of the same variety set out from the original seed bed. Those transplanted in hotbed were much stockier and stronger, as might reasonably be expected, did not flag after setting in the field, and lost no time in becoming established.

As the following tabular statement shows, very few plants had to be replaced of those which were transplanted in hotbed. On the other hand, those which had not been transplanted in the hotbed were much slower in taking root and many more of these had to be replaced, as indicated in the table.

The difference in the two sets was quite plainly visible for the greater part of the summer, in fact till "topping" had taken place.

It should be stated also that in pricking out, the plants were taken in such a manner as to thin regularly those remaining, in order to allow of even development and prevent a spindling and weakly growth.

Harvesting after the "single leaf method" described in general notes which follow on the cultivation of tobacco took place Sept. 15th.

The leaves were separated into two grades, according to soundness and size, and the figures in the weight columns represent how much the leaves of each variety weighed green, immediately after picking. The second column of weights represent the amount which the same leaves weighed after drying previous to sorting and tying in "hands." The estimated returns per acre show that tobacco, as far as quantity is concerned, can be successfully grown in this and other localities having like climates.

TOBACCO.

Variety.	Seedsman.	Number set out.	Number replaced.	Size of Leaf.	Weight, Green. 1st Grade.		Weight, Green. 2nd Grade.		Number of Plants.	Estimated Weight per Acre. Green.	Weight, Dry. 1st Grade.		Weight, Dry. 2nd Grade.		Estimated Weight per Acre. Dry.
				Inches.	Lbs.	ozs.	Lbs.	ozs.		Lbs.	Lbs.	ozs.	Lbs.	ozs.	Lbs.
Brazilian American, transplanted	Thorburn	20	0	29×16	31	12	2	9	17	7,326	4	2½	1	½	1,107
do not do	do	20	4	....	31	8	5	4	18	7,411	4	4	0	12½	1,014
Climax do	do	20	0	29×18	41	10	9	14	19	9,839	5	13	2	12½	1,636
do not do	do	20	6	....	29	14	12	4	15	10,035	2	13	2	2¾	1,210
Canadian do	Evans	82	0	26×14	120	0	45	0	82	7,304	16	12½	6	7¼	1,004
do not do	do	41	12	....	67	0	21	0	41	7,791	8	1	3	3¾	1,000
Canelle do	Foucher	82	0	19×12	64	4	20	0	75	4,070	10	14½	2	8	648
do not do	do	41	30	....	17	0	10	0	32	3,062	2	9¾	0	11½	367
Connecticut Seed Leaf do	Thorburn	20	1	....	59	0	16	4	19	14,376	8	11½	0	13½	1,826
do not do	do	20	4	....	63	0	13	12	20	13,930	6	9¾	2	0	1,582
do do	Foucher	82	3	33×15	219	0	65	0	80	8,429	27	15	10	1¼	1,725
Conqueror do	Thorburn	20	1	29×17	32	4	13	12	20	8,349	5	1¼	2	6¾	1,361
do not do	do	20	6	....	24	0	6	0	20	5,445	3	8¼	1	½	825
Honduras do	do	20	2	29×15	50	4	13	0	20	11,479	5	3½	1	12¼	1,267
do not do	do	20	8	....	88	10	....		18	17,872	5	12¾	....		1,169
Hestor	Landreth	20	1	30×18	31	4	13	8	19	8,549	4	15¾	2	3¾	1,379
Havana Partidas, transplanted	do	20	3	18×11	7	4	3	10	18	2,142	1	6¾	0	10¼	214
Havana Vuelta Abajo	do	20	0	16×10	12	4	3	10	20	2,904	2	2	0	11½	516
Imported Havana, transplanted	Thorburn	20	2	21×14	24	0	3	0	20	4,900	2	2¼	0	8	322

do not do	do	20	10	....	10	4	2	0	11	4,042	1	7¾	0	7	634
Muscat de Perse...	Foucher.........	20	0	26×13	23	6	8	10	20	5,808	3	6½	1	6	867
Oronoka White Stem, transplanted.	Thorburn...........	20	0	29×14	16	12	8	4	20	4,537	5	2¾	1	5¾	1,185
do Yellow do	do	20	0	32×15	41	8	9	10	20	9,347	5	8¼	2	2	1,386
do do not do	do	20	10	....	63	10	....		17	13,448	4	14¼	....		1,044
Pennsylvania Seed Leaf do	do	20	0	37×17	69	12	15	8	18	17,192	6	8	2	1¾	1,736
do not do	do	20	8	....	35	12	15	0	18	10,234	4	8	2	5	1,373
Persian Rose do	do	20	1	26×12	34	4	4	10	20	7,078	3	8¾	0	14¼	805
do not do	do	20	2	....	56	8	9	8	20	11,979	6	8½	1	3½	1,406
Pryor Yellow do	do	20	0	....	43	8	11	0	20	9,891	5	2¼	1	4½	1,165
do not do	do	20	1	33×17	....		7	0	19	8,555	4	15¾	1	3	1,180
Pryor Blue do ...	do	20	1	28×14	32	4	14	12	20	8,100	4	11¾	2	1½	1,420
Persian Muscatelle...	Childs........	20	0	25×15	26	10	6	10	20	6,034	3	13¼	1	0	876
Safrano, transplanted........	Thorburn	20	0	33×16	41	0	16	0	16	12,931	5	8¾	2	2½	1,747
Sterling do	do	20	0	25×15	41	0	11	0	20	9,438	5	4	1	10¾	1,256
Sumatra do	Landreth...........	20	0	17× 8	2	10	1	10	20	771	1	3¼	0	10	328
Tennessee, Red, transplanted......... ...	Thorburn	20	1	33×17	53	0	13	0	20	11,979	7	½	2	6	1,707
do not do	do	20	6	... .	58	4	9	0	20	12,205	5	9½	1	4¾	1,250
Tuckahoe do	do	20	1	29×16	30	0	14	0	20	7,986	4	5½	2	3¾	1,193
Virginia Oak Hill, Yellow.	do	20	1	22×16	32	14	7	10	20	7,350	4	8	1	4¾	1,052
White Burley, transplanted...... . . .	Dreer	20	0	....	36	14	....		19	7,068	7	11	....		1,468
do not do	do	20	9	....	15	14	4	2	10	7,260	2	15	0	13¾	1,378
do do	Foucher...... ...	82	5	36×16	116	8	20	4	59	8,535	20	7	2	11¾	1,425
Yellow Mammoth......................	Thorburn	20	1	34×17	57	12	12	8	20	12,750	7	5	1	14½	1,676

The varieties which have succeeded best both as to yield and time of ripening are *Canadian, Connecticut Seed Leaf, Pryor Yellow* and *White Burley.*

HINTS ON TOBACCO CULTURE.

For the benefit of those who are unacquainted with the tobacco plant and its culture, the following brief outline of the course usually adopted in the management of this crop is appended.

That group of plants known to Botanists as members of the genus *Nicotiana* is a large one, and includes many useful decorative plants as well as the tobacco of commerce. The genus was named after Jean Nicot, who introduced tobacco into France in the latter half of the 16th century. *Nicotiana tabacum* and *Nicotiana Persica* with their varieties include most of the cultivated tobaccos.

The development of this industry has proceeded with great rapidity. With the French colonists of the Detroit River region and of the province of Quebec came seed of this plant to Eastern North America. In the eastern portions of this province long continued selection of home-grown seed has given rise to varieties peculiar to the region. These are usually smaller leaved hardy varieties that do not attain the height of Southern forms. The yield, however, is usually very satisfactory, and with the exercise of skill in harvesting and curing, there is no doubt that an easily marketable product of good quality can be produced.

Soil.

A soil which is deep, friable, rich, dry and warm, and one which may be easily traversed by the numerous tender fibrous roots of this plant, is advisable in this climate in order to hasten early maturity. A sheltered situation is also very desirable. Tobacco is peculiarly a farmer's crop inasmuch as there are few farms which do not afford an acre or half an acre of the above description.

Manures.

Analyses of the stems and leaves of tobacco reveal the fact that this plant draws heavily on the potash of the soil, so that in growing it a proper rotation of crops is desirable, and a careful return to the soil of those elements of fertility which have been withdrawn is of course necessary.

The following analyses are taken from the Report of the Massachusetts Experiment Station for 1892.

Substance Analysed.	Nitrogen.	Average.	Potash.	Average.	Phos. Acid.	Average.	Lime.	Magnesia.
Tobacco leaf........	2·75	2·52	7·24	6·44	·43	·51	4·17	2·17
Tobacco stems.	2·29	2·52	6·44	6·44	·60	·51	3·89	1·23

The above figures show the principal elements extracted from the soil in growing this crop, and indicate the desirability of returning them if the best results are looked for.

It should not be forgotten that the fertilizing constituents are nearly equally divided between the stalk and the leafy matter, and therefore, the utilization of the stalks for fertilizing purposes is an important feature in the economical culture of this plant. It has been estimated by Mr. Loomis of the Connecticut Experiment Station (Report for 1887, p. 84), that "the stalks contain about as much nitrogen and potash as would be furnished by an application of 70 pounds muriate of potash and 300 pounds of cotton-seed meal per acre. The latter would, however, contain nearly twice as much phosphoric acid." In other words, about four tons of barn-yard manure would be needed, from which to obtain an equal amount of potash, as is contained in the stalks from an acre, but one and a half tons of barn-yard manure will furnish an equal amount of nitrogen.

It will be seen then that potash and lime are specially required, and soils in which these elements are present in large quantities produce a leaf of superior burning qualities.

Raising Plants.

Seed should be sown in a hotbed between the 10th and 20th of April; the latter date is usually the right time for this locality. In twenty days the plants should be ready to transplant to a cold frame in the manner already described. Such a course of treatment as will produce good tomato plants may be pursued with every assurance of success.

The time of setting out will depend somewhat on the locality, it must not take place till after all danger of frost is over—in this locality from May 24th to June 10th.

Transplanting and Cultivating.

The large leaved varieties should be set in rows, four feet apart and three feet apart in the row. The rows are easily lined out with a corn marker. Three feet apart each way will give sufficient space to the smaller growing sorts; such as the "Canadian" and the Turkish varieties. Although a cloudy day is preferable for transplanting, yet if plants have been handled as above described, and carefully taken up with a ball of earth attached to the roots of each, there is little need of delaying the work by waiting for clouds or rain. Like all young plants frequent cultivation is very necessary to the rapid growth of the tobacco plant, and the soil should be stirred at least once in ten days, up to the period when the plants are "topped."

Priming and Topping.

"Priming" is the term used to designate the removal of one or two of the lower or primary leaves, which are inferior in size and frequently become torn and injured by the cultivator.

"Topping" is the more important operation of removing the flower stalk, with one or more of the upper and smaller leaves. The energies of the plant are thus diverted from the natural channel—the production of seed—to the more perfect development of its leafy tissues. After topping, numerous suckers will appear in the axils of the leaves; those should be promptly removed.

Harvesting.

It is difficult to describe with sufficient accuracy for identification, the appearance of the tobacco leaf when it has arrived at the proper stage for cutting. The proper time for harvesting is more easily pointed out in practice than intelligently described. When maturity is reached the leaf loses its deep green, taking on a yellow hue, which in some varieties is mottled with deeper markings of the same colonr. At this stage, if the tip of the leaf is doubled back, the mid rib will break with a clean fracture.

There are two principal methods of harvesting the crop:

1. Cutting the plant at the ground, and hanging the whole stalk while it is being dried.

2. Stripping the leaves from the plants in the field as they ripen, and stringing them on wires which are attached to laths, in such a manner as to allow each lath

with its load of leaves to be handled separately. The latter is the ideal method and one which is being introdnced into many of the tobacco-growing regions of the United States with excellent results. It entails, however, a greater amount of labour than the first and older method, and at a season when the farmer is usually pressed for time. When the former method is adopted the plants are strung on laths either by piercing or splitting the stalks. After being allowed to wilt for a short time they are taken to the curing house or barn.

The best drying-houses are now supplied with a system of heating flues which hastens and facilitates the process of drying, which without these aids takes from four to six weeks according to the humidity of the atmosphere and the system of harvesting employed: the whole plant taking longer, of course, than if the "single leaf method" is adopted.

The leaves are next stripped from the plants and graded according to their quality and size, in bundles called "hands" containing a dozen leaves each.

Fermenting.

In order to give the leaves a uniform colour the "hands" are arranged in a compact heap with butts outward, in which condition they remain till heating commences: when the thermometer in the centre indicates a temperature of 100 to 110 degrees the "bulk," as this heap is technically called, is opened and rearranged so that the outer tiers are brought to the centre. After the process of fermentation has been completed the "bulk" is opened, the "hands" taken ont and arranged in loose tiers where they are gradually cooled.

In the case of fine cigar tobaccos the leaves are again sorted before packing in bales or hogsheads for shipment, which completes the course of treatment before marketing.

REPORT OF THE CHEMIST

(Frank T. Shutt, M.A., F.I.C., F.C.S.)

Ottawa, 1st December, 1893.

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

Sir,—I have the honour to submit herewith the seventh annual report of the Chemical Department of the Dominion Experimental Farms.

The work of the department is necessarily of a manifold character. That which relates to the answering of correspondents' questions, and the examining and reporting on samples of soil and agricultural products for individuals, although an extremely useful branch of the work, is not repeated here. In the following pages are recorded only the data and conclusions considered to be of general interest and value to the farming community of the Dominion. A brief outline of this matter, prepared for convenience of reference, is as follows:—

Soils.—Our work on the examination of representative soils has been continued. Interesting data together with conclusions as to the relative fertility and rational treatment of the soils analysed during the past years are here given. The investigation included virgin soils from widely distant points in Canada.

An analysis of every soil received is neither possible nor desirable. A qualitative and physical examination is however made, and a report forwarded to the sender of the sample, with such suggestions as to fertilizers and modes of treatment as are deemed advisable for increased crop yields. The soils so reported on have been received from all parts of the Dominion. In this new departure, I believe, the Chemical Department has been of much benefit to our agriculturists.

Alkaline Soils.—In the chapter on alkaline soils, a distinct and progressive step towards their amelioration is recorded. The experiments of the past year have proven that by the treatment here detailed the baneful effects of magnesium sulphate (Epsom salts) in a soil, may be overcome.

The variable character of the alkali in the affected districts, does not allow us to offer any one method whereby all alkaline soils may be alike beneficially treated, unless it be that of thorough drainage. To all those in Manitoba and the North-west Territories possessing "alkali patches," the reading of the present report is commended.

Mucks, Peats and Muds.—The value of these naturally-occurring fertilizers is stated at some length, and the composition of many samples lately analysed given in tabular form. Suggestions for the economic use of these fertilizers are added.

Wood Ashes.—Special attention is called to the value of potash in agriculture, and a plea is made for the better recognition of the value of Canadian wood ashes.

Legumes.—The results of analyses of several members of the Leguminosæ are inserted together with some remarks upon the value of these plants for fodder and as green manure.

Carrots.—An interesting investigation was made to ascertain if there were any difference in feeding value between the part of the root developed above ground and the part below the surface of the soil. Our analytical data and conclusions are here given for the benefit of our readers.

THE BABCOCK TEST.—Dairymen will find a record of further experiments with this useful method of ascertaining the percentage of fat in milk. These have special reference to the amount of potassium bichromate to be used in composite testing.

WELL WATERS.—As in former years, the analysis of farmers' well waters is a matter that has received our attention. The results of the past year are given, and attention is drawn to the danger of drinking from a contaminated supply.

SALINE WATERS.—Some experiments towards the improvement of certain saline waters have been made this year. The results are commended to the notice of those who unfortunately have to depend upon such unwholesome supplies.

MISCELLANEOUS.—Several other matters, though perhaps of less importance than the foregoing, are treated of in the following report, since they are considered of general interest to farmers.

Addresses have been delivered at several of the larger agricultural conventions in Ontario, and have received publication in their transactions.

They are as follows:—

Dairymen's Association of Eastern Ontario—Home grown Coarse Fodders.

Creameries' Association of Ontario—Paying for Milk according to Butter-fat.

Ontario Agricultural and Experimental Union—The Chemistry of Farmyard Manure.

Convention of Executive Health Officers, Ontario—The Farm Water Supply.

Ontario Fruit Growers' Association—The Chemistry of the Copper Fungicides.

In addition to these, several Farmers' Institutes were attended and addressed.

In August, upon the nomination of Sir Henry Trueman Wood, Secretary to the Royal Commisson of Great Britain, I was appointed a professional juror on cereals at the World's Columbian Exposition, Chicago.

Accordingly, with the approval of the Honourable the Minister of Agriculture and yourself, I proceeded to Chicago and there assisted in the analysis of more than 500 samples of grain including wheat, oats, barley, rye, Indian corn, buckwheat, rice and flour—among which were many samples from all parts of Canada. The awards for excellence in this department were granted from data derived from physical inspection and chemical analysis—the nutritive value as deduced from the composition of the grain, being an important factor.

In this connection, it is particularly gratifying to note that the analysis of the samples of wheat (principally Red and White Fife) sent from Manitoba and the North-west Territories, showed them to be of excellent quality and containing a very high percentage of albuminoids, thus confirming previous analyses and opinions of the wheat grown in these provinces.

The United States Department of Agriculture purpose publishing in bulletin form the analytical data of all the cereals examined.

In January last Mr. A. Lehmann, B.S.A., resigned his post of assistant chemist to accept a position on the staff of the Experiment station of Louisiana, at New Orleans. For two years and a half Mr. Lehmann had worked faithfully and well in our laboratories, and it was with much regret that I parted with an assistant who had proved himself so valuable and had taken such a deep interest in the chemical work of the Farms.

Mr. P. H. Le Rossignol, B.A.Sc. of McGill University, Montreal, was appointed to the vacant assistantship in April. Mr. Le Rossignol has shown himself a careful and skilful analyst and well qualified for the work of this department. To his ability and industry I am indebted for many of the results here recorded.

I have the honour to be, Sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

Chemical Laboratories,
Central Experimental Farm,
Ottawa.

INTERIOR VIEW OF MAIN LABORATORY.

SOILS.

The investigation into the composition of certain Canadian soils has been continued, and the results of the analyses of sixteen samples obtained during the past year are now given.

Since the amount of work involved in soil analysis in very considerable, the chemical examination is restricted to those samples which either represent the virgin soils covering large areas in the Dominion or, on account of supposed barrenness, present themselves as worthy of special examination.

In previous reports (1890 and 1891) the factors upon which the fertility of a soil depends have been enlarged upon, the constituents of soils enumerated, and the limits between which the elements of the plant food vary in soils given. It will only be necessary, therefore, to insert the following abstracts, which afford sufficient information to render intelligible the chemical data in the subjoined table:

Factors of a Soil's Fertility.—"The factors upon which the fertility of the soil depend are many. The amount of plant food and its degree of solubility, the mechanical texture or tilth and the climate (temperature, amount of rainfall, &c.) are the chief of these.

"Soil, to be fertile, must contain the elements of plant food in such forms that they can be readily used for the nutrition of vegetation. At the same time its condition must not be too loose, else a firm hold will not be afforded to the roots of plants, and there will be too much drainage and evaporation; nor must it be too heavy and plastic, for then air and water could not freely permeate it nor the roots extend themselves beyond a very limited area. Generally speaking, light, loose soils are not as rich in plant food as those in which clay predominates; yet, on account of their excellent condition of tilth, they often yield, in favourable seasons, heavier crops than the latter. Stiff, heavy clays, though rich in inorganic plant food (potash and phosphoric acid) are often poor in nitrogen, while their condition is such as to prevent thorough aeration and the penetration of the roots. It is these soils especially that are benefited by drainage. By a system of drainage the water which saturates the surface soil is carried off, air allowed to permeate, the whole rendered more friable and easily worked, and much plant food is converted into assimilable forms.

"Where sand largely preponderates, the soil is not retentive of moisture and fertilizing material, especially if the subsoil be light, and though easily worked, is not so desirable in dry seasons as a heavier soil.

"A proper proportion of sand and clay, therefore, for many reasons, makes the best soil.

"With the clay and sand, varying amounts of peaty matter or humus (derived from the decomposition of vegetable matter), and of calcareous matter (principally carbonate of lime) are usually associated, and a right proportion of the two latter exerts a beneficial influence upon the tilth of a soil. From the presence of these predominating materials, soils are known respectively as clay, sandy, peaty and calcareous, according as one or the other is in excess.

"By the slow decomposition of the clay and the peaty and calcareous matter, plant nutrients are liberated in a soluble form, and therefore the function of these soil fundamentals is not only mechanical but chemical.

The Essential Elements of Plant Food.—"The most important inorganic constituents of a soil are potash and phosphoric acid. These, together with nitrogen, are known as the *essential elements* of plant food.

"*Potash*—derived principally from the decomposition of felspathic rocks, *e.g.*, granite—exists chiefly in combination with silica in a more or less soluble condition. The limits of potash in a soil lie between a mere trace and about 2 per cent. A good agricultural soil contains between ·25 per cent and 1 per cent. Clay soils, usually, are the richest in potash.

"Potash, as a fertilizer, is of special value to clover, pease and other leguminous crops; potatoes, beets, cabbage, grasses and leafy plants in general, are also benefited by it. It should form a large part of manures for orchards and all fruit trees.

"*Phosphoric acid*, combined principally with lime, is found in all fertile soils. Like potash, it has been derived from the rock that originated the soil, and consequently is not constant in quantity. It never exceeds 1 per cent, even in the richest soils, and the average in good soils is about ·2 per cent.

"It benefits chiefly root crops, *e.g.*, turnips and beets, and in conjunction with nitrogenous manures is very effective for the cereals, promoting an early maturity and an increased yield.

"*Lime.*—Of the inorganic elements of minor importance, lime is the principal. It affords food directly to the plant and liberates in the soil potash and nitrogen pre-existent in insoluble forms. Many consider that less than 1 per cent shows a soil to be deficient in lime, and calcareous soils are almost invariably fertile.

"No special mention need here be made of the other mineral constituents, as most soils contain sufficient for all the requirements of farm crops.

"*Nitrogen* is the element of value in the organic portion of a soil. It there exists, for the most part, in forms from which it can be but slowly absorbed by plants. By a process of fermentation, known as nitrification, it is rendered assimilable. The presence of lime (carbonate of lime) appears to assist in this useful operation, especially when the ground is sufficiently open for the air to permeate it. Moisture and warmth are also necessary to encourage the growth of the microscopic ferment which causes the formation of nitrates from nitrogenous material.

"Very rich soils contain from ·5 per cent to 1 per cent of nitrogen; good, fertile soils possess on an average from ·15 per cent to ·25 per cent.

"Nitrogen is essentially the fertilizer for cereals, especially when associated with phosphoric acid. An excess of nitrogen, however, promotes a rank growth of straw."

NORTH-WEST TERRITORIES.

The samples Nos. 1, 2 and 3, were forwarded by Messrs. Osler, Hammond and Nanton, of Winnipeg, Manitoba, who furnish the following information regarding their character:

Speaking of No. 1, they say, "This soil exists in large quantities along the line of railway between Qu'Appelle River and Saskatoon, and is found as a layer between the surface and subsoil, which latter is clay. Wherever this layer is found the grass is thin and rank, and the general appearance of the soil is cold and barren." Locally, the soil is classed alkaline.

Respecting soils Nos. 2 and 3, they quote from a letter written by Mr. Dodd, their inspector, as follows: The sample No. 2 "was taken from the bench west of the arm at Chamberlain (Tp. 22, R. 26, W. 2). There were about 6 inches of surface soil, and 2½ feet of this stuff, perfectly dry. Below this 2½ foot layer was good, sweet clay, and moist. I am satisfied the whole trouble with the land is in this layer. Sample No. 3 is from corner of 2 and 3, 35, 34, Tp. 29, R. 24, W. 2. I fancy it is stronger than the other."

These soils, which from their position must be regarded as subsoils, have in many respects similar characteristics. Air dried, they are almost white, of a very fine texture, and powder easily. They are, essentially, calcareous clays. A mechanical separation of No. 1 proved it to contain but little true sand, though the treatment served to distinguish between fine clay and small agglutinated masses of clay formed by the cementing action of the carbonate of lime present. Nos. 2 and 3 possess fair proportions of sand.

Considered chemically, the following inferences may be made. In potash, while No. 1 is somewhat below the average of good soils, Nos. 2 and 3 contain amounts equal to those in soils of great fertility. The phosphoric acid in all is low, but many soils of an equally small percentage have borne abundant crops. As might be expected in a subsoil, the percentage of nitrogen is not high, though in this

8c—10¾

Analyses of Soils (air-dried), 1893.

Number.	Soil.	Locality.	Water.	Organic and Volatile Matter.	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Soda.	Phosphoric Acid.	Soluble Silica.	Carbonic Acid (undetermined.)	Total.	Nitrogen.	Clay.	Sand.
1	Subsoil	Between Qu'Appelle and Saskatoon, N.W.T.	3·11	6·32	54·93	9·52	14·34	·57	·10	·45	·10	·10	10·40	100·00	·128	.....	.....
2	"	Tp. 22, R. 26, W. 2. .... "	3·12	6·23	60·44	6·69	11·90	2·74	·47	·10	·12	·10	8·09	100·00	·120	33.19	27·25
3	"	2 and 3, 34, 35, Tp. 29, R. 24, W. 2. "	3·67	8·25	44·55	4·97	19·29	4·24	·44	·11	·11	·09	14·28	100·00	·092	32·83	11·72
4	"	Chilliwack, B.C.	1·74	6·66	71·52	14·32	1·49	2·61	·15	·54	·13	·19	·65	100·00	·128	69·58	1·94
5	Surface	Squamish Valley, B.C.	1·50	3·33	81 98	8·59	1·66	1·62	·38	·33	·20	·21	·20	100·00	·087	37·56	44·42
6	"	Alberni "	5·31	10·22	53·46	26·45	1·08	2·78	·31	·12	·08	·72	.....	100·53	·120	53·46	.....
7	"	First Bench, Exp. Farm, Agassiz, B.C.	3·15	6·65	77·86	9·67	·84	1·19	·31	·14	·23	·07	.....	100·11	·154	28·46	49·40
8	"	Second " " "	2·34	4·24	79·42	10·89	·77	1·12	·34	·15	·13	·19	·41	100·00	·099	41·21	38·21
9	"	Orchard " "	3·42	6·69	74·97	11·08	·93	1·52	·38	15	·18	·20	·48	100·00	·149	40·53	34·44
10	"	" "	3·24	6·96	75·14	10·83	·94	1·48	·33	·17	·25	·20	·46	100·00	·148	38·79	36·35
11	"	Lot 28, Con. 1, Tp. Perry, Muskoka, Ont. ..	5·33	8·90	78·91	6·13	·08	·14	·04	....	·17	·05	·25	100·00	·280	20·50	58 41
12	Subsoil	" " " ...	3·75	4·91	84·19	6·28	·13	·26	·06	....	·17	·07	·18	100·00	·114	28·52	55·67
13	Surface	St. Clet, P. Quebec	3·25	7·51	77·65	9·32	·45	1·07	·37	....	·32	·22	.....	100·16	·191	17·73	59·92
14	Subsoil	" "	3·66	3·53	76·61	12·47	·70	1·79	·45	....	·29	·27	·23	100·00	·047	10·54	65.07
15	Surface	St. Ignace du Nominingue, P. Quebec ...	3·22	5·58	79·00	8·84	1·19	1·11	·11	·44	·18	·02	·31	100·00	·174	69·97	9·03
16	Subsoil	" " "	3·21	5·44	79·39	8·26	1·13	1·48	·10	·46	·18	·01	·34	100·00	·166	71·50	7·85

constituent they compare very favourably with ordinary subsoils. It is to be especially noted that they contain a high percentage of carbonate of lime.

For subsoils, therefore, they cannot be considered deficient in the essential elements of plant food.

A careful examination was then made for the presence of any deleterious alkali. The following are our results:—

	No. 1.	No. 2.	No. 3.
Total water-soluble content	·307	·072	·167
which on analysis was found to contain			
Soda (Na_2O)	·04	—	trace
Potash (K_2O)	·01	trace	—
Lime (CaO)	trace	"	trace
Magnesia (MgO)	"	"	"
Sulphuric acid (SO_3)	·03	none	none

It is very evident from the above results that these are not alkaline soils, since the amounts of alkaline salts here found are well within the limits of those in good, arable soils. I conclude, therefore, that these soils do not contain any compound deleterious to vegetation.

It has already been mentioned that tilth or mechanical texture of soils is an important factor in soil fertility. From the nature of these samples, I am led to believe that the apparent barrenness is due to physical rather than to chemical causes. Calcareous soils, such as these, are extremely absorbent. Though they are capable of holding a considerable amount of water, they yield this water with difficulty to the roots of growing crops. It is also a characteristic of this class of soils that they generally appear dry, in spite of the fact that they may contain a very fair percentage of moisture.

These soils are from districts which enjoy a very limited rainfall; it is therefore possible that their barrenness may be in part, if not wholly, due to the absorption and retention of much of this small quantity of rain.

If the overlying surface soil is sufficiently deep and fairly rich in nitrogen, and the climatic conditions (rainfall, &c.) are favourable, there would appear to be no reason why remunerative crops could not be raised upon these soils. The alleged barrenness points to a too shallow or too poor surface soil, to an unsuitable tilth or an insufficient rainfall or other unfavourable climatic condition.

BRITISH COLUMBIA.

No. 4.—Soil from Chilliwack, B.C. This consisted of samples of the upper and lower layers of the surface soil and of the subsoil. It is reported by Mr. Chapman of Chilliwack, who forwarded the samples, that they are representative of an area of about 4,000 acres, all taken up with homesteads of 160 acres each. The tract lies between the mountain range and the Fraser River. Numerous streams flow from the mountain. These, on reaching the base, have no regular channels, and in consequence spread over the surface of the land, finally collecting into a sluggish stream which flows into the Fraser River. Mr. Chapman writes that a drainage scheme is now in progress to reclaim this large area of land. He reports that good yields of the cereals are obtained, though there is a tendency to lodge. Roots and vegetables also, with a few exceptions, do very well.

The specimens of the upper and lower layers of the surface soil—which varies in depth from 2 feet to 4 feet—are peaty in character, reducing easily in the air-dried condition to a deep brown powder. They were submitted to a partial analysis, with the following results:—

ANALYSIS of Air-dried Surface Soil.

Constituents.	Upper layer.	Lower layer.
Moisture	9·37	8·61
Organic and volatile matter	79·14	80·57
Insoluble residue, clay and sand	4·54	3·66
Mineral matter soluble in acid	6·95	7·16
	100·00	100·00
Nitrogen, in organic matter	3·51	3·51

The surface soil is therefore exceedingly rich in organic matter and nitrogen. With a proper admixture of sand and clay, a soil would result, that in tilth and fertility would equal the most productive lands of the Dominion. Good drainage, a certain mixture of the subsoil and an occasional application of wood ashes and lime or marl, are all that is necessary to ensure abundant crops, providing that climatic influences are favourable.

The subsoil (No. 4) is heavy clay, possessing very little sand. Its potash and phosphoric acid are in fair amounts. For a subsoil, its nitrogen may be termed high. In lime it is somewhat deficient. A peculiarity to be noted is the large percentage of oxide of iron and alumina it contains.

No. 5 is a surface soil from the Squamish Valley in the district of New Westminster. "The valley is said to have an area of 14,000 acres. The only drainage at present is the natural one by rivers and creeks. The surface soil has an average depth of fifteen inches, the sample for analysis being representative of the first six inches. The underlying subsoil is of clay, though occasionally running into sand."

Though fairly rich in mineral constituents this soil is poor in humus and nitrogen. To improve it chemically and physically, heavy dressings of barnyard manure are necessary. An alternate method, and perhaps under the circumstances a more economical one, would be to turn under some green crop, preferably, clover or pease, which should be ploughed in while the plants are in flower. Such a treatment would not only add nitrogen in an available form, but improve the tilth and absorbent character of the soil.

No. 6 is a specimen of surface soil from Alberni, Island of Vancouver. The sample represents the soil to a depth of ten inches from an approximate area of 10,000 acres. The depth of the surface soil varies from a few inches to about four feet. The subsoil is variable, sometimes clay, sometimes sand and gravel. The soil is of a deep red colour, due to the presence of a large percentage of oxide of iron. It is essentially clay.

From the analysis I judge it to be a soil of fair quality. Of the important constituents, it is rich in potash—which might be expected from its origin—poor in phosphoric acid and of medium richness as regards nitrogen. To improve it in this latter respect, liberal application of barnyard manure or the turning under of several crops of growing clover or pease would be advantageous. Nitrate of soda or sulphate of ammonia applied in the spring would also give excellent results. Since these latter fertilizers are costly, their economic use can only be determined after several years of trial with varying quantities. It is always the safest practice, before applying more extensively these concentrated fertilizers, to asertain on small areas the amount that gives the best results. Fish waste is also to be highly recommended as a valuable manure for these soils.

To furnish phosphoric acid, superphosphate of lime or ground bones may be used. The former gives more immediate results, while the effect of the latter is more lasting in the soil.

The addition of composted muck, if such is procurable, is to be recommended for improvement of tilth and enrichment of the soil in plant food.

Numbers 7, 8, 9 and 10 are samples of surface soil from the Experimental Farm at Agassiz. Like the other British Columbia soils examined, they may be classed as of medium quality. In tilth they are rather light, though possessing a fair amount of clay. In potash they are all slightly above the average. With the exception of No. 8 (from the second bench), they are very similar as regards nitrogen and phosphoric acid, containing what may be regarded as amounts equal to those in average fertile soils. The data prove the soil from the first bench (No. 7) to be a little richer in nitrogen than the others. Nos. 9 and 10, from the valley, are almost identical in all essential particulars. All these samples are to be considered as somewhat deficient in lime, one per cent being the lowest limit placed by many authorities for the best results.

PROVINCE OF ONTARIO.

Nos. 11 and 12 are surface soil and subsoil from the district of Parry Sound, and constitute members in a series of soils from Muskoka that are being examined in our laboratories.

The results of the analyses of the first five samples in the series are detailed in my report for 1891. These soils were obtained with great care by Mr. G. S. Wilgress, B.A., Barrister at Huntsville, who assures me that they are thoroughly representative of the districts from which they were obtained.

The specimens were procured from Lot 28, Concession 1, Township Perry. "The surface of the land is level or gently sloping, there being no rocky bluffs. The soil is somewhat stony and light in character, producing before cultivation much excellent hardwood, *e.g.*, maple, beech, birch and ironwood. The field from which the samples were taken was in summer fallow. It had never been manured, but had grown a splendid crop of oats the year before."

Both surface soil and subsoil are light in character, sand predominating. In this respect they are similar to the Muskoka soils already reported upon. As regards the important and valuable constituent, nitrogen, the surface soil is considerably above the average (·280 per cent), while the subsoil contains a very fair percentage. In potash, they are very low. In phosphoric acid they are close to the average found in soils of this character. In lime they are particularly deficient.

In favourable seasons, when the rainfall is ample, this soil will undoubtedly yield good crops, though somewhat too light for the best results with cereals. An admixture with clay, if such is possible, and the occasional ploughing under of a green crop, would, I consider, prove of much benefit. It is a warm soil and one that would respond readily to manures; at the same time it is one that would leach easily (more especially as the subsoil is sandy), and therefore requires frequent applications of manure rather than larger quantities at longer intervals. To supply potash and lime, wood ashes and marl are to be recommended. For fruit trees and root crops, such an application will be found of great benefit.

PROVINCE OF QUEBEC.

The soil and subsoil Nos. 13 and 14 are from St. Clet, Soulanges. The surface soil is a dark gray sandy loam. It is somewhat lighter in character than betokens the best tilth. It is a warm soil, permeable to water and air, and, though a *responsive* soil, is one that easily leaches. In all the essential elements of plant food this soil may be placed with those of ordinary fertility.

To increase its percentage of nitrogen and at the same time improve its tilth, the ploughing under of green crops (as before recommended) is advisable. When applying farmyard manure to soils of this character, it is usually a good practice to spread the well rotted manure immediately before the spring ploughing. A dressing of marl, plaster or lime would prove of benefit to most crops grown on this soil, as the latter is somewhat deficient in calcareous matter.

Samples Nos. 15 and 16 are from St. Ignace du Nomininque, Ottawa Co., and represent the character of much of the soil and subsoil on the Lièvre River. Very little difference, either chemically or physically, is to be noticed between the surface and the underlying soil. They are clay loams, of a gray colour and somewhat heavy in texture. To mellow the surface soil (No. 15) drainage is necessary; by this means the tilth would be much improved. It is a retentive and strong soil, being more especially adapted to the growth of cereals. Respecting its elements of plant food, it may be regarded as of average fertility, though in potash the percentage is low. Marl, muck and wood ashes are natural fertilizers the application of which would yield good returns. Barnyard manure, which might be ploughed under green, in addition to thorough drainage, would make this an excellent soil.

ALKALINE SOILS.

The investigation into the character of these soils with a view to their amelioration was commenced nearly two years ago. In our report for 1891 analyses are to be found of three specimens of soils impregnated with "alkali." The data showed that sulphate of magnesium (Epsom salts), and not sulphate or carbonate of sodium (the usual forms of alkali), was in all probability the cause of the barrenness of the soil. The following suggestions were then made for the improvement of these soils:—

"As the alkali is soluble in water, a thorough drainage system should be resorted to wherever practicable. I am firmly of the belief that this would be the most efficacious method of getting rid of the poisonous material. Deep ploughing should be practised. Thorough tillage prevents surface evaporation and the accumulation of alkali near the surface. A heavy dressing of barnyard manure, animal refuse or other highly nitrogenous organic matter, is said by many to materially improve these alkali patches, inducing a vigorous growth. Again, by others gypsum is strongly recommended. Where the alkali is carbonate of soda, gypsum is beneficial in converting this caustic salt into one less deleterious to vegetation."

Since that date further analyses of alkaline soils have been made. Laboratory experiments also have been instituted which had for their object the rendering inert to vegetation the corrosive or poisonous material in the soil. The results obtained by the analyses of four samples during the past year are as follows:—

ANALYSIS of Water-soluble Contents of Air-dried Alkaline Soils.

Locality.	Total water-soluble contents, dried at 110° C.	Soda (Na_2O).	Potash. (K_2O).	Lime.	Magnesia.	Sulphuric acid (SO_3).	Chlorine.	Total Nitrogen in soil.
Near Oak Point, Manitoba	24·010	6·29	....	·27	2·42	10·66	2·42	·245
" "	2·263	·512	....	·13	·31	·56	·62	·441
Near Binscarth "	5·355	1·55	·01	·38	·32	3·00	·06	·558
From a few miles north of Brandon	4·855	·38	·02	·53	·97	2·64	·27	·600

The theoretical combination of these constituents may be stated as follows:—

No. 1.—Near Oak Point—

	Per cent.
Magnesium sulphate (Epsom salts)	14·88
Sodium sulphate (Glauber's salt)	9·65
" chloride (common salt, ...	3·93
Calcium sulphate (gypsum)	·83

No. 2.—Near Oak Point—

Magnesium sulphate (Epsom salts)	1·72
" chloride	·15
Sodium chloride	·94
Calcium carbonate (carbonate of lime)	·23

No. 3.—Near Binscarth—

Magnesium sulphate (Epsom salts)	1·97
Sodium sulphate (Glauber's salt)	3·46
" chloride (common salt)	·07
Potassium chloride	·01
Calcium sulphate (gypsum)	·89
Calcium carbonate	·15

No. 4.—From North of Brandon—

Magnesium sulphate (Epsom salts)	5·96
Sodium sulphate (Glauber's salt)	·355
" chloride	·42
Potassium chloride	·03
Calcium sulphate (gypsum)	1·07
" carbonate	·325

It is to be inferred from the foregoing that not only the total amount, but also the composition of the alkali in the soils, is extremely variable. Though in all the the four specimens, magnesium sulphate is present in large amounts, and notably so in Nos. 1 and 4, sodium sulphate (also deleterious to vegetation) exists in considerable percentages in Nos. 1 and 3. The proportion of magnesium sulphate to sodium sulphate and other soluble alkali is by no means constant.

These soils were of the deep black type, so well known in Manitoba, and contained large percentages of the valuable element, nitrogen. They would undoubtedly prove exceedingly fertile if freed from alkali.

In 1892 several series of pot experiments were carried on with wheat, pease and Indian corn in soils impregnated (*a*) with magnesium sulphate, (*b*) with magnesium sulphate mixed with carbonate of lime (chalk), and (*c*) with magnesium sulphate and lime. Many of the results obtained, together with illustrations showing the growth of the plants under these circumstances, are to be found in my evidence before the "Select Standing Committee of the House of Commons on Agriculture and Colonization" for 1893. It will therefore only be necessary here to give a summary of the conclusions then reached.

In soils to which 5 per cent of magnesium sulphate (Epsom salts) had been added, the germination of the seeds was always greatly retarded. Many of the seeds sown never produced plants that appeared above the surface of the ground, while those which came up lacked robustness, made but little growth and then died. All the experiments proved that magnesium sulphate to the extent of 5 per cent in the soil is most disastrous to plant life.

In another series, sufficient carbonate of lime, in the form of powdered chalk, was mixed with the soil to theoretically convert after the lapse of time the 5 per cent of magnesium sulphate into an inert and insoluble compound. In these pots germination was also delayed, though not so long as in the former series, and a greater percentage of plants grew, though their development was not equal in vigour or luxuriance to those in the potting soil. To a certain extent carbonate of lime had counteracted the deleterious effects of the magnesium sulphate.

Further experiments were then commenced in which lime was substituted for carbonate of lime in the soil containing the 5 per cent of magnesium sulphate. The reaction of the lime in rendering the magnesium salt insoluble would be quicker, and better results were therefore expected, than in the foregoing series. This prediction proved correct. Though germination was somewhat retarded, a greater percentage of plants grew and attained a larger and healthier growth than in the soil containing the antidote, carbonate of lime. It was evident that the lime proved the more efficacious of the two.

This latter series of experiments has been repeated this year, and the results are now given in graphic form. They are in accord with those of last year and show quite distinctly that soils containing magnesium sulphate as the only form of alkali may be effectually treated by a dressing of lime. The growth of the wheat, pease and Indian corn plants under the several circumstances of the experiments is well depicted on the accompanying diagrams.

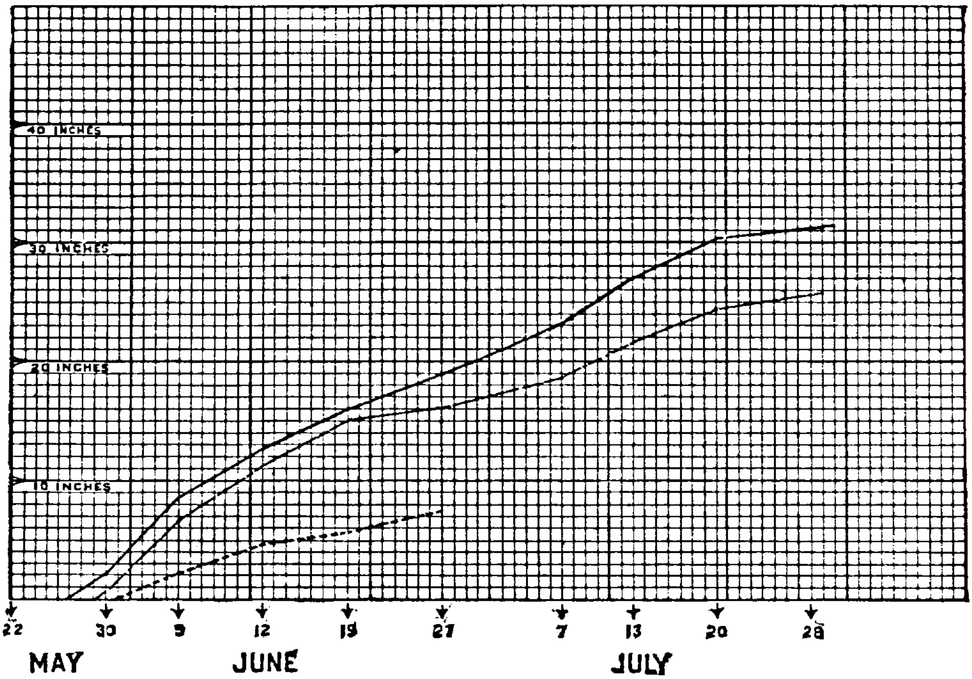
The experiments began May 28th and ended July 28th, 1893.

DIAGRAM SHOWING AVERAGE GROWTH OF WHEAT PLANTS.

Continuous line—Plants in potting soil.

Broken line—Plants in soil + 5 % $MgSO_4$ + excess of CaO.

Dotted line—Plants in soil + 5 % $MgSO_4$.



WHEAT.—Seed planted May 22nd. Experiment ended July 28th.

The average growth of the wheat plants at the close of the experiments (as denoted by the heights attained) in potting soil was 31 inches.

In the pots containing the 5 per cent of magnesium sulphate, it was 7½ inches on June 27th, when the plants died.

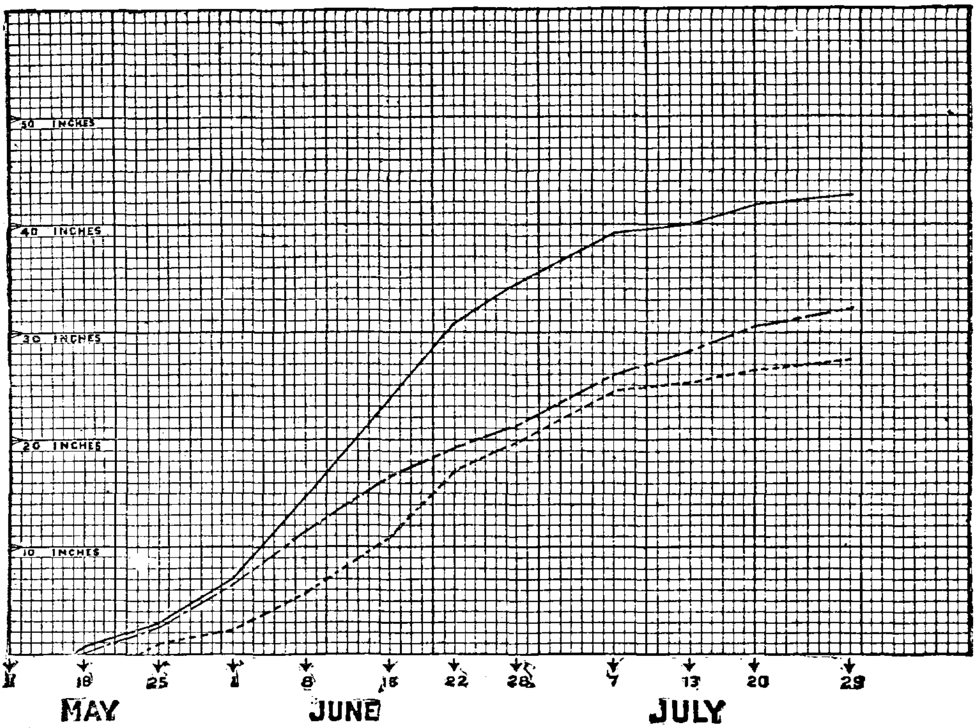
In the soil containing the lime in addition to the magnesium sulphate the growth was 25½ inches when the final measurements were made.

DIAGRAM SHOWING AVERAGE GROWTH OF INDIAN CORN PLANTS.

Continuous line—Plants in potting soil.

Broken line—Plants in soil + 5 % $MgSO_4$ + excess of CaO.

Dotted line—Plants in soil + 5 % $MgSO_4$.



INDIAN CORN.—Seed planted May 11th. Experiment ended July 29th.

The average growth as indicated by the heights of the plants is as follows:

In good potting soil, 42½ inches.

In soil containing 5 per cent of magnesium sulphate, 27½ inches.

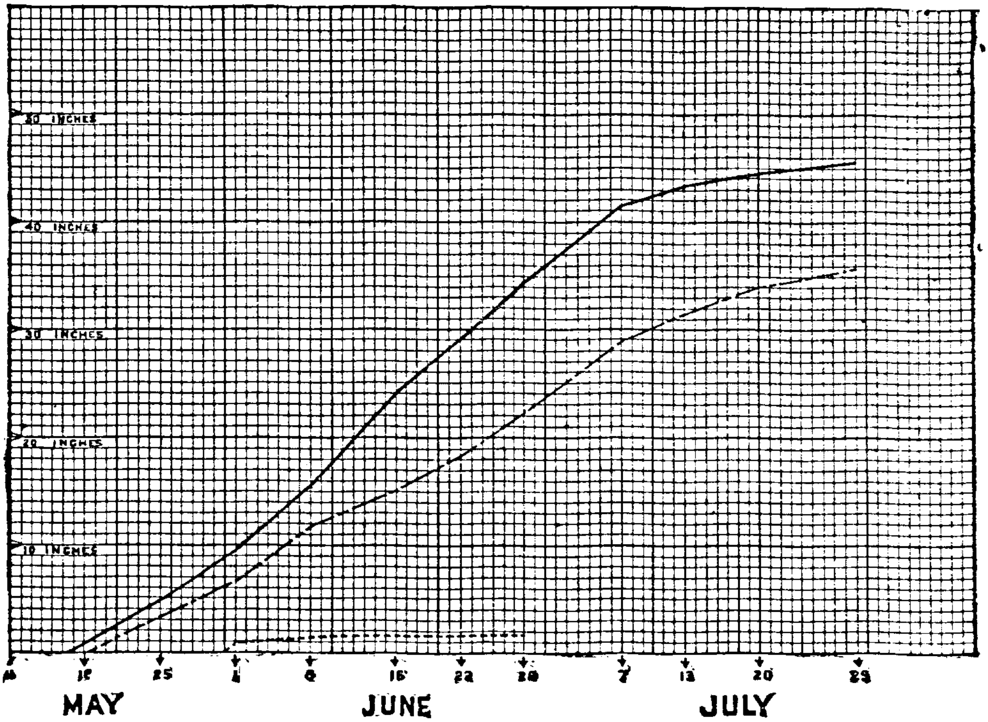
In the soil containing both the magnesium sulphate and lime, 32 inches.

DIAGRAM SHOWING AVERAGE GROWTH OF PEA PLANTS.

Continuous line—Plants in potting soil.

Broken line—Plants in soil + 5 % $MgSO_4$ + excess of CaO.

Dotted line—Plants in soil + 5% $MgSO_4$.



PEASE.—Seed planted May 11th. Experiment ended July 29th.

The average growth in potting soil was 45½ inches at the close of the experiment.

In the soil containing 5 per cent of magnesium sulphate 1½ inches only on May 28th, when the plant died.

In the soil containing both magnesium sulphate and lime the average height was 35½ inches.

The reaction between the magnesium sulphate and the lime would naturally proceed with time, and succeeding seasons would no doubt show better and better results on this treated soil. It would appear, therefore, that soils barren from the presence of this salt, may by the simple method of treatment with lime here suggested, be brought into a state of fertility.

Where a large portion of the saline matter is sodium sulphate, the treatment with lime would first result in the formation of corrosive soda and then of sodium carbonate. This would finally be converted into sodium sulphate. Although much slower in its action, carbonate of lime would here prove beneficial, since it would render the magnesium salt insoluble without reacting upon the sodium compound. An application of a mixture of gypsum and lime in such a case might also be of benefit—the former having the tendency to keep the sodium salt as sulphate—the latter converting the magnesium salt into an insoluble form. This treatment should be carried out in conjunction with drainage, which must always be resorted to wherever practicable. For soils impregnated with alkali in which sodium sulphate largely predominates, drainage, deep ploughiug, thorough cultivation and high manuring are the only remedies that can now be recommended with confidence.

MUCK, LEAF-MOULD, PEAT.

Of all the constituents of plant food taken from the soil by growing crops, there are but three that it is generally necessary to return, viz., nitrogen, phosphoric acid and potash, and repeated experiments the world over have proved that the fertility of the farm soil can only be maintained by such a return. Without it the land becomes, by successive croppings, less and less productive.

Where mixed farming is in vogue, ordinary well preserved barnyard manure is no doubt the most economical form in which to supply these elements, since by this means nearly 80 per cent of the plant food taken from the soil is replaced. From various causes, however, it often occurs that the supply is inadequate and must be supplemented from outside sources. Leaving out of consideration for the present the question of phosphoric acid and potash, we may discuss briefly the sources from which available nitrogen may be obtained, other than that already mentioned. These fall into three classes :

1. ARTIFICIAL FERTILIZERS, such as nitrate of soda and sulphate of ammonia. These present nitrogen to the rootlets of plants in an exceedingly soluble form. They are, moreover, concentrated fertilizers, since weight for weight they possess a much larger proportion of this element than other nitrogenous manures. Their cost, however, mitigates against their general use and necessitates, for their economical application, a considerable amount of skill and experimenting on the part of the farmer.

2. GREEN MANURES.—This method consists in ploughing under a growing crop, preferably of clover, pease or some other of the leguminous plants. These plants are known as nitrogen-collectors in contradistinction to others which are nitrogen-consumers. They are able to appropriate and assimilate nitrogen from the atmosphere, which when the plants are turned in is preserved in the soil for the growth of succeeding crops. For light sandy soils, poor in organic matter and nitrogen, this method of manuring can be highly recommended. It is economical, since it is both cheap and effective, improving the tilth and adding to the store of fertility.

3. MUCK, LEAF-MOULD AND PEAT. These consist largely of semi-decomposed vegetable matter and contain a considerable, though variable, amount of nitrogen. This nitrogen is not so readily available as in the two classes of nitrogenous manures we have just considered, but by fermentation of the material it may be converted into assimilable forms. The value of a muck or similar material depends chiefly therefore on its percentage of nitrogen. By a suitable treatment of the air-dried muck or peat, many farmers of Canada may obtain at little cost a manure not only rich in the valuable element nitrogen, but also containing notable quantities of other plant food constituents. All fertile soils possess high percentages of organic matter. This,

besides yielding nitrogen, liberates in the soil by its decomposition carbonic acid. This latter undoubtedly exerts a beneficial action in setting free mineral plant food. It is therefore apparent that green manuring or an application of composted muck serves many useful purposes in the soil. Besides acting chemically, such materials serve to mellow heavy soils by rendering them porous and permeable to the air, while sandy and light soils have their retentive and absorbent qualities increased. We may briefly discuss the different ways in which muck and peat may be treated before being applied to the land.

The air-dried substance is extremely absorbent and capable of soaking up and retaining large quantities of liquid manure. Its use for bedding stock and for spreading in the barnyard is therefore apparent. By a plentiful application, much valuable fertilizing material that would otherwise go to waste is saved. The stable manure not only has its good qualities preserved, but by the ensuing fermentation the nitrogen of the muck is rendered available. When it is properly preserved and fermented, there results a quick acting and forcing manure.

Without its previous use as an absorbent, the air-dried muck may be composted. Alternate layers of say 6 inches of barnyard manure and muck make an excellent compost. The whole should be kept moist, though not too wet, and the heap occasionally forked over. If sufficient manure is not obtainable, wood ashes and lime may be substituted. Such a compost would be poorer in nitrogen, but richer in potash than the one just described. To the compost heap should be added all bones, carcasses of dead animals and garbage that accrue on the farm. A compost heap not only serves to keep clean and healthy the surroundings of the farmhouse and buildings, but preserves as in a bank from which withdrawals can easily be made and in which good interest is given, much plant food that would otherwise go to waste. Every farm should have a compost heap, conveniently located. If there is not a deposit of muck in the neighbourhood which can be drawn from, the best soil obtainable should be used. Our table shows the composition of 34 different samples of muck, from all parts of Canada, examined during the past year. They vary much in quality, their value as a rule being dependent upon the amount of nitrogen contained; the condition of decay is also an important factor when considering their availability.

ANALYSES OF MUCKS (air-dried), 1893.

Number.	Nature of Material.	Locality.	Sender.	Nitrogen.	Organic and Volatile Matter.	Sand and Clay.	Mineral Matter soluble in Acid.	Water.	Pounds of Nitrogen in one ton of the air-dried material.
1	Swamp muck.	Summerside.... P.E.I.	W. T. Hunt.......	1·280	52·58	24·05	13·68	9·69	25·6
2	" ..	Montague Bridge "	Geo. D. Campbell.	3·077	71·91	12·83	5·23	10·03	61·5
3	" ..	Baldwin's Road. "	Micipsa Moar......	2·135	72·88	6·02	10·27	10·83	42·7
4	" ..	" .. "	"	2·135	77·48	8·52	4·95	9·05	42·7
5	" ..	" .. "	"	2·145	60·92	24·26	7·09	7·73	42·9
6	" ..	Murray Harbour, South......... "	A. D. McDonald...	2·355	61·33	23·25	6·39	9·03	47·1
7	" ..	Summerside..... "	H. E. Wright......	1·096	33·63	44·04	15·85	6·48	21·9
8	" ..	" ..... "	"	2·143	58·88	15·43	14·26	11·43	42·8
9	" ..	Kildare, lot 4... "	Thos. Cahill.......	1·170	54·49	9·41	3·76	32·34	23·4
10	" ..	" ... "	"	1·079	68·26	12·60	2·75	16·39	21·6
11	" ..	Sturgeon, King's Co.......... "	John Jamieson.....	·559	68·33	·81	1·25	29·61	11·1
12	" ..	Braedalbane .... "	A. Matheson.......	·968	32·46	48·69	10·30	8·55	19·3
13	" ..	Grove's Point.... N.S.	J. W. Edwards....	1·820	78·99	1·49	6·67	12·85	36·4
14	" ..	" ..... "	" ...	1·410	38·40	42·98	12·39	6·23	28·2
15	" ..	" ..... "	"	·153	5·87	79·95	12·95	1·23	3·1
16	" ..	Amherst........ "	Geo. Freeman......	1·683	81·59	2·69	7·68	8·04	33·6
17	" ..	Little Bras d'Or, C.B. .... "	Abner Rice........	·692	31·26	47·90	7·46	13·38	13·8
18	" ..	Harrisville...... N.B.	Eli Harris.........	1·215	65·03	1·50	14·83	18·64	24·3
19	" ..	St. John......... "	A. C. Fairweather..	1·680	44·17	40·13	7·24	8·46	33·6
20	" ..	Norton Station.. "	W. H. Baxter......	1·181	78·66	11·89	5·43	4·02	23·6
21	" ..	Shediac....... .. "	Jas. Mugridge.....	2·151	69·30	10·28	10·36	10·06	43·0
22	" ..	Rockville..... .. "	Percy G. Mills.....	1·808	61·62	15·71	16·68	5·99	36·1
23	" ..	Hampton........ "	Wm. McQuarrie....	1·570	65·97	3·67	11·46	18·90	31·4
24	" ..	Bishop's Crossing, Que.	O. M. Bishop	1·745	77·04	1·93	9·47	11·56	34·9
25	" ..	Sutton.......... "	L. E. Dyer........	1·975	59·83	10·41	9·33	20·43	39·5
26	" .	Orono. .... Ont.	F. L. Squair.......	1·790	58·41	8·06	15·98	17·55	35·8
27	" ..	Newcastle.. .... "	W. H. Gibson......	2·000	72·93	2·29	13·47	11·31	40·0
28	" ..	" .... "	"	1·845	62·95	6·53	22·06	8·46	36·9
29	" ..	Hazeldean...... "	Henry A. Allen....	1·141	26·12	48·78	11·04	14·06	22·8
30	" ..	Colborne........ "	J. K. Fuller......	2·261	59·61	12·13	12·99	15·72	45·2
31	" ..	" .... "	"	2·280	64·34	6·84	12·94	15·88	45·6
32	" ..	Victoria......... B.C.	A. Mowat.........	2·235	66·02	6·27	4·16	23·55	44·7
33	" ..	Chilliwack....... "	Jas. W. Chapman..	3·508	80·57	3·66	7·16	8·61	70·1
34	" ..	" ...... "	" ..	3·510	79·14	4·54	6·95	9·37	70·2

The average number of pounds of nitrogen as found in the various provinces are as follows:—

	Lbs. per ton.
Prince Edward Island	33·5
Nova Scotia	28·0
New Brunswick	32·0
Quebec	37·2
Ontario	37·7
British Columbia	57·4
General average of all the provinces	37·6

"MUDS" FROM THE MARITIME PROVINCES.

The deposits formed by tides, or found in the beds of lakes and rivers are known as "muds." From their origin the latter might be designated silt. The composition of "muds" is extremely variable and dependent upon their origin. They consist largely of ground up rock matter, clay and sand, together with shells (more or less broken up) and organic debris (the remains of plants and animals), in variable quantities. Frequently their chief value lies in the carbonate of lime they contain and which has been derived from shells—usually those of mussels or oysters. Some specimens possess notable percentages of nitrogen, phosphoric acid and potash. In organic matter and nitrogen, however, they never approach the richness of swamp muck.

These muds have been largely used in the Maritime Provinces as a fertilizer, and good results as a rule have followed the first applications. It has been the experience of many, however, that the beneficial effects are not lasting and that after a few years there is but little response from a repeated dressing when applied as the sole manure. This is not to be wondered at, since these muds are not complete fertilizers and cannot furnish all the plant food in the proportions required by farm crops. To a certain extent they supply the elements of fertility and also act on many soils as stimulants, but they must not be considered as concentrated manures, nor should they be used exclusively. As far as possible, they should be supplemented with more assimilable and stronger manures. Barnyard manure, superphosphate and wood ashes are probably the easiest to obtain and the cheapest for use with these muds.

The fine mechanical condition of many "muds" may have made them useful in improving the tilth of certain soils, but instances have come to my notice in which the tilth has been injured by an over application. For the improvement of such soils I would recommend the ploughing under of green crops, preferably clover or pease. This green manuring would not only mellow the soil, but would also enrich it in organic matter and nitrogen.

ANALYSES of air-dried Muds.

Number.	Locality.	Forwarded by	Nitrogen.	Moisture.	Organic and Volatile Matter.	Insoluble residue (clay and sand.)	Residue soluble in Acid.
1	Tatamagouche, N. S.	J. A. C. Campbell.....	·730	6·00	28·72	51·35	13·93
2	"	"	·304	2·85	11·44	68·35	17·36
3	Waterville, N. B.	A. E. Plumer.........	·729	2·49	19·80	1·37	76·34
4	Mabou, N. S.	H. Cameron, M.P.....	·014	·44	1·45	39·96	58·15
5	" "	"	·020	·38	2.23	18·23	79·16

Nos. 1 and 3 contain very fair percentages of nitrogen. No. 2 is much of the nature of a good soil. The lake mud from Walkerville, N.B. (No. 3), consists largely of carbonate of lime, derived from shells. In all essential particulars it may be considered a marl. The samples from Mabou (Nos. 4 and 5) possess large percentages of carbonate of lime, but are poor in other constituents. They would only prove of service to soils requiring lime.

Complete analyses were made of river and mussel mud from Shediac, N.B. The data are as follows:—

ANALYSES of "Muds."

Constituents.	River Mud.	Mussel Mud.
Moisture	2·23	1·72
Organic and volatile matter	13·18	10·52
Insoluble matter, sand and clay	67·68	37·51
Oxide of iron and alumina	12.59	9·08
Lime (CaO)	·48	21·64
Magnesia (MgO)	1·50	1·13
Potash (K_2O)	·23	·13
Soda (Na_2O)	1·28	1·70
Silica (SiO_2)	·04	·07
Phosphoric acid (P_2O_5)	·14	·13
Carbonic acid, &c., undetermined	·65	16·37
	100·00	100·00
Nitrogen	·409	·294

As regards potash and phosphoric acid, neither of these specimens exceeds in richness ordinary fertile soils; in fact by reference to the table on page 131 in the present report, it will be seen that they possess amounts under, rather than above, the average found in representative virgin soils. In nitrogen, the river mud is fairly rich, the percentage equalling that found in the most fertile soils. To light, sandy soils that contain in the neighbourhood of ·1 per cent nitrogen, this mud would act beneficially. The mussel mud possesses about two-thirds of the amount of nitrogen present in the river mud. The carbonate of lime, derived from the mussel shells, amounts to 38 per cent.

WOOD-ASHES.

It may not be amiss to again call the attention of farmers to the fact that the percentage of soluble or available potash even in the most fertile soils, is extremely small, and further, that without rational treatment the successive growth of crops more or less depletes this store.

When the produce of the land is fed upon the farm, nearly 80 per cent of the plant food withdrawn from the soil by the crops is returned in the manure and thus fertility maintained. When, however, the produce is sold, and no concomitant return made, the effect of continuous croppings must be to leave the land poorer and more particularly so in its available nitrogen, phosphoric acid and potash. According to the degree to which this latter style of farming is indulged in, so must these fertilizers brought from outside sources be added to the soil.

Leaving out of consideration for the present barnyard manure and muck deposits—which do but return to the soil what has been more immediately taken from it—we may inquire from what outside, but Canadian sources, these valuable and necessary elements for plant nourishment can be obtained. Phosphoric acid for ages to come can be got from our apatite deposits, nitrogen is made available from the atmosphere through the agency of the leguminosæ (pease, clover, &c.) a comparatively rapid process, but of potash Canada has, as far as we know, no natural deposits save those which are stored in the trees of her forests.

In wood-ashes are the mineral or inorganic constituents which the trees by a slow, life-long process have taken from the soil—and chief among these is potash. As a special fertilizer for supplying potash, wood-ashes are of the greatest importance to the Canadian farmer. Nor should it be forgotten that they are also valuable for phosphoric acid, lime and other inorganic plant food, which they furnish in notable quantities.

The following analysis, made during the past year, of an excellent sample forwarded from Williamston, N. S., is now given. Analyses of flue-ashes and of the ashes of oat hulls have also been made and are here stated in tabular form, for the sake of comparison:

ANALYSES OF ASHES.

Constituents.	Wood-ashes from Williamston.	Flue-ashes from Montreal.	Ashes from Oat hulls from Fergus, Ont.
Moisture	4·19	·19	1·06
Organic and volatile matter	....	2·22	6·14
Insoluble matter	4·48	65·04	84·62
Oxide of iron and alumina	·78	16·28	·40
Lime (CaO)	36·40	7·51	1·02
Magnesia (MgO)	4·40	1·76	·67
Potash (K_2O)	12·00	·19	3·59
Soda (Na_2O)	·93	·40	·57
Sulphuric acid (SO_3)	·58	3·32	·15
Phosphoric acid (P_2O_5)	1·67	1·24	·60
Carbonic acid, &c.	34·57	1·85	1·18
	100·00	100·00	100·00

Assigning the following values to the chief constituents: Potash, 6 cents per lb., and phosphoric acid, 5 cents per lb., the wood-ashes are worth $16.07 per ton, the flue-ashes, $1.24 per ton and the ashes from the oathulls, $4.90 per ton.

WOOD-ASHES.—For orchards, vineyards and small fruit plantations, wood-ashes are of especial value, though at the same time they should be supplemented by a more complete manure. All leafy crops, *e. g.* cabbage, beet and potato, and leguminous plants, as the clover, pea and bean, require a liberal supply of potash and hence are much benefited by an application of wood-ashes.

They are also of much value in improving the tilth of light, sandy soils, cementing together the grains of sand and making the whole more retentive of moisture.

Wood-ashes have long been used to advantage for making a compost with muck or peat. The resulting manure is one that is exceedingly rich in available nitrogen and potash.

With these facts before us, I may be pardoned for again impressing upon our farmers and fruit growers the good returns resulting from the home use of Canadian wood-ashes, which is yet extremely limited, compared with the quantities exported. It is to be hoped that in the future their true value will be more and more recognized and appreciated throughout the Dominion.

FLUE-ASHES.—These were collected at the base of a flue from a furnace in which coal was burnt, and hence they may be considered as fine coal-ashes. They have an exceedingly low fertilizing value, the value of potash present being only 22 cents per ton of the ashes. Such material, however, serves a useful purpose in mellowing heavy clay soils.

ASHES OF OAT HULLS.—These were from a by product in the manufacture of oatmeal. As already stated, they have a considerable fertilizing value, though in this respect they are much inferior, weight for weight, to wood-ashes.

GYPSUM.

A specimen from a mine on the Tobique River, N.S., was analysed, with the following result:—

ANALYSIS OF GYPSUM.

Sulphate of lime (gypsum)	68·65
Insoluble rock matter	15·85
Oxide of iron and alumina	3·91
Carbonate of lime	4·98
" magnesia, &c., by difference	6·61
	100·00

Gypsum, in addition to supplying certain elements of plant food, is useful in liberating potash in the soil and absorbing or fixing ammonia.

Though not in any sense a complete fertilizer, an application on rich soils is followed by excellent results. For poor soils, its use must be supplemented by manures containing nitrogen, phosphoric acid and potash.

Gypsum has been found of special value for pease and clover. Since it sets potash free, it is also useful for turnips, Indian corn and many crops that require large quantities of this element.

Powdered gypsum when sprinkled in stable, cow-houses, &c., preserves much ammonia (valuable plant food) that would otherwise escape and be lost. Its use therefore for such a purpose is to be strongly recommended.

LEGUMES.

Several members of the leguminosæ, to which the pea, bean and clover belong, have been analysed during the past year and their composition is now given. The plants of this order are characterized by a large percentage of albuminoids, and consequently as a rule make more valuable fodder than the grasses. It has been shown of late years by carefully conducted experiments that they procure a large proportion of their nitrogen (the essential element of the albuminoids) from the atmosphere, a property not possessed, as far as is known, by plants of other families. They have, therefore, been termed nitrogen-collectors, and must be looked upon as of special value, not only in furnishing rich and nutritious fodder, but also in keeping up the fertility of the soil. Green manuring with the legumes, *i.e.*, ploughing under a crop of clover or pease, preferably while in flower, is one of the cheapest and most effective methods of enriching and improving the soil. It increases the amount of organic matter and nitrogen, the latter becoming readily available for succeeding crops.

ANALYSES of Legumes, 1893.

—	Hay or Fresh Material.						Calculated to Water-free Substance.				
	Water.	Ash.	Protein (Albuminoids).	Fibre.	Nitrogen-free Extract (Carbohydrates).	Ether Extract (Fat).	Ash.	Protein (Albuminoids).	Fibre.	Nitrogen-free Extract (Carbohydrates).	Ether Extract (Fat).
Lathyrus sylvestris, Wagneri (green).	79·65	1·53	4·52	6·60	6·50	1·20	7·52	22·23	32·46	31·72	6·07
Lathyrus venosus (hay).............	7·11	7·37	14·06	32·47	34·10	4·89	7·93	15·13	34·95	36·72	5·27
Astragalus Canadensis (hay)......	9·46	6·02	10·75	33·45	38·78	1·54	6·66	11·87	36·95	42·79	1·73
Melilotus alba (hay)................	9·30	5·31	11·75	43·24	27·70	2·70	5·65	12·91	47·67	30·79	2·98
Vicia Americana (hay)............	7·01	7·99	13·87	34·33	35·58	1·22	8·59	14·92	36·90	38·28	1·31

The botanical data contained in the following notes have been kindly furnished by Mr. Jas. Fletcher, Botanist and Entomologist of the Experimental Farms.

LATHYRUS SYLVESTRIS, Wagneri (Wagner's Wood Pea).

This is a fodder plant of recent introduction, and said to do well even on poor soils. It is a free growing, leafy pea, which in its second year of growth at the

Central Farm, Ottawa, produced a thick mass of leafy stems nearly four feet in height. It flowers profusely during June. It is extremely rich in albuminoids and is reported from England to be relished by the cattle, both in the green condition and as hay. For these reasons and also that it yields a very heavy crop per acre, it may become a valuable addition to our present list of fodders. Our own experience in feeding it is as yet extremely limited. It would appear that the cattle do not at first evince a fondness for it.

LATHYRUS VENOSUS, Mühl.

A free growing, native, perennial pea, with abundance of leaves. Found on the western plains, from which the sample analysed was obtained. There appears to be no statement on record as to its value as a fodder, though judging from the analysis it is well worthy of trial.

ASTRAGALUS CANADENSIS, L. (Canada Milk-vetch).

A stiff, free-growing, vetch-like plant, with abundant foliage and spikes of greenish yellow flowers. It occurs usually on river banks and sometimes attains a height of three feet. Flowering period, July. The sample analysed was sent by Wm. Tingey, Esq., Marieton, Assa., N.W.T., who stated that it was cut about two weeks after it had passed its prime. Probably a palatable and nutritive feed if cut while yet young, but no experience of it as a fodder is recorded, beyond that of Mr. Tingey to the effect that "cattle are particularly fond of it."

MELILOTUS ALBA, Lam. (Bokhara Clover, White Melilot).

An introduced biennial. It is a tall, coarse plant, well known for its sweet odour. It occurs now in many waste places throughout Canada as a weed. It produces a large quantity of fodder, which when cut young is succulent and readily eaten by cattle.

VICIA AMERICANA, Mühl.

A native, perennial vetch, with fine leaves. This sample was obtained on the western plains, where it is an important fodder. Judging from the analysis, it compares very well in feeding value with the preceding legumes.

EXPERIMENTS WITH CARROTS.

It is well known that certain roots have the habit of growing out of the ground, developing to a large extent above the surface of the soil. This exposed portion is green, due to the development of chlorophyll by the action of sunlight. As this tendency is marked among certain varieties of root crops, more especially carrots, it became interesting to ascertain what difference, if any, as revealed by chemical analysis, existed between the lower, underground portion and that which was exposed.

To this end, four White Belgian carrots were selected, nearly half of each root being green, due to growth above ground. They were cut in two at the line of junction of the green and white portions. The weight of the parts were as follows:—

	Lbs.	Ozs.
Upper and green parts	2	10
Lower and white parts	3	7
Total weight of four roots	6	1

These were then submitted to analysis, with the following results:—

—	Water.	Albuminoids.	Fat.	Nitrogen-free extract.	Fibre.	Ash.
Upper (green) portion	89·04	1·05	·41	7·54	1·11	·85
Lower (white) portion	90·70	·75	·21	6·65	·93	·76

The composition of the dry matter is given in the subjoined table.

—	Albuminoids.	Fat.	Nitrogen-free extract.	Ash.
Upper (green) portion	9·60	3·72	68·81	7·70
Lower (white) do	7·97	2·31	71·51	8·17

These data show that in many particulars the composition of the exposed and underground parts is very similar, and that the differences, where such exist, are by no means large. The most notable of these are in the albuminoids and fat. The slightly higher percentage of the former, recorded as occurring in the exposed portion of the carrot, may probably be due to the presence of the green colouring matter (chlorophyll), which contains nitrogen as a constituent, or it may be owing to a development of soluble nitrogen compounds, whose function is to carry this important element from one part of the plant to another to be finally laid up as protein. Further experiments will be made to ascertain if this increase of nitrogen compounds is constant in the parts developed above ground, and also to find out the true character of such compounds. For the present, it will suffice to say that the apparent increased percentage does not in all probability represent any real or material increase in food value. The larger proportion of the constituent here designated as fat, found in the upper part of the root, is undoubtedly due to the presence of chlorophyll, which by the method of analysis is dissolved out and determined with the fat. This increase, therefore, has a fictitious and not a real value.

It may be concluded from the chemical data of the present experiments that no material difference in food value exists between the two portions. The questions of palatability and digestibility (since disagreeable and poisonous principles are sometimes developed in exposed roots), as well as the economic one of cost of culture and harvesting and weight of crop, are probably the most important to be considered in arriving at a conclusion as to the relative merits of those varieties of roots which grow above and below ground.

THE BABCOCK TEST.

In June of this year, a bulletin (No. 13 of the Dairy series) was issued, in which I gave full instructions for working this test in the dairy, for single and composite samples—the latter by the use of potassium bichromate as a preservative. Information was also added, necessary for the calculation of the payments to patrons of creameries and cheese factories in which the percentage of fat in the milk has been adopted as a basis of remuneration.

Since that date, many questions have been received regarding the manipulation of the composite test. Chief among these have been those that referred to the maximum and minimum quantities of potassium bichromate that can be used without affecting the reading of the fat obtained. Several series of experiments were accordingly instituted to establish the limits between which this preservative can be employed with certainty, and also to ascertain the length of time a composite sample so treated may be kept without showing a diminution in its fat contents.

Composite samples were prepared in duplicate from the milk of a herd which, during the week that the samples were taken, gave the average of 3·40 per cent of butter-fat as the mean of the daily tests.

While preparing the composites (from Monday to Saturday) and until the test was concluded, the bottles were gently shaken every day to incorporate the risen cream and to prevent the latter from sticking to the sides of the bottle. The temperature of the samples throughout the test would average about 63°F.

Experiment A.

Date of composite samples, May 8th–15th, 1893.

Mathematical average of daily tests: 3·40 per cent fat.

Composite sample A. = 600 c.c. milk + ·3 grms. potassium bichromate.
" " B. = 600 c.c. " + ·6 " "

(*Note.* These quantities of potassium bichromate are equal to $4\frac{1}{2}$ grains and 9 grains to the pint respectively.)

The percentage of fat was ascertained in these samples on the subjoined dates, with the following results:—

Date.	A. Fat, per cent.	B. Fat, per cent.
May 15th	3·4	3·4
" 20th	3·4	3·4
" 22nd	3·4	3·4
" 27th	3·4	3·4
June 3rd	3·4	3·4
" 10th	3·4	3·4
" 17th	3·4	3·4

These tests were made with the usual quantity of acid and gave clear readings throughout.

It may fairly be concluded from these results that (1) any quantity of potassium bichromate between $4\frac{1}{2}$ grains and 9 grains to the pint serves equally well in preserving the milk in a fluid condition without interfering with the accuracy of the Babcock test, and (2) that milk so treated, if kept carefully shaken and moderately cool, shows the same percentage of fat for at least one month.

Experiment B.

A second series of composite tests was made during the week, May 15th to 22nd. The mathematical average of the daily tests of the samples going to make up the composites A and B was 3·05 per cent fat.

The series was carried on in duplicate:—

Composite sample A.= 600 c.c. milk + 1·2 grms. potassium bichromate.
" " B.= 600 c.c. " + 2·4 " " "

(This is equal to 18 grains and 36 grains to the pint, respectively.)

The fat readings are as follows:—

Date.	A. Fat, per cent.	B. Fat, per cent.
May 27th	3·0	2·95
June 3rd	3·1	3·00
" 10th	3·1	3·00
" 17th	3·0	3·00
" 24th	3·0	2·95
July 7th	3·0	2·90

After this last date the fat in both samples became slightly curdy and the percentage gradually lower. The samples were shaken daily and tests made every week until September 26th, when the respective readings were A. 2·20 per cent fat; B. 2·50 per cent fat. Both samples had curdled and were measured with difficulty.

For more than seven weeks the milk had retained its fluidity and yielded a correct percentage of fat, though the preservative had been increased to 36 grains to the pint.

Experiment C.

A further series was then commenced in which composite sample A. had 36 grains potassium bichromate, and B. 72 grains potassium bichromate to the pint. The fat readings were made at intervals of one week from June 3rd to September 30th. The mathematical average of the percentages of fat, obtained from the daily tests of the samples making the composites, was 3·51.

The results were in accord with those obtained in Experiment B., viz., the percentage of fat *after a time* became gradually less. On September 9th, the fat in both samples read 3·1 per cent. It was further observed that, as the quantity of bichromate was increased, the volume of acid had to be slightly decreased in order to get clear readings. Towards the close of the test period, as the bichromate becomes reduced, however, the volume of acid must again be increased.

Experiment D.

Date of composite sample, May 29th—June 3rd. Potassium bichromate to the amount of 230 grains to the pint was added. The percentage of fat, as obtained from the mathematical average of the daily tests, was 3·35.

The normal quantity of acid (17·5 c.c.) charred the fat so that it could not be read. The amount was gradually reduced till the readings became distinct, and as a result it was found that 11·5 c.c gave clear readings and the correct percentage of fat. On June 24th the milk with this quantity of acid still showed 3·3 per cent fat. After this date the milk became lumpy and the fat adhered to the sides of the bottle, so that a representative sample could not be taken up in a pipette.

Conclusions.—A consideration of all these results will show that the exact amount (*i.e.*, within certain limits) of potassium bichromate to be added is of no moment. For ordinary work from 3 to 7 grains (measured roughly on the point of a knife or in a small spoon) is ample, and is to be recommended as giving excellent results. The daily shaking of the composite when adding a sample, should be done gently and thoroughly, and the bottle kept in a cool place. If the fat readings are obscure through charring due to excess of the preservative, the quautity of acid must be slightly reduced.

The basis or plan of paying in creameries and cheese factories for milk according to its percentage of fat, as made possible by the Babcock test, appears to give excellent satisfaction to all parties concerned, and it is pleasurable to note that every succeeding year marks its more exteusive adoption. It puts the value of the milk upon the constituent that is of the greatest commercial value, and at the same time does away with the necessity of irritating inspection. It encourages good breeding and good feeding, and gives an impulse to intelligent and economic farming. It affords to each patron a just and equitable recompense for his merchandise aud must present itself as being the best basis so far brought forward for the purchase and sale of milk.

DESICCATED MILK.

A sample of this substance, which is made by the evaporation of milk, to which a certain amount of cane sugar has been added, was forwarded from Souris, Prince Edward Island, where it had been manufactured.

It is in the form of a yellowish-white powder, and it is claimed that it may be preserved in good condition and palatable for a length of time, eveu though exposed to the atmosphere. If it possesses this latter quality, it may for certaiu uses replace the ordinary condensed milk.

In view of its possible introduction into the markets as a Cauadiau dairy product, its analysis was deemed advisable.

ANALYSIS.

Water	5·44
Fat	21·73
Albuminoids (casein and albumen)	18·01
Ash	3·15
Milk sugar	25·22
Cane sugar	26·45
	100·00

WELL WATERS.

It is undoubtedly owing to what has been said in previous reports that year by year there is to be noticed an increased interest taken by farmers in the condition of their water supplies. This is indeed encouraging, but from the character of the samples forwarded for analysis, it is plain that our warnings as to the danger of pollution from the barnyard, stables, &c., must be continued. It is probably true that those only who very strongly suspect contamination send samples—since farmers wishing an analysis are required to follow instructions (forwarded on application) and also to prepay express charges—yet the data here given emphasize the fact that many waters used on Cauadian farms are seriously and dangerously polluted. In the majority of instances there is no necessity to have impure water, the contamination of the supply being due to the location of the well in the barnyard or stable, or in the vicinity of some such source of pollution. As a matter of course, such wells must act more or less as cess-pools.

ANALYSES OF

Results stated in

No.	Name.	Locality.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.
1	Quarantine Station..	Partridge Island, N.B...	Nov. 30..	·056	·130	·250	36·2	104·0
2	" " ..	" ...	" 30..	None.	·058	1·104	19·5	112·0
3	" " ..	" ...	" 30..	·024	134	1·504	25·5	138·0
4	Allen Bros..........	Winona, Ont.	Feb. 2..	4·270	·05	None.	440·0	3536·0
5	Mummery, A. R	Chatham, Ont	" 3..	·04	·144	·023	3·5	385·0
6	Radley, E. C........	"	" 3..	·628	·162	·056	100·0	465·0
7	Kemp, D	Weymouth, N.S........	" 3..	·004	·104	5·06	22·0	182·0
8	Rice, B. Spring......	Regina, Assa., N.W.T..	" 4..	·21	·11	....	23·5	4240·0
9	"	" ..	" 4..	·965	·285	....	180·0	18390·0
10	Johnson, Basil J.....	St. Louis, Co. Kent, N.S.	Mar. 29..	·028	·066	·640	125·0	324·0
11	" ...	" ..	" 29..	·14	·155	·963	35·0	252·0
12	Carpenter, F.M., M.P	Stony Creek, Ont.......	" 29..	None.	·064	2·444	430·0	1864·0
13	Petapiece, Geo. E....	Manotick, Ont	April 5..	28·00	......	....	250·0	1134·0
14	....	Yarker, Ont..........	May 1..	·97	·78	·7322	28·0	398·0
15	Dunning, W. H.....	Sandwich, Essex, Ont...	" 15..	·97	·044	·180	483·0	4147·2
16	Dill, J. W...........	Moosomin, N.W.T......	June 14..	·78	·154	None.	12·0	1867·2
17	Shearer, Jas.........	Dromore, Co. Grey, Ont.	" 16..	·032	·022	·026	5·0	226·8
18	Dunning, W. H......	Sandwich, Essex Co., Ont.	" 26..	1·01	....	·022	500·0	4146·0
19	Gordon, J. G.........	Moose Jaw, N.W.T......	July 10..	·048	·104	....	10·0	610·0
20	Kelsey, J. F.........	Agricola, Alta., N.W.T..	" 25..	2·19	·455	....	10·5	720·0
21	McDonald, Jas.....	Starbuck, Man..........	" 25..	1·705	·070	....	2276·0	5915·0
22	Experimental Farm..	Agassiz, B.C............	" 31..	·032	·024	·046	2·5	83·6
23	Knight, Wm	"	" 31..	·028	·074	·03	1·4	140·0
24	McDonald, Hugh....	Mabou, C.B	Aug. 11..	·33	·24	....	293·0	....
25	"	"	" 11..	·10	......	....	275·0	....
26	Campbell, R	Quebec.	" 12..	·036	·04	·349	6·0	....
27	"	"	" 12..	Trace.	·054	·27	17·0	....
28	"	"	" 12..	·106	·084	2·787	13·0	....
29	"	"	" 12..	·112	·425	·023	15·0	....
30	"	"	" 12..	·024	·324	·095	10·5	....
31	"	"	" 12..	·256	·098	2·161	15·0	....
32	Fathers, Joseph.....	South Cayuga, Ont.	" 31..	·229	·314	·804	46·0	2468·4
33	Tragnair, Wm......	Welwyn, Assa., N.W.T.	Sept. 26..	1·676	·084	None.	23·0	1855·2
34	Tattrie, Calvin......	River John P.O., N.S...	Oct. 6..	·016	·042	9·24	85·0	566·0

WELL WATERS—1893.

Parts per Million.

Solids after Ignition.	Loss on Ignition.	Oxygen absorbed at 80° F. In 15 Min.	Oxygen absorbed at 80° F. In 4 Hours.	Phosphates.	Report.
80·0	24·0	·740	1·748	faint traces.	Fair; not polluted by sewage.
86·0	26·0	·268	·6768	"	Of purer quality than No. 1.
104·0	34·0	1·0032	2·1876	"	Fair, though too much vegetable matter.
3186·0	350·0	·038	·2844	traces.	Unfit for use; polluted by drainage from stable.
290·0	95·0	....	....	"	Fair; no indication of sewage pollution.
385·0	80·0	....	....	heavy traces.	Unfit for use; polluted by drainage.
132·0	50·0	·4572	1·004	traces.	Suspicious; previous contamination indicated.
3780·0	460·0	·7156	1·384	heavy traces.	Seriously polluted; unfit for use.
16752·0	1638·0	1·6432	3·1568	"	An exceedingly bad water.
276·0	48·0	·640	1·200	"	A fairly good water, though chlorine too high.
210·0	42·0	1·532	2·308	"	Not safe for drinking purposes; polluted.
1462·0	202·0	·252	·548	....	Second class; with suspicious features.
928·0	206·0	2·584	5·076	very heavy traces.	Totally unfit for drinking purposes; very bad.
222·8	175·2	6·4952	13·3732	"	Very bad water.
3198·4	948·8	None.	·18	....	The free ammonia and chlorine indicate presence of liquid manure.
1428·0	439·2	2·0132	3·6364	traces.	Unfit for drinking purposes.
135·2	91·6	·1492	·3048	none.	Excellent; perfectly wholesome and ranking with first-class waters.
3052·0	1094·0	....	....	....	Polluted as in No. 15.
440·0	170·0	....	....	none.	A good water; safe for drinking purposes.
566·0	154·0	....	....	very heavy traces.	Seriously polluted and unsafe for drinking purposes.
4870·0	1045·0	....	....	none.	Dangerous to use; a bad water.
60·4	23·2	·296	·594	"	A first-class water of excellent quality.
87·0	53·0	....	....	....	An excellent water.
....	....	....	....	....	Not fit for drinking purposes.
....	....	....	....	....	" "
....	....	....	....	....	A good drinking water.
....	....	....	....	....	Probably a good and safe water.
....	....	....	....	....	Polluted.
....	....	....	....	....	Polluted; not fit for drinking purposes.
....	....	....	....	....	A very fair water; safe to drink.
....	....	....	....	....	Condemned as a drinking water.
1965·2	503·2	2·230	4·308	none.	Dangerously contaminated.
1482·0	373·2	·3764	·7532	traces.	Seriously polluted; unsafe for drinking purposes.
311·0	255·0	....	....	....	Shows previous contamination.

It would unnecessarily burden these pages to give here in full the reports forwarded to the farmers who sent the samples, bnt sufficient is said in connection with the analytical data to point out the general character of the waters.

It would only be reiterating what has been said in previous reports were I to state here the reasons why it is of paramount importance to have pure water on the farm. It is only necessary to add that such is indispensable for the good health of man and beast, and that it is only a matter of time before the effects of an impure supply are apparent to those who choose to see them, indeed to all but the most careless. I am well assured that much sickness on the farm and poor results in the stable and dairy are to be attributed to polluted water, rather than to the causes which many now assign them.

It is remarkable that only a very small proportion of those who write for (and receive) the instructions we issue for taking the water, forward a sample. It indicates that many do not consider the knowledge of the character of their well water as worth the trouble and expense consequent upon sending the sample.

MISCELLANEOUS.

EXPERIMENTS TOWARDS THE IMPROVEMENT OF CERTAIN SALINE WATERS.

From the examination in onr laboratories of several samples of saline, or, as they are usually called, alkaline waters from the North-west Territories and Manitoba, it has become apparent that many contain a large amount of Epsom salts or sulphate of magnesium. In some instances this is associated with other saline matter, as sulphate and chloride of sodium (Glauber's salt and common salt), but it often occurs that the Epsom salts is the chief, if not the only, foreign saline material. The well known purgative effect on man and animals which follows the drinking of such waters makes their improvement a subject of the greatest importance, especially to those sitnated in localities where ready access to a supply of pure water is not attainable.

To the end of being able to suggest a method of treatment that wonld resnlt in making these waters potable, the following experiments were made:

A. To 50 c.c. of a saline water containing Epsom salts were added 100 c.c. of lime water, which precipitated the magnesia as the flocculent hydrate. After settling till the supernatant fluid was clear, the whole was filtered, and the filtrate tested for magnesia with negative results. The washings of the magnesinm hydrate however showed traces, pointing to the fact that while magnesium hydrate is insoluble in dilute lime water, it is slightly soluble in pure water, probahly owing to the latter containing some carbonic acid gas in solution.

B. To 100 c.c. of a 1 per cent solution of Epsom salts ($MgSO_4$, 7 H_2O) 200 c.c. of lime-water were added. After standing several hours and filtering, 100 c.c. of the filtrate, after separation of the lime, were tested for magnesia. A very slight precipitation ensued. This precipitate was carefully determined and found to be equal to ·00064 gram of magnesium oxide. By calculation it is ascertained, therefore, that 1·18 per cent. of the original amount of Epsom salts was still in solution, or in other words, the 1 per cent. of Epsom salts had been reduced by this treatment to ·01 per cent.

These experiments being considered very fairly successful and satisfactory in showing that lime-water can precipitate the magnesia in an inert form, the next step was to ascertain if, after treatment, simple exposure of the water to air would serve to separate out the excess of lime used for precipitating the magnesia as the insoluble carbonate. For it should be noted that the water after the precipitation of the magnesia is strongly alkaline and caustic, dne to the presence of the lime as already explained. The experiment now to be detailed offers a solution to this question.

C. The saline water used was taken from the same sample as that employed in experiment A. It was forwarded from near Regina, N.W.T., and contained 715 grains of Epsom salts to the gallon. To 100 c.c. of the water were added 200 c.c. of lime-water, the subsequent treatment being that already described in experiments A and B. The filtrate from the magnesium hydrate was exposed in a shallow dish to the atmosphere of the laboratory for ten days. A considerable precipitation of carbonate of lime ensued, due to carbonic acid in the air, and the water was no longer found to be alkaline to test paper, proving the absence of caustic lime.

From the results of these experiments, I think we may fairly conclude (1) that by the use of lime-water the deleterious magnesium salt may be practically removed, and (2) that by the subsequent exposure of the treated water to the atmosphere, the excess of lime used in precipitating the magnesia may be precipitated as the innocuous carbonate.

No practical application of this mode of treatment on a large scale has yet been made, though its cheapness, simplicity and thoroughness warrant me in suggesting it as well worthy of trial by those compelled to use water more or less impregnated with Epsom salts. Wooden tubs or troughs could be used for the precipitation and subsequent exposure, and no expense, save the cost of the burnt lime, need be entailed. The precipitation of the magnesia and subsequently of the lime by exposure might proceed simultaneously and in the same vessel, and the clear supernatant water subsequently poured or siphoned off. If such a process were adopted, care must be taken not to have too great an excess of lime, or the total conversion into carbonate would take a very long time.

It must be remembered that the water so obtained, though free from Epsom salts and caustic lime, would not rank as first class. It would be a hard water, containing both sulphate and bicarbonate of lime, the latter, however, could be got rid of by a subsequent boiling, which would throw it down as the insoluble carbonate. If the water, however, did not originally contain much sulphate and chloride of sodium, I am of the opinion that a fairly palatable water would result, and certainly one much more wholesome than the original.

SLUG-SHOT: AN INSECTICIDE.

A sample of this material was forwarded by a correspondent in Cape Breton, accompanied by a request for its analysis and a report as to its value for killing the potato beetle.

It is a pinkish red, earthy powder, not unlike burnt clay. It was carefully examined for arsenic and other poisonous compounds with negative results. Further examination proved it to contain flowers of sulphur. This constituent was determined and found to be 5·4 per cent. It is scarcely necessary to add that this material must prove valueless for preserving potato vines from the ravages of the potato beetle.

THE VALUE OF DILUTE SULPHURIC ACID FOR CHECKING THE SPROUTING OF POTATOES.

From a series of experiments recorded in my last report,* the conclusion arrived at under the conditions of the experiments was that a 2 per cent solution of sulphuric acid was valueless for checking the sprouting of potatoes. These trials were, however, made in the spring, and the treated tubers were not protected from light—conditions which it was thought were perhaps unfavourable to the best results of the treatment. In the experiment the results of which are now given, the potatoes were treated in the autumn and preserved in the dark.

On November 30th, 1892, three varieties of potatoes, Early Ohio, Beauty of Hebron and State of Maine were treated (*a*) for twenty minutes and (*b*) for one hour with a 2 per cent solution of sulphuric acid. Immediately after the expiration of these periods, the several samples were repeatedly washed with water, allowed to drain, placed in jars and stored in a dark place, the other details of the experiments being similar to those given last year. On March 13th, 1892, the potatoes were

*Pages 141, 142, Report of Experimental Farm, 1892.

examined. The potatoes of all the samples, both treated and untreated (the latter being stored as checks) had sprouted. It was noticed that the sprouts of the treated tubers were longer than those of the untreated, showing apparently that the action of the acid treatment was to accelerate rather than retard the sprouting. These results corroborate those obtained and reported on last year. The sprouting of the untreated tubers, as well as of the treated, may probably have been assisted by the presence of air which freely surrounded the potatoes in the jars. Potatoes stored in a bin have smaller air spaces between them, and under such conditions it is found that those on the surface are the first to sprout. It is, however, quite evident from our two years' work on this subject that 2 per cent sulphuric acid has not the deterrent action in preserving potatoes that has been claimed for it.

REPORT OF THE ENTOMOLOGIST AND BOTANIST

(JAMES FLETCHER, F.R.S.C., F.L.S.)

W. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to hand you herewith a report upon some of the more important subjects which have been brought officially under my notice during the past season.

DIVISION OF ENTOMOLOGY.

With regard to insects injurious to the agricultural industries, the enormous increase and spread of the Cattle Horn-fly claim first mention. This fly has undoubtedly caused great loss. Where the well known remedies have been applied perseveringly, there has been decided relief to the infested cattle, and much needless loss has been averted. In most instances of failure, I have found on inquiry that the remedy had been applied once or twice only and then given up. Canadian farmers must recognize the fact that this is an exceptional visitation, and that therefore they must take exceptional measures to combat it. As to the trouble and expense of these measures, leaving aside altogether a consideration of the cruelty to the animals, that is merely a matter of dollars and cents. The question which all must ask themselves, is, Will the benefit I shall reap overbalance the cost of the applications? In reply to this I can answer emphatically that it will, many times over, and further, that the better they attend to the instructions given, so much greater will the profit be. Judging from the past history of the introduction and spread of this pest in America, I am led to hope that in districts which have been badly infested this season, the attack will be decreasingly less severe year after year in future.

Grasshoppers have been destructive in western Ontario and a few of the usual fruit pests have been locally abundant. Two of the worst ot these, the Plum Curculio and the Codling Moth, have caused much injury in Ontario. Spraying the trees with Paris green for both of these pests still remains the best remedy. Where the work is done carefully and intelligently it is practically all sufficient, the occasional cases of failure which are sometimes heard of, and these are very rare, are almost invariably due to careless work. One of the most remarkable instances I have ever seen of the results of good careful work, was in the orchard of Mr. S. A. Fisher at Knowlton, Que. When I visited him in September last, I could not find in his orchard a single apple which had been injured by the Codling Moth. This was the first year he had sprayed his orchard. In previous years his crop had always been badly infested, and this year the orchards of his neighbours all around him, none of which had been sprayed, were so still. In British Columbia, where fruit-growing has become a leading industry of the country, the Apple Aphis has developed in a remarkable manner and is doing much harm. Besides information from my own correspondents I see by the extremely valuable report for 1892, published by Mr. J. R. Anderson, the Statistician of the Department of Agriculture of British Columbia, one of the best colonial reports I have ever seen, that this insect is alarmingly abundant and destructive throughout the province.

Early in October by the kind permission of the Hon. Minister of Agriculture, I had the great advantage of attending the World's Columbian Exposition at Chicago, where I not only acquired much information of value to my department by examining the many excellent collections of insects there displayed in illustration of the value of applied entomology, but was able to be of service in reporting upon certain pests of stored grain, which just at that time had been noticed to be destroying the cereals exposed as samples or used in ornamentation of the various courts in the Agricultural Building. From the fact that very few connected with the exhibits knew the life histories of the pests concerned, there was a good deal of unnecessary anxiety at the time of my visit, which I was pleased to be able in a measure to allay. The entomological division of my department was represented at Chicago by a collection of 20 cases of insects systematically arranged. In the preparation of this collection I was materially assisted by Mr. J. Alston Moffat, of London, who arranged the cases of moths, and by Mr. W. Hague Harrington, of Ottawa, who prepared two beautiful cases of Hymenoptera. I have also to gratefully acknowledge donations of insects from the Entomological Society of Ontario, the Rev. C. J. S. Bethune, of Port Hope, Messrs. H. S. Saunders and W. Rennie of London, Ont., and Prof. W. Saunders, of Ottawa. When finished, the collection presented a very creditable appearance and, when returned, will form the nucleus of a reference collection at the Central Experimental Farm. Such a collection for reference has been much needed in the past. I hope during the coming winter to much increase this collection from the large amount of material which had accumulated previous to the appointment of my assistant, Mr. Guignard, and which could not be arranged, owing to pressure of other work.

DIVISION OF BOTANY.

In the Division of Botany the experiments with grasses, native and foreign, have been continued and have attracted much attention from visitors to the farm. The increased importance of the dairy industry during the last decade, has naturally drawn much attention to the subject of fodder plants. The experimental grass plots covering about 1½ acres are situated on a piece of moderately good land, lying to the west of the main road to the office and between the road and the poultry house. The ground is varied and provides the different kinds of soil and degrees of moisture necessary for the testing of grasses of various habitats. The method which has been followed in furnishing these beds has been to obtain seed by exchange, purchase or collection in the field, and cultivate the plants until a sufficient quantity were on hand to set out a plot of one square rod to each species. There are about 130 of these plots now in use. It is considered that plots of this size are large enough to give a correct idea of the value of a grass from its habit of growth and weight of product per acre. In addition to the whole plots of 1 square rod are half plots where grasses are grown which are of known value or have been tested and which may be of interest to visiting farmers. Grasses of botanical interest only are grown in mixed beds, about 4 rows being given to each species. A bulletin (*C.E.F.*, No. 19.) having been lately issued entitled: "*Grasses, their Uses and Composition*," treating of the work of this department in that line, it is not thought advisable to devote much space in this report to that subject. Experiments have been carried on, but are not yet completed with permanent pasture and hay and lawn mixtures. Samples of the best mixtures offered for sale by seedsmen were secured and sown, and although on the whole these mixtures were satisfactory, there were several points in which it was thought they could be improved. Some of the grasses which form a large proportion of the mixtures were not suited to our climate, and others came to maturity at seasons so different that the grasses could not all be at their best when mown for hay. Careful notes have been kept of the time of flowering of all the different varieties year by year, and these have been made use of in some trial mixtures for hay which have been sown in 6 large plots of $\frac{1}{20}$ acre each, lying to the north of the road leading to the poultry house and beyond the row of birch trees shown to the right of the illustration. In addition to the true grasses about 15 plots have been devoted to clovers and other fodder plants; these lie immediately in front of the poultry house. Early last spring a distribution of seeds of grasses for trial was made to farmers in all parts of the Dominion: over 1,000 packets were sent out to 110 different individuals. With the seeds a letter of instructions was sent and a blank form for filling in data as to time of sowing, flowering, etc. I am sorry to say that very few reports have been so far received, which is much to be regretted; for farmers all over Canada are buying large quantities of grass seed every year much of which is quite useless to them. If these reports were made, we should have exact data from all provinces which could be tabulated and would then be of great economic value.

A large addition has been made to the collection of plants in the Arboretum and Botanical Garden, details of which will be found on page 34 of this report.

There has been much correspondence concerning Weeds, particularly from the North-west and Manitoba, where farmers seem to be alive to the importance of destroying these agricultural marauders which drain the soil of its nourishment and choke out the crop. A special collection, separate from the large *hortus siccus*, is being prepared of the weeds of the farm, as well as a reference collection of the seeds of weeds for examination and comparison.

Meetings.—I have during the year attended nine agricultural meetings to deliver addresses upon subjects connected with my department:—

1. Dairymen's Association of Western Ontario, London, Ont.
2. Farmers' and Dairymen's Association of New Brunswick, at Fredericton, N.B.
3. Central Farmers' Institute, Toronto.
4. Meeting of fruit growers of Lincoln Farmers' Institute, St. David's, Ont.
5–7. District of Bedford Dairymen's Association, Cowansville, Que., followed by two meetings of horticulturists on the following days at Knowlton and Waterloo, Que.
8. County of Carleton Farmers' Institute at March Corners, Ont.
9. Township of Fitzroy Farmers' Institute at Galetta, Ont.

Acknowledgments.—I beg again to express my thanks to my many correspondents who have rendered me much valuable assistance in making observations and sending me prompt notice of the occurrence of injurious insects. I am more and more convinced every year of the value of being in constant correspondence with those actually engaged in the cultivation of the soil. If suggested remedies are successful, the very best must be discovered and made known as widely and as quickly as possible; if they fail, the reason of this must be found out, and if useless, farmers must be warned against them, so that neither labour, time nor money may be lost which might be better employed. I have again to acknowledge many courtesies extended and valuable reports received from colleagues, official entomologists and botanists in other countries, amongst whom I would particularly name Prof. Riley, the United States Entomologist; Miss E. A. Ormerod, of England; Dr. J. A. Lintner, of New York; Dr. J. Ritzema Bos, of Holland; Mr. F. Turner, of New South Wales, and Mr. C. French, of Victoria, Australia.

An object which has attracted much attention in my office is a wall case given by Prof. Fernald, Secretary of the Massachusetts Gypsy Moth Committee, illustrating by means of beautifully mounted specimens the life history of the Gypsy Moth (*Ocneria dispar*, L.), which has been the cause of so much loss in the New England States.

For identification of difficult species I gratefully acknowledge my indebtedness to the following specialists: For Coleoptera, Mr. Albert Fauvel, of France, Dr. John Hamilton, of Allegheny, Pa., Dr. George H. Horn, of Philadelphia, Pa., and Mr. W. H. Harrington, of Ottawa; for Lepidoptera (*Noctuidæ*) Prof. J. B. Smith, of New Brunswick, N. J.; (*Microlepidoptera*) Prof. C. H. Fernald, Amherst, Mass.; for *Coccidæ*, Prof. T. D. A. Cockerell, Las Cruces, New Mexico.

For botanical specimens: Prof. J. Macoun, Ottawa; for microscopic fungi, Mr. J. Dearness, of London, Ont., and Prof. B. D. Halsted, of New Brunswick, N. J.

To all of whom I here respectfully tender my heartiest thanks.

The following donations of plants and seeds have been received during the year:

Prof. Beal, Michigan Agricultural College: collection of grass seeds, 14 species.

F. Turner, Esq., Botanist, Department of Agriculture, New South Wales: seeds of grasses and fodder plants, 19 species.

Prof. O. Lugger, Minnesota Experiment Station: collection of grass seeds, 37 species.

Steele, Briggs, Marcon & Co., Toronto: collection of imported grass seeds, 34 species, and 13 varieties of rape.

W. R. Carles, Esq., Chinkiang, China: seeds of *Stillingia sebifera* and *Anemone cernua;* also bulbs of *Tulipa edulis.*

J. A. Balkwill, Esq., London, Ont.: roots of native plants.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

DIVISION OF ENTOMOLOGY.

CEREALS.

The grain crops of the Dominion as a whole have been less injured by insect pests during the past season than has been the case for many years. The only occurrences of unusual severity have been by Cut-worms to wheat in Manitoba, and by Locusts chiefly to oats in Ontario. Specimens of the true Army-worm (*Leucania unipuncta*, Haw.) from which the moths were subsequently raised, were sent to me from Manitoba by Mr. Richard Waugh, of Winnipeg, who writes as follows:—

"August 4.—I send you this day samples of some caterpillars which have appeared in great numbers on the end of a wheat field, just outside the city, eating both blades and ears. The field abuts on the river and the path is strewn with the worms which are in great force."

"August 18.—The army-worm has destroyed a lot of wheat on the east side of the Red River in Northern Minnesota, and I believe our visitation is a stray lot from that section. They devoured both the leaves and the green heads, but vanished in a few days."

The Wheat-stem Maggot (*Meromyza Americana*, Fitch) was observed to a small extent in wheat fields in the Ottawa district; but few complaints were received from other parts. The larvæ were found much more abundantly this year in the root-shoots of grasses than in the stems of wheat and barley.

CUT-WORMS IN GRAIN CROPS.

Year after year complaints are received concerning the injuries of Cut-worms to grain crops, and during the past season, these have been very numerous in Manitoba and parts of the North-west Territories. Up to the present time no satisfactory remedy has been devised to put a stop to these depredations. A great desideratum is more knowledge as to the exact identity and life habits of the species concerned. I trust I may be able next year with the assistance of correspondents in the West, to obtain specimens and work out the life histories and food habits of some of the western Cut-worms, on which there is yet much to learn before a practical remedy can be recommended. The following letters will, I think, give an idea of the urgency of this case and will indicate the present state of the entomological information in our hands:—

"August 19.—I was told a few days ago, that a report had been sent out by you which contained a simple remedy for destroying cut-worms. If such is the case, I would like to have it sent to me. I had a 20-acre field of wheat entirely destroyed last year when the second leaf was about one inch long. Where the drill teeth ran, the ground was as fine after they had done as if it had been sifted; there was not a leaf to be found. As far as I can learn, this grub is known as the little black grub, and what would kill the cut-worm, would kill it."—John Stewart, *Regina, Assa.*

Reply:—"April 26.—I fear the report that I have a simple remedy for destroying Cut-worms is rather more than I can myself admit. Cut-worms are amongst the most troublesome of our farm enemies, more particularly when, as in your case, they attack grain crops. There are upwards of 400 kinds of Cut-worms, some of which differ from the others in their habits. I shall be obliged if you will send me this spring some living specimens for examination. This can be done easily by mail and free of postage. As the Cut-worms you refer to attacked your grain crop, it is just possible that they might not injure some other plants, such as potatoes, which do not belong to the Grass family, like the small grains. Could you not put your infested field under some other crop next season, so as to try this?"

"June 12.—The Cut-worms are not so numerous this summer, as they were last. This evening I could only obtain a few. Last 12th of June, they could have been got by the handful. I send you a box of the grubs."—John Stewart.

Reply:—"June 21.—Yours of the 12th inst. and the insects referred to therein arrived safely. The Cut-worms in your grain crop are the Clay-backed Cut-worm (*Carneades insulsa*, Walk.=*Agrotis campestris*, Grt.), which in many districts of Manitoba and the Territories has done much harm during the last ten years. I find by my notes that this species is always *most numerous where weeds have been allowed possession of the ground during the previous autumn.* Were you able this season, as suggested by me, to put that part of your farm which was badly infested last year under any other crops than grain?"

"June 19.—I am sending you by this mail in a small box some Cut-worms that are doing considerable damage to wheat and oats. A neighbour of mine has had a field of 30 acres of wheat completely cleared by them, and now they have started on my oats in an adjoining field. The land where they began was badly summer-fallowed last year and the weeds came very thickly, chiefly pig weed or lamb's quarters. They seem to have bred in this field. Can you give us any information how to get rid of them? I thought of summer-fallowing all my land on this place next year and sowing timothy. It is no use trying to grow grain where these insects are. I had a small piece of last year's fallow that the weeds had started on this spring, adjoining my neighbour, and when the grubs had cleaned his field they started on the pig weed on mine. I hauled dry straw and manure and covered them up with it and then set fire to it the next day. They got up into the straw over night and I must have burnt millions of them, for I could take them up by the shovelful. I never saw anything like it. I have put feed oats on the land, but expect they will clear the whole. I see they are on many farms here, but the owners do not seem to think much of them, I fear they will be getting worse. There is one thing certain. We shall have to adopt a different method of working our summer-fallows."
—Wm. Richardson, *Douglas, Man.*

In reply Mr. Richardson was informed that the caterpillars sent were the Clay-backed Cut-worm, and that his theory was correct that the prevalence of these insects was largely consequent upon imperfect summer-fallowing of the previous year.

"June 27.—I inclose a few specimens of grubs which are doing considerable damage to gardens and early summer-fallowed lands. Whole fields are being destroyed by them. Can you give us any information concerning their habits of life, such as how deep the eggs are deposited and if late fall-ploughing would kill them."
—John Lawrence, *Sewell, Man.*

In reply Mr. Lawrence was informed that the species was the same as referred to above, and the usual remedies were given.

Early last spring I had some correspondence with Mr. Richard Waugh upon this subject, which began by his sending me a letter from Mr. John Stewart, complaining of the injuries to his crop of 1892, in which he also mentioned that a crop of flax had been left untouched; to this I replied, March 26:—"I have read your correspondent's letter carefully and noticed that the crops attacked by the caterpillars were oats and wheat (Gramineæ), and that flax the only other crop mentioned, which belongs to a different family of plants, was uninjured. Now some of the Cutworms which destroy grass crops, grains included, do not injure other crops, and it is just possible that the species in question may be one of these. Should this be the case, the simplest remedy which suggests itself is to put the land under some other crop than one belonging to the Grass family for two or three years. Potatoes are good for this purpose, not only because comparatively few insects injure that plant, but because potatoes are late in appearing above the ground in spring. I surmise that the insect complained of is the same Cut-worm as some years ago was sent to me by Mr. A. Burrows, and upon which I wrote an article for *The Nor' West Farmer*. It is difficult to suggest a definite remedy for any insect without seeing specimens. I hope that Mr. Stewart or any other farmers will send me specimens of insects which may trouble them."

"June 7.—Yesterday when at Carberry speaking at the Institute, considerable damage was reported to summer-fallowed wheat by caterpillars of which I send you a sample. Very weedy fields which had been allowed to grow so without disturbance, suffered most, and a cultivated strip in the same field seemed free of the insects. Barley was being sown on the top of the ruined wheat, in the hope that it would escape. I asked one man to try a half bushel of flax. Some allege that late ploughed fallow does not suffer, and it is assumed that deep ploughing and rolling later in the year would either bury them or divert them from coming there. Others allege that mellowness of the soil is as much the attraction as the green weeds. Some years ago a crop of wheat was saved by the grubs eating up the pig weed in the crop and leaving the less palatable vegetation. Such grubs have devoured the crops in clean gardens that were summer-fallowed. Will you please consider this and give us your opinion as to remedial action? Prof. Lugger killed the grasshopper grubs in Minnesota by deep ploughing."

Reply:—"June 21.—The grubs sent with your letter are the Clay-backed Cut worm (*Agrotis campestris*)* which is frequently very troublesome in Manitoba. You are correct when you say that Cut-worms are most injurious where weeds have been allowed to grow undisturbed the previous year. It is just possible but hardly likely that the barley sown where the wheat was ruined will escape. This Cut-worm, I think, comes to full growth only toward the end of June, and the barley would, of course, be up long before that. Grain crops being occasionally saved owing to the fact that the grubs attacked by preference pig weed and other plants growing among them, is merely due to the fact that some varieties of Cut-worms feed only upon certain kinds of plants; but then again on the other hand, others are virtually omnivorous, and will eat anything. There are in Canada about 300 different kinds of Cut-worms, many of which differ widely in their tastes and habits. I am afraid that the deep ploughing remedy for this pest, would not avail much. Prof. Lugger's experiments in Minnesota were with grasshoppers' eggs not with the grubs. There are some Cut-worms which pass the winter in the moth state and lay their eggs in the spring, as in the case of the Army-worm moth. It is just possible that those gardens which were infested after having been kept clean the year before, were devastated by a species having this habit. These, however, are luckily few in number, so that, on the whole, I consider one of the best remedies for Cut-worms is, keeping the land as clean as possible in the autumn."

There is perhaps no one single question concerning which so many inquiries are made by farmers and gardeners every year as the best remedy for Cut-worms.

* = *Carneades insulsa*, Walk.

In my annual report for 1888, I published a rather extensive article upon this subject, but as the edition is entirely exhausted, I reproduce here with a few slight alterations part of that article which I think will be of use at the present time.

"Cut-worms are the caterpillars of dull coloured active moths belonging to the Noctuidæ or Owlet moths, of which there are upwards of 400 on the North American lists. Fig. 1 shows the moth of the Devastating Cut-worm (*Hadena devastatrix*, Brace). Of course, the different species vary somewhat in their habits, but taken as a class they are very similar, and in the present state of our knowledge, it will be more convenient to treat them as a class, at any rate in a report like this, which is prepared particularly with the hope of helping farmers to overcome their insect foes. As Cut-worms are the caterpillars of so many different species of moths, the inaccuracy of speaking of them as *the* Cut-worm is apparent. Moreover many other insects are sent in and reported upon as Cut-worms, which do not belong to this class at all. Of these the White Grubs, the larval state of the June Bugs (*Lachnosterna*), are most often referred to. There is some reason in this from their occasional habit of biting off plants in the manner of the true Cut-worms, which are the caterpillars of the moths referred to above; these latter may be described in a general way as smooth, almost naked, greasy-looking, caterpillars of some dull shade of colour similar to the ground in which they hide during the day. The head is smooth and shining and sometimes of a different colour from the rest of the body. On the top of the segment next to the head is a smooth chitinous plate known as the thoracic shield. There are generally three or four series of bristle-bearing tubercles along each side of the body, and when disturbed the caterpillars curl up into a ring.

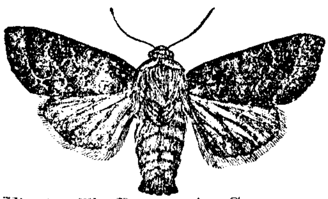


Fig. 1.—The Devastating Cut-worm.

Their habits are almost always nocturnal; they lie hid by day just beneath the surface of the soil and come out at night to feed. When, however, they develop in large numbers, they frequently change their habits and feed by day, owing probably to the reduced food supply consequent upon their ravages. The habits of most Cut-worms are probably as follows. The egg is laid in the spring, summer or autumn, and the insects may pass the winter, either in the perfect moth state, as a chrysalis, as a young half-grown caterpillar, or as an egg. Those which hibernate as moths lay the spring eggs and moths are produced again before winter sets in. Most of the eggs which are laid in the summer or autumn hatch soon after, and the caterpillars either become full fed the same season and pass the winter underground in the chrysalis state, or after feeding for a short time, become torpid and pass the winter as half-grown caterpillars. In this condition they may be found late in the autumn under stones, logs or heaps of dead vegetation, in the roots of grasses or in cells beneath the surface of the ground. Of some, as in the case of *Carneades ochrogaster*, Gn., the eggs are laid in the autumn, but do not hatch until the following spring. The ravages of the young caterpillars which hatch in the summer and autumn, are seldom noticed then, on account of the abundant vegetation at those seasons. In the spring, however, not only are the caterpillars much larger and capable of more mischief, but the land is cleared of all weeds and vegetation other than the crop which is to be grown, and when the Cut-worms, revived by the warmth of the sun and the opening of spring, come from their winter retreats, there is nothing for them to eat but the farmer's early crops. They are particularly troublesome in gardens cutting off young cabbages, tomatoes and other plants, as soon as pricked out. When the caterpillars are full-fed, they burrow into the ground to a depth of some inches and turn to brown chrysalides inside a smooth cell or light cocoon. (Fig. 3.) From these, after a few weeks, the perfect moths emerge. They are very active at night, and when disturbed have the same habit as their caterpillars of dropping to the ground and remaining perfectly still as if dead. From their dull colour they are then difficult to find.

Fig. 2.—Cut-worm.

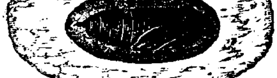


Fig. 3.—Cut-worm Chrysalis in cell.

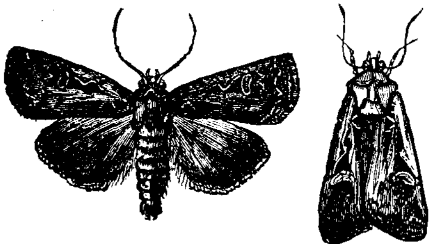


Fig. 4.—The Gothic Dart Moth. Wings open and closed.

When at rest (See Fig. 4.), their wings lie horizontally over their backs, and the upper ones entirely cover the lower pair. The upper wings are generally crossed with one or more waved lines and always bear two characteristic marks, one about half way down the wing, orbicular in shape, the other nearer the tip, reniform or kidney-shaped. Owing to their nocturnal habits, Cut-worms frequently do a great deal of harm to vegetation without being recognized as the cause. It is important, in the view of discovering useful remedies, to ascertain as soon as possible the habits of all these caterpillars."

The remedies given below are from *Bulletin* 11, of the Experimental Farm series.

Remedies.—(i.) *Clean Culture.* As the young caterpillars of many species hatch in autumn, the removal of all vegetation from the ground as soon as possible in autumn deprives them of their food supply and also prevents the late-flying moths from laying their eggs in that locality. Fields or gardens which are allowed to become overgrown with weeds or other vegetation late in the autumn are almost sure to be troubled with Cut-worms the next spring.

(ii.) *Traps.*—Large numbers may be destroyed by placing between the rows of an infested crop, or at short distances apart on infested land, bundles of any succulent weed or other vegetation which has been previously poisoned by dipping it, after tying it in bundles, into a strong mixture of Paris green (2 oz. to a pailful of water). The Cut-worms eat the poisoned plants and bury themselves and die. In hot, dry weather these bundles should be placed out after sun-down, and a shingle may be laid on each to keep it from fading.

(iii.) *Banding and Wrapping.*—(*a.*) It will be found to well repay the trouble and expense, to place a band of tin around each cabbage or other plant at the time of setting out. These may very easily be made by taking pieces of tin 6 inches long and 2½ wide and bending them around a spade or broom handle so as to form short tubes. In placing them around a plant the two ends can be sprung apart to admit the plant, and then the tube should be pressed about half an inch into the ground. I have found this a useful means of disposing of empty tomato and other cans. To prepare these easily, they need only be thrown into a bonfire, when the tops and bottoms fall off and the side becomes unsoldered. The large piece of tin can then be cut down the centre with a pair of shears, and forms two tubes.

(*b.*) Wrapping a piece of paper round the stems of plants when setting them out will also save a great many and is highly recommended.

(*c.*) Hand-picking or digging out the Cut-worms whenever a plant is seen to be cut off, should, of course, always be practised.

Natural Enemies.—There are two enemies of Cut-worms which deserve especial notice, and, from the good service they do, should be known by sight to every cultivator. They are the Fiery Ground-beetle or Cut-worm Lion (*Calosoma calidum*, Fab., Fig. 5) and the Black Ground Wasp (*Ammophila luctuosa*, Smith) which closely resembles Fig. 6. Both of these are desperate enemies of Cut-worms, the former feeding on them in all of its stages, the latter digging them out and storing its nest with them as food for its young grubs.

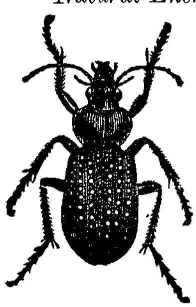


Fig. 5.—Fiery Ground Beetle.

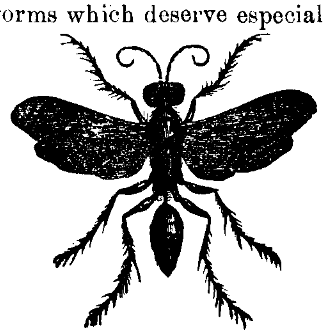


Fig. 6.—Ground Wasp.

THE RED-LEGGED LOCUST

(*Melanoplus femur-rubrum*, DeG.)

One of the notable attacks of the year, mention of which has been made by several correspondents in Western Ontario, has been that of "Grasshoppers" or more properly Locusts. Their injuries have been most serious in those parts of Ontario which have suffered from a lack of rain. They are also mentioned several times in British Columbian correspondence. In Ontario and Quebec the species of which I have received most specimens, was the common Red-Legged Locust.

Occurring with this, however, were many specimens of the Lesser Migratory Locust (*Melanoplus atlanis*, Riley) and the large green Two-striped Locust (*Melanoplus bivittatus*, Say).

Special complaints were made of Locust injuries to oats by many correspondents. Major Lloyd, of Oakville, Ont., and Mr. G. C. Caston, of Craighurst, Ont., speak of their damages in turnip fields, and records of their injuries to vegetation in general were frequent; the following extracts will give some idea of the losses due to these pests:—

"There is almost universal complaint of the damage to the oat crop by grasshoppers. Four-fifths of the correspondents from the Lake Erie counties refer to them. From Lambton, Simcoe, Middlesex, Northumberland and Durham, Prince Edward, Lennox and Addington, and Frontenac, come reports of great destruction to every thing growing in the fields. Correspondents report them more numerous and destructive than for many years."—*Bull.* 47, *Ont. Bureau of Industries, Aug.*, 1893.

"Oats this season are a light crop, owing to the prevalence of rust and the prevalence of grasshoppers."—*Bull.* 48, *Ont. Bureau of Industries, Nov.*, 1893.

"August 15.—I remember seeing in some pamphlet when at Ottawa a description of a machine used in the North-west for destroying grasshoppers; can you let me know how this is made and used. The fact is these insects are becoming a perfect pest in many parts of Ontario, and if something is not done to at least thin out their numbers, the injury to vegetation will be very serious. They have done, I am told, very great damage in the neighbourhood of Woodstock, and the country round there, and out at my place at Lake Simcoe, my neighbours, as well as myself, have suffered not a little. Last autumn I was very careful to have all the stubble and the long grass round the sides of the fields cut close, so as not to leave them any harbourage or place to deposit their eggs, but they are this year more numerous than ever. If you can suggest anything that we can do to lessen the evil, I shall be very much obliged if you would drop me a line. If they go on increasing, farming in Ontario will suffer a heavy blow."

"August 19.—The grasshoppers, now that the grain is all in, are turning their attention chiefly to the kitchen garden, where they are playing havoc with everything, and there does not seem to be any effectual method of fighting them."—HON. G. W. ALLAN, *Toronto, Ont.*


Fig. 7.—Locusts laying their eggs.

The life history of the Red-legged Locust is briefly as follows:—It is single-brooded. The eggs are laid in the autumn but hatch only the following spring. The young pass through five successive moults, attaining their full growth in July, when they have well developed wings. The females deposit their eggs in symmetrical masses called pods within burrows bored with their abdomens; each female lays 3 or 4 pods of eggs before she dies, each pod containing about 30 eggs. Prof. S. A. Forbes says:—"They select by preference for oviposition hard and dry ground, roadsides and pastures being especially favourite localities. Meadows and pastures are commonly resorted to by the mature females, especially the latter, as the eggs seem not to be laid ordinarily on ground covered by luxuriant vegetation. I have never known them deposited in cultivated earth. The food habits of these locusts are extremely simple, and consist in eating nearly everything coming in their way."

THE LESSER MIGRATORY LOCUST is a very widely distributed species which frequently becomes injurious on account of its excessive increase. It is more nearly allied to the Rocky Mountain Locust than to the Red-legged. It is about the size of the latter, but, like the former, has longer wings and, although to a lesser degree, is migratory in its habits. This is the species to which probably most of the locust injury in Canada should be attributed, as it is a common species from British Columbia to the Maritime Provinces, and Prof. Lawrence Bruner says:—"It is the species which most frequently does the locust injury in the New England States, much of that in the Northern States, and some of that in the extreme North-west. It has also been known to become injurious in the Middle and Southern States. In its distribution this species seems to be more partial to hilly or mountainous country, and especially is this noticeable in reference to its appearance in destructive numbers. It seems also to prefer wooded or mixed country to the open prairies or plains."

The Lesser Migratory Locust is about the same size as, and closely resembles the Red-legged Locust, and, as its range is practically the same, it is impossible to separate the injuries of the two in the reports received. The two species may, however, be easily distinguished by the entomologist, from the fact that the prosternal spine of *M. atlanis* is sharply pointed, while that of *M. femur-rubrum* is spatulate or enlarged at the apex.

THE TWO-STRIPED LOCUST is the large common olive-green species with heavy body and two light stripes down the back, which is frequently found in gardens and about the edges of fields. It occurs from the Atlantic to the Pacific and from the Gulf of Mexico to the Saskatchewan. Prof. Bruner says of it:—"Its increase in destructive numbers appears to be confined chiefly to the regions lying between the Rocky Mountains and the Atlantic. This locust appears to vary considerably in size and colour. There are, however, two well defined forms, the one receiving the name *bivittatus* and the other going by that of *femoratus*, the latter occurring only northward."

The large amount of damage annually wrought by locusts is seldom appreciated. Their habits are to frequent grass lands, where a large proportion of the crop may be consumed without making much difference in the appearance of the fields. It is only after hay is cut, or in seasons of unusual drought, that locust injuries are much noticed. If, however, their numbers at all times and their voracity are considered, it will at once be seen that they must every year destroy much produce. They do not develop wings until July, and previous to that they pass most of their lives low down among the stems of grasses. Besides locusts, there are many other grass feeding insects which every year levy a heavy toll unnoticed. These may all be to a large measure controlled by the use of machines called "hopper-dozers," or "tar pans," which were invented in the west some years ago at the time of the so-called "locust invasions." Prof. Herbert Osborn, of Iowa, writing on means of destroying grasshoppers, says:—"In meadows and pastures we believe the use of the hopper-dozer the most practical plan that can be recommended. In many cases it can be used to capture these and the leaf-hoppers at the same time, especially if used when grasshoppers are still quite small and can be held by a thin layer of coal tar used on the simple flat sheet of iron. When larger they need a deeper layer of coal tar, or a pan of water with a covering of coal oil on it. A cheap and simple plan for this purpose, costing but from $1.50 to $2, was described many years ago by Prof. Riley. It consists of a strip of sheet iron 8 or 10 feet long, turned up 1 inch in front and 1 foot behind, with pieces soldered in at the ends (or made of wood), and hooks placed in front at the ends for the attachment of ropes. If to run on rough ground it will be better to put runners 1½ or 2 inches high underneath. Into this put a layer of coal tar half an inch deep, or water and kerosene. It can be drawn by a boy at each end, or by horse power if preferred."

"To treat pastures and meadows for grasshoppers and leaf-hoppers, it would seem from present experience the best plan to run over all grass lands early in May with the simple dozer described for leaf-hoppers (a piece of sheet iron 8½ feet long and 2 feet wide, was coated on the upper side with coal tar, and lying flat on the sod was dragged along by means of three cords, one fastened at each end and one in the middle). Pastures should be treated a second time about the middle of June. For meadows, the second treatment may follow hay cutting, if insects are abundant, and then if grasshoppers appear in July in numbers, resort to the deep hopper-dozer described above." (*Bull.* 14, *Iowa Ag. Exp. Station*, p. 176.)

Summarizing the results of his experiments with leaf-hoppers; the same writer says:—"Experiments with hopper-dozers for grass leaf-hoppers show that this method can be used very successfully in capturing the insects, that the simplest form, a flat sheet of sheet iron was most satisfactory, that one application resulted in adding 34 per cent to the crop of hay on a plot experimented on, and in one experiment leaf-hoppers were captured at the rate of 376,000 per acre."

These results are most striking, and one cannot but feel convinced that it would pay well to adopt systematically such a simple and cheap method of freeing pastures of the myriad insects which reduce the yield every year.

The use of hopper-dozers in the Western States for the destruction of locusts is recognized as one of the standard methods of fighting these injurious insects, and has been attended with marked success. The other method which is relied on is ploughing the land where the eggs have been deposited, so as either to bury them deeply, so that the young cannot emerge in spring, or so as to expose them under unnatural conditions, to the frosts of winter or their numerous predaceous enemies. In the thickly settled portions of Canada where as a rule stubble fields are regularly ploughed up before winter, we as a consequence do not suffer from locust plagues so frequently as is the case in the west.

The use of insecticides such as Paris green for locust attacks is seldom a practical remedy except on limited areas. In response to some who have applied for the receipt of the bran and arsenic remedy, I extract the following from Prof. Clarence Weed's useful little work, "*Insects and Insecticides:*"—"A mixture which has been successfully employed, consists of arsenic, sugar, bran, and water, the proportions being one part, by weight, of arsenic, one of sugar and five of bran, to which is added a certain quantity of water. The arsenic and bran are first mixed together, then the sugar is dissolved in water and added to the bran and arsenic; after which a sufficient quantity of water is added to thoroughly wet the mixture. About a teaspoonful of this mixture is thrown on the ground at the base of each tree or vine (in gardens and orchards) and left to do its work."

I found by experiment that the poison works slowly but is very effectual.

GRANARY INSECTS.

When visiting the Chicago Exhibition, I was requested by the Executive Commissioner for Canada to examine the grain exposed in the agricultural trophy and to report to him whether it would be safe to distribute samples of it to farmers who had made application for it, and to use the straw when taken from the trophy for packing purposes. The following is a copy of my report:—

REPORT UPON INSECT PESTS IN THE CANADIAN EXHIBIT OF GRAIN AT CHICAGO.

J. S. Larke, Esq.,
Executive Commissioner for Canada,
World's Fair, Chicago.

Sir,—I have the honour to report as follows with regard to my examination of the exhibits in the Canadian Court of the Agricultural Building at the World's Fair as requested by you. I examined them carefully as well as similar exhibits situated near them in the building. I found that the greater part of the injury was due to the attacks of the Grain Moth (*Gelechia cerealella*, Oliv.). The Rice Weevil (*Calandra oryzæ*, L.) and the Common Grain Weevil (*C. granaria*, L.), were also both found in smaller numbers. These were chiefly in jars of grain which had been imperfectly closed. In reply to your question whether it would be safe to use the straw of this infested grain for packing purposes and the grain for distribution, I would say that it would be safer and cheaper not to use the straw for packing, because it would be first necessary to disinfect it by inclosing it in some tight receptacle and then submitting it to the fumes of bisulphide of carbon. It would be wiser also to treat all grain required for distribution with the same chemical when, I think, there would be no danger in distributing the grain. As a matter of fact, both the Grain Moth and the Grain Weevils are now well established in all parts of the world where the climate will allow them to propagate. In Canada this is not the case and there is no doubt that our exhibit has been infested from contiguous exhibits in the Agricultural Building. Grain distributed in Canada will do no harm because the insects will not propagate here in injurious numbers, and samples sent to southern countries, even if infested, will only take insects to those countries which already exist there.

I take the liberty of forwarding you herewith a copy of my report for 1889, containing an article upon Granary Weevils. See pages 71-83. I have marked one or two passages, giving a description of the method and apparatus necessary in disinfecting grain, to which I would draw your attention. I may mention that Mr. Chittenden, a member of the entomological staff now in charge of the United States Government exhibit at Chicago, has been making a special investigation of these Granary Weevils and other pests to be found in the exhibits now at Chicago. Prof. Riley the United States Entomologist, by whose instructions this investigation is now being made, will also be in Chicago during this week, as Mr. Chittenden informs me he has been telegraphed for. As requested by you I called upon Mr. Buchanan to explain our position in this matter but was unable to see him until the day I was leaving, when I called again in company with Mr. Chittenden and told him practically what I now report officially to you.

Ottawa, Oct. 13, 1893.

It will be observed that only three kinds of insects were mentioned in the above report. But Mr. F. H. Chittenden of the United States Division of Entomology, who was specially charged by Prof. Riley with the work of examining the food products exhibited at the Exposition, for the purpose of investigating the nature and ravages of any insects which might be found, made observations upon a much larger number of species. This investigation was undertaken as a precautionary measure in case some dangerous enemy might be introduced, and Prof. Riley announces his intention of issuing a bulletin on the subject, covering at the same time other information on insects affecting stored products.

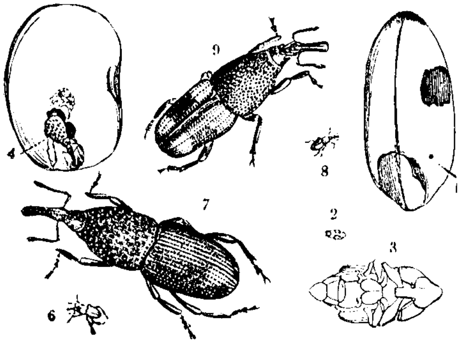


Fig. 8.—9 Rice Weevil. 7 Common Granary Weevil.

The three insects mentioned above occasionally cause slight damage to stored grain in Canada, but they cannot be considered as serious enemies. The Granary Weevils belong to two species, the Rice Weevil, Spotted Weevil or Black Weevil of the South (*Calandra oryzæ*, L.) and the Common Granary Weevil (*Calandra granaria*, L.) These are small, dark coloured, narrow beetles rather more than ⅛ of an inch in length, with their heads prolonged into a slender snout. These insects, both in the grub state and as perfect beetles, sometimes destroy considerable quantities of grain in granaries. The eggs are laid in holes which the females bore in dry grain with their slender beaks. After hatching, the young grubs feed on the contents of the kernel where the egg was laid, complete their growth and turn to beetles inside the same grain, which does not show any sign of injury until the beetle emerges, when it is found that the greater part of the inside has been consumed. The beetles themselves do even more harm than the grubs, for they also feed on the grain and live for a long time, so that in hot climates, when grain is kept in store for a length of time, the injury may be considerable; but in Canada the cold of our winters stops the development and destroys the mature beetles if exposed to it.

The Grain Moth (*Gelechia cerealella*, Oliv.). This insect is better kown as the Angoumois Grain Moth but is also called in the South, the Fly Weevil. It has been treated of by various entomologists. Prof. Howard E. Weed (*Bulletin* 17, *Mississippi Exp. Station*) says:—"The first extensive account of the habits of this insect was given in 1736 by Réaumur, a French naturalist, who found it very destructive to barley at Luçon (France). In 1760 it was very destructive to wheat in the Province of Angoumois, and Harris states that, 'The afflicted inhabitants were thereby deprived not only of their principal staple wherewith they were wont to pay their annual rents, their taxes and their tithes, but were threatened with famine and pestilence from the want of wholesome food.' Two members of the Paris Academy of Sciences were commissioned by the French Government to visit the province of Angoumois to investigate the habits of this insect and since the publication of their report the insect has received the popular name of the 'Angoumois Grain Moth.' The first record of the appearance of this insect in America was in 1768."

The Grain Moth has never developed in Canada even to the same extent as the Granary Weevils, although occasional instances of its occurrence have been brought to my notice. In the Southern States, where it is very abundant, the moths fly from the granaries and lay their eggs upon the ripe grain in the fields; the eggs or young caterpillars are thus carried back into the granary and great loss frequently ensues. This never takes place in Canada. The small eggs are deposited in groups of from 15 to 25, generally upon the underside of the grain or in the crease of the kernel. They are white at first, turning pink before hatching. The young caterpillar is only a millimetre in length, pink, slender and covered with long hair. As a rule, only one enters a kernel, where it remains until full grown, when it is about ⅗ of an inch in length and dirty white in colour. It then changes to a brownish chrysalis, from which subsequently the small moth issues. This is rather larger than, but at first sight very much like, the Carpet Moth (*Tineola biselliella*, Hum.) The wings expand about ½ inch, are of a satiny cream colour and bear a few dark spots on the forewings, which are narrow, pointed and fringed. The hind wings are darker, and have much wider fringes. Prof. Weed states that there are at least eight generations in a year in Mississippi, but that doubtless there are only two in the Northern States, as recorded by Harris.

Since the appearance in the press of notices of the infestation of the grain at Chicago, specimens of various insects injurious to stored grain, have been sent in, as well as those mentioned above, with inquiries as to the best way of treating them: (1) The Lesser Grain beetle (*Silvanus Surinamensis*, L.), a small, flat, brown, beetle with very narrow body and short legs, $\frac{1}{12}$ of an inch in length. This insect is easily recognized by the saw-like edges and three prominent ridges of the thorax. This was sent in large numbers from a store-house in Toronto. (2) The Least Grain beetle (*Silvanus advena*, Walt.), found abundant in flour at Ottawa. (3) The Meal Snout Moth (*Asopia farinalis*, L.), from several places; and (4) *Ptinus fur*, L., a small brown beetle, somewhat oval in shape with long slender antennæ, which was received from Orillia and Toronto as occurring abundantly in flour. This insect attacks numerous specimens of plants and insects in collections, and it is there probably where its ravages have attracted most notice, but the small yellowish curved larvæ about $\frac{1}{8}$ of an inch in length, doubtless feed on many dry substances of animal or vegetable origin.

Remedies.—Should grain at any time be found to be infested by any of the above pests, they may all be treated in the same manner. The surest remedy is to subject the grain to the vapour of bisulphide of carbon. This chemical vaporizes when exposed to the air, and the vapour is so much heavier than air that it will run down through the mass of any grain upon the top of which it has been placed, and will destroy all contained insects. The quantity required is small, 1 lb. being enough for each ton of grain. The method of using it, is to inclose the grain in a perfectly tight bin, then pour some of the bisulphide into a shallow vessel, and place it on the top, keeping the bin tightly closed for forty-eight hours. The bisulphide does not injure the grain, but it must be used with care, on account of its extreme inflammability. The grain should then be emptied out, out of doors, and no flame, lighted cigar or pipe, must be brought near it, or an explosion will occur. In large quantities bisulphide of carbon costs only about 20 cents a pound.

With regard to the treatment of mills Prof. Weed writes as follows:—"To destroy insects infesting mills, quantities of bisulphide should be placed in open dishes or plates in various elevated parts of the mill, commencing the application in the basement and going upwards. The mill should then be closed as tightly as possible, and a watchman employed to see that no lights are brought near until the odour of the bisulphide has passed off. If a mill is thus treated on Saturday afternoon, work can be resumed as usual on Monday morning. The bisulphide should not be applied to unpainted floors or walls, as it will sink into the wood and it will take some time before the fumes will have passed away." (*Bull.* 17, *Mississippi Exp. Station*, p. 14.)

ROOT CROPS.

TURNIPS.

Fig. 9.—The Turnip Flea-beetle.

With the exception of Locusts in Western Ontario, the insect enemies of root crops do not appear to have been so noticeable last season as usual. The only complaints of the attacks of the Turnip Flea-beetle (*Phyllotreta vittata*, Fab.), were received from a few localities in New Brunswick, Eastern Ontario and Quebec. The single report from British Columbia was: "There are no Flea-beetles this year."

This well know pest is shown very much enlarged at Fig. 9.

The remedy recommended, and found successful in all instances but one, was dusting land plaster or ashes and Paris green (50 lbs. to 1) over the young plants early in the morning. In the instance of failure referred to, I found that the ashes and Paris green had been mixed and carried to the field in the evening and left exposed to the dew till the next morning; consequently, when applied, it did not remain on the leaves because it was not, as it should have been, perfectly dry, so as to fall upon the plants as a fine powder, when it would have remained on the seed leaves and had the desired effect.

The North-west RED TURNIP-BEETLE (*Entomoscelis adonidis*, Fab.), treated of fully last year, was much less abundant than previously, only one lot of specimens having been received, and these came without the address of the sender. Mr. J. A. Smith writes from Saskatoon: "I have seen none of the Red Turnip-beetles this season. Crop prospects good." Mr. Thomas Copland, of the same place, however, observed a few, and has been fortunate enough to discover the native food plant. He writes: "July 6.—*In re Entomoscelis*, the beetles made their first appearance here on 17th June. I send you specimens of their wild food plant, which is a common weed. I have found them feeding a little on other weeds, but the kind sent is their chief wild food. This year the beetles are attacking cabbages. I intended to sow no turnips or radishes, so as to starve them, but I have sowed some a few days ago to poison them on." The plant sent by Mr. Copland was the Small-flowered Prairie Wall-flower (*Erysimum parviflorum*, Nutt.), which, like the turnip, radish and cabbage, belongs to the Cress family.

The Turnip Aphis is mentioned in the Ontario Crop Returns for November, as having injured the turnip crop. Specimens were sent to me from Ottawa by Mr. Thomas Nicholson, which had infested his Swede turnips. This is a troublesome insect to treat, but successful experiments have been made with Kerosene emulsion in a crop where the injury was restricted to small areas. This is usually the case when the attack first begins, and the presence of the insects as a rule can be detected if looked for during the operations of thinning and cultivating the turnips.

POTATOES.

THE COLORADO POTATO-BEETLE (*Doryphora 10-lineata*, Say) has been noticeably less prevalent this year in Eastern Ontario than usual, probably owing to the wet season. In Western Ontario, in the sections where drought was felt, it was abundant and very injurious, particularly to egg plants. In the Maritime Provinces also it was plentiful. It is only of late years that this insect has extended its ravages into Nova Scotia and Prince Edward Island, and the farmers there have not yet learnt fully the value of Paris green in destroying it. In June last the *Gold Hunter and Farmer's Journal* of Caledonia, N.S., wrote: "Kindly send formula and directions for using Paris green for exterminating potato bugs. Our people are sorely pestered with them, but are afraid to use Paris green."

Reply: "The proper and only practical remedy for the Colorado Potato-beetle is Paris green used in the proportion of 1 lb. to 160 gallons of water, that is, 1 oz. to 10 gallons. There is no necessity to use it stronger, and with ordinary care, there is not the slightest danger in employing this material as an insecticide. Of course, it is a poison if eaten by animals or human beings, and, therefore, must be kept in a safe place and not used carelessly." It can also be used as a dry application: 1 lb. of Paris green may be mixed with 50 lbs. of perfectly dry land plaster, air slaked lime, common flour or sifted wood ashes.

The Colorado Potato-beetle has never done much injury in Manitoba. Mr. Richard Waugh has referred to it occasionally during the last four or five years; but speaks of it as a minor pest only of uncertain occurrence. During the last season, however, it seems to have rather increased. Mr. W. G. Fonseca writes, "August 9. The Colorado bug has been invading this province by slow measures for three years past. This season has seen the invaders in increased numbers, nearly all my potatoes have disappeared. Tens of thousands have been destroyed. They are now fully winged, and there is danger of their spreading."

In addition to the ordinary Colorado Potato-beetle, the Cucumber Flea-beetle (*Epitrix cucumeris*, Harris), was the cause of considerable injury to potatoes by perforating the leaves. This occurred in many localities from Ontario to New

Brunswick. Specimens were also received of two kinds of BLISTER BEETLES, with notes of their attacks upon potatoes. *Epicauta Pennsylvanica*, DeG., was received from Mr. E. Walker, of Tuscarora, Ont., which was eating the leaves of potatoes and mangels in his neighbourhood and doing a great deal of damage on account of its abundance. The same insect was received from Mr. F. Mitchell, of Innerkip, Ont., with this statement: "I send you by mail specimens of a most destructive beetle, which has this season come upon us in myriads; they are by no means local, as they extend southward as far as Baltimore, Ont., at least; for in reports from there, I find that florists there are suffering loss to the same extent as myself. They devour the petals of almost every kind of flower. Can you inform me what they are?" The same beetle came also from Mr. A. Mackay, Indian Head, as a depredator on beans. My reply to Mr. Mitchell was:—"The insects sent with your letter are the Black Blister beetle, and I have had them sent in from several places. These beetles seldom occur in large numbers for more than one season, and I think it is unlikely that you will be troubled again next year. They are not, however, an unmixed evil, for in their grub state they live as parasites on the eggs of locusts and grasshoppers. I know of no remedy which you could apply for the protection of your asters. When they attack garden crops, as beets, mangels, potatoes, &c., dusting the plants with Paris green and plaster, 1 pound to 50, has been found successful. This, however, would not do for flowers, and the only thing which occurs to me is to sweep them off the plants by means of a hand-net mounted on a short handle."

Mr. Walker was advised to use Paris green in the same proportions, or for a liquid application to mangels, 1 pound in 100 gallons of water, in which had been previously dissolved a pound of soap. The latter must be added so as to make the solution adhere to the leaves of such plants as mangels, turnips, cabbage, etc.

The other Blister-beetle mentioned was the Gray Blister-beetle (*Macrobasis unicolor*, Kirby), of which Mr. A. Laperrière writes from Entremonts, Lake Temiscaming:—"I have just found a black beetle in great numbers in my field of potatoes, which they are devouring voraciously, leaving only the stems. I have not heard of it in other places, but here and on my son's place, it is causing much havoc, and seems to work much more quickly than the old yellow striped Potato-beetle." The habits of this beetle are very similar to the Black Blister-beetle, and like that species, it feeds upon a variety of plants. It may frequently be found in the woods feeding upon the Tall meadow rue (*Thalictrum Cornuti*, L.) and Leguminosæ.

FODDER CROPS.

Fodder crops have been exceptionally good in Canada this year, and very few complaints have been received of either fungus or insect injuries. The new fodder plant, the English Horse bean, rcommended by Prof. Robertson, the Dominion Dairy Commissioner, has been largely grown for mixing with Indian corn and the heads of sunflowers in the preparation of a complete ensilage; and the few reports of injury to fodder crops have been in connection with this plant. The small white BEAN LEAF-HOPPER (*Empoa fabæ*, Harris) has occurred in several places and done much injury by puncturing the leaves and causing them to turn black and wither. As the beans were grown this year mixed with the corn, it was difficult to treat this insect at the time it appeared, in the middle of August. The most satisfactory remedy for the leaf-hoppers is to spray the infested plants early in the season before the insects have developed wings, with Kerosene emulsion. Should this pest become numerous, it will be necessary to watch for its appearance and spray the crop, while the insects are in their larval condition when they have no wings.

BLISTER-BEETLES have also infested beans to a serious degree in some localities, as shown by the following:—

"July 1.—I am mailing you under separate cover a number of beetles (these were the Western Blister-beetle, *Cantharis Nuttalli*, Say) that have proved very destructive to our beans. The specimens were handed to me by Mr. R. Norton at Brandon.

Ashes appear to drive them away for a time. They eat the plants right to the ground."—S. A. BEDFORD, *Brandon, Man.*

"July 6.—*Cantharis Nuttalli* made its appearance on my beans on June 19, but we have had no such immense numbers of them as last year yet."—THOMAS COPLAND, *Saskatoon, Sask.*

"July 7.—I inclose you a few insects that are doing considerable injury in the North-west this year. They attack the Siberian pea tree (*Caragana*), beans, tares and peas, and in other places garden vegetables. I have used Paris green with good effect. Last year a few were found in our tares; so far this is the only pest that has troubled us much this year. It seems to especially appreciate Prof. Robertson's horse-beans."—ANGUS MACKAY, *Indian Head, Assa.*

The insects sent were *Cantharis Nuttalli* and the Black Blister-beetle (*Epicauta Pennsylvanica*, DeG.). It was probably the latter which was referred to as attacking garden vegetables.

"July 4.—I send you to-day some insects, and shall be very much obliged for any information you can give me about them; they have appeared on my horse-beans which I have planted with corn. They eat the leaves only, beginning on the outer edge and leaving the stalks and veins of the leaves. They have appeared on a spot three or four rods square. I do not think they breed on the plants. If these are likely to prove destructive, please tell me what I must do to destroy them. They do not eat the corn which is planted in the same hill as the beans."—PERCY G. MILLS, *Sussex, N.B.*

The insects sent by Mr. Mills were the Gray Blister-beetle (*M. unicolor*, Kirby).

The remedy recommended for blister-beetles on beans in my report last year is as follows: "In looking over all the reports received I find that they are all dated in July, so that the time of injury to this crop will seem to be limited to a few weeks, and if a sharp watch were kept for their appearance, the ravages could be controlled, either by sweeping the crops with a net mounted on a handle or by beating the beetles into a pan containing some water with a little coal-oil on the top. When the area attacked is too large for this, spraying promptly with Paris Green, 1 lb. to 100 gallons of water (or dusting with 1 lb. of Paris green to 50 of flour) would destroy them."

VEGETABLES.

Garden vegetables in Eastern Ontario this season have not suffered very severely from insect enemies, although the abundance of some has made up for the non-appearance of others. The root maggots of the cabbage and onion were very destructive. In the case of the cabbage, experiments with Kerosene emulsion and Hellebore tea poured round the roots of infested plants were to a large measure successful. The Onion Maggot was also experimented with by sowing common salt along the rows and in the bottom of the drills: the results were conflicting, but on the whole quite encouraging, and it is proposed to continue the experiments next year.

Cabbages this year in Eastern Ontario had an almost entire exemption from the attacks of the Imported Cabbage Butterfly (*Pieris rapæ*, L.).

Beans were damaged in many places during June by Cut-worms of several kinds, *Carneades ochrogaster*, Gn., being the most generally distributed species. This caterpillar has a very wide range of destruction, specimens having been received from Cape Breton to Calgary, Alta. The protection of freshly set out herbaceous plants by wrapping a small piece of paper around the stems has been highly commended by several to whom this remedy had been suggested. Celery was received which was heavily infested late in the season by an Aphis. It was too late, the crop having been dug, to apply the usual remedies for plant lice.

Tomatoes were injured in some places by plant bugs and a report was received from Mr. W. G. Baylay of Ottawa, of the girdling of the main stem by the Buffalo Tree-hopper (*Ceresa bubalus*, Fab). The insects were, however, fewer than when he recorded the same damage in a previous year. The Tomato Stalk-borer (*Hydræcia cataphracta*, Grt.) was somewhat prevalent in the Ottawa district, the larvæ being found in the stems of hollyhocks, sunflowers and other succulent herbaceous plants as well as of tomatoes.

Some imported fruit of early tomatoes was sent in from Mr. W. E. Saunders, of London, Ont., containing specimens of the larvæ of the Corn or Boll-worm (*Heliothis armiger*, Hbn.). These had been imported from the United States by Mr. E. West, florist of London, who stated that he had found over a dozen in each crate of tomatoes. Although *Heliothis armiger* occurs in Canada, I have never in this country seen this injury to tomatoes in the field, which is well known in the States.

The Tomato Sphinx (*Protoparce celeus*, Hbn.) was reported as rather abundant in central Ontario, but the actual damage by this large conspicuous insect was slight. A few inquiries were as usual made as to any danger from being stung by the caterpillar when hand-picking it. This, of course, as can easily be ascertained, is utterly impossible; the caterpillar is perfectly harmless.

Early planted tomatoes were somewhat injured by the Colorado Potato beetle, before the potatoes came up. This beetle also is so much attracted by the egg-plant, as to render it almost impossible to grow this vegetable in many parts of Ontario without covering the plants.

ANOTHER VEGETARIAN CARRION BEETLE
(*Silpha bituberosa*, Lec.).

Attack.—Shining black, very active, grubs, ⅜-inch in length, like wood lice, which devour the leaves of pumpkins, squashes and plants of the Spinach family.

A new attack of some interest recorded this year for the first time is that of the larvæ of one of the native carrion beetles upon plants of the Gourd and Goosefoot families in the North-west Territories. In Europe a very similar insect belonging to the same genus is sometimes a serious pest in mangel and beet-root fields. As these last-named plants also belong to the same large family, the *Chenopodiaceæ* or Spinach family, it is not impossible that as the North-west is settled up, this new pest may become troublesome, and it is fortunate that its habits have been found out before it does so. My esteemed correspondent, Mr. Thomas Copland, who has assisted me frequently with his careful and reliable observations, when on the look-out during the past summer for the larvæ of the Red Turnip beetle, found larvæ of the Carrion beetle mentioned. He writes from Saskatoon, N.W.T.:—

"June 5th.—I inclose you a few larvæ which I suppose may be those of *Entomoscelis adonidis*, and, as I am not acquainted with the weed on which they were feeding, I inclose some with the larvæ for them to feed upon on the way and for you to identify. These insects are very active in hunting for their food if they happen to be where weeds are few and cultivated food has not yet been supplied in the gardens and fields. It is possible I may be wrong in the identity of the larvæ."

"June 17.—I send you two more plants of the weed on which I first found the larvæ of the Carrion beetle (which I thought might be those of the Red turnip-beetle when I sent them). The plants sent were the favourite food of the larvæ: but they by no means confined themselves to these. The common lamb's quarters or pig-weed (*Chenopodium album*, L.) and several other weeds were eaten, but not quite so freely as the specimens sent. The larvæ are remarkably active and drop from the food-plants when disturbed, hiding under them or seeking crevices in the ground. I will let you know if they attack any cultivated plants. I have heard of similar, probably identical, larvæ attacking the young squash vines; but, as our vines are inclosed, I cannot say whether they are liable to attack or not."

The weeds sent were the wild North-west plant *Monolepis chenopodioides*, Moq., which also belongs, like the lamb's quarters, to the *Chenopodiaceæ*.

Referring to the above letters, Mr. Copland wrote on July 6th:—"Yours of the 28th June is to hand. I have, since receiving it, recognized and captured a specimen of the *Silpha* beetle. I have not found the larvæ on any cultivated plants, but did observe that they were rather indiscriminate feeders, and the succulent condition of the plant seemed to have everything to do with the choice, except in the case of the *Monolepis chenopodioides*, which is their favourite; they have not yet touched my beets. I will keep a look out for a second brood."

About the same time, I received more specimens of this insect from the same place from Mr. Geo. L. Smith :—

"June 17.—I mail to your address to-day a packet containing a number of insects which I discovered to-day eating my squash and pumpkin vines. Some of the vines they had almost destroyed. When disturbed, they drop to the ground and hide under leaves or earth. They are the first I have seen, and they have not been working, I think, more than a couple of days. Let me know what they are and give me what information you can."

When received these larvæ were nearly full grown, and when placed in a breeding jar, and provided with leaves of lamb's quarters and beet-root, fed freely upon them until ready to pupate. They fed at night and kept out of sight by day. The last date when they were seen feeding was 12th June, and on 24th the first fully developed beetle appeared. The pupæ were white and were found in little cells about 3 inches beneath the surface of the ground.

The larvæ are entirely black, shining, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in length, rounded above, flattened beneath, $\frac{1}{5}$ inch wide and tapering to each end. The body is divided distinctly at the segments like a woodlouse or "sowbug" (*Oniscus*).

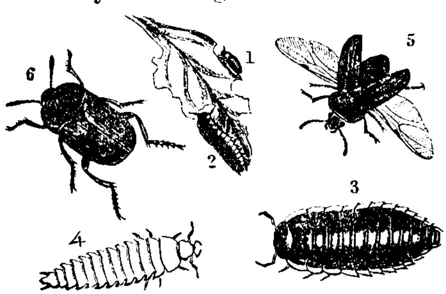


Fig. 10.—The Beet Carrion Beetle.

The beetle is dull black, flattened, having a small prominence on each wing case towards the end, and with the thorax covered with fuscous hairs.

It is in habits and appearance very much like the European Beet Carrion Beetle (*Silpha opaca*, L.), which also occurs in North America, and like that species, probably has the dual habit, both in the larval and perfect states, of feeding sometimes on carrion as well as on vegetable matter. I am indebted to Dr. George H. Horn for the identification of the imago.

These two species are distinguished as follows :—

Form elongate oval (as in *trituberculata*)................ *opaca*.

Form oval (as in *ramosa*)................................ *bituberosa*.

Of the latter Dr. Horn remarks: "It is a much broader species and in form more nearly resembles *inæqualis*." In *opaca*, the middle costa of elytron is given as extending nearly to apical margin, while in the other species it does not attain the apical margin.

Curtis's figure of the Beet Carrion Beetle (Fig. 10) kindly lent by Messrs. Blackie & Son, of Glasgow, at Miss Ormerod's request, gives so good an idea of the different stages, that Nos. 1, 2, 4 and 5 might almost answer for those of *S. bituberosa*.

Remedies.—Should this insect develop into a pest of Chenopodiaceous plants such as beet-root, mangels and spinach, it will be necessary to protect the plants during the first part of June until the larvæ have attained their full growth, by dusting them with Paris green and some dusty diluent such as flour, land plaster, or ashes (1 part to 50), or in the case of spinach it may be necessary to plant a more attractive food-plant near by as a bait, to be afterwards destroyed with the infesting insects. For this purpose *Monolepis* or lamb's quarters should be tried. In the case of young pumpkins or squashes, as the season when the larvæ attain full growth is so early, these plants could be easily protected by keeping the hills covered with cheese cloth or paper after dusting the plants with the poison mixture above mentioned. It is not likely that the mature beetles will attack plants.

FRUITS.

The crop of large fruits this year has not been remarkable for excellence. In Ontario the November bulletin says:—"The August bulletin did not speak cheerfully regarding the prospective apple crop, and reports to hand are confirmatory. The Codling moth has done much injury and so have the scab and drought, hence a considerable quantity of the unusually light yield of apples are wormy, spotted and small." In British Columbia the orchards on the mainland have been badly infested with Apple Aphis (*Aphis mali*, Fab.) and the Oyster-shell Bark louse (*Mytilaspis pomorum*, Bouché). On Vancouver Island Mr. John Tolmie reports "The fruit crop is poor this year, mainly due to heavy showers just as the fruit was forming; small fruits have, however, done well." Mr. G. A. Knight, of Victoria, B.C., also states that the Woolly Aphis (*Schizoneura lanigera*, Hausm.) is now very abundant on Vancouver Island in apple orchards, and that the Cherry-tree Slug (*Selandria cerasi*, Peck,) Fig. 11, has been this year extraordinarily abundant. This insect was also complained of to a certain extent in Nova Scotia and Ontario. At Ottawa, besides cherry trees, the larvæ disfigured ornamental hawthorns and the oak-leaved mountain ash. It is easily treated with a weak application of Paris green, or may be dusted with freshly slaked lime.

Fig. 11.—The Cherry-tree Slug.

THE SHOT-BORER (*Xyleborus dispar*, Fab.), I fear, is again on the increase in the Nova Scotia apple orchards. Through the kindnesss of Mr. W. H. Woodworth, of Berwick, N.S., and Mr. T. E. Smith, of Cornwallis, N.S., I am in possession of a large quantity of facts as to the depredations and habits of this injurious insect, and hope, at an early date, to have more definite information as to remedies than is as yet available.

Fig. 12—The Shot-borer.

Mr. T. E. Smith sent to me from North Sydney, Cape Breton, some larvæ which were abundant there upon apple trees. These, when received, had spun their cocoons; of which specimens were submitted to Prof. J. A. Lintner, and he reports: "There is hardly a doubt but that the little cocoons sent me are those of *Micropteryx pomivorella*, Pack."

THE RED-HUMPED CATERPILLAR OF THE APPLE (*Œdemasia concinna*, Sm. & Abb.) was rather abundant upon young apple trees at Ottawa, and specimens were also sent by Mr. E. Hutcherson from Ladner's Landing, B.C. These are the first specimens I have seen from British Columbia.

The curious caterpillars of the Unicorn Prominent (*Cœlodasys unicornis*, Sm. & Abb.) and of the Hag-moth (*Phobetron pithecium*, Sm. & Abb.) were sent as apple insects by Mr. W. J. Kerr, from Smith's Falls, Ont.

A pest which I found to be very abundant in the peach orchards round St. Catharines was the Peach Bark-beetle (*Phlœotribus liminaris*, Harris). This was first brought to my notice by Mr. C. E. Fisher, of Queenston, and I have later received specimens and facts bearing on the life history both from that gentleman and Capt. James Sheppard. Some experiments which are being carried on to control this insect are not yet completed, so a report upon them is deferred for the present.

Most of the fruit insects reported this year have been enemies of the apple.

THE APPLE-TREE APHIS (*Aphis mali*, Fab.).—From British Columbian reports this insect is committing serious injury in the apple orchards. In the East it is seldom that this insect develops in sufficient numbers to be ranked as a first class pest, but this season a large number of reports have been received from British Columbia complaining that even old trees had been killed. Mr. John S. Warren, in a letter to the *Orillia Packet*, gives an account of the condition of the orchards at Okanagan Mission, B.C., in which he speaks of serious loss from the Apple Aphis. Mr. J. H. Christie also sends specimens of Aphis infested twigs from the same place, of which he says: "The contents of this parcel will, I think, be somewhat of a surprise to you. The twigs sent were cut from three different orchards from trees six to eight years old, and you will have a better idea of the state of affairs here when I tell you that several ten to fifteen year old trees have been destroyed during the last year by Aphis. Large

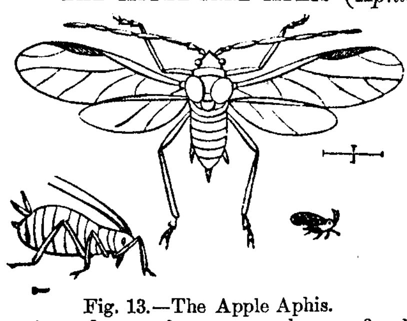


Fig. 13.—The Apple Aphis.

magnificent trees now stand blackened and disfigured monuments of the negligence of the owners. This appears to be a new pest, trees of the old-timers never having suffered before." Mr. G. M. Kinnear, of Ducks, B.C., also sent specimens of Apple Aphis with report on their serious injury to his trees.

Late in autumn the females of the Apple Aphis lay small black eggs on the twigs of the apple trees. These eggs do not hatch until the following spring. In *Insect Life* (vol. VI. p. 152), Prof. F. M. Webster, of Ohio, announces the important discovery that in the autumn this insect also migrates to fall wheat, where it propagates enormously and does much harm. Perfect females then return to the apple trees to deposit their eggs. The most satisfactory remedy I have found to be the Kerosene emulsion which should be sprayed on the trees early in spring just when the leaf-buds are bursting. As large numbers of eggs are frequently laid on the trunks of trees, these should also be well sprayed.


Fig. 14.-The Oyster-shell Bark-louse.

THE OYSTER-SHELL BARK-LOUSE (*Mytilaspis pomorum*, Bouché) is probably the worst pest of the apple tree, concerning which this year, as well as every other year, there has been much inquiry from every province of the Dominion. The life history of this insect is remarkable. About 1st of June, minute white, mite-like insects with six legs, emerge from beneath the scales on the bark, and for two or three days, during which alone of their whole lives they have the power of locomotion, run about over the twigs seeking for a suitable place to attach themselves. They then pierce the young bark with their beaks and live on the sap of the tree. They never move from that place again. Each gradually secretes a waxy mantle and by August has transformed itself into a scale covering a cluster of eggs. These remain unchanged through the winter, and the young do not hatch until the next June.

Remedies.—This insect, like many others, thrives most on unhealthy trees. When detected, therefore, measures should be adopted for inducing a vigorous growth as well as for the removal of the scale insects. Spraying just before the buds open with the Kerosene emulsion will destroy many of them; but the best time, which will vary slightly in different localities, is when the young lice are active, for they are then most susceptible to injury. Prof. A. J. Cook, of Michigan, says that no fruit grower or lover of shade trees can afford to be ignorant of the Carbolic acid emulsion. He writes: "I make it just as I do the kerosene emulsion, only stronger; one part of crude carbolic acid to from 5 to 7 parts of soap solution (one quart of soft soap, or 1 lb. hard soap in two gallons of water) is of the proper strength. This is the best preparation I know of to protect against the Apple-tree Bark-lice and Apple-tree Borers. It is applied to the trunk and larger limbs by means of a stiff brush or cloth about twenty days after the trees blossom." With regard to some inquiries which have naturally suggested themselves to two of my correspondents as to how insects which only have the power of locomotion for three days or so, and then only when extremely minute, can spread so rapidly from tree to tree in an orchard, I believe the generally accepted opinion is, that this is effected through the agency of other larger insects and birds, upon which they crawl when they visit the trees, and by which they are carried to other trees.

An attack upon Apple trees which I do not think has been previously recorded from Canada is of the Otiorhynchid beetle, *Anametis grisea*, Lec. This was received from Mr. R. Z. Rogers, of Grafton, Ont., together with specimens of the way in which apple trees were injured by having the bark eaten off the young twigs. Specimens of a very similar species were forwarded from Okanagan Mission, B.C., by Mr. F. J. Watson. As these beetles are wingless and have to climb up the stems of trees attacked, any mechanical means of preventing them, such as a band of cotton batting or one of the various kinds of "tree protectors" placed around the trunks at the time when the perfect beetles are about, would prevent injury by the mature insects. In *Insect Life* (vol. IV., p. 401) reference is made to considerable damage by this beetle to young peach trees in Goodison, Michigan; the beetles hid near the surface of the ground during the day time and ate the bark and buds during the night. Similar damage to apple trees was reported from Wisconsin in 1882. The larvæ in all probability feed on the roots of the trees.

THE MOTTLED UMBER MOTH

(*Hibernia defoliaria*, L.).

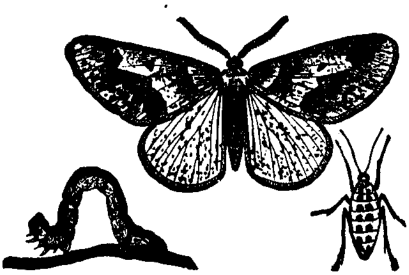


Fig. 15.—The Mottled Umber Moth.

Attack.—Slender loopers or "measuring worms," found on plum and cherry trees; 1¼ inches in length, with chestnut red heads, dark reddish brown backs, mottled with broken narrow black lines, the lowest distinct and waved; the sides bright yellow, paler beneath, including the legs. There is a dark reddish patch shaded with black, surrounding each spiracle.

Some years ago a few specimens of the Mottled Umber Moth, the well-known apple tree pest of England, were taken at Victoria, B.C., by the Rev. George W. Taylor, and since then a few more specimens have been taken by Mr. W. H. Danby of the same place. In June last I received from the latter gentleman a consignment of caterpillars, which may be described in general as above. He wrote:—

"June 20.—I send you herewith some caterpillars which feed mostly on cherry and plum trees. This species is just now rather a prominent nuisance in orchards—what is it?" In acknowledging these specimens, it was surmised that they might be the caterpillars of the Mottled Umber Moth, and Mr. Danby was requested to be on the look out for the moths. I have since received the following notes:—

"November 10.—I think you are right as to the larvæ I sent you: for I to-day caught a fine specimen of *H. defoliaria*. This moth is very uncertain in its appearance. I have seen none since the few I mentioned to you in 1889, but I expect to get more within a week or two."

"November 20.—I send you some very fine males of *H. defoliaria*. I took no less than 93 males, but only one female. This latter is quite the regular apterous female of the English *defoliaria*; but some of the males are very dark, and some very much suffused. I have as fine a series for my collection as it is possible to get. This moth occurs very rarely for a few years, and then like other pests is very common. All I took I got in one day, since which none have appeared."

"December 7.—*H. defoliaria* was wonderfully plentiful this year as compared with other seasons. During June and early in July the larvæ were a pest in most plum and cherry orchards. They seemed to prefer the plum. Apple trees growing close to plum and cherry trees were not attacked; nor can I find from such inquiries as I have made, that the larvæ were seen by any one on apple trees. I will, however, make careful observations on this point next year. The moths were very abundant in the latter half of November. The sexes seemed to average 1 female to 6 males. The electric lights proved a great attraction to the males: I collected on one morning eight dozen on the walls and doorways of two hotels, which had been attracted by the lights; and more or less were to be found for several days afterwards."

The caterpillars sent me by Mr. Danby were received at Ottawa on June 28th, and were full-grown. They pupated in a few days, most of them on the surface of the ground, but some a short distance beneath. A few specimens were parasitised by a Tachinid fly. The first moth, a male, emerged on November 27th, so that the pupal stage lasted almost five months. The pupa is smooth, dark reddish brown, nearly ⅝ of an inch in length, and has the last segment terminated with a stout spine. The male moth is of a dull ochre-brown hue, expanding 1⅝ inches, and has the upper wings dotted and crossed diagonally by two dark waved bands; the space between these is pale and bears on each wing a dark discal spot; the lower wings are paler than the upper, and like them sprinkled with brown dots and they have a dark spot near the middle. The female moth is brown with two rows of conspicuous spots down the back. The wings are almost entirely aborted.

I have to thank my good friend Miss Ormerod for the above excellent cut of this insect, which is the same as is used in her *Manual of Injurious Insects*, page 336.

The occurrence of this insect at Victoria is worthy of note, as in England it is one of the worst orchard pests, and will probably add one more to the already too long list of apple tree pests. Prof. J. A. Lintner, has already noted no less than 282 different species of insect enemies of the apple. Miss E. A. Ormerod says as to the food of the Mottled Umber Moth:—"The caterpillars are very abundant, and very injurious to the leafage of various kinds of fruit and forest trees, as oak, lime, &c. They have been especially noted as feeding at times on unripe cherries, gnawing away one side of the fruit." (*Manual of Injurious Insects*, p. 337.) The habits of this moth are very similar to those of our Canker-worms (*Anisopteryx*). When the moths appear in the autumn, the females crawl up the trunks of trees and lay their eggs on the branches. In this condition the insect passes the winter.

Remedies.—The usual remedies for the Canker-worms are applicable for this species and consist of tying sticky bandages or mechanical contrivances around the trunks of fruit trees to prevent the females from crawling up to deposit their eggs, or what will be found far more effective, spraying the trees in spring when the young caterpillars hatch, with Paris green and lime, 1 pound of each to 200 gallons of water.

An exact description of the larvæ taken from the British Columbian specimens is as follows:—

Mature Larva.—Length $1\frac{1}{4}$ inches. Head round, bilobed at apex, chestnut red, mottled. Mouth parts darkened, dorsal region reddish brown, darkened with fine black broken lines arranged as follows: a dorsal double stripe which widens a little in the middle of each segment and is shaded with pale yellow; two narrow sub-dorsal lines, rather indistinct, and placed on a reddish field; a double lateral stripe the lower line of which is distinct and sinuous. Beneath this dorsal area the stigmatal area is bright yellow. The spiracles themselves are white, ringed with black and are in the centre of blotches of reddish brown, shaded anteriorly with black. Ventral area including thoracic feet and prolegs, pale yellow. Some specimens are much darker than others; in the darkest there is a broken supraventral stripe just beneath the substigmatal fold, sometimes running up on to it. The prolegs on 10th segment are also sometimes darkened exteriorly.

I believe the British Columbian insect to be identical with the English, as I can find no difference between either the moths or the caterpillars.

SMALL FRUITS.

Small fruits in Ontario and Quebec have been a good crop this year, strawberries in Eastern Ontario exceptionally so, and, although various insect pests have been sent in, there are none of them which call for special mention.

The Raspberry Cane-borer (*Oberea bimaculata*, Oliv.) was abundant at Ottawa, as evidenced by the conspicuous injury on the young canes. The injury by this insect, however, I believe to be slight, if the grub be prevented from boring down into the canes, as can so easily be done in June by picking off the injured tips as soon as they show by fading, that an egg has been deposited. The method of nipping back the young shoots of raspberries, at this period, moreover, is in accordance with the views of some horticulturists as to the best way of cultivating the raspberry.

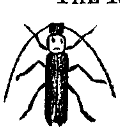


Fig. 16.—Raspberry Cane-borer.

Fig. 17.—The Gooseberry Fruit-worm, Moth and Cocoon.

The Gooseberry Fruit-worm (*Dakruma convolutella*, Hbn.) is reported by Mr. B. Loiselle as abundant at Ste. Philomène, Que. The only remedy which so far can be recommended for this insect, which seems to be attracting much more attention in Canada than formerly, is hand-picking the injured fruit as soon as its premature coloration shows that it is infested.

The Currant Saw-fly (*Nematus ribesii*, Scop.) was as usual abundant in many places, and when neglected did much harm by defoliating the bushes. Much loss every year is due to fruit growers not recognizing the fact that if the late summer brood of this insect is allowed to destroy the leaves, because as some say, "It does not matter now, as the fruit is all picked for this year;" nevertheless, they do suffer much in the quantity and quality of the next year's crop, which is largely fed, as in all early flowering plants, from material laid up through the leaves in the previous season. The larvæ of this saw-fly are extremely easy to destroy. The first brood appears in May and *for this first brood only* a weak mixture of Paris green ($\frac{1}{4}$ oz. to a pailful of water is sufficient) may be sprayed on the bushes, or a dry mixture of 1 oz. of Paris green to 6 lbs. of flour, well mixed together, may be dusted over the bushes after a shower, or when damp with dew. For the second brood of caterpillars, which appears just before the fruit ripens, Paris green must *on no account* be used, owing to its poisonous nature; but instead of it, white hellebore, dusted on dry, or in water, 1 oz. to a pailful of water, will be found quite effective.

Black currants were much affected by Red Spider in the districts where drought prevailed. The same pest was also very abundant on a plantation at Ottawa, where, however, it was to a large extent kept in check by numbers of one of the small Lady-bird beetles (*Scymnus punctatus*, Melsh.) (?)

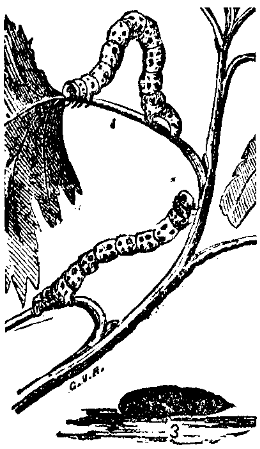


Fig. 18.—Currant Span-worms and Chrysalis.

THE CURRANT SPAN-WORM (*Eufitchia ribearia*, Fitch) was also present in small numbers at Ottawa, and specimens were sent in from Mr. R. Bogue, of Moose Jaw, Assa., who writes: "July 5.—The inclosed caterpillars are doing much mischief on my currants. They first attacked wild bushes, later the cultivated ones. They have not touched the red and white currant bushes. They strip the leaves off, leaving only the fruit." Mr. W. F. Morden also writes from Morden, Man., concerning the same insect, stating that he had tried spraying the bushes with white hellebore, but that it had not worked as satisfactorily as he would have liked, and asking if there was a better remedy. This caterpillar is much more difficult to destroy than the false caterpillars of the Imported Currant Saw-fly, and it is necessary to use Paris green. As there is only one brood in the season, it is easily controlled. If it is considered unadvisable to use Paris green, the conspicuous yellow and black larvæ can be easily picked off by hand.


Fig. 19.—Moth of Currant Span-worm.

Strawberries have been little attacked, no report having been received of the work of the Strawberry-weevil (*Anthonomus signatus*, Say), this year. White Grubs (*Lachnosterna*) and true bugs have also only been reported as injurious to this crop in single instances.

Several kinds of the true bugs have been abundant in gardens, and have attracted more than usual notice. Mr. J. A. Morton, of Wingham, Ont., sent a box containing the Tarnished Plant-bug (*Lygus pratensis*, L.), and the Four-lined Leaf-bug (*Pœcilocapsus lineatus*, Fab.), which had been very destructive in his garden. He said: "They seem to be omnivorous, and attack currant and gooseberry leaves, and sage, also fennel, the leaves of *Cypripedium spectabile*, the common chickweed, this latter not so much as I would like, flowers of Gladioli very badly, when they shrivel, sweet corn kernels when young, if they can get at them." In replying, I suggested that the attack upon the last five plants named was by the TARNISHED PLANT-BUG, and upon the three first by the Four-lined Leaf-bug. The former insect (Fig. 20) passes the winter in the perfect state and attacks plants throughout the season. It is a difficult insect to combat, when, as this year, it occurs in excessive numbers. It sucks the juice from the leaves and flowers of many plants, frequently injuring the young shoots

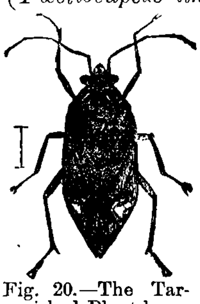


Fig. 20.—The Tarnished Plant-bug.

of apple trees and annuals in gardens, its poisonous punctures causing the flowers to become distorted. Spraying the infested plants with Kerosene emulsion, or dusting them with insect powder, are the active remedies which have been attended with most success, but these cannot be claimed to be altogether satisfactory. The cleaning up of gardens and the burning of all rubbish in the autumn, which will reduce the shelters available for the perfect insects to pass the winter, are very important. Advantage may also be taken of the fact, that although during the heat of the day these bugs are extremely active, they are comparatively sluggish early in the morning, when many of them may be destroyed by beating them off the plants into an inverted umbrella or other receptacle.

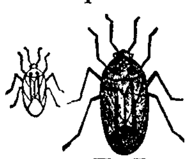


Fig. 21.—The Four-lined Leaf-bug.

THE FOUR LINED LEAF-BUG (Fig. 21, natural size and enlarged,) is not injurious to as large a number of plants as the last named. It is a bright greenish yellow bug, $\frac{3}{10}$ inch in length, with two spots on the thorax, and four black stripes down the back. The presence of this insect upon plants is easily detected by the brown spots it makes upon the leaves near the tips of the branches. This injury is most often seen upon currants, gooseberries, and mint, but also on several other plants, as weigelas, dahlias, snapdragon and sage. Mr. M. V. Slingerland has lately published a very complete account of this insect, which he has made a subject of special study. He has made the important discovery that the winter is not passed in the perfect state, but in the egg state, the eggs being imbedded in the tips of shrubs. This discovery places at any rate a partial remedy within our hands, namely, cutting off the young shoots containing the eggs and burning them. Mr. Slingerland says: "On bushes which have been infested this year the egg scars can soon be found, as the whitish tips of the eggs are quite conspicuous. After a few have been found and their characteristics noted, it will take but a few minutes to look over a bush and clip off the tips of shoots containing eggs. The eggs remain in these tips nine months, thus making it practicable to do the pruning during winter months when other work is not so pressing. The leaves will then also be off, and the egg scars can be more easily seen."

Of insects attacking the grape vine, the kinds which have been most troublesome are the Grape-vine Leaf-hopper (*Erythroneura vitis*, Harris) and the Grape-vine Flea-beetle (*Graptodera chalybea*, Illig.). Specimens of the Beautiful Wood Nymph (*Eudryas grata*, Fab.) were sent to me by a few correspondents, but more as objects of beauty than as injurious insects. On the Experimental Farm at Ottawa, Mr. Craig, the Horticulturist, records unusual injury by the Large Red-headed Flea beetle (*Systena frontalis*, Fab.). Major Roland Gregory sent me twigs of grape-vines injured by the Snowy Tree-cricket (*Œcanthus niveus*, Serv.).


Fig. 22.—The Grape-vine Leaf-hopper.

THE GRAPE-VINE LEAF-HOPPER.—This is a well known enemy of the grape vine and Virginian creeper, and is generally spoken of among fruit-growers as the "Thrip." It is about $\frac{1}{8}$ of an inch in length, marked with red and pale yellow, as in the enlarged figure (Fig. 22). It is very active and generally occurs in large colonies, when its attacks upon the foliage are so severe that vines are frequently defoliated and the fruit is consequently destroyed. It is furnished with a sharp beak with which it sucks the juice out of the leaves, causing them first to turn white in patches and then fall from the vine. It passes the winter in the perfect state, hidden amongst fallen leaves and other rubbish. In the spring it flies to the vines and deposits its eggs, from which the injurious swarms of young leaf-hoppers hatch.

Remedies.—These consist of clean culture and the clearing away of all fallen leaves in autumn, so as to reduce as far as possible the opportunities of wintering near the vines. For this same reason the ground should be raked and kept smooth in autumn. The vines should be examined during the summer, and if the young insects are observed on the leaves, the vines should be sprayed with Kerosene emulsion before the insects reach their perfect development, when only they acquire wings and are able to fly.

Fig. 23.—The Grape-vine Flea-beetle.

THE GRAPE VINE FLEA-BEETLE.—This is a shining blue-black flea-beetle $\frac{1}{4}$-inch long, which sometimes appears in large numbers on grape vines when the buds are bursting, and again late in summer. The grub is of a dirty, yellowish-brown, with black shining bristle-bearing tubercles on the body. This, like the mature beetle, feeds on the foliage which it riddles with holes. Fig. 23 shows the Grape Vine Flea-beetle enlarged; the hair line at the side indicates its real length.

Remedies.—Dusting the vines in early spring when the beetles appear with Paris green and lime (1 lb. to 50), or spraying $\frac{1}{4}$-lb. Paris green to 50 gallons of water. Clean culture and the burning of all leaves and rubbish, as well as keeping the ground smooth, will prevent the mature beetles, which pass the winter in that state, from hibernating near the vines.

Fig. 24.—The Snowy Tree-cricket.

THE SNOWY TREE-CRICKET.—This is not so frequently injurious to the grape as to the raspberry, of which, however, Prof. Saunders (*Insects Injurious to Fruits*, p. 308) considers it the most troublesome enemy. The injury is committed by the female in the operation of depositing her eggs. These are laid in the autumn in long rows of punctures which weaken the stems so that they break easily. The young hatch out in the spring and feed upon other small insects. The injured twigs should always be cut out and destroyed. Fig. 24 shows the female of the Snowy Tree-cricket life-size.

THE LARGE RED-HEADED FLEA-BEETLE.—This beetle belongs to an extensive family of injurious beetles, the *Chrysomelidæ*, and is a slender beetle $\frac{1}{6}$ of an inch in length by $\frac{1}{16}$ in width at the widest part. The whole body is black and shining, with a dull red patch on the top of the head in front. The beetle was particularly troublesome last season and attacked a great variety of plants. Potatoes and horse-beans, many kinds of deciduous shrubs and particularly grapes were at times badly damaged. Mr. Craig found it very injurious to young grape vines at Ottawa. Its attacks were worst on those varieties which belonged to the thin-leaved grapes derived from *Vitis riparia*. The greatest damage was done to some young seedlings which were not trained on trellises and which had not been sprayed with fungicides.

Remedy.—Spraying infested plants with Paris green, $\frac{1}{4}$ lb. to 50 gallons water.

THE BLACK VINE WEEVIL

(*Otiorhynchus sulcatus*, Fab.).

Attack.—Snout beetles, three-tenths of an inch in length, black, spotted with white, which attack foliage of various plants. In the larval state, yellowish white grubs, with head darker, which attack the roots. It may be specially noted as bearing on the question of remedies, that the wing cases which in most beetles are separate and cover true wings, in this family are joined together, and the beetles have no wings, so that they can only reach their food plant by crawling.

Last winter I received from Mr. G. A. Knight, of Victoria, B.C., some specimens of Coleopterous larvæ. He wrote later :—

"February 25.—I received your letter some time ago, asking for some more grubs. They are now turning into beetles, so I send them on. They are from Cyclamen plants in the green-house."

"March 31.—The weevil grubs only eat the roots of the Cyclamens and make them sickly and unsaleable. I had thrown my plants away before I received your last letter. I only grow a few Cyclamens, there being little demand for them. I raise the plants from seed every year. I think I have seen a few of these larvæ out of doors. They attack lots of other plants in the green-house beside Cyclamens.

Gloxinias and Adiantums they are very bad on, eating the roots of the Gloxinias and the young fronds close to the roots of the Adiantums."

The Black Vine Weevil is a rare insect in Canada. In the *Canadian Entomologist*, XXIII. (1891), page 72, Mr. W. Hague Harrington writes: "*Otiorhynchus sulcatus*, Fab., was found by me at Sydney, C.B., Nova Scotia, in August, 1884, and again in September last. It is apparently quite abundant, as at several points I found fine fresh specimens under boards, &c. Provancher states that this beetle is common in Quebec, and adds: 'We think that its larva lives in haws, as we have nearly always found it beneath hawthorns and apple trees.'" It may be noted that this last suggestion is erroneous, as the larvæ live in the soil and attack roots. In 1891 I received a specimen of this weevil from Mr. W. H. Danby, of Victoria, B.C., and later, as recorded above, specimens came from Mr. Knight of the same place. These are the only records that I know of, of the occurrence of this insect in the Dominion. In *Insect Life*, III., page 37, Mr. E. A. Schwarz says: "*Otiorhynchus sulcatus* occurs in both North America and Europe. In the latter country it has been frequently mentioned as an enemy to grape vines, strawberries and other cultivated plants. In North America, Dr. J. A. Lintner (*Second N.Y. Rep.*, 1885, p. 51) introduced it, on the testimony of Mr. S. Henshaw, as a species injurious to 'bulbs and house plants,' Mr. Henshaw's statement apparently referring to injury done in Massachusetts. Quite recently Dr. H. A. Hagen (*Psyche*, V., 1890, No. 167–68, p. 333) states that this species has injured Cyclamens in green-houses at Montvale, Mass., the flowers being destroyed, and in some instances the bulbs injured. As to the probable future course of this pest, we do not anticipate that its injury will be a very serious one, nor that it will spread very much. The species was already known from North America to coleopterists more than sixty years ago, and is confined to the extreme north-eastern portion of the country (from New York northward to Newfoundland and Nova Scotia). For this reason we are inclined to believe that it is not an imported species, but that it belongs (with the other species of *Otiorhynchus* known from North America) to the circumpolar fauna."

By a further note (*Insect Life*, IV., p. 222), it is shown that the weevil has a great partiality for ferns, and it is stated to be "still comparatively rare in this country. In Europe it has long been known as a pest attacking the grape, strawberry and raspberry, and Miss Ormerod records an instance of its having ravaged a field of mangel-wurzels in England. The beetle feeds at night and remains under shelter during the day. Its nocturnal habits render it comparatively easy to deal with. The larvæ are not so readily destroyed, but the beetles may be shaken at night from the plants infested by them or may be captured by what is known as the chip-trap process, both well known methods employed against the native Plum Curculio."

In the letter given above by Mr. Knight it is shown that this insect is capable of committing considerable injury in British Columbia, and it is probable that less careful observers have overlooked it.

FOREST TREES.

Forest insects have not been brought before the department very much during the past season, most of the injuries reported having been to cultivated shrubs. The most serious of these is by the WESTERN TEN-LINED JUNE BUG (*Polyphylla decemlineata*, Say) upon nursery trees in Vancouver Island. Grubs were sent by Mr. G. A. Knight, of Victoria, who had found them very destructive in his nursery. He wrote: "I send you some young plants of *Cupressus Lawsoniana* to show how plants of different kinds are attacked by these pests. They are also very bad on strawberries and young cherry trees. In fact, I know nothing that they will not attack. They are also very hard on young grafts, such as Irish yews, *Cedrus Deodara* and *C. Libani*, Araucarias, etc. There appears to be no remedy for this destruction in a nursery because the plants are dead before one knows that the grubs are at work. The only way seems to dig up the plant and kill the grub."

"March 31.—I send you some more large grubs and some small ones that I found with them. A few days ago I was digging up two rows of young plum trees raised from cuttings, and found about one hundred of the large grubs and a large number also of the small ones."

In July last Mr. Knight also sent me the larvæ, chrysalides and a perfect beetle with the following note: "Last week I was forking among the roses and I found about thirty chrysalides. I forward you some of them. The grubs are playing havoc again this season."

This large handsome beetle is 1¼ inches in length by over ½ inch wide. It is shaped like the ordinary June-bug, is of a tawny brown appearance with four white stripes and a short dash from the shoulders on each wing case. The colour of the wing cases is really black, but they are so covered with tawny scales as to give the beetle a brown appearance. The thorax is piceous, bears three longitudinal white stripes and is covered with tawny scales. The whole of the thorax beneath is densely covered with long silky down, which also appears above as a conspicuous tuft between the thorax and the wing cases. Abdomen beneath banded with white. A remarkable character in this genus is that in the antennæ of the males, the terminal joint is very much enlarged and curved, in this species ⅜ inch in length. It consists of seven plates closely appressed together. The larva from which this large beetle comes is a formidable enemy. When full-grown and stretched to its full length, it is 2½ inches in length, by ⅝ inch wide. The body is curved and white. The head pale chestnut, the mandibles black. Thoracic feet long and slender. When full grown, it forms a large cell nearly 3 inches in length by 1 inch in diameter and changes to a pupa from which the perfect beetle emerges two or three weeks later. I regret to say that for the present, I am unable to suggest any practical remedy.

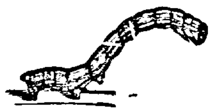


Fig. 25.—Canker-worm

CANKER-WORMS, the larvæ of two Geometrid moths (*Anisopteryx vernata*, Peck, and *A. pometaria*, Harris), were very abundant in the Ottawa district last spring. Only one instance, however, came under my notice of their attacking fruit trees. They were so abundant in the woods that basswoods (*Tilia*), ashes, and maples (*Acer dasycarpum*, Ehrh.) were in some places almost defoliated. In Winnipeg they were very abundant upon the ash-leaved maples grown as shade trees. Through the commendable efforts of Mr. W. G. Fonseca, of that city, some of the residents were induced to spray their trees with Paris green, and as a consequence many trees were saved. The result of this spraying will also show itself in the future.

The NEGUNDO PLANT-LOUSE (*Chaitophorus negundinis*, Thomas).—For several years complaints have been received from Manitoba of an injurious plant-louse upon the ash-leaved maples (*Negundo*), but I always failed to obtain specimens until this year, when a letter was received through Mr. S. A. Bedford from Mr. Thomas Partington, town clerk of the town of Selkirk, Man., as follows:—

"June 9.—I inclose sprig of maple for your inspection. All the maples in the town (and we have hundreds of them planted) are covered with these lice, and we are afraid the trees will be ruined. Will you please advise me what to do. Would spraying with tobacco water do, or smoking smudges made underneath have any effect? Kindly advise us as soon as possible."

At the same time other specimens were received from the same place, from Mr. A. H. Vaughan. Both of the above were advised to use the ordinary Kerosene emulsion. Subsequently I received the following very satisfactory letter:—

"July 10.—*In re* insects on trees, I thank you for your letter and Bulletin 11. We tried the Kerosene emulsion and found it quite effectual. I think 9 parts of water to 1 of emulsion is a little too strong. With 20 gallons of oil and soap and 12 times as much water we have sprinkled and saved many hundreds of large trees."—THOMAS PARTINGTON, *Town Clerk, Selkirk, Man.*

LIVE STOCK.

THE HORN-FLY

(*Hæmatobia serrata*, Rob-Desv.).

On page 144 of my last year's report I referred to a new cattle pest which had appeared in Canada for the first time in the summer of 1892. This was the Cattle Horn-fly, *Hæmatobia serrata*, of which an enlarged representation is given herewith. The perfect insect is shaped much like the Common Cattle-fly or the House-fly, but is smaller and slighter, being only one-sixth of an inch in length, that is, one-third the size of those insects. The colour is dark gray with a yellowish sheen, and the body is covered with short black bristles. The head consists almost entirely of the dark-red silver-edged eyes, but bears on its lower surface the black dagger-shaped tongue which is the cause of so much torture to cattle. When not in use this organ is carried projecting in front of the head. This pest will be at once distinguished from the ordinary Cattle-fly by its smaller size, greater activity and a characteristic habit of gathering in clusters upon the horns of cattle, for which reason it is now generally known as the Horn-fly.

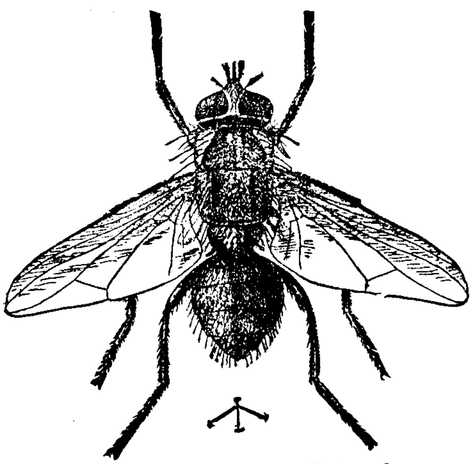


Fig. 26.—The Horn-fly. Enlarged.

It is also for some unaccountable reason often referred to as the "Texas fly." This is only the second year since it first appeared in Canada, but it has increased and spread so quickly, that it has produced great consternation among cattle owners. The frequent assertion that the flies or the maggots have caused the death of cattle by boring into the horns, head or body, is entirely inaccurate: the whole injury is due to the bites of the fly; however, the irritation from this cause is in many cases so great that animals fall off rapidly both in flesh and yield of milk.

The life history is briefly as follows:—The mature flies appear early in spring and lay their eggs upon the fresh droppings of cattle. These soon hatch and the maggots live in the dung while it is in a moist condition. They then turn to pupæ in or beneath the dung, and the flies again appear within two or three weeks from the time the eggs were laid. There can thus be several broods in a season.

The enormous increase and rapid spread of this insect throughout the provinces of Ontario and Quebec caused naturally enough, as stated, great consternation among stock owners and dairymen. In many districts the loss was most serious, and I have been informed by cheese-makers that during July in the several districts the amount of milk supplied by their patrons was reduced at least to half the quantity it would have been, but for these pests. A large number of letters were received asking for remedies. The following are selected to show how severe the injuries were, although from what I have been told at farmers' meetings, these do not at all indicate the real extent of the loss in many districts of both Provinces.

"July 18.—Will you kindly send me recipe for the fly pest on cattle? The milk has gone down tremendously in this section during the past week owing to the flies."—OGDEN HINCH, *Napanee, Ont.*

"July 30.—The horn-fly is playing the mischief hereabouts and we must take prompt measures to fight the pest and minimize the loss it is entailing. The falling off in milk production within a week has been about 25 per cent, in spite of the fact that frequent rains have kept the pastures in unusually good condition for the season. The milk delivered at a local creamery has diminished in eight days or so from 21,000 to 15,000 lbs. This you will see is a serious matter."—C. H. PARMELEE, *Waterloo, Que.*

"August 10.—Please send me a horn-fly Bulletin. The flies are very bad and the cows are shrinking and other cattle losing flesh in a frightful way. I have been spraying my cows, etc., for a fortnight with Kerosene emulsion as recommended; but it seems to do but little good. Have you found anything better at Ottawa?"—SYDNEY A. FISHER, *Knowlton, Que.*

So great was the demand for information on this subject from the Province of Quebec that the French edition of Bulletin 14 on the Horn-fly was soon exhausted, and by instruction of the Honourable Minister of Agriculture, I prepared a revised edition which was printed and distributed widely. At the same time I also prepared a single-sheet illustrated circular for publication in newspapers. Copies of this circular were sent to the leading French and English newspapers, together with stereotypes of the above figure, and by that means many who would not otherwise have been reached, obtained the information required to enable them to protect their cattle. The following are the remedies which I have suggested:—

Remedies.—Almost any greasy substance rubbed on the animals will keep the flies away for several days. A number of experiments were tried in the field, with the result that train-oil alone, and train-oil or lard with a little sulphur, oil of tar or carbolic acid, added, will keep the flies away for from five to six days, while with a small proportion of carbolic acid it will have a healing effect upon any sores which may have formed. Axle-grease, tallow, and any such greasy substance can be used to advantage, but train-oil or fish-oil seem to be more lasting in their effects than any others experimented with.

The safest and most convenient way of using carbolic acid is in the shape of carbolized oil which can be prepared by dissolving one ounce of crystallized or liquefied carbolic acid in 1 quart of oil. Train oil, fish oil, tanner's oil, olive oil or any other fixed oil will answer; but not coal oil, as carbolic acid is not soluble in this liquid. The crude carbolic acid does not dissolve easily in fixed oils, and therefore must not be used. Instances have been reported to me of injury to animals, and the hands of operators, when the crude has been substituted for the purer form of carbolic acid.

An effective and undoubtedly the easiest remedy to apply, if a small spray pump be used, is the Kerosene emulsion; which consists of the following:—Kerosene (coal oil), 2 quarts; rain water, 1 quart; common hard soap, 2 oz. Boil the soap in the water till all is dissolved; then while boiling hot, turn it into the coal oil, and churn it constantly and forcibly with a syringe or force pump for five minutes, when it will be of a smooth creamy nature. If the emulsion be perfect, it will adhere to the surface of glass without oiliness. As it cools it thickens into a jelly-like mass. This gives the stock emulsion, which must be diluted before using with nine times its measure (that is, twenty-seven quarts) of water. It will be found to mix much more easily if done at once, before it cools. The above proportions give three quarts of the stock emulsion, which with twenty-seven quarts of water added make up thirty quarts of the mixture ready for use. This may be applied to the animals by means of a sponge, brush, rag, or, what will certainly be found most convenient where there are many animals to treat, by means of a force pump and spray nozzle. The emulsion thus made and sprayed over the cattle kills all the flies it reaches, and if repeated twice a week will almost entirely relieve cattle from annoyance. Another method of diluting the coal oil is to make the emulsion with milk instead of soap and water. Take sour milk, one part; coal oil, two parts. Mix the two thoroughly, as described above for the soap emulsion. Then dilute with water, so that one part in ten will be coal oil.

Prof. H. A. Morgan, of the Louisiana Experiment Station, has tried some experiments during the past year with various materials, the results of which he summarizes as follows:—"It was soon found that none of the solutions were of much value except Kerosene and Fish-oil emulsions, and after a third trial, all were discarded except these. At this time the Fish-oil emulsions had shown superiority over the Kerosene, and further trials soon showed that animals after four or five days from time of spraying with Fish-oil emulsion were free from attack of flies, while those upon which Kerosene emulsion had been used were more or less annoyed." (*Louisiana Exp. Station Bull., 2nd series, No.* 22.) Fish-oil emulsion differs from Kerosene emulsion only in the substitution of fish-oil for coal oil or kerosene.

A good way to fight this pest will doubtless be to prevent it from breeding and increasing. As stated above, the maggots can live only in the moist droppings of cattle. Any means, therefore, which will insure the drying up of these before the maggots are full grown, will destroy them. This can be done most easily by spreading the dung out in the pastures regularly and at short intervals. Twice a week would be sufficient, and it would be equally effective in wet weather when the substance would be washed away, as in hot weather when it would be dried up.

Where the flies gather in large numbers, on the ceilings and walls of stables in cool weather, or when driven from the cattle by applications, they can be destroyed by spraying them with either Kerosene emulsion or a strong decoction of Pyrethrum Insect Powder. Dusting them with dry Pyrethrum powder by means of an "insect gun" would also be effective.

In studying the history of this insect since it first appeared in North America in 1887, I have noticed that at the places where some years ago its attacks were very severe, it is now much less troublesome. I was, therefore, led to hope that after a time, the considerable loss which Canadians are now suffering from the Horn-fly, would be much less. Correspondence with entomologists confirmed this view. In reply to letters, on this point and with regard to any new remedies which might have been discovered, addressed to the United States Entomologist, and other specialists who have studied this pest, I have received the following:—

"Yours of 25th has been received during Prof. Riley's absence. We have found nothing better than Kerosene emulsion for the protection of cattle from the Horn-fly. In answer to your second question, I may say that it has been almost the invariable rule that the second year the flies are worst, and after this bad second year the numbers are fewer. We have explained this on the ground that native parasites preying ordinarily on native dipterous larvæ in cow-dung acquire a taste for the Horn-fly larvæ after a short time."—L. O. HOWARD, *Acting Entomologist, Washington, D.C.*

"Concerning the Horn-fly, I have nothing new in the way of remedies. As I have stated on several occasions, the insect is not now troublesome in our State, and there is no necessity for applications of any kind to cattle. Our farmers found fish-oil with a little carbolic acid to be much the most satisfactory material that could be used, and I never could induce any to try the Kerosene emulsion. *A propos* of this, at the Madison meeting of the Association of Economic Entomologists, in the course of a discussion, almost all those who had been advocating the use of Kerosene emulsion on live stock, stated that they did not further recommend it, because of the difficulty of getting farmers to make it properly, and of the danger where it is not properly made."—PROF. JOHN B. SMITH, *New Jersey Agric. Coll. Exp. Station.*

Prof. W. B. Alwood, of West Virginia, has found that the stock emulsion diluted ten times and mixed with one part of water extract of tobacco waste (made by steeping 1 pound of tobacco stems in 1 gallon of hot water for an hour or more), gave almost perfect immunity for a period of three days, and that two treatments per week almost entirely relieved his cattle from annoyance. He makes the application with a knapsack pump fitted with a cyclone nozzle, and the work is done just after milking time. His method is as follows:—The animals are driven into an inclosure through a gate which will only admit one at a time. A man with a knapsack pump on his back stands at the gate and sprays one side of each animal as it passes; they are then driven out again, and the other side is treated in the same manner. The quantity of liquid thus applied is very small, but has been found sufficient.

Prof. Alwood writes recently:—"Concerning treatment of Horn-fly I am proceeding still just as given in my note at Washington meeting. (*See above*). Of course details vary with conditions and surroundings. The Horn-fly has given no trouble to speak of, this season. It began its depredations here in 1889, was bad in 1890 and 1891, less so last year, and was scarcely noticed this year after July."

With reference to the remedies above given I must mention that I have had complaints from two or three, that the Kerosene emulsion did not protect the cattle for a sufficient time to make it worth while to apply it. I, therefore, have experimented to find something more effective. The results of these experiments were that, when the flies are at their worst, it is necessary to spray cattle with the ordinary Kerosene emulsion every two days. Tanner's oil containing some carbolized oil, or oil of tar, is more lasting in its effects, but takes longer to apply and requires much greater labour.

DIVISION OF BOTANY.

A large number of additions have been made during the year to the collection of shrubs and trees in the Arboretum; many species of the following genera were allotted places in their own groups in the Botanical garden, viz., the Ashes (*Fraxinus*), the Lilacs (*Syringa*), the Elms (*Ulmus*), the Meadow Sweets (*Spiræa*), the Withe bushes (*Viburnum*), the Poplars and Willows (*Salicaceæ*), and in addition to these, several specimens were added to other orders of plants. Many plants were set out in the border for perennials, and the seeds of others were sown for future transplantation.

At present the collection of trees and shrubs in the Arboretum consists of 600 different species and varieties, all of which are arranged to show the individual species to the greatest advantage and grouped in families. There are in nearly all cases two specimens of each kind.

Notes have been taken as to the comparative beauty of the different varieties of flowering shrubs, their hardiness at Ottawa and the dates at which they flower. Herbarium specimens have also been taken to show to any one wishing to know the appearance of the best and hardiest shrubs and ornamental trees before purchasing. The following is a list of the orders represented in the Arboretum, with the numbers of species in each order:—

Anacardiaceæ	9
Anonaceæ	1
Araliaceæ	1
Berberidaceæ	12
Betulaceæ	13
Bignoniaceæ	5
Caprifoliaceæ	51
Celastraceæ	9
Compositæ	1
Coniferæ	83
Cornaceæ	18
Cupuliferæ	47
Ebenaceæ	1
Elæagnaceæ	12
Ericaceæ	1
Hamamelaceæ	2
Juglandaceæ	9
Lauraceæ	2
Leguminosæ	23
Magnoliaceæ	1
Moraceæ	5
Myricaceæ	3
Oleaceæ	60
Platanaceæ	2
Rhamnaceæ	6
Rosaceæ	64
Rutaceæ	2
Salicaceæ	56
Sapindaceæ	34
Saxifragaceæ	27
Simarubaceæ	1
Solanaceæ	1
Ternstrœmiaceæ	1
Thymelaceæ	1
Tiliaceæ	8
Urticaceæ	27
Verbenaceæ	1

AWNLESS BROME, AUSTRIAN BROME

(*Bromus inermis*, Leyss).

This grass which has sprung rapidly into favour with most who have tried it, has now been under cultivation at Ottawa for 6 years. It has been reported upon favourably two or three times (*C. E. F. Annual Report*, 1890, p. 185; 1891, p. 213; *C. E. F. Bulletin* 19, p. 10.) and all reports which are now being received, particularly from the North-west Territories, are almost universally in praise of it. In order to get it known as soon as possible in those districts where such a grass was urgently needed, samples were distributed to farmers in all parts of Canada in rather larger packets than those which were included in the collections of desirable grasses sent out for testing. From such reports as are to hand, I am therefore able to speak more confidently of the value of this grass than if the opinion were formed only upon my experience with it here at Ottawa.

Fig. 27.—Awnless Brome Grass.

It is a perennial with a running rootstock. It is conspicuous for its free leafy growth and tall stems which bear an abundance of good seed. It has proved itself to be very hardy, earlier than most of the grasses in cultivation, and a heavy cropper. It flowers at Ottawa in the last week of June. On good rich moist soil it has produced over 3½ tons of hay to the acre, and later a heavy aftermath of succulent leafy shoots. It has great power to withstand drought, as has been observed by my western correspondents. Prof. S. M. Tracy, Director of the Mississippi Experiment station and one of the leading specialists of economic grasses in the United States, says of it: "This is nearly related to the well-known 'rescue grass,' but is decidedly superior in its more permanent character and ability to thrive on drier and less fertile soil. It starts into growth with the autumn rains, and is fresh and green during the winter months, being uninjured by our heaviest frosts." (This is in Mississippi, but it is equally true in Canada.—*J. F.*) "It forms a compact sod so firm as to prevent the growth of other grasses and weeds, and the yield of forage is larger than from any other winter grass we have tested. It is eaten well by all kinds of stock." (*U. S. Dept. of Ag. Rep.*, 1892, p. 209.)

On the whole we consider this one of the most valuable of the introduced grasses, both from its feeding qualities as evinced by the following analysis made by Mr. Shutt, in which it is shown to be rich in albuminoids and at the same time low in fibre, and also for its free luxuriant habit of growth, its earliness, heavy aftermath and hardy nature. The seed is light and should be sown by hand when there is a slight breeze. It may be sown from 28 to 35 lbs. to the acre. The seed weighs 14 lbs. to the bushel.

Analysis of Awnless Brome.	Green Plants.	Water-free Substance.
Water	63·02	0·
Ash	3·12	8·45
Protein (albuminoids)	4·99	13·50
Fibre	11·18	30·24
Carbohydrates	17·27	46·65
Fat	0·42	1·16
	100·00	100·00

GRASS FOR THE PROTECTION OF SHORES AND HARBOURS.

Inquiries are frequently made for the seeds of grasses to be grown as binders of shores and sand banks. During July last, information was sought on this subject by Mr. E. T. P. Shewen, resident engineer of the Department of Public Works at St. John, N.B., Mr. Shewen writes:—

"August 30.—My object in using the grass is to stop the dry drift of sand which is now filling a harbour. The beach I wish to protect at Cape Traverse is flooded in gales."

At the time I received the above letter I had neither seed nor plants of the true Beach grass, *Ammophila arundinacea*, Host., (=*Calamagrostis arenaria*, Roth, =*Psamma arenaria*, R. & Sch.), nor could I, although it is a native of Canada, obtain any from seedsmen or others. In 1890 I received from Mr. John Mather of Ottawa, seeds of that grass and the closely similar *Elymus arenarius*, L., both imported from Scotland by him for the very purpose desired by Mr. Shewen. Of all the seed sown of both species, only two plants of *Elymus arenarius*, Sea Lyme grass, grew, and these have increased and spread enormously since they were first put out in 1891. These two grasses are extremely alike in appearance and habit of growth, in fact in everything except their inflorescence. I therefore sent Mr. Shewen in September about 100 sets of this grass and some of the seed. Some time in October I had the pleasure of showing Mr. Artemas Howatt of Tryon, Prince Edward Island, over the grass beds and was explaining the uses of the Sea Lyme grass to him, when he told me he was sure it, or a similar grass, grew on the shores of Prince Edward Island. It at once occurred to me that the grass he spoke of might be the Beach grass I had been trying to get. He kindly sent me, on his return home, a good supply of the roots and some of the seeds from which I saw it was the true Beach grass.

I at once wrote to Mr. Shewen, and he has corresponded with Mr. Howatt with a view to getting a supply of the grass roots.

These two grasses mentioned are probably the best varieties for growing for the purpose named, on the sea shore, where the disturbance is sometimes very great. Indeed this disturbance seems to be a necessary factor towards their full development. They will however flourish inland and at localities where they are in no way affected by the sea or its influences, as I have found at Ottawa. On lake and river shores the different forms of *Agropyrum repens*, L., (Quack, Couch, Scutch, etc.) may be grown, or the Holy grass (also called "Indian Hay" and "Vanilla Grass," *Hierochloa borealis*, R. & S.). A trial might also be made with the new fodder grass, *Bromus inermis*, Leyss, (Awnless or Austrian Brome grass). When it can be obtained, however, it is probable that the true Beach grass (*Ammophila arundinacea*) is the best of all for protecting harbours, and after that the Sand Lyme Grass (*Elymus arenarius*).

The following extract from Sowerby's *English Botany*, will show the great value of this grass for the purpose recommended: "This grass is known as Mat grass or Murram. Dr. Prior says, the latter name is derived from the Gaelic *muram* or the Danish *marhalm*, sea haulm or straw. Its value as a natural sand-binder cannot be overrated; many thousand acres, on various parts of our coast, are preserved from being overwhelmed by the drifting sand by means of its agency. In the latter part of the last century a large district on the eastern side of Scotland, near the Moray Firth, was completely destroyed and rendered in a few years as desert as the Sahara by the advance of the sand from the shore, owing to the wanton destruction of the Murram that grew upon it. This grass, therefore, when found growing on sandy shores, should always be carefully preserved by proprietors of land. Acts of Parliament have been passed to protect it, which are but little attended to; and in Holland it is said that its destruction is a penal offence. The strong underground stems, which render it so valuable as a protection against the action of the wind and waves, are capable of being made into ropes; and people near the coast often plait them into mats, whence one of the common names of the grass. Professor Buckman says: 'We have exhumed rhizomata of this grass several feet in length, and as these mat and weave together, in the position indicated, they act as powerful conservators of the coast-line, and we cannot help thinking that the *Psamma* might be cultivated with advantage with the view of keeping together some of our slippery railway embankments. To this it may be objected that it is a maritime species; but inasmuch as we have grown it on the sandy clays of the Forest Marble, far remote from the seaside, we have no fear of its success on this account.'"

The following is extracted from "*Grasses and Forage Plants*" by Charles L. Flint (Boston, 1887), and shows what an important role the plant has played in the history of a part of the American coast: "This grass is very generally diffused on sea coasts over the world and is found inland on the shores of Lake Superior. It has also been cultivated by way of experiment and with success on the sands at Lowell, Massachusetts, and still further up on the banks of the Merrimack River. Though not cultivated for agricultural purposes, it is of great value in protecting sandy beaches. It is preserved in England and Scotland by act of Parliament. It flowers in August.

"As it is of national importance in protecting our sandy coasts, some account of its culture may not be inappropriate or uninteresting. The town of Provincetown, once called Cape Cod, where the Pilgrims first landed, and its harbour, still called the Harbour of Cape Cod,—one of the best and most important in the United States, sufficient in depth for ships of the largest size, and in extent sufficient to anchor three thousand vessels at once,—owe their preservation to this grass. To an inhabitant of an inland country it is difficult to conceive the extent and the violence with which the sands at the extremity of Cape Cod are thrown up from the depths of the sea, and left on the beach in thousands of tons, by every driving storm. These sand-hills, when dried by the sun, are hurled by the winds into the harbour and upon the town. A correspondent at Provincetown says: 'Beach grass is said to have been cultivated here as early as 1812. Before that time, when the sand drifted down upon the dwelling-houses, as it did whenever the beach was broken, to save them from burial, the only resort was to wheeling it off with barrows. Thus tons were removed every year from places that are now (owing to the cultivation of this grass) perfectly secure from the drifting of sand. Indeed, were it not for the window glass in some of the oldest houses in these localities, you would be ready to deny this statement; but the sand has been blown with such force and so long against this glass as to make it *perfectly ground.* I know of some windows through which you cannot see an object, except to remind you of that passage where men were seen 'as trees walking.'"

"The mode of culture is very simple. The grass is pulled up by hand and placed in a hole about a foot deep, the sand is then pressed down upon it. These holes are dug about one foot and a half apart. The spring is the usual time of planting, though many do this work in the fall or winter. The roots of the grass, from which it soon covers the ground, are very long; I have noticed them ten feet, and I suppose upon high hills they extend down into wet sand.

"Congress appropriated, between the years 1826 and 1839, about $28,000, which were expended in setting out Beach grass near the village of Provincetown, for the protection of the harbour. From the seed of that grass it is estimated that nearly as much ground more has become planted with it, as was covered by the national government. In 1854 five thousand dollars were wisely expended by the general government in adding to the work; and the experience of former years was of great value to the efficiency of this latter effort."

The Beach grass and Sand Lyme grass are harsh coarse grasses with tough pale grayish leaves and spread by long underground root stocks. The leaves are tipped with a sharp hard spike which is capable of piercing the skin. The chief difference between these two grasses is a botanical one, viz., in the arrangement of the flowers; for practical purposes they are so much alike that, if the true Beach grass cannot be obtained, the Sand Lyme grass may be used, but it has not apparently power to spread quite as rapidly.

As to the fodder valne of these grasses, we have made no experiments; bnt the following extracts bear on this point:—

"*Psamma arenaria.*—This grass seems to be indestructible by drift sand, and authorities differ as to whether it is eaten by stock; but the park ranger at Port Fairy says they eat it ravenously in winter and thrive well upon it." (*Report of Agric. Bureau of South Australia for* 1892, p. 12.)

"*Elymus arenarius.*—Sinclair calls this grass the sngar-cane of Great Britain. It contains a large quantity of saccharine matter, and it is probable that, mixed with beach grass, as it is in Holland, it would be valuable to cut np and mix with common hay for winter feed." (*C. L. Flint. Grasses and Forage Plants*, p. 120.)

TUMBLE WEEDS.

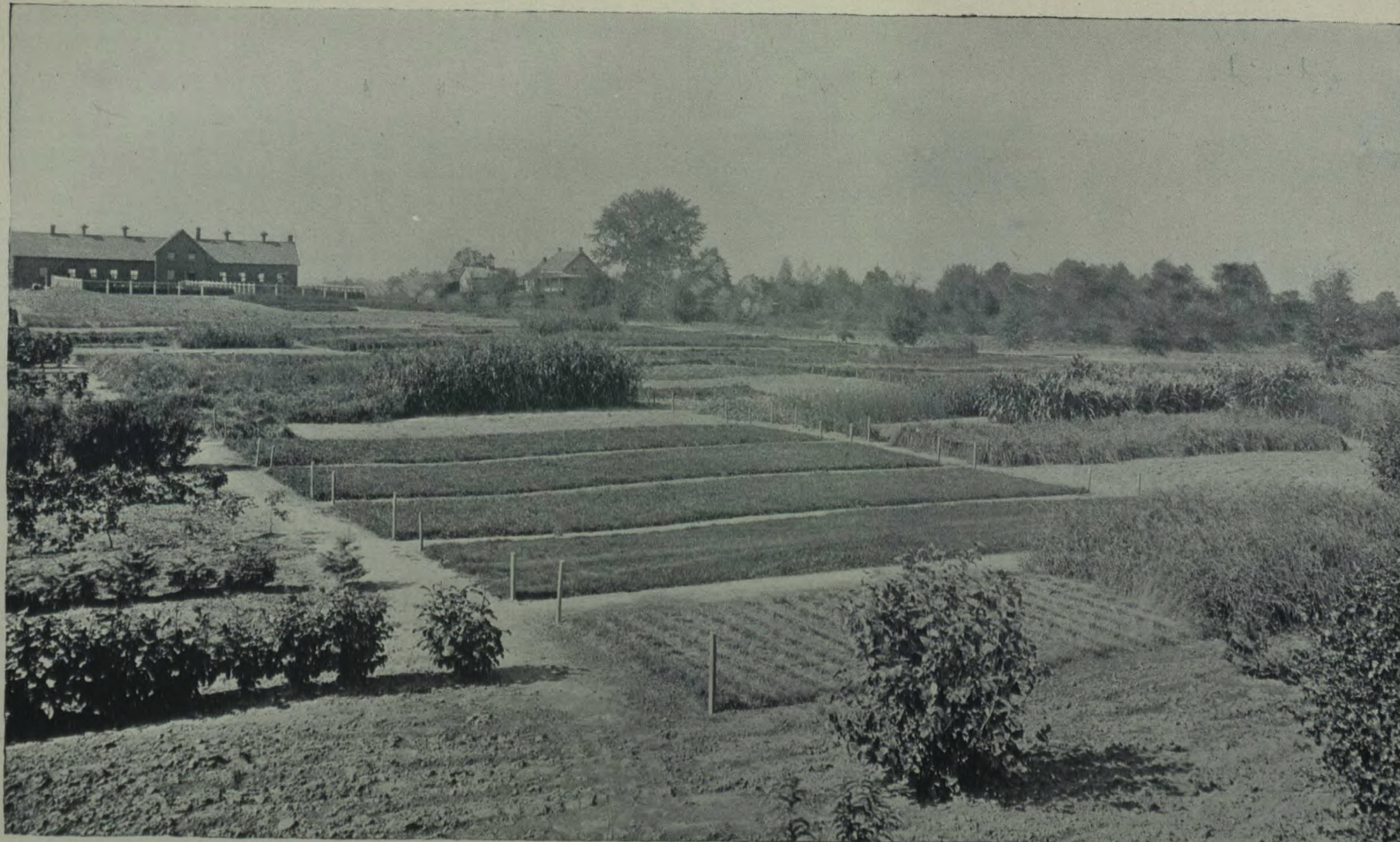
Tumble Mustard (*Sisymbrium sinapistrum*, Crantz).

This new pest in the North-west Territories is still very abundant about Indian Head, notwithstanding the efforts which have been made by Mr. Mackay and others to eradicate it. Mr. Mackay writes from Indian Head nnder date Nov. 14:—"We were almost buried yesterday with a neighbour's tumble weed. A hurricane blew all day from the North-west, and the edge of a field adjoining the farm is now 10 feet deep with this weed. The trees are full and fences cannot be seen for bank of weeds. The result of yesterday's blow will be to give ns many extra days' work next summer, for millions of seeds have been left on the farm. Looking between here and the town while the weeds were galloping along, the prairie seemed like the ocean with a big storm blowing." It is needless to say that every effort should be pnt forth now to eradicate this annual weed, as it is evidently one of the very worst pests which has ever been introduced into the country. The name "Tumble Mustard," proposed by Prof. W. M. Hays of the Minnesota Agricultural Experiment station, is, I think, particularly appropriate for this pest, for, as he says, "it draws attention to the important fact that the weed combines the spreading power of a 'tnmbler' with the longevity of seeds of a mnstard." The weed which more than any other has always been known as Tnmble weed in the west is *Amarantus albus*, L.

The Russian Thistle, Russian Tumble Weed (*Salsola Kali*, L., var. *Tragus*, DC.)

This plant which has attracted so mnch attention in the United States, has not yet been found in Canada; but it is well to warn our farmers to take every precaution against its introduction. The United States Government has issued a timely bulletin by Mr. L. H. Dewey, Assistant Botanist of the United States Department of Agriculture, illustrated by figures of the plant in different stages, and of the seed enlarged. The *Farmer's Advocate*, of London, Ont., has wisely published a warning article to Canadian farmers, giving quotations of the above, and reproductions of the figures. The publishers have kindly lent me the fignres used in that article for this notice.

These will serve to draw attention to the plant and show those who have not seen the above articles, what its appearance is. It is not a true thistle, but is a variety of the European Salt-wort, and is related to the lamb's quarters and spinach. It takes its name "thistle" from the fact that, as the seeds ripen, the stems develop at each joint instead of leaves three sharp spines. The spines are described as harder than, and as sharp as, those of the Canada thistle, so that farmers have to wrap leather round their horses' legs when cutting grain infested by it. It is an annual, and has been introduced for fifteen years. It has now spread over an area of 30,000 square miles, and is abundant and tronblesome over two-thirds of that area. Mr. Dewey says in his bnlletin: "In the badly infested areas more than 940,000 acres are devoted to wheat raising. The average loss on this land, which may be attributed to the Rnssian Thistle alone cannot be



GRASS-BEDS—CENTRAL EXPERIMENTAL FARM, OTTAWA.

less than five bushels per acre; and 3,200,000 bushels at the minimum price of 50 cents per bushel (which is considerably less than the average price) indicates a loss to the farmers in the two Dakotas of $1,600,000. The loss in other crops, the injuries caused by the spines, and the fires caused by the plants jumping fire-breaks, will bring the total loss to something more than $2,000,000 for the year 1892.

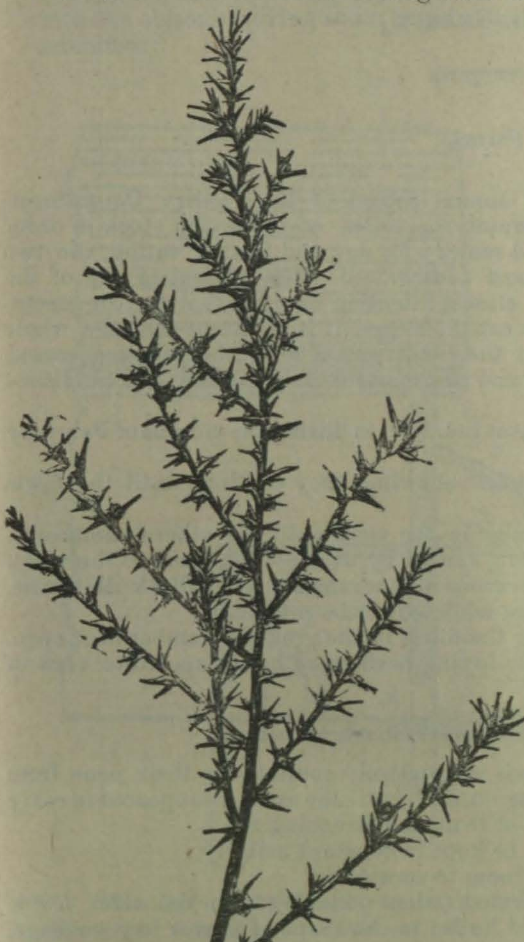


Fig. 28.

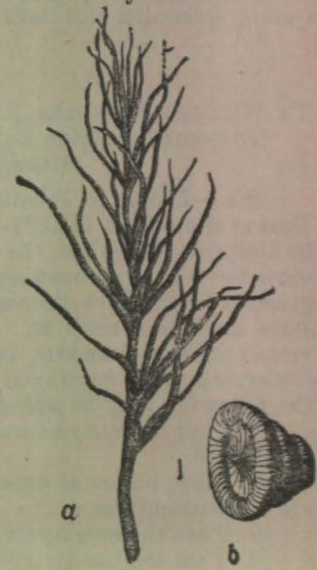


Fig. 29.

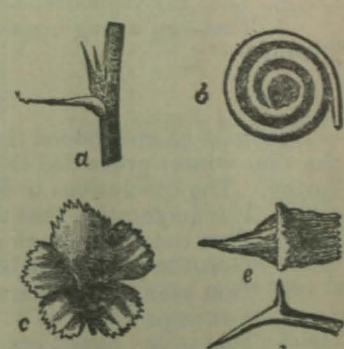


Fig. 30.

RUSSIAN TUMBLE WEED.

Fig. 28.—A branch of a mature plant. Fig. 29.—A young stem showing the nature of the leaves before the flowering period and a single seed enlarged. Fig. 30.—Enlarged details of the prickles, the flower and the seed from which the seed coat has been removed.

"These figures may seem alarming, but they are based on conservative estimates. If they are alarming to the farmers, it is well, for it is only when alarmed that most men will take effective measures to avoid danger."

I have been on the lookout for this weed through my correspondents for the last two years, and my attention was officially directed to it during the past summer by the Immigration Branch of the Department of the Interior. I am glad to be able to report that so far it has not been detected in the Dominion.

REPORT OF THE POULTRY MANAGER.

(A. G. GILBERT.)

To WILLIAM SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I beg to submit the sixth annual report of the Poultry Department. During the winter of 1891–92 careful watch was taken of the laying stock in order to discover, if possible, the cause of and remedy for egg and feather eating, the two vices fowls in close confinement are most addicted to. The subject is one of the greatest importance, necessitating the closest attention in order that correct conclusions may be arrived at. If the fowls eat their eggs, it is apparent that the whole means of money making is gone from the poultryman, until the practice ceases. Observation was continued last winter and to the notes already made and published the following may be added:—

1. That the vicious practices are most indulged in during the months of February and March.
2. That, unless at once checked on first showing, they continue until the fowls are allowed outside.
3. That the non-layers do not indulge in the vices until the others commence.
4. That the inactivity of the layers, caused by overfeeding, leads to the vices.
5. That the breeds of the more nervous temperaments viz., Black Minorcas, Andalusians, Red Caps, &c. &c., are most addicted to the practices.
6. That the vices first show among the fowls in the greatest number in one pen.
7. That egg eating began where the laying nests were most exposed to view of the fowls.

CONCLUSIONS ARRIVED AT.

It must be understood that the fowls were closely confined to their pens from the time winter prevented their running outside, until the snow disappeared in early spring. The conclusions to be arrived at from the foregoing are:

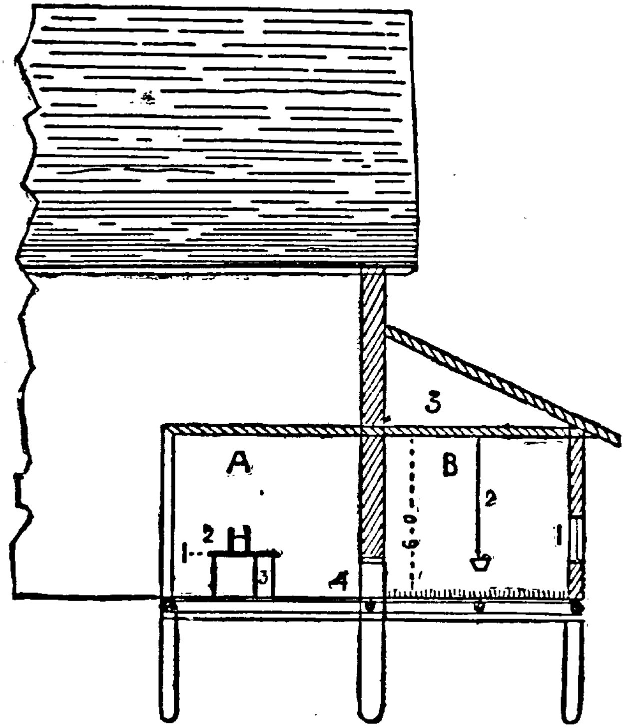
1. It is imperative that the layers be kept in constant activity.
2. That they must have plenty of room to scratch in.
3. That the pullets are better separated (when possible) from the older fowls.
4. That plenty of green stuff should be fed in the shape of clover hay, cabbage, mangels, turnips, &c.
5. That green bones, cut up and fed regularly, are the best preventives.
6. That the laying stock should have access to barn, shed or stable to scratch in, whenever circumstances permit.
7. That the nest boxes *must* be so arranged that they will be dark and not too easy to get to.
8. The more limited the quarters, the greater the necessity of exercise.
9. The more natural the conditions under which the layers are kept, during the close season, the better for them, the more profitable the result.

In the portions of the Dominion where the winters are comparatively mild the care and treatment of the stock are attended by a *minimum* amount of labour and anxiety. In such localities opportunities to let the layers out for a run frequently occur and the vices mentioned above are not experienced. On the other hand there are portions of the country where necessity compels the housing and the artificial treatment of the layers during certain months. As remarked in report of 1891, it is to persons so situated that the experiments relating to the care and management of fowls in winter quarters will be most valuable.

A FEW PLANS FOR THE FARMER.—HOW RANGE AND SCRATCHING ROOM MAY BE SECURED.

The farmer with one breed, or his ordinary barn yard fowls will have little difficulty or expense in arranging a house so that while it gives some warmth to the layers at night, which is very desirable, will also afford room for them to range, scratch and dust in during the day, and so prevent the vices aforementioned. It is with the object of giving some help in this direction that the following plans are submitted:

Diagram No. 1.



A.—1. Platform.
2. Support for roost with notch.
3. Entrance to nests under platform.
4. Slide door to scratching house.

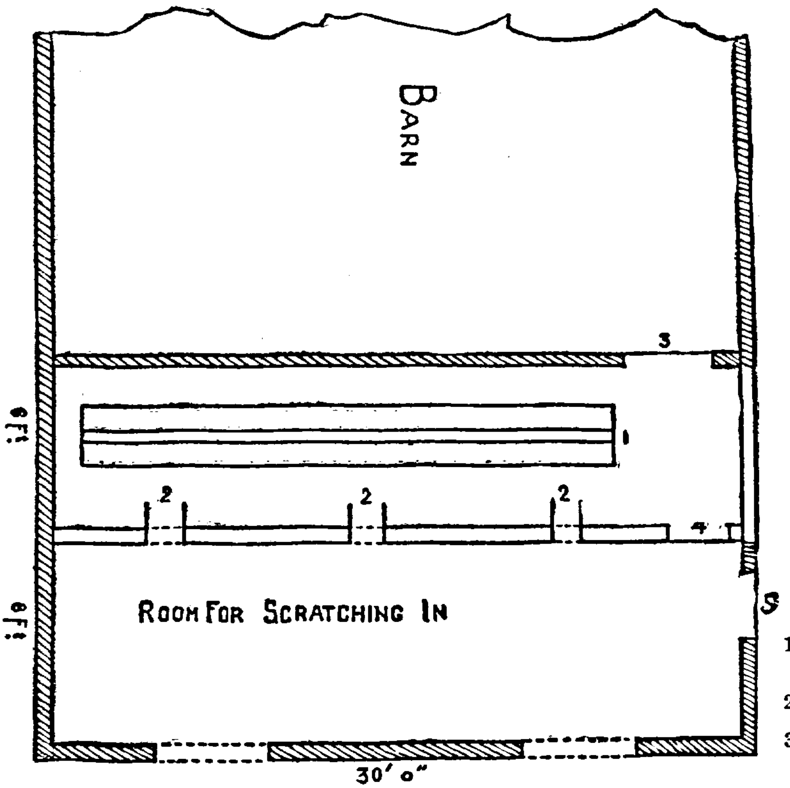
B.—1. Window facing south.
2. String with cabbage attached.
3. Space for straw, sand, gravel, &c., to be let down below.

The above plan No. 1 represents a house and addition that can be added to the end or side of a barn facing south. A small portion "A" of the end of the barn is partitioned off for the roosting and laying room. The ceiling is made low, and under this low ceiling is the platform and roost so placed as to economise the animal heat of the fowls during the cold night, and keep them as comfortable as possible during that period. The roost should be a 2 x 4 inch scantling, broadside down, and placed 10 or 12 inches over a platform which should be two and a half feet wide and eighteen inches from the ground. Under this platform should be the nests so arranged that by boarding the front of the platform, they (the nests) will be kept dark. The partitions of the nests will support the platform. The object of keeping the nests dark is to offer no inducement to the hens to stay in, or about them after the egg is laid, and to keep the other hens from seeing the eggs. Egg eating is so prevented and prevention is a great deal easier than the cure. After keeping themselves comparatively warm by scratching busily all day in the scratching room the layers require some warmth during the night and in most poultry houses that is the very time they are coldest.

"B." This is an addition that can cheaply be made to the barn and should be to the south. A slide admits the fowls from A to B. On the floor of this scratching house B is 2½ feet of dry sand, fine gravel, fine coal cinders, ashes, lime and grit in the shape of ground oyster shells, broken mortar or plaster, pieces of old crockery broken up, and any other substances calculated to make the conditions as like those of the outside run, of the open season, as possible. The floor may be of boards or earth but it must be kept perfectly dry. A narrow trough 2 or 2½ inches wide should be attached to the wall so as to permit of the proper feeding of soft food, if given. The object of this scratching house is to keep the layers busy all day and as much as possible out of house A, where they are only wanted to go to roost in and to lay. A fair sized window or windows should be in the south wall so as to admit as much sunlight as possible.

The houses can be made as large or as small as the number of hens require, always allowing 4 feet square for each hen, at the least, in the scratching room, and 8 to 10 inches roosting room for hens of medium and small size.

Diagram No. 2.



1. Platform and roosts with nests underneath.
2. Slides to scratching room.
3, 4 and 5. Doors.

The above plan, No. 2, shows the end of the barn with the roosting and laying room and scratching room attached.

The numbers are explained as follows:—

1. Is the platform and roost with the nest boxes underneath. This platform need not run all the length of the room. Indeed, the room might be made smaller and warmer at night by making the platform into smaller lengths and running them cross-ways or from north to south.
2. Are the slides to allow access to scratching-room. In a smaller house one or two might do.

3 and 4. Are doors to get into the apartments.

5. Is a side door to get in and out of the room for scratching, to clean up, etc. If it can be managed without, there need be no necessity for this door, as the fewer openings the less cold the premises are likely to be.

Diagram No. 3.

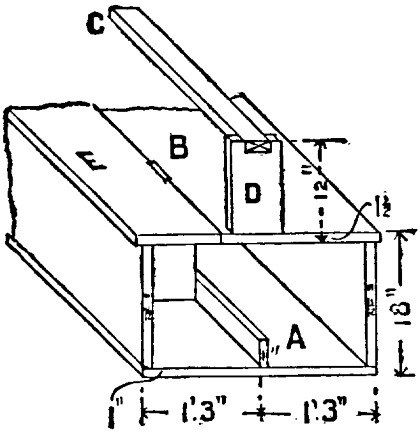


DIAGRAM SHEWING PERCH AND NEST BOXES UNDER

The above diagram shows the darkened nests. A is the passage way to the nests under the platform B. The 2 x 4 inch scantling roost is shown by C. D shows the piece of wood with notch to support the roost. E is a portion of the platform hinged so as to lift up (as shown in diagram 4) to permit access to the nests.

Diagram No. 4.

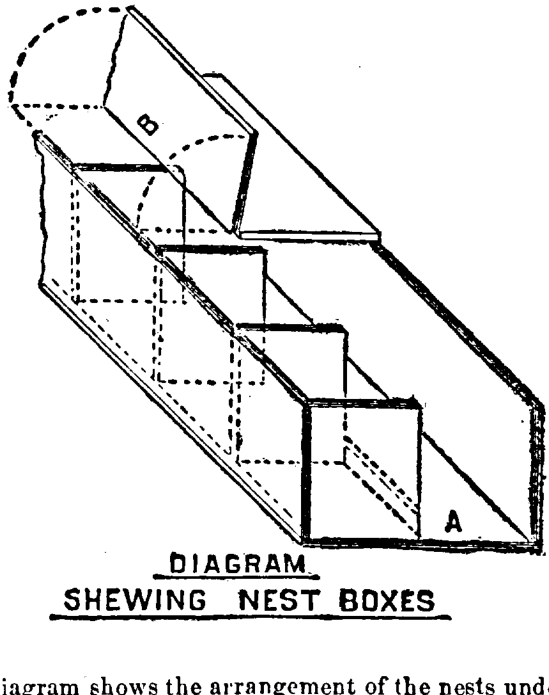


DIAGRAM SHEWING NEST BOXES

The above diagram shows the arrangement of the nests under the platform, the passage way A and the hinged board B. The hinged board lifts up so as to allow access to the nest boxes.

THE RESULTS HOPED TO BE ATTAINED.

The results hoped for in having the houses constructed as outlined, briefly summarized are:—

1. By a southern exposure to secure as much sunlight and warmth as possible.
2. The sunlight being a great incentive to scratching, dusting in the earth, etc.
3. To prevent by constant exercise any opportunity to indulge in feather eating.
4. By having the nests dark and secluded, to prevent egg eating.
5. By the comparatively low ceiling to keep the layers as comfortable as possible during the night, by economizing the heat of their bodies.
6. By the liberal quantity of sand, fine gravel, grit, &c., &c., placed on the floor of scratching-room, or shed, to make the conditions as natural as possible and so afford every inducement to constant activity.

THE PROPER TREATMENT OF THE LAYING STOCK IN ABOVE QUARTERS AN IMPORTANT CONDITION.

Before going on with the consideration of this subject, it must be insisted that the laying stock be under two years of age, and that they should never be allowed to exceed that age. The winter quarters may be according to the most approved designs; the treatment the very best known, and yet eggs will be few in number if the hens are over the age mentioned. It has been remarked, in previous reports, that in the case of Leghorns, Minorcas or Andalusians another year may be permitted, but except in the case of experts, it is best to be on the safe side. And in the case of selecting breeders from the best layers, it may be necessary to keep a hen two and a half or three years of age, but at present we are strictly speaking of how best to secure eggs in paying quantities. It is like going over old ground to repeat the instructions so fully given in 1889 report as to the treatment of the laying stock, but as the conditions as to housing, &c., &c., in the present case are somewhat different, it may be admissible so to do.

THE EARLY RATION.

The first essential to success is proper feeding. If a mash is prepared for the morning ration only enough to satisfy should be fed. On page 107 of 1889 report, the following rule is laid down *re* the early morning ration: "Feed only enough soft food to *barely satisfy*, never so much *as to gorge*. When a hen has had so much food that she will go into a corner and mope, she has had too much and if the overfeeding is continued, will soon cease to lay." The rule is *emphasized* on the present occasion. Where opportunity permits the cutting, or breaking up (not grinding) of green bones they might be given for the morning ration and nothing else. There is really no rule as to the quantity of green bones to feed, so much depends upon the breed, but one pound to 15 or 20 hens, may be mentioned as a guide. If the hens are exercising well and laying freely, and the latter generally follows the former, a small quantity of grain may be fed at noon, but it must be so scattered in the straw, or buried in the sand, that the hens will have to search for every grain of it. A plan that has been found successful is the suspension of a cabbage by a string from the ceiling, about three feet from the ground, so that the hens will have to jump to get at it. Substituting a piece of tough meat, raw, or partially cooked, will be found to answer well. Experience has proved that green stuff in the shape of any of the dry clovers steamed and mixed in the morning mash, or exposed by itself, is much relished by fowls. When mixed in the mash it should be cut up into inch pieces. Vegetables of some kind must be kept before the layers at all times. It is astonishing the quantity of grass, fowls and chickens eat, when at large, and if we are to make the conditions of their artificial treatment as natural as possible, green food must be liberally supplied. It is not necessary to use every kind of vegetable in rotation, but vegetables of one kind or another, are as a rule, abundant on a farm and the inferior or unmarketable specimens may be given to the poultry. Small potatoes boiled and mixed with wheat bran to which may be added the table and kitchen waste and a couple of handsfull of coarse sand or ground mortar, the whole fed warm for the morning ration, will be found an excellent variation.

LIGHT FEEDING OR NONE, AT NOON.

Where meat, bones, and vegetables are furnished liberally and regularly there will be no necessity for a noon ration. It must be borne in mind that the tendency is rather to overfeed than otherwise where poultry are cared for, and on the other hand where poultry are not looked after, they get neither care nor comfortable quarters, and of course there is little likelikood of results of any kind being obtained.

THE AFTERNOON RATION.

The evening or rather early afternoon ration, for winter days are short, should be a generous one. It is well to remember that a long night fast is before the layers and it is proper to have them go to roost with a full crop. It is better to feed whole grain for this afternoon ration. Should cut, or broken up green bones, not have been fed in the morning it might be well to give a half ration of them at noon and the remaining half at the afternoon grain ration, reducing the grain in proportion to the quantity of bone fed. Neither bones, nor mash, should be fed in anything or anywhere, but in the clean narrow trough at the side of the scratching room. Mr. Alexander Stewart, the well known market gardener and farmer of Hintonburg, told me that he always found his Plymouth Rock hens to lay well in winter on oats and plenty of cabbage. His poultry house was not a particularly warm one.

KEEP THE WATER FROM FREEZING IF POSSIBLE.

It would be a very great gain if the shed or house for scratching in, could be so constructed or situated, as to prevent the freezing of the drink water. And where the water does freeze care should be taken to have the chill taken off before it is given to the layers. It should be supplied in this luke warm condition at least three times a day. Laying hens drink a large quantity of water. But a cold house has other disadvantages such as the vegetabies freezing solid; droppings freezing hard to platform and the floor becoming very cold. It has been before remarked that when the layers are kept in a very cold house, the food instead of going to make eggs is drawn upon to supply animal heat. And yet artificial heat is not desirable when it can possibly be done without. If the house could be kept at the freezing point, or three or four degrees higher, it would be found suitable. Before going further it may be as well to summarize the information so far given as to the exercising and feeding of the layers. In that shape the points may be easier to remember.

SUMMARY OF EXERCISE AND FEEDING POINTS.

1. Do not gorge the layers by overfeeding.
2. Use every incentive to keep them from idleness.
3. Feed as much cut or broken green bones as possible.
4. Less grain is to be fed when bones and vegetables are supplied in abundance.
5. The evening ration should be a grain one and generously fed.
6. The object being to keep the crops of the layers full during the long night fast.

7. The soft food and cut bones should be fed in a clean narrow trough.
8. When necessary take the chill off the drink water and supply regularly.
9. Keep only young, active, prolific layers, and select from them to breed from.
10. Kill the non-layers for they are only eating away the profit margin.
11. Keep no male bird with the laying fowls. They do better without him.
12. Keep a sharp watch on the layers and anticipate every want.

THERE MUST BE NO COMPLAINT ABOUT TROUBLE.

"Oh! all this entails a great deal of trouble" may be remarked. Of course it does, but is it as much, or any more, than that experienced by the successful dairy farmer; the market gardener; the cattle breeder, or that peculiar to any other department of the farm?

"And it requires a lot of study to learn the proper management of poultry," is the next objection heard. And so it does, but when that knowledge is acquired there is no department of the farm that will pay a larger percentage of return for the time invested. The great drawback to the poultry department heretofore has been that no systematic or intelligent efforts have been made to develop its true value. Eggs have been put on the market when the warm spring weather made everybody's hens to lay and prices were, in consequence, at the very lowest. During the winter the fowls were non-productive and their keep was likely a loss to the farmer. And they were so kept because the farmer did not care to make them remunerative. Taken even at the lowest, the egg and poultry trade of Canada and the United States represent enormous figures. But the object is not to discuss the poultry interests at this time, but to glance at the inducements held out in different parts of the country to the farmer to produce eggs in winter.

INDUCEMENTS TO PRODUCE EGGS IN WINTER.

In rapidly scanning the Dominion the following are the phases presented by the different provinces. In the sections where the winters are comparatively mild, and the procuring of eggs a matter of little difficulty—prices are cheap. On the other hand in those portions where the winter season is more severe and the production of eggs attended with greater difficulty—prices are high. In Montreal new laid eggs command a high figure during December, January, February and the earlier portion of March. Mr. Thomas Hall, poultry breeder, and market gardener of Outremont, a suburb of Montreal, says he has no trouble in obtaining 45 cents per dozen from choice customers for *new laid* eggs during the months mentioned and in periods of scarcity as high as 60 cents is sometimes got, at retail. It is to be remembered that there is great difference in the fresh egg of the grocer which may be several months old, but good enough for cooking purposes, and the new laid egg only two or three days, or even a week old. The flavour of the first named is seriously affected, while it is perfect in the new laid article.

In Toronto, new laid eggs are quoted at 30 cents per dozen by retailers and the *Poultry Review* of the same city, says there is plenty of money in eggs at that price.

From Fort William a correspondent writes "that eggs are at a good price there at any time."

A correspondent at Ashcroft, B.C., says, "The average price of eggs in this locality, all the year round, is 25 cents per dozen."

Another correspondent from the neighbourhood of Calgary, N.W.T., wishes "he had a number of good laying fowls, for eggs here are 50 cents per dozen in winter and command a good price at any time."

From what can be learned there is a good market for new laid eggs at Halifax and St. John, during the winter months.

In our own locality the price obtainable at the grocers for new laid eggs during the cold season is from 30 to 35 cents per dozen according to the severity of the season: when retailed to special customers they occasionally bring as high as 50 cents per dozen.

And when and where eggs are at their very cheapest there is the British market to be taken into consideration. Speaking of that market a bulletin issued by the Finance Department in relation thereto says "Canadian poultry and eggs which arrived in excellent condition realized the very highest prices in the London market" and again that a leading Canadian dealer who had made a handsome profit out of a shipment of Canadian turkeys expressed himself confident, "that an unlimited, steady and profitable trade can be done in England with Canadian poultry and eggs." The complaints made about some of the shipments were small size of the egg and bad packing. The shipper can easily remedy the latter, but it is only the farmer, who can by breeding the right kind of fowls, put the large egg on the market.

WHEN AND HOW HE CAN DO IT.

After the farmer has taken advantage of the high prices of the winter home market, he can on the return of the warm spring weather—if he has the proper breed of fowls—allow them free range outside. After a short season of rest they will begin to lay again and if non-sitters will continue to do so, until the moulting period begins—in the latter part of the month of September—and which will continue for the next two months. But by this time his layers will have well earned their rest. And by the end of September his early hatched pullets ought to begin to lay. Thus a large number of eggs can be had to put on the best market offering. If he has non-sitters and does not use an incubator and brooder the farmer will have to keep a certain number of one of the sitting breeds to hatch out his chickens. All depends upon intelligent management. And he will require to reserve a certain number of his two-year old hens for breeding purposes. His male bird should be a vigorous yearling cockerel. He should make it a strict rule to allow no male bird among the laying stock. The reason for so doing has been given in report for 1889, p. 107, as follows:—"Take away the male birds from the laying hens. The cock bird is a nuisance in the pen of layers. He not only monopolizes the most of the food, but teaches the hens to break eggs and so learn to eat them. Besides the stimulating diet is too fattening for him and will ruin him as a breeder." The separation of the male bird from the breeding stock during winter, is also insisted upon by a great many of the leading breeders. The experience of five years at the Experimental Farm at Ottawa, when the winter season is long, leads to the same conclusion. But the farmer with one breed and one or two cock birds need have little trouble in keeping the birds apart, if he thinks it necessary so to do in the case of his breeding stock.

DIFFERENT BREEDS.

THEIR APPEARANCE AND CHARACTERISTICS—EGGS, THEIR SIZE AND COLOUR—MARKET CHICKENS.

It will be noticed that the foregoing remarks apply particularly to egg production, but should eggs and poultry be sold by weight throughout the Dominion, a probability of the near future, rapidly maturing chickens, as well as large eggs will be more profitable for the home market. The following information as to the colour and size of eggs laid by the fowls of the different breeds named, as well as to the weight put on per month by the chickens hatched and reared at the Experimental Farm may be useful. Some of the breeds are represented by cuts.

White Leghorns.

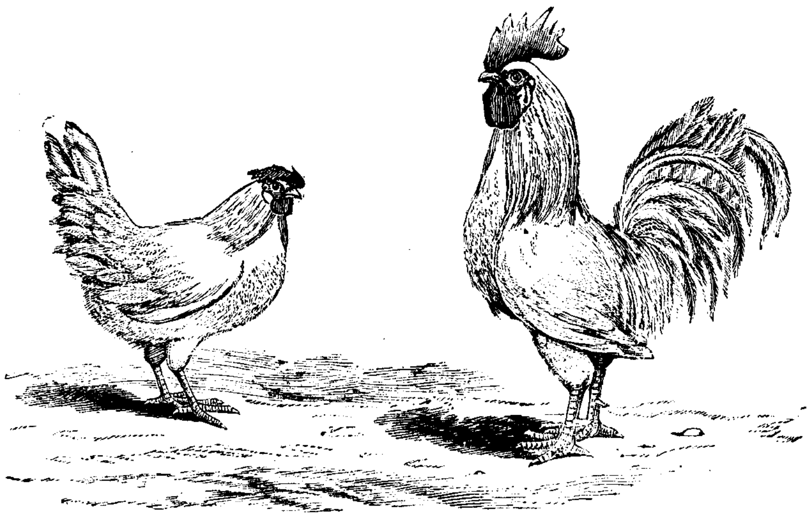
An active prolific layer of white eggs. Some strains lay much larger eggs than others. The hens of a good strain will lay eggs $2\frac{1}{4}$ oz. each or 1 lb. 10 oz. to 1 lb. 11 oz. per doz. Pullets' eggs $1\frac{9}{10}$ oz. each, or 1 lb. 8 ozs. per doz. Chickens hardy and grow quickly. Require to be kept active in close confinement and regularly supplied with lime, grit, &c. There is no standard weight for the Leghorn family.

Black Minorcas.

The females lay a large white egg, weighing as follows: Hens, $2\frac{3}{8}$ to $2\frac{1}{4}$ oz. each, or 1 lb. 11 oz. per doz. Pullets' eggs, 2 oz. each, or 1 lb. 7 oz. per doz. The hens lay from 130 to 150 eggs each according to room and range. The chickens are hardy and make vigorous growth. The plumage is jet black. The standard weight of the cockerels must be $6\frac{1}{2}$ lbs.; pullet, $5\frac{1}{2}$ lbs.; cock, 8 lbs.; hen, $6\frac{1}{2}$ lbs. Must be kept busy in winter quarters and regularly supplied with egg shell making material.

Andalusians.

Another member of the Spanish or Mediterranean class but of blue colour in feather. Indeed they are sometimes called the Blue Spanish. They are prolific



layers of large white eggs. Chickens are hardy and grow vigorously, of the same type as the Black Minorcas, and require the same conditions of treatment in winter quarters. Hens' eggs weigh $2\frac{1}{7}$ to $2\frac{1}{4}$ oz. each, or 1 lb. 11 oz. per doz. No weight qualification is demanded by the standard.

Red Caps.

A prolific layer of eggs, of medium size, but not quite so white in shell as those laid by the Leghorn family. Some strains lay larger eggs than others. Dr. Nivin, of London, Ont., claims for his Red Cap hens a yield of 150 eggs in a year. If properly cared for, they lay well in winter. Chickens are hardy and grow rapidly. They are an English breed and have gained many friends.

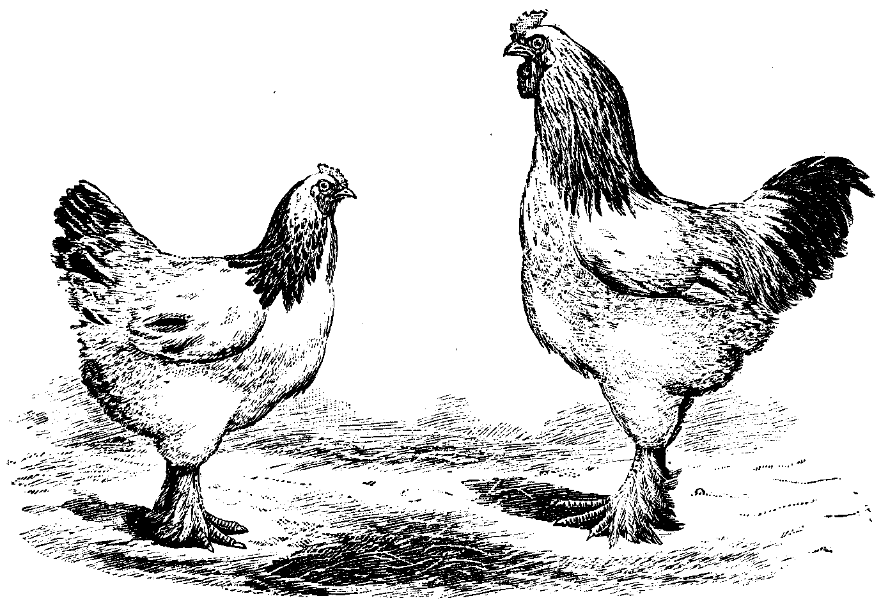
HOUDANS.

A breed of French origin, but having the five toes of the Dorking. The plumage is mottled black and white and there is a heavy crest on the head. The females lay a large white egg. Hens' eggs $2\frac{1}{4}$ oz. each or 1 lb. 11 oz. to 1 lb. 13 oz. per doz. The flesh is white and of very superior quality and the body of the fowl is plump and heavy. The chickens are hardy, and grow rapidly, the cockerels showing a development of 1 lb. per month. They are great foragers and require range. They do not seem to lay as many eggs during the close confinement of winter. It is the intention, another year, to give a number of pullets of the same age a trial as winter layers. The standard demands the following weights:—Cock, 7 lbs.; hen, 6 lbs.; cockerel, 6 lbs.; pullet, 5 lbs. It will be noticed that the weights are not as great as those called for in the case of the Black Minorcas.

LAYERS OF EGGS OF DARK COLOUR.

LIGHT BRAHMAS.

Hens are layers of large coloured eggs, in number about 100 to 110 per year. When in winter quarters eggs are not quite so large as when hens are running at large. Hens' eggs from $2\frac{1}{4}$ to $2\frac{1}{2}$ oz. each; per dozen 1 lb. $9\frac{1}{2}$ oz. to 1 lb. 13 oz. Chickens hardy and grow well at development of 14 to 16 oz. per month for cockerels.



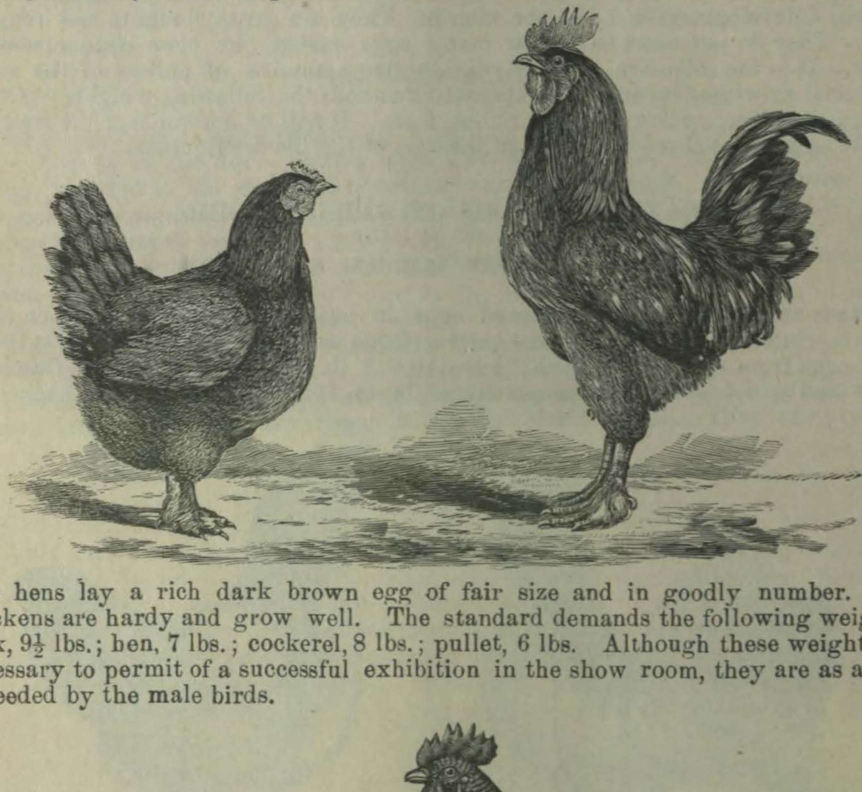
Layers require to be kept busy in winter quarters and must not be over fed or will get too fat. They are a very popular breed, being quiet and easily kept in bounds by a low fence. The weights demanded by the standard are: cocks, 12 lbs.; hens, $9\frac{1}{2}$ lbs.; cockerel, 10 lbs.; pullets, 8 lbs. They are classed among the Asiatics.

BUFF COCHINS.

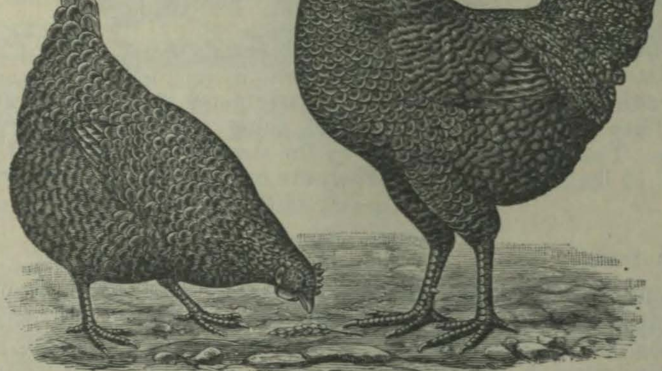
Of the Asiatic type. A fair layer of richly coloured eggs. Some strains lay much larger eggs than others. At the farm a hen of one strain layed eggs weighing only $1\frac{3}{8}$ oz. each, while a hen of another strain layed eggs $2\frac{1}{4}$ oz. each. They require to be kept active when in close quarters, as they put on fat very easily. The weights are: cock, 11 lbs.; hen, $8\frac{1}{2}$ lbs.; cockerel, 9 lbs.; pullets, 7 lbs. The chickens are hardy and grow well, showing about the same development as the Light Brahma cockerels. They are great favourites with many fanciers and some very fine specimens are held in Ontario.

LANGSHANS

Are classed as belonging to the Asiatic family. They are a very valuable breed. In England they are much prized as a market fowl on account of their white flesh.



The hens lay a rich dark brown egg of fair size and in goodly number. The chickens are hardy and grow well. The standard demands the following weights: cock, 9½ lbs.; hen, 7 lbs.; cockerel, 8 lbs.; pullet, 6 lbs. Although these weights are necessary to permit of a successful exhibition in the show room, they are as a rule exceeded by the male birds.



BARRED PLYMOUTH ROCKS.

Plymouth Rocks.

One of the best known breeds on the continent and one of the best for the farmer, who wishes an all round fowl. The pullets and young hens are good layers and the cockerels put on more flesh per month than any breed so far tried at the Experimental Farm. The chickens are hardy and grow well, the cockerels putting on 1 lb. to 1¼ lbs. of flesh per month, when properly cared for and fed. Early pullets will lay at age of five to five and a half months. The laying stock require to be kept busy, and the hens must not be overfed as they get fat very easily. The pullets will stand a little more pushing, as the pullets of all heavy breeds will. The hens make excellent mothers. There are three varieties of this popular breed, viz.: Barred, White and Buff. The latter is a new comer.

Silver Laced Wyandottes.

Another breed of American origin and a great favourite with a great many, on account of their laying and table qualities. The cockerels make good growth, showing a development equal to 14 to 16 oz. per month. They are square and compact in shape. The hens are excellent layers of eggs of fair size: some strains lay large brown eggs, and they make excellent mothers. They come close after the Plymouth Rock as a general purpose fowl. There are three other varieties, the White, Golden and Buff. The white variety is described later on. The weights called for are: cock, 8½ lbs.; hen, 6½ lbs.; cockerel, 7½ lbs.; pullet, 5½ lbs.

THE NEW VARIETIES ON TRIAL.

The White Plymouth Rocks, White Wyandottes and the Coloured Dorkings are the three new breeds on trial at the Experimental Farm. The value of the Dorkings, as table fowls, in Great Britain, is well known, and it is hoped by their numerous admirers that they will be much more extensively bred in this country than they have been. The characteristics of the three breeds are given as follows:—

White Plymouth Rocks.

All the good points of the Barred are claimed for this variety with the additional ones of greater size and whiter appearance of flesh when dressed for market. The latter claim is advanced on the ground that the white "pin" feathers do not show so darkly as in the barred. In order to give them a fair trial, eggs from two of the best strains in the country were procured and from them 17 pullets and 8 cockerels were hatched. The chickens were strong from their hatching out and made good progress, a cockerel hatched on the 20th May last showing 6 lbs. on the 21st September. Two others weighed 4 lbs. 5 oz. and 4 lbs. 8½ oz. respectively. The pullets are large and handsome. So far they are fully equal, if not superior, to the barred in growth and robust health. Careful observation well be made of the one variety as compared with the other. The standard weights required are: cock, 9½ lbs.; hen, 7½ lbs.; cockerel 8 lbs.; pullet, 6 lbs.

White Wyandottes.

A very promising variety, showing so far, all the good points of the Silver Laced. They are claimed to dress better for market on account of the white pin feathers showing less. The same point it may be remembered, is claimed for the White Plymouth Rocks. From eggs of different strains procured, eleven pullets and ten cockerels were hatched. The chicks displayed hardinesss and grew well. A cockerel hatched on the 30th May last, weighed on 2nd October following, 4 lbs.

Two cockerels hatched 12th June, weighed 4 lbs. 6 oz., and 3 lbs. 15½ oz. on 13th October. Other weights were 3 lbs. 14 oz., 3 lbs. 11½ oz., 3 lbs. 10 oz.

The merits of the breed as furnishing early cockerels for market will be seen. Careful note will be taken of the laying qualities of the pullets. The weights required are: cock, 8½ lbs.; hen, 6½ lbs. Cockerel, 7½ lbs.; pullets, 5½ lbs.

Coloured Dorkings.

We have no cut of this favourite English breed. There are three varieties, viz., Coloured, Silver Gray and White. Of these, the Coloured are considered the hardiest, although the breeders of the Silver Gray contend there is no difference. They are a breed that will surely come to the fore on the score of superior quality and quantity of flesh. They are only fair layers. The chickens were eqnal in hardiness to that of other breeds. A cockerel hatched on the 25th May showed 3 lbs. 8 oz. on the 26th October. An accident resulted in the loss of the other cockerels so that we have the record of only one. The eggs laid by three hens procured last fall were of medium size. The hens show the long compact bodies so characteristic of the breed. The weights by the standard are: cock, 9½ lbs.; hen, 7½; cockerel, 8 lbs.; pullet, 6 lbs Since writing the above a letter was received from Mr. John Dickinson, of Barrie, Ont., in which he states "that with his sons he is breeding Colonred Dorkings with great success, and that at date of letter, 2nd Dec., he had cockerels hatched late in May last, which weighed 9¾ lbs." This is certainly a strong endorsation of the worth of the breed as a market fowl.

EGGS LAID AND THE BREEDS WHICH LAID THEM.

The winter of 1891-92 will be remembered for its severity. In the poultry buildings of the farm the cold was felt as it was almost everywhere else. The lowest temperature was noted in No. 1, or the house wherein the layers were kept, when the temperature went down to 20° below freezing on the night of the 24th December, and it remained so for twelve or fourteen hours afterwards. Outside the thermometer registered 28° below zero, accompanied by a strong and piercing wind from the north-west. In previous reports it has been stated that where the laying stock is kept in cold houses, the food instead of going into eggs is drawn npon to furnish animal heat, and it has been urged upon the farmers to keep their fowls in as comfortable quarters as possible, in order to obtain eggs. Attention is also given to the subject in this report for it is one deserving consideration. It will be interesting then to note the eggs laid by the different breeds under the circumstances as noted. It will be seen that some of the breeds said to be the best winter layers and hardiest of fowls did not prove themselves so. The breeds which did best during the cold season were the Plymouth Rocks, Black Minorcas, Andalusians, Red Caps and White Leghorns, as follows:—

Plymouth Rocks.

There were eleven hens and nine pullets. Of this number seven pullets were separated and reserved for breeding stock. The remainder laid 211 eggs. During January 97, February 53 and March 59. Some of the hens were two years of age and the pullets late.

Black Minorcas.

Of this breed there were four hens and thirteen pullets. The hens and five of the pullets were kept as breeders. The remaining eight pullets laid 213 eggs. In January 89, February 50 and March 74.

ANDALUSIANS.

There were eleven hens and seven pullets of which number five of the hens were used as breeders. The remainder laid during the three first months of the year 182 eggs, viz., January 71, February 72, March 39.

RED CAPS.

There were five hens and six pullets of this breed, three hens and two pullets being reserved as breeders. The remainder laid 165 eggs as follows: January 55, February 69, March 39.

WHITE LEGHORNS.

Of this breed there were seventeen hens and twelve pullets. The most of the hens were old and were kept for breeding from. Seven of the pullets were put into the breeding pen in No. 2 house. The remainder laid 157 eggs, viz., January 32, February 73, March 51.

WYANDOTTES.

Nine hens and six pullets, five pullets being reserved as breeders. The remainder laid 79 eggs, January 25, February 31, March 23.

LIGHT BRAHMAS.

There were six hens and sixteen pullets of this breed. They were all in one pen and were rather crowded. The pullets were of late hatch. The hens did nothing, the pullets seemed at a stand-still during the cold season, and did not begin to lay until the change of season in the beginning of April. The lesson to be learned from the foregoing is that pullets of this breed must be hatched early, so as to have every opportunity to mature before the winter season begins, and they must not be crowded. This has been remarked in previous reports.

LANGSHANS.

There were three hens and eight pullets of this breed. The pullets were late of hatch as in the case of the Brahmas and the same remarks made *re* last named, apply to the former, as their characteristics are about the same. The three hens laid 95 eggs, viz., January 10, February 25, March 27. Several of the pullets were sickly during the early part of the winter and a good deal of trouble was experienced in getting them on their feet and they were never robust. Fine specimens of this breed have been reared this season from superior stock and good results are hoped for, as the breed is a good one.

HOUDANS.

There were eleven old hens of this breed kept for breeding stock and such being the case it would be hardly fair to expect an egg record. These hens did not begin to lay until April.

WHITE LEGHORN-BRAHMA CROSS.

There were six pullets of this cross and one of White Leghorn-Plymouth Rock cross. They were of different ages, some being late. Three pullets laid 75 eggs during the first three months of the year, viz., 42 during January; 30 in February and 3 in March. A number of eggs were eaten during the last named month. In

April when the fowls got out, the egg eating ceased and the seven pullets laid 133 eggs during the month. In April the seven pullets laid 7 eggs *per diem* 5 times; six eggs *per diem* 10 times, five eggs 5 times and the remainder at the rate of 4, 3 and 2 per day. This is excellent laying even for that time of year.

Mixed or Common Fowls.

There were twenty-nine fowls of all ages and size. They were of no particular breed and were kept for sitters only. They were fairly representative of the barn yard fowl of the ordinary farm yard. These fowls were placed in two pens in a cold part of the building but no colder than the fowl house so common in the country. They were fed the same rations as the Plymouth Rocks, Minorcas and Red Caps but they laid few eggs until the month of April when they laid 312 eggs. The record is 32 eggs for January, 37 for February and 18 for March. In April eggs were down to 15 and 17 cents per dozen so that they began to lay when eggs where cheap. It may be said that the mixed fowls were no worse than the Brahma thoroughbreds. But in the case of the latter breed the explanation is given that the pullets were of too late hatch and when they did begin to lay their eggs were worth one dollar per setting to the farm as thoroughbred eggs sold for hatching from.

The total number of eggs laid during the eight months of the year was 6,228. Of this number the months show as follows: January, 434; February, 442; March, 384; April, 1,278; May, 1,563; June, 758; July, 788; August, 581. It will be seen that more than half the total number of eggs were laid—most of them by the pure bred fowls—during the months of April, May and June when they were readily purchased at one dollar per setting for hatching.

The Experience Gained.

The experience of last and previous winters confirms what has been written in previous reports, viz.:

1. Pullets should be hatched out as early as possible.
2. The laying stock should be young and birds of the same age should be in the one pen.
3. A warm or comfortable house is more economical in the long run than a cold one.
4. What will go into eggs in the pullets will make the hens of the heavy breeds too fat to lay.
5. The laying stock require ample room. See instructions on a previous page.

BREEDING PENS MADE UP.

After a very cold winter the weather moderated about the beginning of March, and the breeding pens were made up as follows:—

Breed.	When mated.	No. in Pen.	Remarks.
Brahmas	March 3	1 cockerel, 9 hens	
Plymouth Rocks	do 3	1 cock, 11 hens	
Brahmas (2nd pen)	do 3	1 do 11 pullets	
White Leghorns	do 27	1 do 9 do	
do (2nd pen)	do 25	1 cockerel, 7 hens	
Crosses.			
Langshan-Black Minorca	do 30	1 do 5 do	
White Leghorn-Brahma	April 2	1 do 5 do	

As in previous years the demand for eggs for hatching was much greater than ould be filled, and many disappointments were the result, but the orders were taken n rotation, and as far as possible farmers had first choice.

EGGS SET AND CHICKENS HATCHED.

When set.	Description of Eggs.	Number of Chicks hatched.	When hatched.	Remarks.
April 8.	11 Black Minorca	5	April 29.	From Toronto.
do 19.	8 Red Caps, 3 crosses	7	May 11.	
do 21.	11 Langshans	7	do 13.	From F. A. Mortimer, Pottsville, U.S.
do 24.	13 Plymouth Rock	7	do 17.	
do 29.	13 White Plymouth Rocks	12	do 20.	From Allan's Corners, Q.
do 29.	13 S. L. Wyandottes	6	do 20.	do Todmorden, Ont.
do 29.	13 do	6	do 20.	do do
May 2.	8 W. P. Rocks, 5 Langshans	10	do 23.	do Toronto.
do 3.	13 Red Caps	8	do 24.	do do
do 4.	13 Coloured Dorkings	6	do 25.	do London, Ont.
do 9.	13 White Plymouth Rocks	12	do 30.	do Toronto.
do 9.	13 Langshans	6	do 30.	
do 11.	13 White Wyandottes	10	June 1.	do Kingston.
do 13.	13 Black Minorcas	7	do 3.	do Toronto.
do 17.	13 White Wyandottes	10	do 6.	do Ottawa.
do 18.	8 G. Polands, 5 P. Rocks	12	do 8.	
do 22.	13 White Wyandottes	6	do 12.	
do 27.	13 Red Caps and Plymouth Rocks	9	do 17.	
do 27.	9 Plymouth Rocks, 4 G. Polands	9	do 17.	
do 29.	13 B. Plymouth Rocks	7	do 19.	do Kingston.
do 30.	13 Houdans	12	do 20.	
do 30.	13 Langshans-B. Minorca, cross	12	do 30.	
do 30.	Sundry eggs	9	do 30.	
		195		

Sitters Scarce.

The difficulty in obtaining early sitters clearly proved the necessity of the assistance of a good incubator. It is an every year experience. When sitters become numerous the season is too far advanced to permit of early chickens being hatched out so as to obtain pullets that will lay while the hens are moulting, or early hatched cockerels to make early market chickens. The probabilities are that the time is not far distant when artificial incubation will be well understood and generally practised. The first hen to become broody was a Plymouth Rock, and she was given eleven Black Minorca eggs on the 8th April. The hens were all "set" on board floors covered with two to three inches of sand and earth. Description of the nests used, and the method of setting the hens have been fully described in previons reports. Drink, food and a dust bath were in close proximity to the sitters at all times.

Progress of the Chicks.

The chicks made good progress, considering that the ground has been used for the same purpose for the four previous years. It is the intention to give the newly hatched chickens entirely new ground next spring, a large space having been fenced in for that purpose. After hatching, the chicks were allowed to remain in the nest until thoroughly strong on their legs. Their first food was stale bread soaked in milk and squeezed dry, varied by stale bread crumbs. In a day or two granulated oatmeal was added, then crushed corn and after 12 or 15 days whole wheat. A splendid mash for the rapidly growing youngsters was found to be shorts, cornmeal, bran, bone meal, and bread and table scraps from the houses of the farm, the whole being mixed up with boiling milk or water. Where milk is in abundant supply it will be found one of the best foods for the growing chicks or the laying hens. Some figures showing the weights made by chickens of certain breeds have been given in a preceding page, but the following may be stated without repetition:—

The most rapid growth was made by a White Plymouth Rock, which hatched on the 20th May, weighed on the 21st October following 6 lbs.; representing a development of 19 oz. per month. This gain may not represent that made in the first month after hatching, but it was subsequently made up.

The next best growth was made by a cross of the Langshan—Black Minorca breeds, the Langshan male being used. This cockerel was hatched on the 11th May, and weighed on the 21st October, 5 lbs. 15 oz. The Barred Plymouth Rocks came next, closely followed by the Wyandottes, both White and Silver Laced. In some cases the weights were the same.

The White and Silver Laced Wyandottes made about the same progress. Both represent a development of 1 lb. per month, taking the heaviest weights. On new ground the figure named should be fairly representative for all cockerels. With special feeding the cockerels might be pushed to a heavier weight. The same may be said of all the breeds mentioned.

The chicks were fed a little and often for the first four or five weeks, and as their size increased and their rations became more solid, they were fed four times daily. Care was taken that the evening ration of grain was a generous one, the object being to keep their crops as full as possible, and for as long as possible during the night. The necessity of pushing their chickens to early maturity has been urged on the farmers in previous reports.

DISEASES OF POULTRY.

Numerous inquiries were received during the year from different parts of the country as to diseases affecting poultry. Satisfactory information was given in almost every case.

On the 7th July last a letter was received from Mr. Hector Chauvin of Montebello, P.Q., stating "that a disease (similar to that of cholera) had shown itself among his chickens. Since the previous Sunday he had lost thirty and he noticed many others which were sickly looking. He feared for the remaining 260."

As the distance was not great and it was known that Mr. Chauvin had valuable chickens, a visit was paid to that gentleman's poultry yard. The disease was found to be a slight diarrhæa caused by acute indigestion, the result of a little overcrowding and too close confinement. It had already been checked by the timely and judicious remedies given by Mr. Chauvin, who is thoroughly up in poultry matters. It was advised that his chickens be allowed free run outside.

Mr. Chauvin has a large and well constructed poultry house, fitted up according to the most approved methods and furnished with all the latest machinery, conveniences, &c. It is doubtful if there is a more completely furnished poultry establishment in the Dominion. Mr. Chauvin sold all the eggs laid by his hens last winter, in Montreal, at 40 cents per dozen.

Suspected Tuberculosis.

The following may be of service to others. On the 21st November ult. Mr. M. Cowley, of Bristol Corners, P.Q., wrote under date of the day previous:

"Sir,—My hens have taken a disease this fall that proves fatal in a month or six weeks time. They first take lame in one leg, then their comb wilts away. They hobble round for a few weeks and die. I opened four of them and found that all their livers were diseased. The livers looked as if they had been covered with hay seed and some were ulcerated. It seems to be more prevalent with my Brown

Leghorn hens. None of the cock birds have it yet, nor have this year's chickens. The sick ones are mostly last year's birds. My hens have the same run as any farm yard fowls. The disease seems to be general round here. I would be glad if you could let me know what to do."

As the disease seemed to affect several localities Mr. Cowley's letter was fowarded to Prof. Wesley Mills, of McGill University, Montreal, and the following reply was received :—

McGill University,
Montreal, 28th November, 1893.

Dear Sir,—I am in receipt of your letter of 23rd instant. From the account of the disease given by Mr. Cowley, I should suspect some germ disease, possibly tuberculosis. If you will forward one of the birds to my address as above, as soon after death as possible, I will ask our professor of pathology to kindly make a careful examination.

In any case I would recommend isolation of sick birds and disinfection of the houses in which the fowls have been kept, with a special care to comfort and feeding.

Faithfully yours,

Wesley Mills, M.D.

In accordance with the above Mr. Cowley was requested to send the fowl to the address as requested. On the 18th December, Mr. Cowley drove in from Bristol's Corners with a fowl which had died of the disease and the subject was at once forwarded to Dr. Mills. The result of the examination will be awaited with interest.

Beginning of Winter Laying.

After enjoying a free run outside, the fowls went into winter quarters during the third week in November. The hens were in most cases over their moult, but some were still very ragged. The White Leghorns were the first to lay followed by the Light Brahmas. Up to date none of the pullets had laid.

The Poultry Show at the Industrial.

During the Industrial Exhibition at Toronto, in September last, the meeting of the Ontario Poultry Association held on the 15th of the month named was attended and upon the invitation of the president an address was delivered on "the value of poultry as a means of revenue to the country and to the farmer." The exhibition of poultry, held in the enlarged and improved poultry building of the Exhibition Association, was the best fall show ever seen on the continent at the time of year. The management, arrangement and judging of the birds were simply magnificent.

Increased interest in Poultry.

Apart from the numerous excursion parties which visited the Experimental Farm during the early part of the season, the increase in the number of farmer visitors to the poultry department and in the interest taken in the same were most gratifying. A largely increased correspondence and demand for plans of buildings; reports containing details as to management of poultry, &c., indicate a more general appreciation of the value of the poultry department as a means of making money.

Improvements.

During the past summer season a large piece of land adjoining the poultry building has been fenced in as part of the department, and will afford change of ground for the young chicks next season. The cedar posts in front of the main poultry building and in the runs to the rear have been removed and replaced by a light iron posts and wire netting, the whole presenting a very handsome appearance. In the outside runs in rear of the buildings one and three and to the side of No. 2, grass sods have been laid for one-half the runs and the other portions have been boxed off and filled with sand in one part and gravel in the other.

Earth versus Straw Covered Floors.

In No. 1, on main building which contains the laying stock, the floors of the five pens in the south wing have been covered with sand to the depth of three or four inches. A quantity of fine gravel has been mixed with the sand. In the north wing the floors of the five pens are left covered with the straw and chaff heretofore used. The object is to find out the merits of the earth *versus* the straw covered floor. It is presumed the conditions will be more natural, in so far, that better opportunity will be afforded the layers to dust, scratch in, pick up grit, &c., &c., and that while egg laying will be increased, the vices of egg and feather eating will be prevented.

Pullets of different breeds on trial.

A pen of Barred and another of White Plymouth Rock pullets and a pen each of White and Silver Laced Wyandottes are side by side in the south wing of No. 1 house. Note will be taken as to any points of superiority between these different varieties. Trial is also being made of a pen of pullets of the Langshan-Black Minorca cross and other pullets of the White Leghorn-Brahma cross, all of which promise to make good winter layers.

I have the honour to be, sir,

Your obedient servant,

A. G. GILBERT,

Manager Poultry Department.

Central Experimental Farm,
Ottawa, 5th December, 1893.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF WM. M. BLAIR, SUPERINTENDENT.

To WILLIAM SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces at Nappan, N. S., during the year 1893.

WEATHER.

The winter of 1892-93 was a cold one. Water pipes that were 4 feet deep in the ground, were frozen in several places. Seeding commenced on April 29th. The spring was fine and dry, with some very warm weather in May. During June the crops suffered much with drought, which continued until July 4th. After that the vegetation was rapid and with good harvest weather the crops were gathered in good condition and were a good average yield.

MANURE.

Some 200 dollars worth of special fertilizers were used, in addition to the farmyard manure. These combined are gradually bringing up the farm to a good state of fertility.

HAY.

The hay was a good crop both on marsh and upland—the former as well as the latter readily responding both in quantity and quality to a more perfect drainage.

About 110 tons of excellent hay was secured in fine condition. This hay, with roots and grain grown on the farm is consumed by cattle and horses.

Thirty-three loads of English hay was secured from 10 acres of upland, while from the marsh land 50 loads of English and 17 loads of broad leaf hay were harvested, there being 30 acres of the former and 16 acres of the latter. The loads averaged 2,200 pounds.

About 10 acres of upland, that was in meadow last year, and yielded 30 tons of hay, was this year devoted to pasturage.

WINTER WHEAT.

Eight varieties of winter wheat were sown in September, 1892, all of which were completely winter-killed, while winter rye sown at the same time on the same kind of land yielded 14½ bushels from ¾ bushel seed sown.

Spring Wheat.

Twenty-nine varieties of spring wheat were sown, as stated below, in plots of one-twentieth of an acre each. Four and one-half pounds of seed (equal to 1½ bushels per acre) was sown on each plot, with the results given.

Name of Variety.	Sown.	Harvested.	Number of days maturing.	Yield per acre. Bush.	Yield per acre. Lbs.	Lbs. per bushel.	Condition when cut.
White Fife	May 4	Aug. 29	117	18	20	55	Long, stiff, bright straw.
Great Western	do 4	do 22	110	25	20	60¼	Long, weak, bright straw.
Hungarian Mountain	do 4	do 23	111	21	00	61½	Medium long, stiff, bright straw.
Defiance	do 3	do 24	113	20	00	60	Long, stiff, bright straw.
Rio Grande	do 3	do 22	111	20	50	61½	do do
White Connell	do 3	do 26	115	25	40	61½	Medium long, stiff, bright straw.
Wellman's Fife	do 3	do 24	113	15	40	57	Short, stiff, bright straw.
Red Fife	do 3	do 22	111	26	20	59¾	Medium long, medium stiff, bright straw.
Herisson Bearded	do 4	do 24	112	21	00	62	Short, stiff, bright straw.
Red Fern	do 3	do 23	112	19	45	62	Medium long, stiff, bright straw.
Ladoga	do 3	do 19	108	21	40	60	Medium long, medium stiff, bright straw.
Pringle's Champlain	do 3	do 21	110	23	20	55	Long, medium stiff, bright straw.
Campbell's White Chaff	do 3	do 16	105	24	40	59	Medium long, stiff, bright straw.
White Russian	do 3	do 23	112	21	40	59½	Medium long, medium stiff, bright straw.
Colorado	do 3	do 19	108	26	40	61	Long, stiff, bright straw.
Hueston's	do 4	do 24	112	20	40	60	do do
Azima, Russian	do 4	do 24	112	10	40	59	Very short, stiff, bright straw.
Black Sea	do 4	do 19	107	20	00	60	Medium long, stiff, bright straw.
Abundance	do 4	do 20	108	22	30	60	Medium long, weak, bright; some lodged.
Beta	do 4	do 19	107	19	40	58½	Medium long, stiff, bright straw.
Alpha	do 4	do 23	111	27	00	58	Long, stiff, bright straw.
Carleton	do 4	do 22	110	24	40	59	Medium long, weak, bright straw.
Ottawa	do 4	do 22	110	22	00	57	Medium long, stiff, bright straw.
Prince	do 4	do 21	109	15	50	60¾	do do do
Advance	do 4	do 21	109	21	30	57	do do do
Stanley	do 4	do 21	109	26	40	60	Long, stiff, bright straw.
Preston	do 4	do 24	112	21	00	59½	Medium long, stiff, bright straw.
Albert	do 4	do 21	109	17	00	59	do do do
Crown	do 4	do 23	111	20	00	60	do do do

Barley.

Eighteen varieties of barley were sown in plots of one-twentieth acre each. Four and three-quarter pounds of seed was sown on each plot, with the results as stated below.

Name of Variety.	Sown.	Harvested	Number of days maturing.	Yield per acre.		Lbs. per bushel.	Condition of Straw when cut.
				Bush.	Lbs.		
Baxter's Six-Rowed	May 9	Aug. 10	93	37	4	49¼	Medium long, stiff, very rusty.
Rennie's Improved	do 9	do 11	94	18	46	46¾	Short, soft, bright.
Odessa	do 9	do 11	94	20	00	44	Medium long, soft, bright.
Oderbruch	do 9	do 10	93	25	00	48	Medium long, stiff, bright.
Mensury	do 9	do 15	98	19	28	45	Short, stiff, bright.
Two-Rowed Naked	do 9	do 19	102	15	40	59	Short, weak, bright; some lodged.
Guaymalaye	do 9	do 16	99	24	18	58	Short, soft, bright.
Thanet	do 9	do 21	104	22	4	49½	Short, stiff, bright.
New Golden Grains	do 9	do 21	104	18	26	51½	Short, weak, bright; some lodged.
Duckbill	do 9	do 18	101	31	32	49¾	Medium long, stiff, bright.
Prize Prolific	do 9	do 19	102	27	4	51	Very short, weak; some rust.
Golden Melon	do 9	do 22	105	32	9	50½	Short, soft, bright; some lodged.
Goldthorpe	do 9	do 22	105	26	32	49½	Short, weak, bright.
Canadian Thorpe	do 9	do 18	101	20	20	49	Short, stiff, bright.
French Chevalier	do 9	do 19	102	18	16	49	do do
Improved Chevalier	do 9	do 19	102	26	2	49½	Short, weak, bright.
Common Six-Rowed	do 9	do 21	104	40	00	47¾	Medium long, soft, bright.
Newton	do 9	do 21	104	20	00	48¼	Short, stiff, bright.

Two varieties of cross-bred barley received from the Central Farm, Ottawa, of one pound each, were sown with the following results:—

Name of Variety.	Sown.	Harvested.	Number of days maturing.	Lbs. per bushel.	Condition of Straw when cut.
Summit	May 20	Aug. 24	96	48½	Long, weak, bright; lodged.
Surprise	do 20	do 24	96	49	Medium long, weak, bright; some lodged.

OATS.

Forty-three varieties of oats were also grown in plots of one-twentieth acre each; four and a quarter pounds of seed being sown in each case, equal to two and a half bushels per acre, from which the following results were obtained :—

Name.	Sown.	Harvested.	Number of days maturing.	Yield per acre. Bush.	Yield per acre. Lbs.	Lbs. per bushel.	Condition of Straw when cut.
Victoria Prize	May 8	Aug. 11	95	57	2	39½	Long, stiff and coarse, bright.
Rennie's Prize White	do 8	do 11	95	56	16	37	Short, stiff, bright.
Flying Scotchman	do 8	do 12	96	67	2	38	Long, weak, bright; some lodged.
Challenge (Webb's)	do 8	do 11	95	44	24	39	Medium long, stiff, bright.
Early English White	do 8	do 16	100	48	18	39	do do
Poland White	do 8	do 18	102	61	26	40½	Medium long, soft, bright.
Bonanza	do 8	do 18	102	72	32	42	Long, weak, bright; much lodged
Early Racehorse	do 8	do 15	99	68	8	42½	Long, medium weak, bright; some lodged.
Canadian Triumph	do 8	do 15	99	64	24	41¾	Long, soft and weak, bright; much lodged.
Welcome	do 8	do 10	94	54	4	39	Medium long, stiff and bright.
Hazlett's Seizure	do 8	do 10	94	56	21	39¼	Medium long, medium soft and bright.
Prize Cluster	do 8	do 11	95	58	8	38	Medium long, weak, bright.
Early Archangel	do 8	do 12	96	47	22	39¾	Medium long, stiff, bright.
Rennie's New	do 8	do 22	106	66	21	35	Short, stiff and bright.
Improved Ligowo	do 8	do 17	101	67	2	36	Medium long, weak, bright; some lodged.
Banner	do 8	do 17	101	56	16	36½	Medium long, stiff and bright.
Cream Egyptian	do 8	do 18	102	89	14	39	Long, soft, bright; some lodged.
Early Blossom	do 8	do 16	100	64	24	35	Long, stiff, bright.
American Beauty	do 8	do 14	98	47	22	36	Short, stiff, bright.
Early Etampes	do 8	do 19	103	64	4	35	do do
Joanette	do 9	do 19	102	51	16	35	do do
Prolific Black California	do 9	do 19	102	56	16	35	Long, weak, bright; some lodged.
Prolific Black Tartarian	do 9	do 18	101	63	18	36¼	Long, soft, bright.
Abundance	do 9	do 17	100	50	20	36¼	Medium long, stiff, bright.
Doncaster Prize	do 9	do 14	97	50	20	37	do do
Holstein Prolific	do 9	do 16	99	68	8	38	Long, soft, bright; some lodged.
Improved Black Tartarian	do 9	do 18	101	52	32	35½	Long, stiff, bright.
Early Gothland	do 9	do 18	101	50	30	39½	do do
Rosedale	do 9	do 15	98	55	10	40	Medium long, stiff, bright.
Black Brie	do 9	do 24	107	44	24	33	do do
Giant Cluster	do 9	do 24	107	62	22	34	Long, weak and bright; lodged.
Black Coulommiers	do 9	do 25	108	60	00	35¼	Medium long, stiff, bright.
Golden Beauty	do 9	do 19	102	57	2	35	Long, weak, bright; some lodged.
Oderbruch	do 9	do 19	102	58	8	39	Long, stiff, bright.
Scottish Chief	do 9	do 10	93	63	18	40	do do
Siberian	do 9	do 23	106	55	10	35¼	Long, medium weak, bright.
Cave	do 9	do 18	101	61	6	37	Medium long, stiff; some rust.
Abyssinnia	do 9	do 18	101	56	16	39	Long, stiff, bright.
Wide Awake	do 9	do 18	101	57	22	35	Long, weak, bright; lodged.
Imported Irish	do 9	do 17	100	54	4	39	Medium long, soft, bright; some lodged.
Columbus	do 9	do 18	101	52	12	34	Short, soft, bright; some lodged.
White Wonder	do 9	do 11	94	58	28	39¾	Long, weak and bright; some lodged.
American Triumph	do 9	do 23	106	51	26	37¼	do do

Early and Late Sowing.

In order to test the relative value of early and late sowing, a field was laid off in plots of one-tenth of an acre each and sown at four different times, commencing on May 10th, one week intervening between each sowing, the same kind of grain in all cases being sown. There were two plots each of wheat, barley and oats. The following table gives the results.

WHEAT SOWN AT DIFFERENT TIMES.

Nine pounds to each plot.	Sown.	Harvested.	Bushels per plot.	Lbs. per bushel.
1. Campbell's White Chaff	May 10	Aug. 26	1¾	60¾
Red Fife	do 10	do 26	1¾	57
2. Campbell's White Chaff	do 17	do 29	2	58¼
Red Fife	do 17	do 28	1¾	55
3. Campbell's White Chaff	do 24	do 30	2	58
Red Fife	do 24	Sept. 2	1¾	52½
4. Campbell's White Chaff	do 31	do 2	¾	47
Red Fife	do 31	do 4	½	45

BARLEY SOWN AT DIFFERENT TIMES.

Nine and a half pounds on each plot.	Sown.	Harvested.	Bushels per plot.	Lbs. per bushel.
1. Duckbill	May 10	Aug. 21	3	52
Baxter's Six-Rowed	do 10	do 11	3¼	47
2. Duckbill	do 17	do 26	2¾	51
Baxter's Six-Rowed	do 17	do 18	1¾	47
3. Duckbill	do 24	do 28	3¼	49
Baxter's Six-Rowed	do 24	do 22	2¾	46
4. Duckbill	do 31	do 30	¾	43¾
Baxter's Six-Rowed	do 31	do 26	1	46

OATS SOWN AT DIFFERENT TIMES.

Eight and a half pounds on each plot.	Sown.	Harvested.	Bushels per plot.	Lbs. per bushel.
1. Banner	May 10	Aug. 19	5⅓	37
Prize Cluster	do 10	do 18	3¾	40
2. Banner	do 17	do 22	5⅓	34
Prize Cluster	do 17	do 21	3¼	40
3. Banner	do 24	do 27	5	35
Prize Cluster	do 24	do 26	3¼	39
4. Banner	do 31	do 30	3	32
Prize Cluster	do 31	do 29	2½	38½

Pease.

Ten varieties of pease were sown in plots of one-twentieth acre each, with results as given in the following table:—

Name, and pounds of Seed sown.	Sown.	Harvested	No. of days maturing	Yield per acre. Bush.	Lbs.	Lbs. per bush.	Condition when cut.
Black-eyed Marrowfat— 10½ lbs., or 3½ bush. per acre.	May 10..	Aug. 20..	102	34	00	60	Vines made a strong growth.
Mummy— 9 lbs., or 3 bush. per acre....	do 10..	do 16..	98	32	00	61	Vines very strong growth.
Crown— 7½ lbs., or 2½ bush. per acre..	do 10..	do 14..	96	35	20	59	Vines made a very strong growth.
Golden Vine— 7½ lbs., or 2½ bush. per acre..	do 10..	do 14..	96	33	20	60	Vines, strong growth and stiff.
Multiplier— 7½ lbs., or 2½ bush. per acre..	do 10..	do 18..	100	38	40	63	Medium strong growth of vines.
Centennial— 9 lbs., or 3 bush. per acre....	do 10..	do 18..	100	33	00	62	Long vines and heavy growth.
Prince Albert— 7½ lbs., or 2½ bush. per acre..	do 10..	do 19..	101	34	20	61	Small vines; medium strong.
Pride— 9 lbs., or 3 bush. per acre....	do 10..	do 11..	93	31	20	61	Vines strong; heavy growth.
Potter— 7½ lbs., or 2½ bush. per acre..	do 10..	do 17..	99	27	20	60½	Large vines; good growth.
Rennie's No. 10— 10 lbs., or 3⅓ bush. per acre..	do 10..	do 17..	99	37	20	63	Vines made a strong growth.

Turnips.

Eleven varieties of turnips were sown in plots, consisting of three rows, 30 inches apart and 66 feet long, of each kind, on May 22nd. Duplicate plots of the same varieties were sown on June 6th. The following table gives the results, showing that all the varieties excepting Skirving's Purple Top, gave a larger yield from the earlier sown plots:—

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot, Weight. Lbs.	2nd Plot, Weight. Lbs.
Selected East Lothian	May 22..	June 6..	Oct. 18 .	Oct. 18..	735	435
Sutton's Champion	do 22..	do 6..	do 18..	do 18..	750	505
Mammoth Purple Top	do 22..	do 6..	do 18..	do 18..	480	355
Carter's Prize Winner	do 22..	do 6..	do 18..	do 18..	775	503
Steele's Selected Purple Top	do 22..	do 6..	do 18..	do 18..	700	645
Jumbo or Monarch	do 22..	do 6..	do 18..	do 18..	865	550
Carter's Elephant	do 22..	do 6..	do 18..	do 18..	555	410
Marquis of Lorne	do 22..	do 6..	do 18..	do 18..	745	475
Bangholm	do 22..	do 6..	do 18..	do 18..	755	515
Skirving's Purple Top	do 22..	do 6..	do 18..	do 18..	523	605
Prize Purple Top	do 22..	do 6..	do 18..	do 18..	475	350

Mangels.

Ten varieties of mangels were sown in plots of three rows, 30 inches apart and 66 feet long, of each kind. These were sown on May 22nd, and a duplicate plot of each kind was sown on 6th June, with the following results:—

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot Weight.	2nd Plot Weight.
					Lbs.	Lbs.
Gate Post or Long Red	May 22	June 6	Oct. 17	Oct. 16	415	450
Pearce's Canadian Giant	do 22	do 6	do 17	do 16	260	370
Giant Yellow Intermediate	do 22	do 6	do 17	do 16	455	550
Champion Yellow Globe	do 22	do 6	do 17	do 16	430	400
Red Globe	do 22	do 6	do 17	do 16	325	275
Golden Tankard	do 22	do 6	do 17	do 16	560	370
Red Fleshed Tankard	do 22	do 6	do 17	do 16	275	340
Erfurt Model	do 22	do 6	do 17	do 16	456	360
Warden Orange Globe	do 22	do 6	do 17	do 16	250	205
Mammoth Long Red	do 22	do 6	do 17	do 16	305	475

Carrots.

Ten varieties of carrots were sown on 22nd May in three rows, each 66 feet long and 24 inches apart, with duplicate plots of each variety sown on June 6th. The results were as stated below:—

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot, Weight.	2nd Plot, Weight.
					Lbs.	Lbs.
Improved Short White	May 22	June 6	Oct. 17	Oct. 16	400	220
Large Short Vosges	do 22	do 6	do 17	do 16	295	130
Mam. White Intermediate	do 22	do 6	do 17	do 16	525	202
Guerande or Oxheart	do 22	do 6	do 17	do 16	315	110
Early Gem	do 22	do 6	do 17	do 16	333	140
Chantenay	do 22	do 6	do 17	do 16	232	140
Half Long, Danver's	do 22	do 6	do 17	do 16	270	155
Long Red (without core)	do 22	do 6	do 17	do 16	193	78
Carter's Orange Giant	do 22	do 6	do 17	do 16	280	182
White Belgian	do 22	do 6	do 17	do 16	245	100

Sugar Beets.

Four varieties of sugar beets were sown in three rows, each 66 feet long and 30 inches between the rows, with the results as given below:—

Name of Variety.	Sown.	Pulled.	Weight.
			Lbs.
Vilmorin's Improved	May 22	Oct. 19	214
French New Rich	do 22	do 19	126
Klein Wanzleben	do 22	do 19	104
Green Top Brabant	do 22	do 19	248

Mixed Grain for Feed.

Two kinds of mixed grain were sown on one-tenth acre plots, to be cut green and cured for hay, with the following results:—

No. 1. *Mixture sown May* 11. *Harvested August* 11.

—	Weight. Green.	Weight. Dry.
	Lbs.	Lbs.
5 lbs. Prize Prolific Barley; 6 do Golden Vine Pease; 3½ do Banner Oats — 1 bushel each per acre	1,140	553

No. 2. *Mixture sown May* 11. *Harvested August* 11.

—	Weight. Green.	Weight. Dry.
	Lbs.	Lbs.
6 lbs. Golden Vine Pease; 6 do Red Fife Wheat; 3½ do Banner Oats — 1 bushel each per acre	960	430

Corn.

Nine varieties of corn were sown in two rows each, in hills 3 feet apart each way 66 feet long, and in rows 3 feet apart and 66 feet long, with the following results:—

Name of Variety.	Sown.	Harvested	Weight in rows, pounds.	Weight in hills, pounds.	Condition when cut.
Compton's Early	May 24	Sept. 27	500	475	Glazed.
Golden Dew Drop	do 24	do 27	400	520	Silking.
Mastodon Dent	do 24	do 27	505	420	do
Pearce's Prolific	do 24	do 27	250	305	Soft glazed.
Smut Nose Flint	do 24	do 27	450	410	Silking.
Mitchell's Extra Early	do 24	do 27	260	280	Glazed.
Angel of Midnight	do 24	do 27	550	335	Silking.
Thoroughbred White Flint	do 24	do 27	465	400	Tasselled.
North Dakota	do 24	do 27	260	475	do

The Robertson Combination for Ensilage.

Two acres of corn and beans of this combination were sown on May 23rd, also one-half acre of Russian sunflowers, and were cut on Sept. 23rd and 25th.

The corn and beans weighed when wilted two days 28,060 pounds, and the sunflower heads weighed 3,635 pounds.

The land was prepared the same as for turnips, being in grain last year, ploughed in the fall, manured this spring with forty 30 bushel cart loads of manure from the barn-yard per acre well ploughed in and cultivated, 2 barrels of superphosphate per acre was sown broadcast and then harrowed in. The seed was then sown with the seed drill 3 feet apart in the rows, with 2 to 4 seeds per foot. About one-half of the corn germinated, and made slow growth. The beans all grew well.

The corn was badly broken down by a storm on August 23rd, but it did not appear to damage the beans so much. The corn was in the milk stage when cut, and some of the beans on the lower part of the stalks were ripe.

It was evident that the same kind of corn grew better that was planted in plots without the beans, but we thought the beans grown alone did not appear to be so vigorous, as those grown among the corn.

POTATOES.

Forty-nine varieties of potatoes were planted in two rows, each 66 feet long; dates of planting, May 21st to 23rd; dates of digging, Sept. 13th and 14th; results as given below; sets, 2 to 3 eyes; 1 foot apart.

Varieties.	Weight, sound in pounds.	Weight, rotten in pounds.	Colour of Tubers.	Remarks.
Everett	184	10	Light pink	Medium long, oval, medium late.
Daisy	85	12	White and pink eyes	do large, smooth, round late
Clarke's No. 1	138½	19½	White and pink	do long, smooth, late.
Empire State	168	7	White	Large, smooth, late.
Thorburn	168	20	Light pink, white eyes	Medium, smooth, late.
Early Sunrise	143½	13	Pink	Large, smooth, early.
Sharpe's Seedling	166	14½	White	Long, large, late.
Crown Jewel	132	41½	Pink and white	Oval, medium, large, early.
Holborn Abundance	218	....	White	Large, long, late.
Lee's Favourite	143½	19	Pink and white	Long, smooth, early.
Vanguard	61½	33	do	Oblong, smooth, late.
Algoma No. 1	113	32	do	Large, oval, early.
Early Ohio	164	9	Light pink	Long, oval, early.
Northern Spy	169	6	Red	Large, long, flat, late.
Dakota Red	185	2	do	Large, round, late.
Early Rose	140	6	Pink	Long, oval, early.
State of Maine	197	13½	White	Large, long, flat, late.
Early Puritan	155½	19	White and pink	Long, smooth, early.
Burpee's Extra Early	117	28½	Pink and white	Medium long, round, early.
Chicago Market	161	3	Pink	Long, oval, late.
Beauty of Hebron	122	24	White	Oblong, smooth, early.
Rural Blush	165	....	Pink	Long, round, late.
Delaware	172	13½	White	Large, round, late.
London	142	10½	Pink	Medium large, oval, early.
Polaris	136	18	White	Oblong, smooth, medium early.
Bruce's White Beauty	114½	16	do	Medium large, oval, early.
Toronto Queen	115	4	Light pink	Small, smooth, oblong, early.
Earliest of All	108	27	White	Medium large, oval, early.
American Giant	192	9	do	Long, large, deep eye, late.
New Variety No. 1	160	1	Pinkish white	Long, round, deep eye, med. late.
I. X. L	144	8	White and pink	Medium large, long, early.
Pearce's Extra Early	155	11	White, some pink	do do do
Stray Beauty	160	2½	Red	Round, smooth, early.
Rural New Yorker No. 2	88	....	White	Smooth, round, late.
Sugar	99	1	do	Small, round, late
Richter's Imperial	125	42	Pink	Long, oval, late
Rosy Morn	126	11	Dark pink	Medium large, round, early.
Rose's New Giant	130	7	White	Large, long, flat, late.
Late Goodrich	135	10	do	Round, with deep eyes, late.
Compton's Surprise	128	....	do	Large, long, smooth, late.
Richter's Schneerose	158	6½	do	Large, rough, late.
Early White Blue	65	3½	White and blue	Small, round, early.
Dixon's Early	147	12	White and pink	Medium large, oval, early.
Richter's Elephant	111½	8	Light pink	Long, smooth, early.
Lizzie's Pride	92	16	White pink	Large, long, oval, late.
Munro County	123	10	Light pink	Long, rough, late.
Early Gem	154	7½	Pink	Long, oval, early.
Acadian	145½	....	Blue	Large, flat, late.
Mnchonic	120	....	White and pink	Large, round, late.

Cut Potatoes for Seed.

Six different ways of cutting potatoes for seed purposes were tried, and the following results obtained. Taking everything into consideration, the pieces with three eyes gave the best results.

Number of Eyes.	Planted.	Dug.	Weight in pounds.	Remarks.
One eye	May 23	Sept. 14	44½	Even lot; very few small.
Two eyes	do 23	do 14	44	do do
Three eyes	do 23	do 14	66	do do
Cut in half lengthwise through the seed end	do 23	do 14	68	do some small.
Cut in half crosswise, seed end whole	do 23	do 14	70	Some very large and some very small.
Whole potatoes	do 23	do 14	63	Even, some few small

Bordeaux Mixture for the Prevention of Potato Rot.

The following table gives the results of experiments carried on with the Bordeaux mixture as a fungicide, as applied to potatoes for the prevention of rot. The first application was made on July 28th and a second one on August 12th. For this purpose a plot of thirteen different varieties, embracing both early and late kinds was selected. This plot was divided across the middle and one-half treated, the other half was left untreated.

The mixture used was ready prepared and applied according to directions given —one pound to five gallons of water: this mixture did not appear to be so strong as the Bordeaux mixture formerly used here, the formula for which is given in the report of 1892.

Both of these mixtures were applied in the same way, with a sprayer, and the mixture tried this year did not give as good results as that formerly used.

Bordeaux Mixture.

Names of Varieties.	Treated.		Not treated.	
	Sound.	Rotten.	Sound.	Rotten.
	Lbs.	Lbs.	Lbs.	Lbs.
Dixon's Early	89	4	86½	8
Everett	134	1	96½	9
Sharpe's Seedling	108	5	84½	9½
Burpee's Extra Early	97	8	68	20½
Early Ohio	117	2	92	7
Richters Elephant	61	2	59	6
Bruce's White Beauty	74	10	65	6
Polaris	84	10	81	8
Daisy	68	9	42½	3
New variety No. 1	84	0	56	1
Vanguard	46	11	36	22
Northern Spy	92	2	103	4
Holborn Abundance	132	0	112	0

Broom Corn.

Three varieties of broom corn were sown on May 20, and grew well and just began to tassel out when killed with frost.

Names of Varieties.	Height of growth.	Remarks.
	Feet.	
Improved Dwarf	3½	Season too short for it to mature, but it reached a good growth.
California Golden	5	
Long Brush	....	
Long Brush Evergreen	4½	

Beans.

Seven varieties of beans were planted in small plots, with results as given below. The Early Dun Coloured has proved to be one of the best ripening sorts, and yielding heavy, while the Seville Long Pod ripened and yielded the best of the several sorts tried.

Names of Varieties.	Planted.	Pulled.	Condition when pulled.
Early Dun Coloured	May 24	Sept. 27	Very early; all ripened.
Crystal White Wax	do 24	do 27	Medium early; one-half ripened.
Best of All	do 24	do 27	Only part ripened.
Golden Wax	do 24	do 27	Fairly early; not one-half ripened.
Common Long Pod	do 24	Oct. 9	Three-quarters ripened.
Seville Long Pod	do 24	do 9	Nearly all ripened well.
Early Mazagan	do 24	do 9	One-half ripened.

Millet.

Three varieties of millet were sown, but failing to get well started before the drought, in the early part of the season, which seemed to affect it, it failed to mature.

The varieties sown were Pearl, White Freuch and American.

Hemp.

One variety of hemp was sown on May 20th and grew remarkably well, reaching a height of 3½ feet; the seed ripened and was secured.

Flax.

One half bushel of Russian flax was sown on May 24th and cut on August 22nd from which 6 bushels of good seed was obtained.

Buckwheat.

Silver Hull buckwheat was the only kind grown this year, 3 acres were sown which gave a return of 104½ bushels. This has proven to be the most profitable buckwheat grown here. It was sown on May 27th and cut August 27, and filled out well.

WINTER RYE.

One-half acre was sown in winter rye, September 9th in the fall of 1892, which grew well, yielding 14½ bushels from ¾ bushel sown, weighing 55 pounds per bushel. Two and one-half bushels were sown this fall which it is proposed to experiment with as to its value as an early green feed for stock.

CAULIFLOWER.

Fifteen varieties of cauliflowers were transplanted from the hotbed and made very good growth. Among the best varieties noticed were the Early Snowball, Extra Early Dwarf Erfurt, Thorburn's Nonpareil, and Autumn Giant. The following table gives character of the growth:—

Name of Variety.	Remarks.
Gilt Edge	Fair growth; very early; small heads.
Le Normand Short Stem	Good growth; medium early; large heads.
Thorburn's Nonpareil	Strong growth; medium early; large firm heads.
Early Dwarf Erfurt	Fair growth; early; large heads.
Early Paris	Fair growth; early; solid medium heads.
Large Early Dwarf Erfurt	Good growth; medium early; large heads.
Large Early London	Strong growth; medium early; fair heads.
Extra Early Dwarf Erfurt	Medium growth; very early; large firm heads.
Half Early Dwarf French	Fair growth; medium late; medium heads.
Italian Taranto	Strong growth; late; good solid heads.
Autumn Giant	Very strong growth; late; large firm heads.
Stadtholder	Medium growth; late; medium heads.
Early Snowball	Strong growth; early; large fine heads.
Large Algiers	Medium growth; late; fair heads.
Early Walcheren	Medium growth; medium early; good heads.

GENERAL STATEMENT OF CROPS.

Fifty-six acres in hay land grew 110 tons, and in addition to the plots of grain for testing purposes which yielded 248 bushels, there were 10 acres in oats and pease which gave 453 bushels, and 3 acres in buckwheat which gave 104½ bushels, making in all 805½ bushels of grain grown this year.

The plots of roots gave 577 bushels, and in addition, there were 5 acres in turnips which yielded 4,620 bushels, making in all 5,197 bushels of roots.

Three acres were sown with corn, beans and sunflowers for ensilage; 4 acres were devoted to grain crops for feeding purposes during the summer months.

About 3 acres were in small fruits, nursery and shrubbery. The remainder of the cleared land was devoted to pasturage.

DRAINAGE AND ITS ADVANTAGES.

Nine acres of land has been underdrained this year: this with that previously drained, makes 70 acres of the farm thoroughly underdrained. This work has cost an average of about $50 per acre, including main drains with from 8 to 4-inch tiles; about 49 acres are laid with 3-inch tiles, the remainder with 2-inch. They are principally 30 feet apart and 3 feet deep, in some of the land that was very boggy they are 20 and 22 feet apart, while 7 acres are drained with tiles placed 24 feet apart and 2¾ feet deep.

In some cases where the land was uneven, the drains had to be deepened in places to insure a gradual fall, this being necessary in all underdrains. To accomplish this object, it was necessary in one place to lay a main drain of 4-inch tiles

9 feet deep, and in another an 8-inch main drain was laid for several rods 8 feet deep, while in other places the drains are from 4 to 5 feet deep.

Tiles landed on the farm cost, including freight:

2 inch,	$13.00	per M.
3 "	18.00	"
4 "	24.00	"
6 "	45.00	"

The advantages of draining are very many, about 10 days earlier seeding, consequently earlier ripening, when the weather is more suitable for harvesting.

The land is more easily worked and this insures better cultivation than is possible on wet land.

During heavy rains all surplus water is carried away rapidly, the land retaining a sufficient quantity for nourishment; and thus by making the water level lower, the plants are enabled to feed at a greater depth, making more plant food available, thereby providing food and nourishment for crops during severe drought.

The following statement shows cost of draining $3\frac{6}{10}$ acres of land, fertilizers used; also yield of turnips grown on the same.

Cost of draining per acre	$ 54 28	
Cost of draining $3\frac{6}{10}$ acres		$ 195 41
Fertilizers used—		
9030-bush. cart loads manure @ 80c	$ 72 00	
2,160 lbs. bone meal @ 2c. per pound	43 20	
700 lbs. guano @ 3c. per pound	21 60	
		136 80
Total cost		$ 332 26

Yield of turnips per $3\frac{6}{10}$ acres, 3,600 bushels; 3,600 bushels @ 10c. per bushel, $360.00, showing a balance of $27.79 on $3\frac{6}{10}$ acres, or a balance of $7.72 per acre towards cost of labour.

Grasses.

Of the 30 varieties of grasses tried on the farm 11 varieties appear to be suitable to the climate, and from their appearance I think some of them would be valuable if added to our pasture grasses. I have carefully saved the seed from these plots and am now trying them on a field which is being prepared for permanent pasture.

The following are the most suitable varieties: Western Rye Grass, Orchard Grass, Italian Rye Grass, Late or Fowl Meadow, Fringed Brome, Reed Canary, Western Brome, Austrian Brome Grass, Tall Fescue, Meadow Fescue and Red Top.

Strawberries.

The following varieties of strawberries fruited this year: Crescent, Capt. Jack, New Dominion, Manchester, May King and Maggie.

The following varieties were sent here from the Central Farm in May last, and have made good growth, viz.: Sharpless, Warfield and Bubach. There was also a large variety of plants sent from the Central Farm in August last, some of which are living, but many failed to root, and from the experience gained here it appears that May is the best time to transplant strawberries, in this climate.

Raspberries.

Raspberries and blackberries always make good growth. The new wood this year overshadowed the fruit before it was ripe. In some cases the canes were seven feet high;—this rapid growth appeared to injure the fruit.

Gooseberries and Currants.

Ten varieties of currants were received from the Central Farm last May, these have made good growth and will be further reported on another year.

Nineteen varieties of gooseberries were also received, nearly all of which are growing well.

Nuts.

Two varieties of filbert nuts, Cosford Cob and Kentish Cob were sent from the Central Farm last season and are growing well.

Poultry.

There are now on the farm fifteen White Leghorn fowls and one pair of Plymouth Rocks, and it is proposed to add other breeds shortly.

Ornamental Trees and Shrubbery.

All the ornamental trees and shrubs previously planted here are growing well and others have been set out this year. The young forest trees in the nursery are growing remarkably well.

Hungarian Wheat.

A small package of Hungarian wheat was sent from the Central Farm. It received all possible attention, but failed to head and has all the appearances of winter wheat.

Buildings.

The dairy room in one of the buildings, was fitted up in the spring with the necessary appliances to care for the milk until the dairy station was completed on the 1st of July. It is now used for cleaning cans, pails, and keeping the milk over night: we find this a very useful and convenient building.

We also found it necessary to have some of the cattle and horse stalls repaired; the floors in some cases were worn out and decayed.

Stock.

No cattle were bought for feeding experiments last year. A few young steers, which were raised on the farm, were sold in the spring for beef.

Of the thorough-bred cattle now on hand, there are four Shorthorn cows and one bull. A year old bull was sold last spring to the Earltown Agricultural Society.

There are also two Ayrshire cows and one heifer calf and one bull; also two Holstein cows, one heifer (yearling) and two bulls. A bull calf was sold last spring to James Frie, Shediac.

The remaining cattle, 52 in all, are grade cows, steers, and calves.

The surplus milk, after feeding the calves and supplying five families on the farm with milk has been delivered at the dairy station since July 3rd to be converted into cheese and butter.

Five horses are found necessary to carry on the work of the farm, and a pair of one-year-old colts are being raised.

A Yorkshire boar and sow were sent from the Central Farm, also a Berkshire boar. There are in addition 6 Berkshire sows, also five young grade pigs.

FRUIT TREES.

An orchard was commenced three years ago, and additions have been made to it each spring since until now there are 222 apple trees, consisting of 72 varieties; 90 plum trees, 26 varieties; 90 cherry trees, 29 varieties; 62 pears, 21 varieties; 26 crab apple trees, 7 varieties; in all 481 trees, covering about 12 acres. These trees are making good healthy growth, they do not make wood fast, but with few exceptions are growing stout and strong.

Some have commenced to bear. The Longfield has borne for 2 years a small hard apple, but the wood appears weak, and the limbs having fruit on them break easily with the wind. The Wagener, Scott's Winter, Rod Astrachan, Yellow Transparent, Maiden's Blush, Tetofsky and Borovinka fruited this year. A heavy storm of rain and wind on August 22nd shook the young trees very badly, blowing off much of the fruit and breaking some of the branches.

The canker worm and bark lice are the most troublesome pests so far.

MEETINGS ATTENDED.

I attended a farmers' meeting at Belmont on January 12th; was at a meeting of the Farmers and Dairymen's Association of New Brunswick, at Fredericton, on 26th and 27th of January; at the farmers and dairymen's meeting at Truro on March 15th and 16th, also a meeting of Provincial Grange at Bass River, N.S., on June 27th.

EXHIBITIONS ATTENDED.

I exhibited grain in straw and in glass bottles, grasses, potatoes and beans at Pictou exhibition held on 19th, 20th and 21st of September, and also at Charlottetown on the 26th, 27th, 28th and 29th of September, in all about 127 varieties of grains aud grasses and 49 varieties of potatoes were shown.

I also attended the Sackville exhibition on 13th of October.

I have the honour to be, sir,

Your obedient servant,

WM. M. BLAIR,

Superintendent.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., 30th November, 1893.

To WM. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my sixth annual report of the experiments undertaken and work accomplished on the Brandon Experimental Farm during the past eleven months.

GENERAL VIEW, EXPERIMENTAL FARM, BRANDON, MAN.

The past spring will be long remembered as one of the most backward ever experienced in this part of the province. The first wheat sowing was done on this farm on 1st May, fully two weeks later than the average season. But spring once opened the weather was all that could be desired and growth was very rapid, and prospects for a heavy crop were excellent, until 15th July, when dry weather accompanied with extremely hot winds set in, the thermometer reaching 106·4 in the shade on 7th August, and all vegetation received a severe check.

The land on the Experimental Farm being in a good state of cultivation did not suffer as badly as the average farms in this section, still the berry of the earlier varieties of wheat grown on the farm, was greatly shrunken, and the returns especially of hay, roots and fodder plants would have been much larger, but for the drought and hot winds of July and August followed by a dry autumn.

The past season has emphasized the necessity in this portion of the province of a shorter course of rotation than is generally adopted, it is questionable whether more than two, or at the most three crops should be grown on the same land without summer fallow; properly summer-fallowed land is not only freer of weeds, but retains moisture to a much greater extent than loose land filled with unrotted stubble, a condition that obtains in most of the land here when cropped for several years in succession.

This fall in digging drains through stubble land the soil was found almost perfectly dry for 5 and 6 feet deep, while in summer fallow the soil was found quite moist for the same depth.

As a result of the high temperature and bright weather, there has been an almost total absence of injury from rust or fall frost, the first severe frost was experienced on the 16th September when the thermometer showed 8 degrees of frost, at that date even the latest sown wheat was cut and out of danger.

In addition to the repetition of some former experiments so necessary to the reaching of accurate conclusions, a quantity of entirely new work, much of it arranged so as to meet suggestions made by farmers of the province, has been undertaken this year.

RESULTS OF TESTS WITH VARIETIES OF WHEAT.

In addition to the varieties tested on this farm for the past four years a number of new varieties, principally cross-bred wheats, have been tried here this year for the first time. These wheats were originated at the Central Experimental Farm, are nearly all early maturing varieties and were in the milk stage when the hot winds of the 7th August prevailed, and for that reason the kernel was greatly shrunken and the yield reduced; and being nearly ripe at the time of a severe wind storm which occurred on 14th August, when much of the grain was beaten out, the yield was reduced from this cause also.

It will be noticed that nearly all these varieties are early and many of them have short bearded heads.

The Stanley and Alpha are exceptions, having fair sized bald heads and are thus far the most promising of the series.

The accompanying table gives full particulars regarding the test of varieties of wheats for this year.

As all the varieties stood up equally well, the column giving the character of straw is omitted this year.

Test of Thirty-nine Varieties of Wheat.

Sown in the valley, 3rd May; soil, black loam, summer fallow, sown with common drill, 1½ bushels per acre, bluestoned, no smut; size of plots, one-tenth acre.

Variety.	Length of straw.	Kind of head.	Length of head.	No. of days maturing.	Rust.	Ripe.	Yield per acre.		Lbs. per bush.
	Inch.		Inch.				Bush.	lbs.	Lbs.
Goose	47	Bearded	3	113	None	Aug. 24	36	10	62½
Herisson Bearded	44	do	2	107	do	do 18	32	40	62
Rio Grande	47	do	4½	110	do	do 21	31	40	61
Pringle's Champlain	40	do	3½	107	Little	do 18	31	30	60
Gehun	34	Bald	2½	107	None	do 18	30	30	62
Preston	38	Bearded	3½	103	do	do 14	30	..	59
Red Fife	41	Bald	4	110	do	do 21	29	20	60
Old Red River	44	do	4	110	do	do 21	28	50	60
White Russian	47	do	4	110	do	do 21	27	50	59
Hueston's	41	do	4½	110	do	do 21	27	40	58
White Fife	39	do	4½	110	do	do 21	27	40	60
Albert	42	Bearded	3	103	do	do 14	27	30	55
Green Mountain	39	Bald	3½	107	do	do 18	27	10	59
Azima, Russian	41	Bearded	3½	113	do	do 24	27	..	60½
White Connell	39	Bald	4	110	do	do 21	26	50	60
Great Western	47	Bearded	4	111	do	do 22	25	50	60
Red Fern	43	do	4	103	Little	do 14	25	50	59
Emporium	47	do	4½	107	do	do 18	25	40	60
Hungarian Mountain	38	Bald	3	107	None	do 18	25	30	58
Golden Drop	42	do	2½	105	do	do 16	24	50	61
Stanley	37	do	4	103	do	do 14	24	40	59
Ladoga	45	Bearded	3	103	do	do 14	24	..	57
Wellman's Fife	44	Bald	4½	110	do	do 21	23	50	58
Colorado	41	Bearded	3	101	do	do 12	23	20	60
Campbell's Triumph	41	Bald	3	101	do	do 12	23	..	57
Crown	42	Bearded	3½	110	do	do 21	22	10	60
Alpha	45	Bald	4	109	do	do 20	22	..	59
Stonewall	42	Bearded	3	101	do	do 12	22	..	57
Prince	40	do	2¾	103	do	do 14	21	20	56
Manifold	42	do	3	103	do	do 14	21	..	56
A. No. 1	42	do	3	105	Little	do 16	20	30	57
Campbell's White Chaff	41	Bald	4	104	do	do 15	19	40	57
Trial	42	Bearded	3	104	None	do 15	19	..	57
Black Sea	42	do	3	104	do	do 15	18	10	57
Abundance	42	do	4	107	Little	do 18	17	50	56
Ottawa	40	do	3	104	do	do 15	17	40	56
Beta	41	do	3	104	do	do 15	16	50	56½
Carleton	43	do	3	104	None	do 15	16	40	56
Anglo-Canadian	37	do	4½	123	Badly	Sept. 3	7	..	32

Note.—The weights per bushel given here, and also with all other grain tables in my report, are not the maximum weights that the grain could be brought to, but were taken from grain cleaned to a condition fit for milling purposes only.

Cross-bred Wheats.

The parentage of the cross-bred varieties referred to in the table is as follows:—

(Bearded)	Carleton..	Ladoga female and	White	Fife male.	......
(Bald)	Stanley........	do	Red	do	......
(Bearded)	Preston.	do	do	do	....
do	Prince.........	do	White	do	....
do	Abundance...	do	Red	do	....
do	Ottawa........	do	do	do	....
do	Albert.........	do	do	do	....
(Bald)	Alpha	do	White	do	......
(Bearded)	Crown..	do	do	do	....
do	Stonewall....	do	Red	do	....
do	Manifold.....	do	White	do	......
do	A No. 1.......	do	Red	do	....
do	Trial..........	do	do	do	......
do	Beta............	do	do	do	....

Summary of tests of varieties continued over a number of years.

The conditions surrounding even the best conducted field experiments are so variable that any one year's experience should not be considered final and only by repeated tests continued through a number of years can we hope to reach correct conclusions.

A number of the leading varieties of grain have now been tested on this farm for several years and a short summary is submitted of the results obtained.

The greater portion of these varieties have been grown during four greatly varying seasons and the average results may be considered fairly reliable.

In the accompanying table it will be noticed that Blue Stem, a variety grown quite extensively in the North-western States, has given a large average yield, but we find that it matures on an average 4 days later than Red Fife, a great objection here.

White Connell gives a slightly larger return than Red Fife, and White Fife somewhat less than Red.

The yield from Ladoga averages nearly 9 bushels per acre less than Red Fife, but Ladoga matures on an average eight days earlier.

Hungarian Mountain is a hard variety that promises well and I think deserves some attention.

Campbell's White Chaff is an early ripening variety, but soft in the berry and not nearly as productive here as the Fifes.

TABLES showing the average wheat yields for four years, with average weight per bushel, and days taken to mature.

Variety.	Years included.	Average yield per acre.		Average days maturing.	Average weight per bushel.
		Bush.	lbs.		
Blue Stem	1890-91-92	34	42	134	57
Pringle's Champlain	1890-91-92-93	33	18	125	58½
White Connell	1890-91-92-93	32	8	128	59
Rio Grande	1890-91-93	32	2	129	60
Hungarian Mountain	1890-92-93	31	57	125	60
Red Fife	1890-91-92-93	31	56	130	57½
Defiance	1890-91-92	31	4	133	58
French Imperial	1890-91-92	30	32	128	62
White Fife	1890-91-92-93	30	23	128	58
Club	1890-92-93	29	19	120	61
Green Mountain	1890-92-93	28	34	121	60½
Red Fern	1890-91-92-93	28	33	125	59
White Russian	1892-93	28	10	....	58½
Emporium	1892-93	27	40	....	59
Colorado	1890-91-92-93	27	6	122	57
Wellman's Fife	1890-92-93	26	58	126	60
Old Red River	1890-92-93	26	6	124	60½
Gehun	1891-92-93	25	50	119	60
Campbell's White Chaff	1890-92-93	24	49	123	59½
Golden Drop	1890-92-93	23	2	123	61
Ladoga	1890-91-92-93	23	..	122	56
Campbell's Triumph	1890-92-93	22	36	120	59
Hard Red Calcutta	1890-92	18	42	120	61

EARLY MEDIUM AND LATE SOWN WHEAT.

These experiments which proved so interesting in 1892 have been repeated this year, and the season being different, the results are not quite the same. With one exception the wheat plots yielded in the order they were sown, the first sown giving the best return and decreasing each week after. They also ripened in the exact order of sowing, again emphasizing the fact that to escape fall frosts, wheat should be sown as early as possible. Red Fife again gave the largest yield, and ripened as early as the Campbell's White Chaff, the rust on the latter variety appearing to delay its ripening, soil, black loam $\frac{1}{10}$ acre, sown with common drill, 1½ bushels per acre, summer fallow.

When Sown.	Variety.	Length of Straw.	Length of Head.	Rust.	No. of days maturing.	Ripe.	Yield per Acre.		Lbs. per Bush.
		Inches.	Inches.				Bush.	lbs.	Lbs.
May 2	Red Fife	43	4	None	108	Aug. 18	28	10	59
do 9	do	43	3½	do	104	do 21	33	20	60
do 16	do	43	3½	do	100	do 24	28	50	60
do 23	do	43	3½	do	101	Sept. 1	26	40	56
do 30	do	34	3½	Little	96	do 3	22	10	61
June 6	do	35	3	do	98	do 12	18	50	59
May 2	Campbell's White Chaff	42	3	do	108	Aug. 18	23	30	60
do 9	do do	46	3½	do	104	do 21	23	..	57½
do 16	do do	38	3½	do	104	do 28	17	..	57
do 23	do do	36	3	do	101	Sept. 1	15	..	57
do 30	do do	30	3½	Badly	96	do 3	15	..	57
June 6	do do	34	2¾	Very bad	95	do 9	12	30	59

EARLY, MEDIUM AND LATE SOWN OATS.

With oats the Banner plots yielded in the order of sowing, but the returns from the Prize Cluster were irregular; the last named variety is more readily affected by drought, the absence of rain even for a short time lessens the yield. The Banner oat has again proved the most productive, but ripened, on an average, 6 days later than the Prize Cluster, soil, black loam, sown with drill, 10 pecks per acre, plots $\frac{1}{10}$ acre, summer fallow.

When Sown.	Variety.	Length of Straw.	Length of Head.	Rust.	No. of days maturing.	Ripe.	Yield per Acre.		Lbs. per Bush.
		Inches.	Inches.				Bush.	lbs.	Lbs.
May 2..	Prize Cluster..	41	8	None.....	94	Aug. 4..	61	26	40
do 9..	do	40	9½	do	90	do 7..	69	24	40
do 16..	do	42	9	do	87	do 11..	64	24	40½
do 23..	do	44	8	Little	86	do 17..	48	28	34
do 30..	do	40	9	Badly....	85	do 23..	52	12	40
June 6..	do	39	9	do	80	do 25..	50	30	38
May 2..	Banner................	42	7	None....	101	do 11..	86	16	33
do 9..	do	41	7	Little	98	do 15..	75	10	33
do 16..	do	40	7½	do ..	94	do 18..	69	4	34
do 23..	do	46	8	do ...	91	do 22..	61	26	34
do 30..	do	46	9	do	91	do 29 .	57	12	32
June 6..	do	44	7	do ...	87	Sept. 1..	52	32	32

EARLY, MEDIUM AND LATE SOWN BARLEY.

Baxter's six-rowed with a single exception yielded in the order sown, ranging from 40 bushels for the first sown plot, to 34 bushels for the last. Two-rowed Duckbill like the Prize Cluster oat, and apparently from the same cause, gave a very irregular yield.

Sown with common drill, 2 bushels per acre, soil strong loam, summer-fallowed, size of plot, one-tenth acre.

When Sown.	Variety.	Length of Straw.	Length of Head.	Rust.	No. of days maturing.	Ripe.	Yield per Acre.		Lbs. per Bush.
		Inches.	Inches.				Bush.	lbs.	Lbs.
May 2..	Baxter's Six Rowed......	37	3	None	97	Aug. 7..	40	40	49
do 9..	do	34	2½	do	90	do 7..	28	16	49½
do 16..	do	37	2¼	do	88	do 12..	36	12	48
do 23..	do	37	2	do	81	do 12..	35	40	46
do 30..	do	34	2½	do	77	do 15..	35	..	45
June 6..	do	32	2¼	do	73	do 18..	34	18	42
May 2 ..	Duckbill Two Rowed....	37	3¼	do	102	do 12..	43	46	49
do 9..	do	34	3¼	do	95	do 12..	42	34	47
do 16..	do	31	3½	do	93	do 17..	47	24	50
do 23..	do	29	3	do	87	do 22..	45	40	48
do 30..	do	33	3¼	do	90	do 28..	42	4	47
June 6..	do	31	3	do ...	87	Sept. 1..	36	32	48

THE CUTTING OF WHEAT AT DIFFERENT STAGES OF RIPENESS.

Two years ago a series of experiments were commenced to determine the proper stage at which wheat should be cut; at that time fall frost seriously interfered with the completeness of the experiment. The past season was a more favourable one and the result quite clear.

When the season is backward and fall frosts threaten, the temptation to harvest wheat before it is fully matured is great, but it is evident from the following table that considerable loss results both in quantity and weight of sample if the grain has not at least reached what is generally called the dough stage.

In this experiment both red and white varieties of wheat were used, and the result with each is practically the same.

The plots were one-tenth acre; soil black loam, summer-fallowed previous year, sown with common drill on 5th May, 1½ bushels per acre.

Variety.	Stage when cut.	No. days from sowing.	Date of cutting.	Yield per acre.	Weight per bush.
				Bush. lbs.	Lbs.
Red Fife, 1st cut	Early milk stage	94	August 7	16 20	45½
do do 2nd do	Late do	97	do 10	24 10	54½
do do 3rd do.	Dough stage	101	do 14	28 20	58
do do 4th do	Ripe yellow	108	do 21	28 40	60
White Connell 1st cut.	Early milk stage	94	do 7	15 40	48
do do 2nd do.	Late do	97	do 10	20 20	53
do do 3rd do	Dough stage	101	do 14	28	58
do do 4th do	Ripe yellow	108	do 21	29	60

The accompanying view is from a photograph taken during wheat harvest at the Brandon Farm.

HARVESTING WHEAT, EXPERIMENTAL FARM, BRANDON, MAN.

HOME GROWN, AGAINST CHANGED SEED.

Red Fife was procured from the North-west Territories and sown alongside of Red Fife grown on the Experimental Farm, the result is slightly in favour of the home grown seed, but the experiment will have to be repeated several times before a safe conclusion can be reached.

Sown on black loam soil 5th May with a common drill, 1½ bushels per acre, land summer-fallowed the previous year, size of plots one-tenth acre.

Variety.	—	Length of straw.	Length of head.	No. days maturing.	Ripe.	Yield per acre.		Weight per bush.
						Bush.	lbs.	Lbs.
Red Fife..........	Home grown	42 inches.	4 inches..	111	Aug. 24	29	50	57
do	Changed seed....	42 do .	4 do ..	111	do 24	27	50	58

CULTIVATION OF FALL PLOUGHED LAND.

With the object of retaining moisture it is generally considered advisable to harrow and roll land after ploughing in the fall. To ascertain whether this method is beneficial or not four adjoining plots were selected, one received a fall ploughing only, the others were also worked more or less with harrow and roller.

It will be seen by the accompanying table that the plot simply fall ploughed, gave the largest return, and was the freest from weeds.

The absence of weeds can be explained by the more thorough work of the harrow in spring on the rough furrows of this plot. For a comparison a summer-fallowed plot adjoining was sown the same time, this gave three bushels per acre more than the best of the fall ploughed plots, and nearly five bushels more than the average of them.

Soil black loam, summer-fallowed, sown with press drill on the 2nd May, 1½ bushels seed per acre, bluestoned, no smut or rust, size of plots one-tenth of an acre.

Variety.	How treated.	Weeds.	Length of Straw.	No. days maturing.	Ripe.	Yield per acre.		Weight per bushel.
			Inches.			Bush.	Lbs.	Lbs.
Red Fife...	Summer fallowed............	None	43	109	Aug. 19..	26	20	59
do	Fall ploughed only..........	do	37	104	do 14..	23	20	59
do	Fall ploughed and harrowed twice....................	Few.........	35	104	do 14..	22	40	60
do	Fall ploughed and rolled twice.	Weedy.......	38	103	do 13..	21	30	58
do	Fall ploughed, harrowed and rolled.	Very weedy ..	32½	103	do 13..	19	10	60

THE USE OF BARN-YARD MANURE AS A FERTILIZER.

Last year a few tests were made with barn-yard manure as a fertilizer for wheat, to ascertain whether the effect of the manure was lasting or not; these plots were sown again this year with wheat; very little increase is shown from the manure applied in 1892, but the unrotted gives slightly the best return.

Upland prairie, light loam, sown 12th May with press drill, 1½ bush. per acre, one-tenth acre plots, 20 tons per acre of each kind of manure applied in spring of 1892.

Variety.	—	Length of straw.	No. days maturing.	Ripe.	Yield per acre.		Lbs. per bushel.
		Inches.			Bush.	lbs.	
Red Fife. . .	Unrotted manure.........	36	93	Aug. 13....	15	10	56
do	Rotted manure..........	38	93	do 13....	13	50	56
do	No manure...............	36	96	do 16....	13	30	55

Besides the plots included in the preceding table, eight additional ones on clay loam were this year treated with manure which was applied both on the surface and ploughed in. It will be seen that manure applied on the surface has generally given the best return, it no doubt acted as a mulch and retained the moisture during the drought. Fall ploughing appears to encourage weed growth, and this agrees with our experience every year. Soil clay loam, Red Fife, sown 2nd May with press drill, 1½ bushels per acre, plots, one-tenth acre, wheat stubble land.

When ploughed.	Kind of manure.	How manure was applied.	Weeds.	Length of straw.	No. days maturing.	Ripe.	Yield per acre.		Weight per bushel.
				Inches.			Bush.	lbs.	Lbs.
Spring....	None.. ..	....	No weeds...	42	104	Aug. 14..	22	40	59
Fall......	Unrotted. ..	On the surface...	Weedy......	35	104	do 14..	22	20	60
Spring....	do ...	do ..	Few weeds..	38	104	do 14..	22	10	59
do	Rotted.	do ..	do ..	35	104	do 14..	21	..	60
do	do	Ploughed in.....	do ..	37	102	do 12..	19	20	60
Fall......	do	On the surface...	Very weedy.	31	103	do 13..	19	10	60
do	None.......	....	do ..	36	103	do 13..	17	..	59
do	Rotted......	Ploughed in.....	do ..	33	103	do 13..	17	..	59

TEST OF DRILLS.

The difference each year between the returns from drilling and broad-casting have been so great on this farm, that the importance of this question should be kept constantly before the farming public.

In addition to a report of this year's tests of drilling and broadcasting wheat, a summary of four years' tests is also given; it will be seen that the average difference in favour of drills is over 5 bush. per acre with wheat, and 11 bush. with barley. It is estimated that there are one million acres devoted to wheat in this province, and if only 25 per cent of this is sown broadcast and the resnlts reached on this farm fairly represent the whole province it represents a loss of over one million bushels a year.

We find that in addition to the increased yield obtained by sowing with a drill, the grain also ripens more evenly and stands up better.

TEST OF DRILLS FOR SOWING WHEAT.

Wheat stubble ploughed in spring, soil rich black loam, Red Fife wheat, sown 3rd May, size of plots one-fifth acre.

——	Pecks per acre.	Length of Straw.	No. days maturing.	Ripe.	Yield per Acre.		Weight per Bushel.
		Inches.			Bush.	lbs.	Lbs.
Press Drill, wheel coverers, 3½ inches.....	6	41	103	Aug. 14..	29	35	60
Broad-cast Machine, and ploughed in......	8	41	110	do 21..	27	35	60½
Press Drill, wheel coverers, 7 inches........	6	44	104	do 15..	25	55	60
Common Drill..........................	7	41	108	do 19..	23	50	60
Press Drill, chain coverers.................	6	41	108	do 19 .	18	30	60
Broadcast Machine......	8	40	111	do 22..	17	15	60

FOUR YEARS' TEST OF DRILLS IN SOWING WHEAT.

Kind of Drill.	Years included.	Average Yield per Acre.		Average Days Maturing.
		Bush.	lbs.	
Common Drill....................................	1890-91-92-93..	30	44	128
Press do	1890-91-92-93...........	30	29	128
Broadcast Machine..............................	1890.91-92-93...........	25	18	130

THREE YEARS' TEST OF DRILLS IN SOWING BARLEY.

Press Drill....	1890-91-92..............	57	45	112
Common Drill........	1890-91-92............	53	44	112
Broadcast Machine..............................	1890-91-92..............	46	37	112

TEST OF BLUESTONE AS A SMUT PREVENTIVE.

The use of bluestone as a smut preventive is increasing very rapidly in this province. Merchants who a few years ago were unable to sell a hundred pounds in a season, now import it by the ton, and the almost total absence of smut this year is evidence that this fungus is being rapidly brought under control.

The results of this season's experiments with bluestone were practically the same as last, the untreated giving about 30 times as many smutty heads as the treated, the treated also gave from 6 to 7½ additional bushels per acre.

Land summer-fallowed, size of plots, one-tenth of an acre, six pecks per acre, bluestone liquid sprinkled on the seed, results obtained by counting the wheat heads on ten feet square. Common drill used, soil clay loam, sown 10th May, cut 24th August.

Variety.	How treated.	Yield per Acre.	Weight per Bush.	Smutty Heads.	Heads with no Smut.
		Bush. lbs.	Lbs.		
Very smutty Red Fife.........	1 lb. bluestone to 5 bushels..	27 30	58	10	1,980
do	1 do 10 do ..	25 50	58	12	1,572
do	No bluestone................	20 00	55	306	1,956

VARIETIES OF OATS.

Forty-five varieties of oats have been tested on the Experimental Farm this year, and although the season has been unfavourable the yield was large and the weight per bushel fair.

It is customary in this country to sow oats on land unfit for wheat, and for that reason the grain throughout the central aud western portions of the province suffered very severely from the unfavourable weather during August.

On the Experimental Farm, nearly all the oats were sown on summer-fallow and the drought and hot winds have had very little effect on the yield, but the straw was shorter than usual, but stiff and free from rust.

That excellent variety the Banner oat has again made a good record for itself, yielding 91 bushels per acre. Although this variety has been introduced for a number of years, it is still one of the best oats we have, being productive, with a kernel of medium weight, white in colour, and apparently thin hulled.

The following varieties have been tested this year for the first time.

Wide Awake,—a white branching oat, productive, but rather light in weight for a white oat, this variety yielded 68 bushels per acre, the best return from the new varieties of the year.

Imported Irish,—white, with a branching head medium early, the straw of this variety was quite rank for the season, and free of rust.

Cave,—a rather short strawed white oat, with a very handsome branching head, yield 65 bushels: this variety was badly beaten out by wind, otherwise it would have made a better return.

Golden Beauty,—a late ripening white oat, with long straw and kernel: this variety is the lightest weighing oat of the season.

White Wonder,—a very early ripening variety, maturing in 93 days, and like all oats of its class, it weighs well. Oderbruch, a promising side oat, but rather light in weight. Scottish Chief and Canadian Beauty are both early, white oats with branching heads, the last named ripens with the Welcome, but does not equal that variety in productiveness. The Columbus has proved both unproductive and light in weight, and its yellow colour is against it.

TEST OF FORTY-FIVE VARIETIES OF OATS.

Sown on 6th May in valley on clay loam soil, summer-fallowed, sown with common drill, 9 pecks of seed per acre, size of plots, one-tenth of an acre.

Variety.	Length of straw.	Kind of straw.	Length of head.	No. of days maturing.	Ripe.	Yield per acre.		Weight per bushel.
	Inch.		Inch.			Bush.	lbs.	Lbs.
Banner	41	Branching	9	98	Aug. 12	91	6	35
Abundance	40	do	8	98	do 12	85	..	35
Rosedale	43	Half sided	7	97	do 11	82	22	35½
American Beauty	42	Branching	8	100	do 14	82	2	35
Victoria Prize	40	do	7	96	do 10	79	4	42
White Russian	43	do	8	97	do 11	77	2	38
Early Gothland	42	Sided	7	96	do 10	76	16	35½
Welcome	41	Branching	7	90	do 4	76	6	41
English White	38	do	10	95	do 9	75	20	34
Challenge White	45	do	7	96	do 10	75	..	40
Improved Ligowo	38	do	7	96	do 10	75	..	38½
Archangel	46	do	9	96	do 10	75	..	40½
Prize Cluster	41	do	8	90	do 4	74	4	41½
Cream Egyptian	45	do	11	96	do 10	72	2	40½
Bonanza	43	do	8	90	do 4	71	26	40
Winter Gray	47	do	10	90	do 4	71	6	41
Abyssinia	45	Sided	7	100	do 14	69	14	37
Wide Awake	41	Branching	8	100	do 14	68	8	37
White Dutch	40	do	11	93	do 7	67	22	38
Imported Irish	44	do	7½	96	do 10	66	17	37
Imported Blk. Tartarian	47	Sided	8	100	do 14	66	16	35
Rennie's Prize White	46	Branching	10	94	do 8	66	16	40
Early Blossom	43	Half sided	8	103	do 17	66	6	35
Early Etampes	35	Branching	6½	100	do 14	66	6	34
Cave	39	do	8	101	do 15	65	10	36
Holstein Prolific	44	do	7	100	do 14	65	10	32
Golden Beauty	42	do	8	102	do 16	64	24	31
Joanette	31	do	6	98	do 12	64	24	34
Black Tartarian Prolific	38	Sided	7	100	do 14	64	24	33
Black Coulommiers	41	Branching	8	....	do —	64	24	35
Hazlett's Seizure	46	do	13	96	do 10	63	8	39½
Flying Scotchman	37	do	7	90	do 4	62	32	35
Royal Doncaster	29	do	7	96	do 10	59	24	35
White Wonder	43	do	11	93	do 7	59	4	41
California Prolific	46	Sided	8	100	do 14	58	18	31
Poland White	37	Branching	9	96	do 10	57	22	38½
Oderbruch	40	Sided	8	100	do 14	56	6	35
Giant Cluster	35	do	8	100	do 14	54	14	28
Scottish Chief	42	Branching	8	93	do 7	54	14	40
Canadian Beauty	39	do	9	90	do 4	53	28	40½
White Hungarian	38	Sided	7½	104	do 18	53	18	33
American Triumph	47	Branching	9	102	do 16	53	8	32½
Siberian	43	Sided	8	102	do 16	51	16	36
Swedish	36	do	7	104	do 18	47	2	31
Columbus	42	Branching	7	100	do 14	31	6	34

AVERAGE RESULTS FROM FOUR YEARS' TESTS WITH VARIETIES OF OATS.

In addition to tables giving the past season's tests with oats, the average results with several of the leading varieties for the past three or four years are given.

In this table also the Banner takes the lead for productiveness, with the high average of 82 bush., closely followed by English White and Rosedale.

Winter Gray and Prize Cluster are the two earliest varieties, but they are behind in productiveness, Winter Gray also gives the highest average weight per bushel.

It is evident from the returns, which cover several seasons of varying temperature and rainfall, that some of these varieties may be safely regarded as less desirable than others for this province.

Variety.	Years included.	Average Yield per Acre.		Average days maturing.	Average weight per bushel.
		Bush.	lbs.		Lbs.
Banner	1890-91-92-93	82	8	112	35
English White	1890-91-92-93	78	13	109	34
Rosedale	1890-92-93	74	5	109	37
White Russian	1890-91-92-93	74	3	112	36
Welcome	1890-91-92-93	73	18	106	38
Australian	1890-91-92	72	19	121	34
Early Blossom	1890-91-92-93	72	5	112	36
Archangel	1890-91-92-93	71	28	107	39
Black Champion	1890-91-92	71	14	120	35
Black Tartarian	1890-91-92-93	70	19	114	34
Glenrothern	1890-91-92	70	8	123	35
Holstein Prolific	1890-91-92-93	69	16	117	34
Winter Gray	1890-91-92-93	67	12	105	40
Prize Cluster	1890-91-92-93	64	19	105	37
American Triumph	1890-91-92-93	64	10	118	33
Early Race Horse	1890-91-92	62	5	112	39
Rennie's Prize White	1890-92-93	61	22	104	39

VARIETIES OF BARLEY.

Although barley in common with other cereals suffered from the excessive heat and drought of August the returns from this year's crop are nevertheless good, and when taken in connection with the results of the feeding tests it will be seen that this can be made one of the most profitable crops grown in the province.

Barley has two strong points in its favour; it is seldom injured by fall frosts, it can be sown after wheat in spring, and harvested before that staple crop is ripe, by this means profitably utilizing the spare time between wheat seeding and harvest.

We have found that crushed barley is an excellent food for horses, cattle, swine and poultry.

TESTS OF VARIETIES OF BARLEY.

Sown 16th May with a common drill, 8 pecks per acre, on clay loam soil, summer-fallowed, size of plots $\frac{1}{10}$ acre.

Variety.	Length of straw.	Kind of head.	Length of head.	Number of days maturing.	Ripe.	Yield per acre.		Lbs. per bush.
	Inch.		Inch.			Bush.	lbs.	
Odessa	37½	6 row	2½	85	Aug. 9	57	4	48
Mensury	40	6 do	3½	86	do 10	54	18	47
Sharpe's Improved Chevalier	36	2 do	3	90	do 14	53	6	48
Kinver Chevalier	39	2 do	3	90	do 14	51	2	47
Golden Grains	36	2 do	4½	90	do 14	48	46	48
Duckbill	36	2 do	3½	86	do 10	48	26	48
Goldthorpe	36	2 do	3	92	do 16	48	16	45
French Chevalier	36	2 do	4	90	do 14	47	44	48
Baxters	35	6 do	2	80	do 4	46	42	47
Danish Chevalier	33	2 do	4	90	do 14	45	30	45½
Oderbruch	36	6 do	2½	86	do 10	45	10	48
Canadian Thorpe	36	2 do	2½	90	do 14	44	38	45
Rennie's Improved	33	6 do	2½	80	do 4	43	16	47
Common Six-rowed	32	6 do	2½	83	do 7	43	6	49½
Prize Prolific	33	2 do	4½	90	do 14	42	14	47
Thanet	41	2 do	5	90	do 14	40	10	45
Petschora	31	6 do	3½	83	do 7	39	28	42
Guymalaye	37	6 do	3	85	do 9	31	2	55

RESULTS OF TESTS WITH BARLEY FROM 1890 TO 1893.

In the following table will be found a summary of the results obtained with some of the principal varieties of barley, during the past four years; the Duckbill, Goldthorpe and Odessa are the three most productive varieties, these are also stiff strawed sorts, an important consideration in this country where the rich soil encourages a rank and tender growth of straw.

Variety.	Years included.	Average yield per acre.		Average days maturing.	Average weight per bushel.
		Bush.	lbs.		Lbs.
Duckbill Two-rowed	1890, '91, '92, '93	59	28	102	50½
Goldthorpe do	1890, '91, '92, '93	59	21	109	49½
Odessa Six-rowed	1890, '91, '92, '93	59	10	97	51
Prize Prolific Two-rowed	1890, '91, '92, '93	55	16	105	50
Sharpe's Improved Chevalier Two-rowed	1892, '93	54	38	94	49½
Danish Chevalier do	1890, '91, '92, '93	54	11	104	50½
California Prolific do	1891, '92	53	46	105	50½
Kinver Chevalier do	1891, '92, '93	52	22	103	50
Rennie's Six-rowed	1890, '91, '92, '93	51	31	94	50
Beardless Two-rowed	1890, '91, '92	50	27	110	51
Mensury Six-rowed	1892, '93	47	34	89	47½
Thanet Two-rowed	1890, '92, '93	44	32	101	50
Baxter's Six-rowed	1890, '92, '93	41	7	88	49

PEASE.

Twelve varieties of pease have been tested on the farm this year, the season was favourable, and nearly all the varieties have given a good return.

This crop if grown on clean land has always given profitable returns here, the only objection to its increased cultivation is the difficulty found in harvesting and threshing it. To ascertain whether this could be lessened a trial was made of growing it with other grain, and using a binder to cut, and a separator to thresh the combined crop. Grown with other grain, both stood up well, and were readily cut with a binder, and we found no difficulty in threshing it with a separator, but the accompanying table will show that the return of pease from this method was small.

It is said that pea harvesters are in use in eastern Canada, but they have not been introduced here.

TEST OF VARIETIES OF PEASE.

Sown May 5th on summer fallow, with a common drill; soil-clay loam; size of plots one-tenth acre.

Variety.	Amount sown per acre.	Apparent thickness.	Length of straw.	Length of pod.	Number of days maturing.	Ripe.	Yield per acre.		Weight per bushel.
	Bush.		Inch.	Inch.			Bush.	lbs.	Lbs.
Golden Vine	2½	Right	41	2	101	Aug. 14	36	20	65
Prince Albert	2½	Thin	50	3	108	do 21	32	40	64½
Multiplier	2½	do	49	2½	114	do 27	31	50	63
Crown	2½	Right	34	2	99	do 12	31	50	64
Mummy	3	do	38	3	110	do 23	30	50	64
Prussian Blue	2½	do	41	2¾	108	do 21	29	50	63
Potter	2½	Very thin.	38	3	115	do 28	29	00	62
Pride	3	Thin	38	3	96	do 9	28	30	63
White Marrowfat	3½	do	35	3½	115	do 28	27	00	64
Black Eyed Marrowfat	3½	do	44	3	111	do 24	26	30	62
Canadian Beauty	3⅓	do	49	3	116	do 29	25	50	62
Centennial	3	do	48	3	115	do 28	18	40	63½

MIXED CROPS GROWN FOR GRAIN.

Variety.	Pecks per acre sown.	Date of sowing.	How sown.	Lbs. per bushel.	Yield of mixed grain per acre.		Proportion of pease per acre.	
					Bush.	lbs.	Bush.	lbs.
Pease—Crown Oats—Prize Cluster	8 4	May 5 do 5	Press drill do	31	56	14	4	40
Pease—Crown Wheat—Red Fern	8 4	do 5 do 5	Press drill do	60	27	..	3	40
Pease—Crown Barley—Prize Prolific	8 4	do 5 do 5	Press drill do	50	49	30	3	40
Pease—Crown Oats—Holstein Prolific	4 8	do 16 do 16	Press drill, north & south do east and west.	31	64	19	2	30
Pease—Crown Oats—Holstein Prolific	4 8	do 16 do 16	Press drill, 3½ inches do do	31	61	29	1	10
Pease—Golden Vine Oats—Banner Wheat—Red Fife	4 4 4	do 16 do 16 do 16	Common drill do do	31	46	4	1	10

THICK AND THIN SOWING OF PEASE.

The quantity of seed per acre generally sown here has been regulated by eastern experience, and has always appeared too little for this province.

To test this matter, three plots of Prince Albert peas, a variety of medium size, were sown with different quantities of seed, and the results seem to show that a liberal seeding is the most profitable.

Soil, black loam, plots one-tenth acre, sown with common drill on summer-fallow.

Variety.	When sown.	Amount sown per Acre	Apparent Thickness.	Length of Straw.	Length of Pod.	No. Days maturing.	Ripe.	Yield per Acre.		Weight per Bush.
		Bush.		Inches.	Inches.			Bush.	lbs.	Lbs.
Prince Albert.........	May 5..	2	Thin...	50	3	111	Aug. 24.	22	30	64
do	do 5..	3	Right..	50	3	109	do 22.	27	30	64
do	do 5..	4	Thick..	50	3	108	do 21.	26	20	64

ROTATION OF CROPS.

At present very few farmers in this country, practice a rotation of crops, many following wheat with wheat until the land is so impoverished or made foul with weeds, that less than half a crop is obtained.

As this system, or rather want of system, will have to be changed before many years, some experiments were undertaken this year for the purpose of throwing light on the proper rotation for this country.

It will be seen that both fodder corn and millet stubble, gave better returns than summer-fallow, this, however, is the result of only one year's test.

Variety sown.	How prepared.	Character of Soil.	When sown.	Length of Straw.	Length of Head.	When cut.	Days Maturing.	Yield per Acre.		Lbs. per Bush.
				In.	In.			Bush.	lbs.	
Red Fife, Barley stubble	Spring ploughed ...	Loam	May 3.	39	4	Aug. 19	108	17	05	59
do summer-fallow.	No spring preparat'n	do	do 3.	40	4	do 20	109	24	35	58
Red Fife, Millet stubble	Spring ploughed	Loam	May 2.	36	4	Aug. 19	109	28	20	59
do summer-fallow.	No spring preparat'n.	do	do 2.	43	4	do 19	109	26	20	59
Red Fife, Fodder Corn stubble	Spring ploughed	Clay loam	May 17.	38	$3\frac{1}{2}$	Aug. 21	97	35	30	61
do summer-fallow.	No spring preparat'n.	do ..	do 17.	41	4	do 21	97	31	30	60
Red Fife, Pea stubble...	Spring ploughed	Light loam	May 12.	34	$3\frac{1}{2}$	Aug. 13	93	14	40	54
do do	Unploughed	do ..	do 12.	32	$3\frac{1}{2}$	do 13	93	13	10	54
do summer-fallow.	No spring preparat'n.	do ..	do 12.	36	$3\frac{1}{2}$	do 15	95	15	00	55
Red Fife, Oat stubble...	Spring ploughed	Light loam	May 12.	34	$3\frac{1}{2}$	Aug. 13	93	13	20	55
do summer-fallow.	No spring preparat'n.	do ..	do 12.	36	$3\frac{1}{2}$	do 15	95	15	00	55

LOSSES FROM SOWING INJURED SEED GRAIN.

Complaints are being received from all parts of the province regarding the lack of germinating power in the graiu sown last spring, some farmers losing their whole crop from this cause.

The grain of this province if properly stacked and garnered will always show a high germinating power; and the losses this year can generally be traced to the use of damp wheat for seed, the grain garnered in a damp condition may be apparently sound, but experience has proved that grain ever so slightly heated, is unsafe to sow and should be tested before sowing, and if this cannot be done, it should be discarded, and only perfectly sound seed used.

Where doubts exist regarding the germination of seed grain, a sample should be forwarded by mail to the Central Experimental Farm, Ottawa, where it will be tested and the returns sent back, free of charge.

All seed grain intended for distribution from this farm is tested for germinating power before being sent out.

The following tables give the number of samples tested, and the average germinating power of each kind of grain grown on the Experimental Farm in 1892. These were tested at the Central Experimental Farm.

Wheat, 49 samples tested: average germinating power, 91 per cent; strong plants, 84 per cent; weak plants, 7 per cent.

Oats, 41 samples tested: average germinating power, 97 per cent; strong plants, 86 per cent; weak plants, 11 per cent.

Barley, 34 samples tested: average germinating power, 90 per cent; strong plants, 75 per cent; weak plants, 15 per cent.

COUCH GRASS EXTERMINATION.

Numerous letters of inquiry are received each year regarding the best plan for destroying Couch or Quack Grass.

The above terms are applied indiscriminately here to two quite distinct grasses, both of them different from the couch grass of the east, *Agropyrum repens.* One variety, *Agropyrum glaucum* or Colorado Blue Stem, Fig. 2, has a bright bluish-green narrow blade, and ripens its seed in July, the other *Hierochloa borealis*, Holy Grass or Sweet Grass, Fig. 3, has a wide, light green blade, and ripens its seed in May; the last mentioned is the more common, and is fast getting possession of some farms, and completly chokes out any grain that may be sown with it. Both varieties are readily propagated from both seed and root stocks.

Fig. 2.—COLORADO BLUE-STEM. (*Agropyrum glaucum*, *R. & S.* var. *occidentale*, V. & S.)

Fig. 3.—*Hierochloa borealis*, R. & S.

The sweet grass ripening early, generally sheds its seed before summer-fallows are ploughed and the one ploughing usually given summer-fallow here covers this seed, and spreads the root stocks over the field, the smallest piece of which will grow and become a centre of distribution another year.

Last spring four one-tenth acre plots badly infested with the sweet grass were set apart for experimental work.

All were ploughed May 28th.

Plot 1, was at once sown with three bushels of barley per acre, and the crop allowed to ripen.

Plot 2, also sown, but with oats, and the crop allowed to ripen.

Plot 3, was summer-fallowed by ploughing once and the weeds kept down with surface cultivation.

Plot 4, also summer-fallowed but ploughed twice and couch grass roots brought to the surface by harrowing.

Very little sweet grass is left in Plots 1 and 2, and none whatever can be seen in Plot 4, twice ploughed; but in Plot 3, ploughed but once, the grass appears thicker than ever.

These plots will be kept in view and their condition reported on next year.

FODDER CORN.

This plant has generally given such good returns here that an increased area has been sown every year.

In addition to the fifteen varieties sown in small plots, a field of eleven acres was sown this year for ensilage purposes.

As this plant makes its principal growth late in the season, it suffered severely from the drought and hot winds of August, this reduced the yield to one-half of last year's crop, but the open fall and high temperature was favourable to early maturing and all the varieties formed ears, some of them reaching the roasting stage.

In addition to the usual plan of sowing in rows, a set of duplicate plots were planted in hills; sowing in rows is by far the most expeditious and has this year given the largest return; there was no noticeable difference in point of earliness between the two methods of sowing.

The land for this crop was prepared by ploughing in ten loads of rotted manure in spring, was then well harrowed and the corn sown with a press drill.

This land was in millet the previous year.

FODDER CORN sown on 26th May, with a press drill, in rows three feet apart, and nine inches apart in the row, cut 14th September.

Variety.	When tasseled.	In Silk.	Early Milk.	Late Milk.	Stage when cut.	Height in inches	Leafiness.	No. of Stools.	Weight green cobs per doz.	Yield per acre, green.	
									Lbs.	Tons.	Lbs.
Mastodon Dent......	Aug 20	Aug 25	Sept 4	......	Early milk	84	Little ...	2	7	13	950
Angel of Midnight....	do 1	do 9	Aug 25	Sept 4	Roasting ears ...	62	Fair......	3	7½	11	1,100
Compton's Early......	do 1	do 10	do 23	do 4	Late milk.	62	Good.....	3	9	11	1,100
Golden Dew Drop....	do 4	do 20	do 27	do 5	do ..	63	do	4	7½	11	1,100
Great Northern......	do 2	do 9	do 26	do 6	Roasting ears....	64	do	4	8½	11	1,100
Gold Dollar.........	do 3	do 10	do 24	do 5	do ..	69	Very good	4	10	11	
North Dakota Flint..	do 1	do 9	do 24	do 4	do ..	59	Good.....	6	8	10	1,450
Thorobred White Flint	do 25	Sept 5	Sept 11	....	Early milk	52	do	4	......	9	1,800
Gold Coin........ ..	July 28	Aug 9	Aug 23	Aug 29	Roasting ears....	65	do	3	6½	9	700
Early Minnesota......	Aug 1	do 5	do 26	Sept 5	do ..	52	do	4	5½	9	700
Pearce's Prolific	do 3	do 9	do 15	Aug 24	do ..	56	Fair.. ...	3	5	8	1,050
Smut Nose Flint......	do 4	do 15	do 25	Sept 3	Late milk.	63	Good.....	3	6½	8	1,050
Early Champion	do 1	do 9	do 26	do 5	Roasting ears.. .	39	Poor.....	5	8	6	1,200
Mitchell's Extra Early	July 25	do 1	do 10	Aug 20	Nearly ripe	45	do	3	4	4	1,900
Burpee's First of All.	do 29	do 7	do 25	do 24	Roasting ears....	44	do	5	5½	4	800

FODDER CORN planted on 26th May, in hills, three feet apart each way, three grains in a hill, cut 14th September.

Variety.	When tasseled.	In Silk.	Early Milk.	Late Milk.	Stage when cut.	Height in inches	Leafiness.	No. of Stools.	Weight green cobs per doz.	Yield per acre, green.	
									Lbs.	Tons.	lbs.
Mastodon Dent	Aug 20	Aug 25	Sept 4	......	Early milk	84	Little	2	7	11	1,100
Great Northern	do 2	do 9	Aug 26	Sept 6	Roasting ears	64	Good	4	8½	10	900
Angel of Midnight....	do 1	do 9	do 25	do 4	do ..	62	Fair	3	7½	9	1,800
Golden Dew Drop....	do 4	do 20	do 27	do 5	Late milk.	63	Good	4	7½	9	700
Compton's Early.....	do 1	do 10	do 25	do 4	do ..	62	do	3	9	9	1,500
Thorobred White Flint	do 25	Sept 5	Sept 11	....	Early milk	52	do	4	......	8	1,600
Gold Coin	July 28	Aug 9	Aug 23	Aug 29	Roasting ears	65	do	3	6½	8	1,600
Smut Nose Flint.....	Aug 4	do 15	do 25	Sept 3	Late milk.	63	do	3	6½	8	500
Pearce's Prolific......	do 3	do 9	do 15	Aug 24	Roasting ears	56	Fair	3	5	7	1,400
Gold Dollar..........	do 3	do 10	do 24	Sept 5	do ..	69	Very good	4	10	7	1,400
North Dakota Flint..	do 1	do 9	do 24	do 4	do ..	59	Good.....	6	8	7	300
Early Minnesota.....	do 1	do 5	do 26	do 5	do ..	52	do	4	5½	7	300
Early Champion	do 1	do 9	do 26	do 5	do ..	39	Poor	5	8	5	1,000
Mitchell's Extra Early	July 25	do 1	do 10	Aug 20	Nearly ripe	45	do	3	4	4	1,900
Burpee's First of All..	do 29	do 7	do 25	do 24	Roasting ears	44	do	5	5½	3	160

MIXED GRAIN FOR HAY.

Six plots have been sown with mixed grain for hay, the returns are very variable ranging from under 2 to nearly 4 tons per acre.

Plots 5 and 6 were sown for the purpose of testing cross-sowing pease against sowing them in every other drill.

In plot 5 the oats were sown at the rate of 8 pecks with a seven-inch drill, then the pease were sown at the rate of 4 pecks in the spaces between the oat drills, making alternate drills of oats and pease, 3½ inches apart.

In plot 6 the oats were sown in 7-inch drills, east and west, and then the pease north and south.

It will be seen that the 3½ inch drills gave much the best return.

Soil clay loam, size of plots one-tenth acre, summer-fallowed.

	Variety.	Pecks per Acre Sown.	Date of Sowing.	How Sown.	When Cut	Weight per Acre Dry.	
						Tons.	lbs.
1	Oats, Prize Cluster..	4	May 5...	*Press drill...........	Aug. 17...	1	1,850
	Pease, Crown.........	8	" 5...	do			
2	Wheat, Red Fern................	4	" 5...	Press drill	" 21...	2	350
	Pease, Crown..................	8	" 5...	do			
3	Barley, Prize Prolific	4	" 5...	Press drill	" 14...	2	1,850
	Pease, Crown......	8	" 5...	do			
4	Wheat, Red Fife...............	4	" 16...	Common drill	" 17...	2	1,800
	Oats, Banner.................	4	" 16...	do			
	Pease, Golden Vine.	4	" 16...	do			
5	Oats, Holstein Prolific..	8	" 16...	Press drill, 3½ in	" 17...	3	1,950
	Pease, Crown...................	4	" 16...	do do			
6	Oats, Holstein Prolific........	8	" 16...	Press drill, east and west.	" 17...	2	1,500
	Pease, Crown..................	4	" 16...	do north and south			

* Injured slightly by alkaline soil.

MILLETS.

The hot, dry August of this year was very much against a large yield of millet, but the land selected for this crop was clean and naturally moist and the returns were very fair for the season.

The plots were of 2 sizes, $\frac{1}{10}$ and $\frac{1}{20}$ acre. The $\frac{1}{20}$ acre plots were sown in drills 12 inches apart, and cultivated between the drills with a Planet jr. drill, the $\frac{1}{10}$ acae acre plots were sown in 7 in. drills and not cultivated, it will be noticed that in every case the cultivated drills gave the largest return.

One-twentieth of an acre of hemp was also sown. This reached 6 feet high and gave 1,300 pounds of the dry product per acre.

Variety.	Size of Plot.	How treated.	Yield per Acre. Green. Tons.	Green. lbs.	Dry. Tons.	Dry. lbs.
Hungarian Grass..	$\frac{1}{20}$ acre ...	1-foot drills, and cultivated between......	3	1,900	2	100
do	$\frac{1}{10}$ " ...	7-in. drills, not cultivated	3	1,050	2	300
Common Millet.........	$\frac{1}{20}$ " ...	1-foot drills, and cultivated between.....	3	200	2	100
do	$\frac{1}{10}$ " ...	7-in. drills, not cultivated	2	1,150	1	1,000
German Millet.........	$\frac{1}{20}$ " ...	1-foot drills, and cultivated between	3	100	1	1,800
do	$\frac{1}{10}$ " ...	7-in. drills, not cultivated...............	3	.....	1	800
American Millet.. ...	$\frac{1}{20}$ " ...	1-foot drills, and cultivated between.. .	3	700	1	1,300
White French Millet.. .	$\frac{1}{20}$ " ...	do do	3	.....	1	1,400
Hemp................	$\frac{1}{20}$ " ...	do do . ..	2	900	..	1,300

GRASSES.

The plots of native and hardy imported grasses sown in 1890 and 1891 were again cut this year: the yield of all was somewhat smaller than usual, and the timothy sown in 1890 was scarcely worth the cutting. The native grasses sown the same year are however still giving fair yields.

A considerable area was sown to grass seed this year both with and without a grain crop; owing to the dry summer very few of the varieties, native or imported, sown in spring with a grain crop, have grown well; but six acres sown with native grasses alone, have made a good catch, and were from four to six inches high when winter set in.

The plan of sowing grass seed alone on fallowed land late in summer, is, it seems, the most certain for this country, and would be more generally adopted if it were not for the loss of a grain crop which that method entails.

The accompanying table gives the yield and other particulars of the plots of hardy grasses sown during 1890–92; the plots vary in size from one-tenth to one-half an acre each.

Variety.	Size of Plot.	When sown.	When cut.	Yield per acre, dry. Tons.	lbs.
Elymus Americanus...	25 × 310 links ..	Spring 1891.....	July 18......	1	1,870
Muhlenbergia glomerata.....	60 × 480 do	do 1891.....	Sept. 1. ...	1	881
Agropyrum tenerum.	25 × 480 do	do 1892.....	July 18	1	400
Austrian Brome.....................	25 × 480 do	do 1891....	do 1......	1	333
Sheep's Fescue........................	25 × 480 do	do 1890.....	do 1......	..	1,500
Timothy............................	$\frac{1}{2}$ acre.........	do 1890.....	do 1 ...	..	1,080

SUNFLOWERS FOR SEED AND ENSILAGE.

Two acres of Russian sunflowers were sown at three different times, May 8th, 15th and 22nd, and although there were eleven degrees of frost after the plants were up, the frost had no apparent effect on them, the early sown were the finest plants all the season. The sowing was done with a common wheat drill, in rows three feet apart, the seed dropped about one foot apart, and thinned to two feet after the plants were np ; soil clay loam. The field was kept clean with a Planet jr. cnltivator during the growing season. The plants averaged 6 feet high when cnt, the heads were cut with sickles on September 9th, and run through the cutting box with the fodder corn for ensilage, the seed being nearly ripe at that date.

After the heads were cut, the stalks were allowed to dry, then cut and piled for fuel. They burn well when dry and give out considerable heat, but last for a very short time. Where wood cannot be obtained they could be utilized for summer fuel, bnt would not be suitable for winter fires.

The following table gives full particulars of this crop.

Variety.	Sown.	When cut for silo.	Yield of heads per acre.	When cut for seed.	Yield of threshed seed per acre.	Weight of seed per bushel.	Yield of stalks per acre.	Max. diameter of heads.
Mammoth Russian..	May 8..	Sept. 9.	11,220 lbs.	Sept. 16..	35 bush...	37 lbs.....	4½ cords..	12 inches.

SILOS.

The ensilage made in the fall of 1892 from well matnred and wilted North Dakota Flint Corn proved to be excellent, much better than that made from nnwilted corn in 1891; only a very small quantity on top and on the west side of the silo was injured.

This year the yield of fodder corn was light and only one silo was filled, partly with corn and sunflower heads, and the balance with corn and horse beans. The silo is not yet opened for use, but judging from appearance the ensilage promises to be as good as last year.

Since the silos were built at the Experimental Farm a nnmber of others have been built in different parts of the province, and all appear to give good satisfaction.

FIELD ROOTS.

Owing to the light rainfall during the season of growth, all kinds of field roots throughout the central and western parts of the province gave a very unsatisfactory yield, the returns on the Experimental Farm were no exception to the rule, the yield being scarcely one-half of an average crop.

The soil selected for roots was a strong clay loam, thoroughly summer-fallowed the previous year, and all weeds were kept down between the rows by the nse of the Planet jr. cnltivator.

The yield per acre has been calculated from the results obtained from three rows of each variety one chain long.

RESULTS OF EXPERIMENTS WITH TURNIPS DURING 1893.

Land in summer-fallow the previous year, treated with ten tons rotted manure per acre, applied in the spring of 1893. Turnips were sown in flat drills 2½ feet apart. Two sowings were made, one on 3rd June and one on 19th June. Taken up Oct. 10th; soil, clay loam.

Variety.	Yield from Plots sown 5th June. Yield per Acre.			Yield from Plots sown 19th June. Yield per Acre.		
	Bush.	Tons.	lbs.	Bush.	Tons.	lbs.
Carters's Prize Winner	352	10	1,120	296	8	1,760
Selected Purple Top	312	9	720	293	8	1,580
Selected East Lothian	293	8	1,580	253	7	1,180
Sutton's Champion	293	8	1,580	281	8	860
Bangholm Improved	278	8	680	253	7	1,180
Skirving's Purple Top	275	8	500	231	6	1,860
Rennie's Prize Purple Top	272	8	320	246	7	760
Marquis of Lorne	253	7	1,180	234	7	40
Jumbo or Monarch	249	7	940	227	6	1,620
Carter's Elephant	234	7	40	202	6	120
Mammoth Purple Top	187	5	1,220	225	6	1,500
Monarch	139	4	340	92	2	1,520

YIELD OF MANGELS AND SUGAR BEETS.

Sown in flat drills 2½ feet apart on clay loam soil, summer-fallowed the previous year, treated with ten tons of rotted barn yard manure applied in spring of 1893. Two sowings were made, one on 6th June and one on 20th June. The roots were pulled on 6th October.

Variety.	Yield from Plots sown 6th June. Yield per Acre.			Yield from Plots sown 20th June. Yield per Acre.		
	Bush.	Tons.	lbs.	Bush.	Tons.	lbs.
Mammoth Long Red	429	12	1,740	274	8	440
Champion Yellow Globe	420	12	1,200	386	11	1,160
Giant Yellow Intermediate	378	11	680	293	8	1,580
Gate Post	344	10	640	278	8	680
Golden Tankard	344	10	640	312	9	720
Canadian Giant	340	10	400	305	9	300
Warden Orange Globe	340	10	400	288	8	1,280
Red Globe	319	9	1,140	259	7	1,540
Red Fleshed Tankard	261	7	1,660	181	5	860
Erfurt Model	155	4	1,300	146	4	760
Green Top Brabant (Sugar Beets)	385	11	1,180	264	7	1,840
Vilmorin's Improved do	344	10	640	246	7	760
French New Rich do	322	9	1,320	264	7	1,840
Klein Wanzleben do	316	9	960	246	7	760

RESULTS OF EXPERIMENTS WITH FIELD CARROTS.

Land in summer-fallow the previous year, treated with ten tons per acre of rotted stable manure, applied in spring. Carrots were sown in flat drills eighteen inches apart. Two sowings were made, one on 6th June and one on 20th June. Soil clay loam.

Variety.	Yield from Plots sown 6th June. Yield per Acre.			Yield from Plots sown 20th June. Yield per Acre.		
	Bush.	Tons.	lbs.	Bush.	Tons.	lbs.
Large Short Vosges	154	4	1,240	146	4	760
Early Gem	147	4	820	139	4	340
Improved Short White	146	4	760	132	3	1,920
Chantenay	146	4	760	132	3	1,920
Half Long Danvers	146	4	760	95	2	1,700
White Intermediate	139	4	340	117	3	1,020
Long Red without core	110	3	600	95	2	1,700
White Belgian	110	3	600			
Carter's Orange Giant	102	3	120	95	2	1,700

POTATOES.

The potato crop throughout the central and western parts of the province is lighter this year than it has been for a number of years; the dry summer and fall reducing the yield to less than one-half of an average crop. Fortunately the eastern parts of the province fared better and are in a position to supply the deficiency in the west.

The land on the Experimental Farm selected for this crop was a stiff clay soil, very retentive of moisture and for that reason suffered but slightly from the drought, but the cold, wet soil, delayed germination in spring, making the plants late to ripen and injuring the quality so badly that tests in this particular would be misleading, and are not included in the tables this year.

The accompanying tables give particulars of this crop. The returns per acre are based on the product of 2 rows, each one chain long.

POTATOES.

Ploughed in, in rows three feet apart, one foot apart in the row; weeds kept down during the growing season with a one-horse cultivator. All were planted 26th May, and the last were taken up 5th October.

Variety.	Yield per Acre.	Earliness.	Size.
	Bush.		
Daisy	253	Late	Medium.
Rural Blush	251		do
Rose Valley	245	Late	Large.
Genessee Seedling	244	do	do
Everett	242	do	do
The Freeman	238	do	Small.
Sharpe's Seedling	236	Medium	Medium.
Dakota Red	229	Late	Large.
Polaris	229	do	do
Bruce's White Beauty	223	do	Medium.
Harbinger	220	do	Small.
Burpee's Extra Early	220	Early	
New Variety No. 1	216	Late	Large.
Empire Bell	205	do	Medium.
Holborn Abundance	201	Medium	do
State of Maine	201	Late	do
Pearce's Prize Winner	201	do	Large.
Pearce's Extra Early	196	do	do
Cream of the Valley	190	do	do
White Unknown	188	do	do
Lizzie's Pride	187	do	Medium.
Algoma	187	Early	do
American Giant	187	Late	Small.
I.X.L	183	do	Medium.
Toronto Queen	179	do	Large.
Northern Spy	174	do	do
Early Puritan	170	do	do
Green Mountain	168	do	Medium.
Crown Jewel	165	do	Large.
Lee's Favourite	165	Medium	Medium.
Early Rose	165	do	do
Thorburn's Late Rose	165	Late	Large.
Early Sunrise	161	do	do
Vanguard	157	do	do
Early Ohio	152	Very early	Medium.
Delaware	148	Late	do
Empire State	146	do	Large.
Beauty of Hebron	137	do	do
Steele's Earliest of All	135	do	Very large.
Rural Blush	128	do	Medium.
Thorburn's Paragon	110	do	do
Clarke's No. 1	106	do	Large.
Chicago Market	100	do	do
Snowdrop	95	do	Small.

SWINE FEEDING EXPERIMENTS.

Two series of experiments in swine feeding were undertaken in the winter of 1891-2, with the anticipation that supplementary tests would be made during the following summer. For this reason the results were not published in the last report. It was afterwards found impracticable to make the summer tests for want of suitable accommodations.

The building in which the swine were kept during the winter was very open and cold, the thermometer often going below zero, they were thus fed at a great disadvantage, but as the conditions were such as obtain on many farms in this country during winter, the results of these experiments may be useful as showing what can be done under very unfavourable circumstances.

FEEDING FROZEN WHEAT TO SWINE.

Two Berkshire grade pigs were selected for this experiment, they were purchased at 5c. per pound live weight, and sold at the same rate, their combined live weight when the test began 7th December, was 180 lbs. They were fed three times a day, all the chopped No. 3 or badly frozen wheat they would eat clean, mixed with cold water at the time of feeding, the building being too cold to admit of soaking the food for any length of time before using.

The accompanying table will show that this wheat, although badly injured, and fed under unfavourable conditions realized in its value in pork 49 cts. per bushel. The market value of such wheat during the winter of 1891-92, was about 30 cts. per bushel, and it would not realize 20 cts. this winter.

——	Amount of wheat consumed each month by the two swine.	Gain in pounds of pork each month.	Return per bushel of wheat fed.	Pounds of wheat consumed for one lb. of pork.		Weight of the swine at end of month.
	Lbs.	Lbs.	Cts.	Lbs.	oz.	Lbs.
First month	330	67	60	4	14	247
Second do	319	45	42	7	1	292
Third do	294	55	56	5	5	347
Fourth do	313	39	37	8	0	386

Summary.

It took on an average 6 lbs. 1 oz. of wheat during the four months, to make one pound of pork.

Average return per bushel of wheat consumed, 49 cents.

FEEDING BARLEY TO SWINE.

The two pigs selected for this test were also grade Berkshires, their combined weight at the commencement of the test, 28th December, was 117 lbs. These were also purchased at five cents per pound live weight, and sold at the same rate.

The barley was fed three times a day, chopped and mixed with water at the time of feeding. No more was fed than would be eaten up clean at each meal.

The following results show that the barley fed in this experiment realized in pork 50 cents per bushel, farmers at that time were selling the same grade of barley on the market at an average of 25 cents per bushel, a difference of one hundred per cent in favour of feeding it.

——	Amount of barley consumed each month by the two swine.	Gain in pounds of pork each month.	Return per bushel of barley fed.	Pounds of barley consumed for one pound of pork.		Weight of swine at the end of month.
	Lbs.	Lbs.	Cts.	Lbs.	oz.	Lbs.
First month	288	83	69	3	7	200
Second do	335	71	50	4	11	271
Third do	370	65	42	5	11	336
Fourth do	341	62	43	5	8	398

Summary.

It took an average of 4 lbs. 11 oz. of barley during the four months to make one pound of pork.

Average return per bushel of barley fed 50 cents.

CATTLE.

The cattle on the farm have been perfectly healthy during the year, and there have been no losses through sickness.

During the year there has been added to the herd the following calves, all bulls, viz.: two Ayrshires, two Holsteins and one each of Shorthorn and Galloway, and one Grade.

Three young bulls, one each of Holstein, Ayrshire and Galloway were sold by public auction on November 15th. The herd now consists of 7 Shorthorns, 6 Ayrshires, 7 Holsteins, 4 Galloways and 3 Grades.

A record has been kept of the yield of milk given by each cow; but as the necessary apparatus for testing the quality of the milk of the different breeds, is about to be supplied it is thought best to defer publishing the yields until the relative richness of the milk of the different breeds can be accurately determined.

FATTENING STEERS WITH FROZEN WHEAT AND BARLEY.

Recognizing the fact that the results of several years' experiments are required in almost every line before reliable conclusions can be reached, the experiments in feeding steers with frozen wheat and barley commenced in the winter of 1892-3, were continued last winter, but with three steers in each group instead of two.

Nine very even and fairly thrifty steers, raised by farmers near here, were secured for this purpose. They were all grades, Shorthorn blood predominating and about 2½ years old, they were purchased in the fall at 2½ cents per pound live weight, and sold in the spring at 3½ cents.

The nine steers were divided into three groups of three each, and fed for five months *all they would eat clean* of the following rations :—

Composition of the different Rations.

First lot of steers—

	Lbs.
Cut wheat straw	20
No. 3 frozen wheat chop	15

Second lot of steers—

	Lbs.
Cut wheat straw	15
No. 3 frozen wheat chop	9
Turnips sliced	20

Third lot of steers—

	Lbs.
Cut wheat straw	10
Barley chop	10
Turnips sliced	20

The several ingredients were spread in layers in a heap, and after being moistened were throughly mixed and fed *all they would eat up clean* the following day, in three feeds.

Feed consumed.

The total amount and cost of feed consumed during the feeding period (151 days) was as follows:—

First lot of steers—

6,344	pounds cut straw	
4,996	" wheat chop at ½ cent per lb	$24.98

Second lot of steers—

6,101	pounds cut straw	
3,833	" wheat chop at ½ cent per lb	19.16
140	bush. turnips at 5 cents per bush	7.00
		$26.16

Third lot of steers—

5,140	pounds cut straw	
5,478	" barley chop at ½ cent per lb	$27.39
184	bush. turnips at 5 cents per bush	9.20
		$36.59

Summary of Results	First cost of Steers.	Cost of Feed.	Price sold for.	Profit.	Daily gain of each Steer.
	$ cts.	$ cts.	$ cts.	$ cts.	Lbs. oz.
First lot of steers—Wheat and straw	76 50	24 98	127 05	25 57	1 4
Second do Wheat, turnips and straw	77 85	26 16	128 62	24 61	1 3
Third do Barley, turnips and straw	72 62	36 59	130 27	21 06	1 13

Last year's return from the frozen wheat fed to group 1, was equal to 56 cents per bushel, this year it equals 60 cents.

Deducting the value of turnips, the frozen wheat fed to Group 2 realized last year 61 cents per bush., this year, 68 cents.

The wheat fed was the same both years, but the steers were much quieter last winter and for that reason better feeders.

No. 3 frozen wheat sold at an average of 30 cents per bushel in the winter of 1891-2 and about 25 cents last winter.

After deducting the value of turnips, the barley fed to group 3 realized forty-two cents per bushel.

Fortunately the crops in this province have escaped injury from frost during the past two years, but in case of injurious frost occurring at any future time it is well for the farmer to know that prime beef can be made from even badly frozen wheat, and that he is not compelled to sell it at a sacrifice as is so often done.

Barley is a grain that can be sown after wheat seeding, it is seldom if ever injured by fall frost, if sown in good season, and judging from the returns obtained under field culture on this farm, it should be a profitable crop at 42 cents per bushel.

APPLE TREES.

The apple trees planted here in 1889 were divided into two lots, one lot was set out in cleared scrub land on the side hill facing the south; it is sheltered on every side by scrub 6 to 12 feet high. As the scrub on each side extends for some distance, very little snow drifted into the plots, and seldom more than six inches of snow lies on the ground each winter, this condition with the southern exposure is probably in part responsible for the heavy losses in trees each year. The other plot used as an apple orchard is in the lower part of the valley with a slightly northern exposure: this plot has simply one row of trees 7 to 15 feet high on the south, east and west sides, the north being without protection; every winter the snow drifts into this plot from 5 to 10 feet deep, completely covering the apple trees, and is not thawed out until late in the spring.

It will be seen from the following table that all the varieties of apple trees but one planted in this plot have survived the past four winters, although the growth has not been large.

The Anis apple is the most promising variety grown on the farm thus far, and it is interesting to note that Prof. Budd, of the Iowa Experimental Station, states "That this variety in Iowa is perfect in tree, and its fruit has the size, fine colour, keeping capacity and nearly the high quality of the Jonathan."

APPLE Trees planted in the valley on black loam soil, spring of 1889: plot sheltered by a row of trees on the south, east and west.

Variety.	No. of trees planted.	No. of trees alive.	Season's growth.	Present condition.	Variety.	No. of trees planted.	No. of trees alive.	Season's growth.	Present condition.
	1889	1893	In.			1889	1893	In.	
Anis red	8	8	11	Extra g'd.	Livland Raspberry	1	1	16	Poor.
Anis yellow	2	2	15	Good.	Lead	1	1	21	do
Antonovka	2	2	18	Fair.	Liebig	1	1	8	Good.
Aport	2	2	13	do	McIntosh red	1	1	18	Poor.
Alexander	2	1	18	do	Plikanoff	2	2	20	Good.
Arabka, winter	1	1	12	Good.	Pointed pipka	1	1	12	do
do summer	2	1	14	do	Peach	1	1	17	Fair.
Borovinka	1	1	16	Fair.	Repolovka	1	1	29	do
Borodovka	1	1	10	do	Red repka	1	1	9	do
Bogdanoffs Glass	1	1	11	Poor.	Simbirsk No. 2	1	1	15	do
Ben Davis	1	1	15	do	Shaker pippin	1	1	16	do
Baldwin Canada	2	1	8	Good.	Switzer	1	1	14	Good.
Christmas	1	0	....		Steklianka	1	1	30	do
Duchess of Oldenburg	4	4	18	Very good	Serinkia	1	1	28	Fair.
Grimes golden	1	1	13	Poor.	Scott's winter	1	1	19	Poor.
Golden russet	1	1	12	do	Tsiganka	1	1	16	Fair.
Grandmother	3	3	11	Good.	Tetofsky	1	1	14	do
Grand Duke Constantine	1	1	22	Fair.	Ukraine	2	2	22	do
Golden white	1	1	17	do	Winter St. Lawrence	3	3	27	Good.
Haas	1	1	13	do					

APPLE TREES planted on the upland with southern exposure, sheltered on all sides by scrub, soil light loam: trees planted spring of 1889.

Variety.	Number of Trees planted, 1889.	Number of Trees alive, 1893.	Season's growth.	Present Condition.
			Inch.	
Anis, red	2	2	25	Good.
do yellow	2	0	....	
do mottled	1	0	....	
Autumn streaked	1	0	....	
Antonovka	1	1	15	Fair.
Aport	1	0	....	
Arabka, summer	1	1	17	Fair.
do winter	1	0	....	
Borovinka	1	1	6	Poor.
Ben Davis	1	0	....	
Cross	1	1	....	Poor.
Christmas	1	0	....	
Duchess of Oldenburgh	3	3	20	Good.
Enormous	1	0	....	
German Calville	1	1	15	Good.
Gipsy girl	1	1	10	Poor.
Hibernal	1	1	20	Fair.
Kruder	1	1	13	Poor.
Liebig	4	4	22	Good.
Longfield	2	0	....	
Pointed pipka	1	1	15	Fair.
Romna	1	0	....	
Red repka	1	0	....	
Repolovka	1	1	17	Fair.
Switzer	1	0	....	
Silken	1	1	12	Good.
Tsiganka	1	0	....	
Titovka	1	1	18	Poor.
Wealthy	2	2	16	Good.

APPLE TREES PLANTED IN 1890.

Soil, light loam; southern exposure; sheltered on all sides by scrub.

Variety.	No. of trees planted.	No. of trees alive.	Season's growth.	Present Condition.	Variety.	No. of trees planted.	No. of trees alive.	Season's growth.	Present Condition.
	1890	1893	In.			1890	1893	In.	
Antonovka	2	2	18	Good.	Pointed Pipka	2	2	21	Very good
Arabka summer	1	1	25	Very good	Peach	2	2	13	Fair.
Anis	2	1	11	Good.	Red Astrachan	2	2	11	do
do red	1	1	15	do	Steklianka	2	2	17	Good.
Ben Davis	3	3	16	Fair.	Serinkia	1	1	15	Poor.
Canada Baldwin	2	1	8	Good.	Stettin Yellow	1	1	4	Fair.
Duchess of Oldenburgh	2	2	18	do	Sandy Glass	1	1	23	do
Fameuse	3	1	17	Fair.	Sugar Sweet	2	1	5	Poor.
Gipsy Girl	3	3	13	Good.	Tashkin	2	2	15	Good.
Golden russet	2	1	17	Poor.	Tiesenhausen	1	1	9	do
Grimes' golden	1	0	....		Ukraine	3	2	16	do
Hibernal	4	1	24	do	Vargulek	3	1	19	Poor.
Haas	1	1	18	Good.	Yellow Arcadian	2	1	20	Fair.
Mann	1	1	13	Poor.	Yusoff	2	2	12	Good.

APPLE TREES planted in 1892, soil light loam, plot sheltered on all sides by scrub.

Variety.	Number of trees planted.	Number of trees alive, Fall.	Present condition.	Season's growth.	Remarks.
	1892.	1893.		Inches.	
Little Hat	6	6	Fair	30	Soft growth.
Red Raspberry	6	5	do	14	do
Hare Pipka	6	6	Poor	24	Doubtful hardiness.
Peter	2	2	Good	22	Hardy growth.
Bode	6	6	do	15	do
Sugar Sweet	6	6	do	10	do
Blushed Calville	6	4	Fair.	17	Winter kills.
Saccharine	6	3	Poor	20	Tender.

CRAB APPLE TREES.

Crab apple trees suffered more injury from winter-killing during last season than they have done any winter yet. One quarter of them were completely killed, and many of the others badly injured.

Ten additional Transcendents were received last spring, and have made a good growth.

CRAB APPLE Trees planted on light loam soil, with a southern exposure; trees planted spring of 1889, plots protected on all sides by scrub.

Variety.	Number of Trees Living.		Present Condition.	Season's Growth.
	1892.	1893.		
Transcendent	9	7	Extra good	34 inches; hardy growth.
Whitney's No. 20	3	2	Good	20 do do
Hyslop	7	4	do	19 do do
Orange	2	1	Fair	12 do kills back.
Early Strawberry	2	1	do	15 do do
Queen's Choice	1	1	Poor	25 do do

PLUM TREES.

Since my last report, two more varieties of plums have been winter killed, and two others have been badly injured. De Soto and Nicholas are still promising.

The native Manitoba Plum is quite thrifty under cultivation, and one of the trees planted in 1892, bore a few very fair plums of a bright red colour this season. In May last 70 additional native plum trees were transplanted from the woods, and 68 of them are living at this date.

Variety.	When planted.	No. of Trees living, 1892.	No. of Trees living, 1893.	Present condition.	Season's growth.
Bradshaw	1889	2	2	Fair	22 inches, tender growth.
De Soto	1892	2	2	Good	29 do hardy growth.
Early Red	1889	7	0		
Nicholas		3	3	Extra good	31 do hardy growth.
Late Red	1889	1	1	Poor.	15 do kills back.
Otschakoff	1889	2	0		
Native wild Plum	1890	7	7	Good	36 do good.

CHERRIES.

This climate appears particularly severe on all cultivated varieties of cherries, each year sees two or three varieties completely killed, 6 m. and Koslov Bush Morello are now the only ones at all promising.

A native variety, the Sand Cherry (*Prunus pumila*) is found growing wild on very sandy soil throughout the province, it is a very handsome shrub when in bloom, and the fruit is decidedly the largest native variety we have, and we have no difficulty in growing it on loamy soil. Introduced trees of this variety, as well as the native, seem quite hardy, and bear each year a heavy crop of rather indifferent fruit. Possibly this variety may be the starting point for improved varieties hardy enough for this country.

Variety.	When planted.	No. of Trees alive, 1891.	No. of Trees alive, 1893.	Present condition.	Present Height.	Season's growth.
					inches.	
Bessarabian	1890	2	0	....	....	
Lutovka	1890	5	3	Poor	40	8 inches, doubtful.
6 m Cherry	1890	2	2	Fair	63	14 do hardy growth.
12 m Cherry	1891	1	0	....	....	
Koslov Bush Morello	1890	4	4	Good	30	6 do hardy growth.
Vladimir	1892	6	4	Fair	51	12 do tender growth.
Lutvoka	1892	6	0	....	....	
Bessarabian	1892	6	5	Fair	40	10 do tender growth.
Sand Cherries, Prunus pumila	1892	5	5	Good	32	15 do hardy growth.

CURRANTS.

Currants of all kinds are quite hardy here, and were well covered with blossom last spring, but the hot winds of July and August caused the immature fruit to drop off, shrinking the fruit to one-half an average crop. Below will be found a description of the varieties that have fruited here, also the yield from ten average bushes. In addition to the lists given below, 13 seedlings were planted in 1891, and nine named varieties last spring. All of these are growing and will be reported on as soon as they fruit.

Variety.	Number of Trees living.		Color.	Size.	Flavour.	Yield of 10 average bushes.
	1892.	1893.				
Lee's Prolific	426	426	Black	Very large	Excellent	18 lbs.
Champion	10	10	do	Large	Poor	17 do
Naples	100	100	do	Very large	Good	10 do
Native, Large var	40	40	Brown black	Medium to large	Strong	
do , Small var	8	6	Jet black	Small	Bitter	
Raby Castle	202	202	Red	do	Good	13 do
Fay's Prolific	24	16	do	Large	do	14 do
Victoria	13	9	do	do	do	10 do
Cherry	140	140	do	do	do	10 do
White Grape	170	170	White	Very large	Choice	15 do
Prince of Wales	8	8	Planted in 1892			Very little fruit
Prince Albert	17	17	do			do
Versaillaise	12	12	do			do
London Red	12	12	do			do

GOOSEBERRIES.

The last of the Downing gooseberries were winter-killed last year, and that variety is evidently too tender for this country.

Smith's Improved and Houghton continue hardy, and the Houghton produced this year about one pound of fruit per bush.

A fine collection of nineteen new varieties were received last spring, these have all rooted and will be reported on next year.

RASPBERRIES.

The yield of raspberries in common with all the small fruits was this year seriously diminished by the summer drought. The Turner and Philadelphia are quite hardy, and do not appear to require covering here, the other varieties need protection by bending down and covering with a little soil and manure.

Among the black caps the Hilborn has thus far been the best bearer, and is as hardy as any other of the tip varieties.

In addition to the list of varieties given below, three seedlings sent from the Central Experimental Farm in 1890 have proved hardy and fruited last season, the original plants of these were divided this year and for that reason did not fruit.

Variety.	Number of plants living.		Size.	Colour.	Flavour.	Remarks.
	1892.	1893.				
Turner	200	200	Medium	Red	Good	Hardy.
Philadelphia	200	200	Medium to small.	do	do	Extra hardy.
Cuthbert	150	150	Large	do	Excellent	Half hardy.
Marlboro'	50	50	Extra large	do	do	Hardy.
Reider	35	35	do	do	Good	Early and hardy.
Caroline	20	19	Medium	Yellow	do	Late and tender.
Golden Queen	20	18	do	do	do	Tender.
Hilborn (black cap)	150	150	Extra large	Black	Excellent	do
Nevada blackberry	50	10	Large	do	Fair	do
Gainor blackberry	50	5				do
Wachusett's Thornless blackberry	50	8	Large	Black	Fair	do

FOREST TREE PLANTING.

This portion of the Experimental Farm work has given very satisfactory results during the past season.

The trees set out in nursery rows and shelter belts have generally made a rapid growth. The avenues have also done remarkably well. The accompanying cut (Fig. 4) is from a photograph showing a part of one of these avenues leading from the main road to the superintendent's house. Considerable additions have been made to the collection of forest trees and shrubs this year.

FIG. 4.—PART OF AVENUE OF MANITOBA MAPLE, EXPERIMENTAL FARM, BRANDON, MAN.

In June last I made a visit to Rat Portage, and procured from there a collection of native trees of the following varieties: White Pine (*Pinus Strobus*), Jack Pine (*Pinus Banksiana*) and Red Pine (*Pinus resinosa*) White Spruce (*Picea alba*), Black Spruce (*Picea nigra*), Balsam Spruce (*Abies balsamea*), also plants of native Sumach and Labrador Tea (*Ledum latifolium*). Although these were moved rather late in the season many of them have rooted, and will make interesting additions to the collection; there are still other varieties of trees and shrubs found in that district that have not been tested here and which it would be desirable to obtain as soon as practicable.

A number of Riga Pine, Norway Spruce and Native Oak (*Quercus macrocarpa*), the latter from seed gathered here, and a very full collection of Lilacs, Spireas with other shrubs were received from the east last spring; these have nearly all rooted and will be reported on later.

FOREST TREES AND SHRUBS PLANTED IN SPRING OF 1892.

In the fall of 1891 a number of forest trees and shrubs were received from the Central Experimental Farm, these were heeled in over winter and planted the following spring: although they were nearly covered with soil, many of the trees failed to start in the spring.

The following list includes all the varieties that rooted, with their growth and present condition.

Variety.	Number of Trees planted, 1892.	Number of Trees alive, 1893.	Season's growth.	Present Condition.
			Inches.	
Artemisia Abrotanum (Eng var)	4	4	14	Hardy growth.
do do (Russian)	25	25	49	do
Alnus glutinosa	15	15	9	do
Acer Tataricum	2	1	Small.	Tender.
do Pennsylvanicum	1	1	7	do
Butternut	10	0	....	
Berberis Thunbergii	20	20	4	Kills back badly.
Birch, white	20	20	13	Hardy.
do yellow	20	20	12	do
Clematis viticella	1	0	....	
Crataegus coccinea	1	0	....	
Caragana frutescens	6	4	5	Tender.
Picea excelsa	25	19	11	Half hardy.
do alba	10	4	5	do
Pyrus Americana	5	5	18	Half hardy.
Pyrus Aucuparia	25	23	17	do
Pyrus Toringo	2	2	7	Healthy.
Ptelea trifoliata	3	3	....	Small.
Rhamnus infectoria	2	1	6	Tender.
Ribes aureum	4	1	4	do
Spiræa opulifolia	100	100	60	Very hardy.
Syringa Josikæa	25	25	15	do
do Rothmagensis	5	5	10	Healthy.
Salix Babylonica annularis	2	1	5	Winter kills.
Sambucus aurea	5	4	30	Tender growth, very handsome.
Syringa vulgaris	25	25	14	Very hardy.
Virginian creepers, native	195	195	24	Hardy.
Viburnum Lantana	10	5	6	Half hardy.

THE RATE OF GROWTH IN TREES ON THE EXPERIMENTAL FARM.

A number of trees were planted on the farm in 1889, from one year seedlings and rooted cuttings of the same age, these were measured this fall, and below will be found their height and also circumference one foot from the ground.

It will be seen from these measurements that forest tree protection can be quickly obtained on the rich soils of our prairies, and there is now no necessity for confining the planting to one or two varieties, as a very fair collection of useful sorts are now proven to be hardy.

Variety.	Height.	Circumference at butt.	Remarks.
Populus Bereolensis	14 feet.	13 inches.	Trimmed tree shape.
do Wobstii Riga	15 do	12 do	do
do Siberica	10 do	10 do	do
Cottonwood	12 do	10 do	do
Salix Voronesh	11 do	4 do	Bush.
do acutifolia	9 do	6 do	do
Ash-leaf Maple	12 do	10 do	do
Native White Elm	10 do	5 do	Tree shape.

Last spring the planting around the superintendent's house was commenced and the following trees and shrubs were set out, nearly all of which have been tested on the farm and found hardy.

TREES.

Ash white, Fraxinus Americana.
Alder European, Alnus glutinosa.
Ash Mountain, Pyrus Americana.
Acer ginnala, Asiatic maple.
Birch, native.
Birch, cut leaved, weeping.
Beech, Fagus ferruginea.
Arbor-vitæ globe, Thuya occidentalis globosa.
Arbor-vitæ common, Thuya occidentalis.
Elm Manitoba white, Ulmus Americana.
Poplar, Populus tremuloides.
Balm Gilead, Populus balsamifera.
Russian Poplar, Populus Petrovsky.
do do Siberica.
Russian Poplar, Populus Alba argentea.
do do bereolensis.
do do certinensis.
do do Voronesh.
Pine, Jack Pine, Pinus Banksiana.
do Scotch, Pinus sylvestris.
Spruce native white, Picea alba.
do Ont. do do
Willow Voronesh, Salix Voronesh.
do Sharp leaved, Acutifolia.
do Golden leaved, Aurea.
do Laurel leaved, Laurifolia, French.
do do do true.

SHRUBS.

Southernwood, Russian, A. abrotanum Var. Tobolskiana.
do European, A. abrotanum.
Barberry purple, Berberis vulgaris purpurea.
do Thunbergii.
do common, Berberis vulgaris.
Cherry, ground or sand, Prunus pumila.
Siberian Dogwood, Cornus Sibirica.
Caragana pendula. Weeping Caragana.
do arborescens. Siberian Pea-tree.
Caragana mollis glabra.
Cytisus capitatus.
Currant flowering, Ribes aureum.
Elder golden, Sambucus aurea.
Honeysuckle, Tartarian.
Snowberry, Symphoricarpus.
Hazel nut, Corylus Americana.
do do rostrata.
Cornus native.
Cranberry, Viburnum opulus.
Sheepberry, do lentago.
Honeysuckle, native.

Lilac Alba.
do Siberian, white.
do de Marley.
do vulgaris.
do Lemoinei, fl. pl.
do purpurea.
do Princess Alexandra.
do Josikea.
do Prince of Wales.
do Albert the Good.
do Alba grandiflora.
do Jaques Cabot.
Olive Russian.
Philadelphus coronarius. Sweet Syringa.
do Gordonianus. Gordon's syringa.
do primulæflorus. Primula flowered syringa.
do Yokohama. Japanese syringa.
Rose, native, Manitoba.
Spiræa Douglasi.
do semperflorens.
do superba.
do opulifolia.
do van Houttei.
do Billardi.
do Californica.
do floribunda.
Saskatoon, native, Amelanchier alnifolius.
Viburnum Lantana.

EXPERIMENTS WITH TREES AS WINDBREAKS.

The windbreaks surrounding the 12 plots mentioned in my last report, have continued healthy, and none of them have been injured by insect enemies.

The gaps among the cotton woods caused by cuttings not striking, have been filled with layered plants, these have all rooted and have made considerable growth.

The Russian Poplar (Populus bereolensis) and Salix acutifolia are decidedly the most promising for this purpose. Ash Leaf Maple and Elm are also thickening up well, but the Native Green Ash is growing very slowly.

These plots are in the most exposed situation on the farm, and before the windbreaks were planted, the crops sown in this field suffered severely from wind storms. This year all the plots were sown with rye or barley, and none were injured by wind, and all produced a very heavy crop.

To maintain an even growth, the tallest trees among the Willows, Maples, and Elms have been cut back. This is done quickly with a sickle, this encourages side growth, and thickens up the hedge.

In the following table particulars are given of the growth of each of the plots enclosed, the distance between the young trees in each wind break, and the growth made by each.

Variety.	Size of Plot inclosed in feet.	Distance apart of Trees.	Average Season's Growth.	Average Height.		Remarks.
			Inches.	Ft.	In.	
Ash-leaf Maple..............	78×330	1×2	22	5	0	Healthy growth.
do	78×330	2×3	26	6	0	Appears the best.
do	78×330	2×2	29	6	0	Healthy growth.
do	90×330	3×3	18	4	0	Healthy.
do	102×330	2×2	25	5	6	do
do	304×66	4×4	13	4	0	do
do	304×66	1×2	12	3	6	do
do	304×66	2×2	14	3	6	Exposed to wind.
Native Green Ash...........	304×66	2×2	6	2	6	Small growth, healthy.
do	304×66	4×4	10	2	6	do do
Native White Elm	304×66	2×2	14	4	0	Very healthy.
Populus Bereolensis.........	304×66	4×4	30	8	0	Already an effective hedge.
Cottonwood	304×66	3+3	25	3	0	From cuttings, healthy.
Salix acutifolia..............	304×66	4×4	36	7	0	An excellent wind break.

The accompanying cut (Fig. 5) is from a photograph of one of the earliest planted hedges on the Experimental Farm.

Fig. 5.—HEDGE OF MANITOBA MAPLE, EXPERIMENTAL FARM, BRANDON, MAN.

FOREST TREE AND SMALL FRUIT DISTRIBUTION.

This branch of the farm work increases each year.

Applications for fifty-nine thousand forest tree seedlings and cuttings, twelve thousand small fruit cuttings, and four hundred one pound bags of maple seed were received last winter. As the applications for forest trees exceeded our supply, ten thousand of these were sent from the Central Experimental Farm, the balance were supplied from trees grown here.

Favourable reports are being received of the trees sent out in former years, and in some instances cuttings are already being made from those sent out in 1890.

One hundred thousand cuttings are being prepared for next year's distribution.

The packages were sent by mail and each contained one hundred trees and cuttings as follows :—

Variety.	Number.	——
Ash-leaf maple	28	Trees.
Cottonwood	15	Cuttings.
Artemisia Abrotanum	10	do
Native white elm	10	Trees.
Poplar bereolensis	4	Cuttings.
do Petrovsky	10	do
do certinensis	1	do
do alba argentea	1	do
do Wobstii Riga	1	do
Willow Voronesh	10	do
do acutifolia	10	do
	100	

TABLE VARIETIES OF CORN.

The past season was favourable to the early maturing of corn, and eight of the ten varieties tested produced ears fit for the table.

All were planted in hills three feet apart each way in May and kept free from weeds during the season of growth.

Variety.	Weight of corn per dozen, green.	When fit for table use.	Remarks.
	Lbs.		
Manitoba Squaw corn	3	Aug. 15	The earliest, but flavour poor.
Mitchell's Extra Early	4	do 19	An improved Squaw corn.
Early Minnesota	5½	do 20	Fair flavour.
Early Marblehead	3½	do 23	do
Perry's Hybrid	5½	do 23	do
Burlington	4½	do 23	Good flavour ; one of the best.
Crosby's Early sugar	4	do 24	do , and sweet.
Burpee's First of All	5½	do 25	do ,
Stowell's Evergreen	None.	....	
Early Champion	do	....	

LETTUCE.

Eighteen varieties of lettuce were tested on the Experimental Farm this year, seven of these were almost identical, and no doubt are the same variety under different names. All were sown in the open on 20th April.

A second sowing was made on 15th May, but the hot weather interfered with the growth of many of the varieties.

Variety.	Weight at maturity.	When started to seed.	Earliness.	Quality.	Remarks.	
Silesian	26 oz.	July 30	Early.	Tender	Wrinkled.	
Denver Market	18 oz.	Aug. 1	do	do	do	
Blonde Beauty	16 oz.	July 27	do	Fair	Slightly wrinkled.	
Paris Sugar	15 oz.	" 27	Late	Tender	Smooth.	
Drumhead	12 oz.	" 15	do	Fair	do	
Nonesuch	8 oz.	Aug. 1	do "	do	do	and flat.
St. Louis	14 oz.	" 2	do "	do	do	
Hanson	17 oz.	" 1	do "	do	Slightly wrinkled.	
Golden Sunset	14 oz.	July 25	Medium	do	do	do
Nonpareil	22 oz.	Aug. 2	do	Very tender.	do	do
Hamilton Market	16 oz.	July 25	do	do	do	do
Rosedale	13 oz.	Aug. 1	do	do	do	do
Trianon's White Star	12 oz.	" 1	do	do	do	do
Excelsior	17 oz.	July 25	do	do	do	do
Gardeners' Favourite	10 oz.	Aug. 4	do	do	do	do
Boston Market	16 oz.	July 20	do	do	do	do
Toronto Gem	17 oz.	Aug. 1	do	do	do	do
Trianon's Cos	20 oz.	" 1	do	do	Cos. shape.	

CAULIFLOWERS.

Fifteen varieties of cauliflowers were tested on the farm, the season was very unfavourable for this plant and only the early varieties headed.

The following were the best this year: Thorburn's Gilt Edge, Steele's Extra Early, Extra Early Paris, and Extra Early Erfurt.

RHUBARB.

Mention was made in my last report of the usefulness of this plant here.

The series of experiments with seedlings commenced last year were continued this year; and the roots of twenty standard varieties were obtained from the United States and Britain, these were set out and will be reported on next year.

A few of the best plants of Victoria and Tottle's Improved Seedlings were allowed to ripen seed, each plant produced about 3 oz. of seed containing 1,800 seeds per oz.

The stalks of the plants set out last year were pulled every ten days and weighed; below will be found the returns per plant, &c., as the plants were set 4 x 4 feet the returns per acre were in some instances very large.

Variety.	Origin.	Ready for use.	Yield from each plant. Lbs.	Oz.	Quantity.
Manitoba Seedling No. 1.	Seedling of Victoria	May 26	21	02	Choice, tender.
do No. 2.	do Myatt's Linnæus	do 28	19	13	Good do
do No. 3.	do Johnston St. Martin	June 1	6	00	Green, hard, poor.
do No. 4.	do Stotts Mammoth	do 10	5	11	Fair quality.
Tottle's Improved	Root from J. Tottle, Stonewall	do 1	18	13	Good, tender.

TOMATOES.

Three varieties only of tomatoes were planted on the farm this year. All were sown in hot beds and transplanted to the open ground 1st June.

The first to ripen was Steele's Earliest of All, a large wrinkled variety; this ripened on 22nd August and yielded 23 lbs. from ten plants.

Atlantic Prize, nearly smooth, and large, ripened 30th August and gave a return of 20 lbs. from ten plants.

Dwarf Champion a smooth variety, medium size, ripened 1st September and gave 1 lb. per plant of choice tomatoes.

FLOWERS.

Recognizing the fact that the surroundings of many of the farms in this province require to be made more attractive if the young people are to remain contented with a rural life, some attention has been paid each year to testing the hardier varieties of annual and perennial flowering plants.

As many of the perennial plants require very little skill or attention, a special effort has been made to collect and test the varieties likely to be hardy here.

The following have so far been found quite hardy, if protected with a few inches of litter; and have flowered freely on the dates mentioned.

PERENNIAL FLOWERS.

Variety.	Season of Flowering.	Remarks.
Tulips, single, double and parrot..	20 May to June 15	Can remain in ground for years.
Crocus..........................	2 do to May 15.........	do do do
Scilla Siberica..................	1 do to do 15.........	do do do
Pansies	1 do to fall frost.......	do do do
Sweet William....................	20 June to do	Should be renewed every two years.
Pæonies herbaceous...............	1 July to July 20.........	Can remain in ground for years.
Perennial Flax..................	15 May to Aug. 1.........	do do do
Delphinium, Perennial............	20 July to frost.........	do do do
Columbine.......................	1 do to Aug. 1.........	do do do
Bleeding Heart...................	20 do to do 1.........	do do do
Day Lily.........................	1 do to do 1........	do do do
Tiger Lily.......................	15 do to do 1.........	do do do
Pinks, from seed.................	1 Aug. to frost	
Gladioli collection..............	18 do to severe frosts. ...	Bulbs require to be stored in winter.
Hyacinthus candicans.............	1 Sept..................	do do do

ANNUALS.

Variety.	Season of Flowering.	Remarks.
Larkspur.........................	10 July to Aug. 1.........	Easy of culture and free bloomers.
Phlox Drumondii..................	15 do to fall frost..	do do do
Escholtzia.......................	15 do to do	do do do
Zinnia...........................	20 do to do	do do do
Mignonette.......................	20 do to do	do do very fragrant.
Godetia..........................	25 do to do	do do free bloomers.
Salpiglossis.....................	13 do to Aug. 30.........	do do do
Hibiscus.........................	1 Aug. to fall frost........	do do do
Marigold.........................	15 do to do	do but late to bloom.
Stocks...........................	1 do to do	do and fragrant.
Sweet Peas.......................	1 July to do	Must be sown early.
Asters...........................	1 do to do	do do to succeed.
Balsams..........................	15 Aug. to do	do do do
Verbena..........................	20 July to do	Easy of culture and free bloomers.
Portulacca.......................	1 do to do	do do do

FARMERS' INSTITUTE MEETINGS.

During the past winter a number of additional farmers' institutes have been organized throughout the province, and invitations to address meetings have in consequence largely increased, although more of this work was undertaken than in any previous year, I regret that other duties did not permit of my accepting all the invitations received.

Institute and other meetings were attended at the following places by invitation and the papers mentioned read by me:—

Wawanessa,	13th	January,	"Experiments in feeding Steers," full meeting.
Winnipeg,	18th	do	Dairymen's Convention, "Fodders and Grasses."
Glenboro,	20th	do	"Preventives of smut," small meeting.
Rapid City,	18th	February,	"A Review," crowded house.
Douglas,	25th	do	Dairy meeting, "Fodder for cows," full house.
Niverville,	27th	do	"Summary of experiments," good meeting.
Morris,	28th	do	do do large attendance.
Elkhorn,	4th	March	"Cattle feeding," good attendance.
Virden,	11th	do	"Grasses and feeding steers."
Carberry,	12th	do	"Varieties of wheats," small attendance.

Portage la Prairie, 22nd March, "Grasses and Fodder Plants," large attendance.

Hartney,	23rd	March,	"A Review," good attendance.
Hartney,	11th	May,	"Summer-fallow," full attendance.
Elkhorn,	3rd	June,	do good attendance.
Russell,	6th	do	"Grasses and Fodder plants."
Birtle,	8th	do	"Summary of experiments."

TILE DRAINAGE.

Three fields on this farm, two of twenty acres, and one of two acres, have each year been more or less flooded during the spring freshets, making it difficult to utilize them for early sown crops, one field in particular remained flooded until July this year, it was found impracticable to remove the water from this field by surface drainage, and a system of tile under drainage has been commenced, 3,400 feet of this was completed during the fall, and the balance is expected to be in place in time next spring to prepare the land for barley seeding.

WINDMILL.

The 12-foot steel windmill mentioned in my last report, has so far given entire satisfaction, and has cost nothing for repairs since its erection.

Although located directly under a hill one hundred feet high, it pumps the water, grinds the feed, and cuts all the straw required for 35 head of cattle and ten horses.

With a moderate wind it pumps eleven barrels of water per hour, and with a stiff breeze grinds 16 bushels of oats, or 8 bushels of barley per hour.

Fodder corn for ensilage was also cut by wind power this year, one ton was cut into inch lengths in nine minutes, by a Watson Excelsior cutting box.

NEW BUILDINGS.

A frame implement and carriage building 28 x 72 feet has been erected this year.

Part of the ground floor will be used for storing implements and carriages, and the south end has been partitioned off as an exhibition room for produce grown on the farm.

The upper story is utilized for sorting and cleaning grain for seed and exhibition purposes. This building is close to the bank barn and will be a great convenience.

Poultry runs made of wire netting seven feet high and 60 feet long have been constructed in connection with the poultry house. Now that it is possible to keep the different breeds of poultry separate, we hope to be able to test their suitability for this country.

METEOROLOGICAL.

In July 1889 this farm was supplied from the Dominion Meteorological Service with a set of instruments including four thermometers, rain gauge, wind vane, sunshine recorder, &c., since that date observations have been taken three times each day and monthly returns forwarded to the Central Office at Toronto for publication.

Below will be found the maximum and minimum thermometer readings for the past ten months, also the amount of rainfall and sunshine for the growing season.

RAINFALL.

	Inches.
April	·1
May	·9
June	2·3
July	1·5
August	·7
September	1·4
Total	6·9

SUNSHINE.

	Hours.
March	191·0
April	126·5
May	278·6
June	206·6
July	286·5
August	287·4
September	221·0
Total	1,597·6

TEMPERATURE.

Months.	Maximum.	Minimum.
	°	°
January	30·5 on 8th.	— 47 on 29th.
February	32·6 on 20th.	— 52 on 1st.
March	40·4 on 31st.	— 31 on 15th.
April	59·6 on 30th.	—3·6 on 1st.
May	88·3 on 18th.	21·3 on 25th.
June	95·6 on 11th.	37·5 on 9th.
July	96·3 on 20th.	35·6 on 9th.
August	106·4 on 7th.	30·6 on 28th.
September	93·4 on 3rd.	11·6 on 27th.
October	63·5 on 19th.	8·3 on 25th.

AGRICULTURAL EXHIBITIONS.

Unfortunately a large proportion of the agricultural fairs in this province are held about the same date and only a few can be attended each year.

This year two fairs were attended on the main line of the Canadian Pacific Railway, two on the Pembina Branch, and one on the Manitoba and North-western Railway.

A full collection of grain threshed and in the straw, field roots, fruits, &c., was shown at the following places :

Brandon, 25th and 26th July.
Pilot Mound, 3rd and 4th October.
Manitou, 5th and 6th do
Neepawa, 10th and 11th do
Carberry, 12th and 13th do

EXHIBITS FOR THE WORLD'S COLUMBIAN EXPOSITION.

In addition to the collection of field roots, garden vegetables and preserved fruit mentioned in my last report, as having been sent to Chicago, in November, 1892. sixteen cases of grain samples, threshed and in the straw were shipped to Chicago in March last, these were shown in connection with the Dominion Exhibit in the Agricultural Hall. Two awards were received in Chicago for these exhibits.

It was intended to supplement the farm exhibit with fresh vegetables from time to time, but owing to the unfavourable season this was found impossible.

VISITORS TO THE FARM.

It is evident by the rapidly increasing number of visitors each year, that interest in the work of the farm is not abating. This year 11,400 visited the farm, an increase of 6,000 over last year.

The Central Farmers' Institute again held their annual picnic on the farm, the Patrons of Industry also joined with them and it was estimated that over 2,000 persons attended; nearly all of whom were farmers and their families.

The farm was also visited by a large number of delegations from the United States, Britain and the continent of Europe. These parties were shown over the farm, its objects explained, and every opportunity given them to gain information as to the agricultural capabilities of this part of the province.

CORRESPONDENCE.

During the ten months since my last report, 1,817 letters have been received and 2,332 letters despatched from this office; the correspondence includes inquiries regarding nearly every branch of agriculture and horticulture and often entails considerable labour and research.

I have the honour to remain, sir,

Your obedient servant,

S. A. BEDFORD,

Superintendent.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF A. MACKAY, SUPERINTENDENT.

INDIAN HEAD, N. W. T., 31st October, 1893.

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

SIR,—I have the honour to submit herewith my sixth annual report of work done on the North-west Experimental Farm during the year 1893.

Except roots and potatoes, crops of all kinds on the experimental farm were good the past season. A hot wind on the 6th of August made the weight of grain less than usual, but the yields in almost all cases were satisfactory.

GENERAL VIEW, EXPERIMENTAL FARM, INDIAN HEAD, N. W. T., SHOWING PORTION OF FOREST SHELTER BELT. (FROM A PHOTOGRAPH).

The spring opened much later than usual, but no severe night frosts occurred afterwards and winds not being severe the grain came up evenly and made rapid advancement during the growing season.

Rain fell in abundance on the Experimental Farm and induced too much stooling on well worked land which, with warm weather caused a very rank growth of straw in several plots, but except in low places no lodging occurred.

In consequence of favourable weather, grain matured in less time than usual. The harvest commenced on August 8th when plots of oats and barley were cut and everything was in stook by the end of that month. During the whole harvest the weather continued so favourable that not over one-half day was lost in cutting and drawing in. Broken weather has taken place since harvest, but there has not been sufficient rain to do any good to the root crop, consequently the roots and potatoes on the farm were comparatively poor.

WHEAT.

Forty-seven varieties of wheat were tested the past season. Of these, 20 were sorts tried before, 8 were new varieties obtained from commercial sources and 19 were cross-bred wheats produced at the Central Experimental Farm.

FIELD PLOTS.

Thirty acres of clean fallowed land were sown with Red Fife for the purpose of obtaining a large quantity of clean and pure seed for distribution.

The soil of this field was unfortunately somewhat lighter than the average and the grain suffered from the extreme heat of 6th August and though sound and good for seed is not as plump as it would otherwise have been. The yield of straw and grain was large, but the sample will scarcely grade No. 1.

Six varieties, Wellman's Fife, Red Fern, White Fife, White Connell, Ladoga and Johnstons, had two acres each allowed them. These were sown on fallow but on different dates on account of wet places in the field. All suffered from the heat and in quality or quantity did not turn out as well as Red Fife although sown in the same field.

Following will be found the results in detail.

TESTS OF WHEAT IN FIELD PLOTS.

Name of Variety.	Acres.	Sown.	Headed.	Ripe.	Matured in.	Height.	Condition.	Yield per acre.	Weight per bushel.
						Ft. in.		Bus. Lbs	Lbs.
Red Fife	24	Apr. 22.	July 20..	Aug. 23..	124 days..	4 7	Very heavy	35 00	61½
do 1½ bu. seed.	3	do 24.	do 20..	do 23..	122 do ..	4 7	do	35 50	62½
do 2 do .	3	do 24.	do 20..	do 23..	122 do ..	4 7	do	37 20	62
Johnston's.......	2	May 1.	do 20..	do 23..	115 do ..	4 6	Medium ..	27 40	56½
Wellman's Fife. ..	2	do 1.	do 20..	do 22..	114 do ..	4 6	do ..	29 30	60
Red Fern.........	2	do 1.	do 19..	do 28..	120 do ..	4 6	Straw soft.	23 40	57½
Ladoga...........	2	do 1.	do 17..	do 19..	111 do ..	4 7	Medium ..	25 10	58½
White Fife.	2	do 10.	do 24..	do 31..	114 do ..	4 6	do ..	32 16	61½
White Connell....	2	do 10.	do 24..	do 31..	114 do ..	4 6	do ..	30 00	61

TEST OF SOWING WHEAT AT DIFFERENT DEPTHS.

Red Fife was used for this test and two inches proved to be the right depth for last season, as well as for 1892.

Name of Variety.	Depth Sown.	Sown on.	Headed.	Ripe.	Matured in.	Height.	Condition.	Yield per acre.	Weight per bush.
						Ft. in.		Bush.	Lbs.
Red Fife.........	2 in.	May 4..	July 23..	Aug. 25..	114 days..	4 8	Good.....	41·20	62
do	2½ in.	do 4..	do 23..	do 26..	115 do..	4 8	do	37·10	61

TEST OF SOWING PLOTS A WEEK APART.

Two varieties, Red Fife and Campbell's White Chaff were sown at the earliest possible date, 19th April, and seedings continued one week apart for 6 weeks, until 22nd May. The plots were one-tenth of an acre each.

In this test Campbell's White Chaff, which is a soft wheat, matured from one to two days ahead of Red Fife and all the plots came in in the order sown with seven days' difference in time of ripening between the first seeding of Red Fife and the last. The best yields were from second and third weeks' sowing. Following are dates of seeding, yield, &c.

RESULTS OF SOWING WHEAT AT DIFFERENT DATES.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Condition.	Weight of Straw.	Yield per acre.	Weight per bush.
				Days.	Ft. in.		Lbs.	Bus. lbs.	Lbs.
Red Fife...........	April 17..	July 19..	Aug. 23..	129	4 6	Stiff & good.	356	24 40	60½
do	do 24..	do 20..	do 25..	124	4 6	do ..	333	31 10	61½
do	May 1..	do 22..	do 26..	118	4 6	do ..	458	37 ..	62½
do	do 8..	do 22..	do 26..	111	4 6	do ..	375	32 30	62
do	do 15..	do 23..	do 28..	106	4 6	do ..	330	30 ..	61
do	do 22..	do 26..	do 30..	101	4 6	do ..	325	29 10	61½
Campbell's W. Chaff.	April 17..	do 18..	do 21..	127	4 10	Good.....	291	26 30	58
do ..	do 24..	do 19..	do 23..	122	4 10	do	369	31 40	58½
do ..	May 1..	do 21..	do 25..	117	4 10	do	319	30 10	61
do ..	do 8..	do 21..	do 26..	111	4 10	do	357	25 30	56½
do ..	do 15..	do 23..	do 27..	105	4 8	do	370	30 ..	57
do ..	do 22..	do 25..	do 28..	99	4 8	do	341	29 50	57½

TEST OF DIFFERENT VARIETIES SOWN SAME DATE, ONE-TENTH ACRE EACH.

To test the question of earliness as well as yield, 35 varieties of wheat were sown on the same day, on as uniform a piece of ground as possible. The land had been fallowed the year previous, receiving one ploughing and several surface cultivations. The soil being rather lighter than the average, all the varieties suffered a good deal from hot wind on August 6th. Twelve of the varieties were cross-bred wheats and like the older sorts were injured, which caused the grain to be small and shrunken.

In earliness, four of the cross-bred sorts, Beta, Albert, Abundance and Ottawa, —crosses between Red Fife and Ladoga—Gehun, an Indian variety, and Ladoga were first.

In yield Gehun, a wheat received several years ago from India gave the highest, closely followed by one of the cross-bred sorts and four of the older kinds. Gehun was also the best sample.

Following are the varieties tested, date sown, date of heading, &c., &c.

TESTS OF VARIETIES OF WHEAT, ALL SOWN SAME DAY, ONE-TENTH ACRE EACH.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Weight of Straw.	Yield per Acre.	Weight per bush.
				Days.	Ft. in.	Lbs.	Bus. lbs.	Lbs.
Red Fife	May 3..	July 21..	Aug 25..	115	4 8	380	30 00	59½
Wellman's Fife	do 3..	do 21..	do 27..	117	4 6	372	31 20	60
White Fife	do 3..	do 22..	do 27..	117	4 6	375	30 50	60
Campbell's W. Chaff	do 3..	do 22..	do 26..	116	5 0	390	28 20	60½
White Connell	do 3..	do 22..	do 26..	116	4 6	348	35 20	59½
Campbell's Triumph	do 3..	do 20..	do 24..	114	4 6	380	30 00	59½
White Russian	do 3..	do 22..	do 22..	112	4 0	392	28 00	56½
Hungarian Mountain	do 3..	do 22..	do 23..	113	4 0	399	26 50	57½
Great Western	do 3..	do 20..	do 27..	117	4 6	359	35 30	61½
Hueston's	do 3..	do 22..	do 26..	116	4 6	346	35 41	61½
Ladoga	do 3..	do 18..	do 18..	108	4 8	391	33 10	57
Red Fern	do 3..	do 20..	do 23..	113	4 0	402	31 20	60
Pringle's Champlain	do 3..	do 19..	do 23..	113	4 3	394	32 40	59
Rio Grande	do 3..	do 23..	do 24..	114	4 0	426	27 20	57½
Colorado	do 3..	do 13..	do 22..	112	4 8	396	32 20	60½
Azima, Russian	do 3..	do 22..	do 26..	116	4 6	389	33 30	62
Black Sea	do 3..	do 20..	do 23—	113	4 6	404	31 00	57½
Herisson Bearded	do 3..	do 19..	do 27..	117	4 6	500	30 00	61
Prince No. 1, cross-bred	do 3..	do 19..	do 20..	110	4 6	406	27 20	56½
do 2, do	do 3..	do 19..	do 20..	110	4 6	378	32 00	57½
Advance do	do 3..	do 20..	do 21..	111	4 3	381	34 30	60½
Carleton do	do 3..	do 21..	do 21..	111	5 0	436	27 20	56
Crown do	do 3..	do 21..	do 26..	116	5 0	392	34 40	60½
Preston do	do 3..	do 19..	do 21..	111	4 6	410	30 40	58
Beta do	do 3..	do 19..	do 18..	108	4 8	448	25 20	56½
Albert do	do 3..	do 20..	do 18..	108	4 8	467	22 10	56½
Abundance, cross-bred	do 3..	do 19..	do 18..	108	4 0	465	22 30	56
Ottawa do	do 3..	do 18..	do 18..	108	4 6	397	33 50	57
Stanley do	do 3..	do 19..	do 21..	111	4 8	489	35 10	59½
Alpha do	do 3..	do 20..	do 22..	112	4 0	404	32 40	60½
Golden Drop	do 3..	do 20..	do 25..	115	4 0	403	27 00	60½
Old Red River	do 3..	do 22..	do 26..	116	4 3	395	28 20	60½
Red Fife (from Saskatoon)	do 3..	do 20..	do 27..	117	4 8	454	24 00	60½
Gehun	do 3..	do 10..	do 18..	108	3 3	322	37 40	64½
Australian	do 3..	do 20..	do 26..	116	4 8	336	35 40	59½
Johnston's	do 3..	do 20..	do 26..	116	4 6	456	31 20	60

TEST OF SOWING DIFFERENT QUANTITIES OF SEED PER ACRE.

In this test Red Fife was used and sown on 3rd May. The highest yield was obtained from 1¼ bushels per acre closely followed by 1½ bushels seed. All the plots ripened together.

Name of Variety.	Seed per acre.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bush.
	Bush.				Days.	Ft. in.	Bus. lbs.	
Red Fife..........................	1	May 3..	July 23..	Aug. 28..	118	4 6	38 50	62½
do	1¼	do 3..	do 23..	do 27..	117	4 6	40 00	60½
do	1½	do 3..	do 23..	do 27..	117	4 6	39 40	62
do	1¾	do 3..	do 23..	do 27..	117	4 6	37 30	61½

TEST OF LAND TREATED WITH SUPERPHOSPHATE OF LIME AND FIELD LIME.

In this test three plots of $\frac{1}{10}$th acre each were sown with Red Fife at the rate of 1½ bushels per acre. On one plot 50 pounds of superphosphate of lime was sown; a second plot had 60 pounds of field lime (air slacked) sown on it, and the third plot was untreated.

The plot on which field lime was used gave at the rate of 4 bushels per acre more than either of the other two. The superphosphate of lime plot was one day earlier in ripening.

The details of the test are as follows:—

Name of Variety.	Treatment per acre.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bush.
					Days.	Ft. in.	Bus. lbs.	Lbs.
Red Fife. ..	500 lbs.—Sup. ph. lime.....	May 4..	July 22..	Aug. 26.	115	4 6	36 ..	61
do	600 lbs.—field lime.........	do 4..	do 21..	do 27..	116	4 6	40 50	62½
do	Untreated.................	do 4..	do 21..	do 27..	116	4 6	36 20	60½

TEST OF BROADCAST, DRILL AND PRESS-DRILL SOWING.

Red Fife was nsed also in this test and the three plots were sown on the same date. The broad-cast plot was so much injured by winds that it was ploughed up and re-sown on 29th May.

Name of Variety.	How Sown.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bush.
					Days.	Ft. in.	Bus. lbs.	Lbs.
Red Fife. ..	*Broadcast................	May 29..	Aug. 2..	Aug. 29..	93	4 6	25 40	60
do	Drill.......	do 4..	July 23..	do 28..	117	4 8	36 18	62½
do	Press-drill.......,......	do 4..	do 21..	do 26..	115	5 ..	38 20	62½

*Re-sown May 29th.

TEST OF STUBBLE FALL PLOUGHED, SPRING PLOUGHED, WITHOUT PLOUGHING AND FALLOWED LAND.

In this test two acres of stubble land was ploughed in the fall of 1892, two acres of stubble ploughed with a gang plough at the time of seeding, two acres of stubble land sown by press drill without ploughing and not touched before or after using drill, and two acres of fallow were sown. The stubble in all cases had been fallowed in summer of 1891 and had produced a crop of Red Fife in 1892.

The fallow land gave much the better result, and the fall ploughing the result expected, and the result that has always been had in our experience, a much smaller crop no matter how well the work may be done. Spring-ploughing and the plot sown by the press-drill without ploughing, gave a fine crop of straw and a good yield of grain, but the sample was shrunken.

TEST OF FALL AND SPRING PLOUGHING AND PRESS-DRILL ON STUBBLE COMPARED WITH SUMMER FALLOW.

Name of Variety.	Mode of Cultivation.	Sown.	Headed.	Ripe.	Matured in.	Height.	Condition.	Yield per acre.	Weight per bush.
					Days.	Ft. in.		Bus. lbs.	Lbs.
Red Fife..	Fall ploughing; stubble..	May 2..	July 15.	Aug. 21..	112	4 4	Light..	22 10	59
do ..	Spring do do ..	do 2..	do 18.	do 23..	114	4 6	Medium	31 30	60
do ..	Press-drill; stubble.....	do 2..	do 15.	do 21..	112	4 6	Medium	29 50	59½
do ..	Fallow................	do 3..	do 21.	do 23..	113	4 7	Good...	37 50	60

SMUT TESTS.

Two kinds of seed were used in these tests; one badly affected by smut and the other almost entirely free from it.

The same treatment was given in each case namely, one pound of bluestone in one and one half pails of water to 5, 7 and 10 bushels wheat; all mixed on the barnfloor and turned over several times. The heads were counted on six feet square in each plot.

RESULTS OF SOWING SMUTTY WHEAT, TREATED AND UNTREATED.

Name of Variety.	Treatment.	Sown.	Headed.	Ripe.	Good heads.	Smutty heads.	Yield per acre.	Weight per bush.
Seed badly affected.							Bus. lbs.	Lbs.
Red Fife..................	Untreated..........	May 4..	July 23.	Aug. 29.	1,452	251	24 10	57½
do	1 lb. to 10 bush......	do 4..	do 23.	do 27.	1,648	8	34 20	59½
do	1 lb. to 7 bush......	do 4..	do 23.	do 27.	1,760	9	33 50	60½
do	1 lb. to 5 bush....	do 4..	do 23.	do 27.	1,590	6	31 20	61½
Seed not badly affected.								
Red Fife..................	Untreated	do 4..	do 23.	do 26.	1,480	28	28 10	60½
do	1 lb. to 10 bush......	do 4..	do 23.	do 26.	1,536	3	28 20	60½
do	1 lb. to 7 bush......	do 4..	do 23.	do 26.	1,700	2	30 30	60
do	1 lb. to 5 bush......	do 4..	do 23.	do 26.	Record lost.		29 ..	60

CROSS-BRED WHEATS.

The result of the tests of the cross-bred wheats during the past season, was not very satisfactory. All gave a large quantity of straw and there were fair yields of nearly all the sorts tried, but the grain was poor except in two cases and these were not equal to Red Fife. This was caused to a great extent, no doubt, by the hot winds of August 6th, as other varieties sown alongside the cross-bred sorts were, with few exceptions as badly hurt.

Stanley and Alpha, beardless sorts, give promise of being the most valuable of all thus far tested. These two gave 35·10 and 32·10 respectively per acre, of fairly good grain and were 4 and 5 days earlier than Red Fife sown alongside for comparison. The results of a test of 12 varieties of these cross-bred wheats sown on $\frac{1}{10}$th acre plots have been given and the yields of 9 varieties which were sown on acre plots will be found below. The small plots are of new sorts, tested here for the first time, and have occupied too small an area to admit of a satisfactory calculation as to yield per acre.

TESTS OF CROSS-BRED WHEATS ON ONE ACRE PLOTS.

Name of Variety.	Cross between	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft.	Bush.	Lbs.
Abundance........	Ladoga and Red Fife..	May 2.	July 21.	Aug. 19.	110	4·7	24·	56½
Carleton..........	do do ..	do 2.	do 19.	do 19.	110	4·7	37·15	58
Ottawa...........	do do ..	do 2.	do 19.	do 19.	110	4·7	20·	56½
Stonewall.........	do do ..	do 2.	do 19.	do 18.	109	4·7	22·24	57½
Trial....	do do ..	do 2.	do 19.	do 18.	109	4·7	27·15	60
Advance...... ...	Ladoga and White Fife	do 2.	do 19.	do 20.	111	4·7	28·9	59
Manifold.........	do do ..	do 2.	do 23.	do 20.	111	4·6	31·20	59½
Albert	Ladoga and Red Fife..	do 2.	do 18.	do 18.	109	4·7	25·27	57
A. No. 1..........	do do ..	do 2.	do 15.	do 15.	106	4·7	30·40	58½

SMALL PLOTS.

New Hybrids.....	Red Fife and Club Bombay.	May 4.	July 21.	Aug. 22.	111	4·6	Plot small and no yield taken.
	Red Fife and Ladoga..	do 4.	do 22.	do 23.	112	4·6	do
	Anglo-Canadian and Karachi.	do 4.	do 12.	do 24.	113	4·7	do
	Red Fife and Ladoga (Red Chaff.)	do 4.	do 21.	do 23.	112	4·7	do
	Spiti Valley and Red Fife (beardless.)	do 4.	do 10.	do 22.	111	4·7	do

GENERAL RESULT OF WHEAT TESTS FOR 1893.

On account of there being no spring or fall frosts to injure any of the varieties of wheat tested, it may safely be said that Red Fife has given the best results in every respect.

The result of the wheat tests, on the whole, the past season, has not been altogether satisfactory. While the crop of straw in all the varieties was large, the hot winds in August injured the grain in all the late kinds considerably, and caused it to ripen prematurely, but early sorts, such as the Gehun, which were well advanced before the hot winds came suffered less. The result of the injury is not so much observed in the yield as in the weight and quality of the grain.

As to earliness, all the sorts matured in much less time than in 1892. Red Fife in 1892 took 139 days to mature; this year 115 days; Gehun, in 1892 took 121 days; this year 108 days.

BARLEY.

Twenty-five varieties of barley were tested the past season. Of these, 17 were old sorts and 8 new hybrids between six-rowed and two-rowed barley which have been produced at the Central Experimental Farm. Five varieties yielded over 50 bushels per acre, 8 over 40 bushels and the remainder over 30 bushels.

All kinds were very heavy in the straw but the grain was light in weight caused by the hot winds ripening it too quickly. Except two varieties and in a few others in low places no lodging took place. The straw, as will be seen, was from 3 to 4½ feet in length, and some kinds went over 400 pounds to the $\frac{1}{10}$th acre.

Except a few acres sown on stubble land, all the barley was put in on fallow and unless otherwise stated, 2 bushels of seed were sown per acre.

Sixteen varieties sown on the same day, under the same conditions, matured on an average in 95 days, while last year, 13 kinds under the same conditions, took an average of 120 days to ripen. The weather during the barley harvest was fine and all sorts were secured without being weather-stained.

FIELD LOTS.—PLOTS OF FOUR ACRES AND UPWARDS.

Five varieties were sown in fields, all of these were two-rowed, and one of them California Prolific was sown on three different dates.

All sorts were very heavy in the straw, but all, excepting Prize Prolific and Newton, stood up and were easily harvested. One field of California Prolific of 5 acres, yielded 57 bushels 44 pounds per acre, from the thresher. The grain of all the varieties is much lighter than usual.

RESULTS OF FIELD CROPS OF TWO-ROWED BARLEY.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.		Character of Straw.	Yield per Acre.		Weight per Bushel.
				Days.	Ft.	in.		Bush.	lbs.	Lbs.
California Prolific...	May 6	July 18	Aug. 12	98	4	6	Strong & fine.	45	..	49
do ...	do 8	do 17	do 11	95	4	6	Strong & fine.	57	44	49
do ...	do 9	do 20	do 14	97	4	0	Strong.	48	2	48
do fall pl'h'ng	do 11	do 17	do 12	93	3	9	Strong.	41	32	47
Newton............	do 12	do 19	do 16	96	3	0	Weak.	39	17	46½
Kinver Chevalier....	do 9	do 20	do 18	101	3	0	Weak.	47	60	47
Prize Prolific.......	do 9	do 20	do 18	101	3	9	Weak.	40	..	47
Goldthorpe.........	do 11	do 21	do 17	98	3	6	Weak.		Not	threshed

RESULTS OF SOWING BARLEY AT DIFFERENT DATES ON ONE-TENTH ACRE PLOTS.

In this test Duckbill, a two-rowed variety, and Baxter's six-rowed were used. The first plots were sown on 24th April and the last on 29th May, with a week intervening between each set of plots.

The plots sown on 1st and 8th May gave the best returns. The three last plots in both sorts gave a smaller yield per acre and lower weights per bushel than the first three sown, caused probably by the hot wind on August 6th, catching these plots while in the milk stage and hastening their ripening. All the plots were heavy in straw excepting those of the last seeding.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.		Weight of Straw.	Yield per Acre.		Weight per Bushel
				Days.	Ft.	in.	Lbs.	Bush.	lbs.	Lbs.
Duckbill..............	April 24	July 18	Aug. 12	111	4	0	222	35	..	48½
do	May 1	do 19	do 12	104	4	0	248	43	6	50
do	do 8	do 21	do 14	99	4	0	273	42	4	50
do	do 15	do 21	do 15	93	4	0	263	37	44	49
do	do 22	do 22	do 17	88	4	0	193	32	34	46
do	do 29	do 26	do 19	83	3	10	144	26	12	44
Baxter's 6-rowed.......	April 24	do 10	do 8	107	3	6	233	36	42	51
do	May 1	do 12	do 8	100	3	6	406	42	24	50½
do	do 8	do 13	do 9	94	3	6	368	40	..	50
do	do 15	do 15	do 12	90	3	6	280	30	10	50½
do	do 22	do 18	do 14	85	3	6	276	30	..	46½
do	do 29	do 20	do 16	80	3	2	249	31	22	49

TEST OF VARIETIES ALL SOWN SAME DATE, ONE-TENTH ACRE PLOTS.

Sixteen varieties were sown in this test. The soil was sandy loam uniform in character and had been fallowed the preceding year. Two bushels of seed per acre was sown by drill. In earliness the six-rowed matured in from 6 to 11 days less time than the two-rowed. All sorts produced a good crop of straw, some very heavy and all stood up well.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.		Weight of Straw.	Character of Straw.	Yield per Acre.		Weight per Bushel.
				Days.	Ft.	in.	Lbs.		Bush.	lbs.	Lbs.
Six-rowed sorts—											
Baxter's...........	May 10	July 12	Aug. 8	90	3	6	333	Fair...	36	42	50
Common...........	do 10	do 9	do 8	90	4	0	169	Weak..	36	42	51½
Rennie's Improved..	do 10	do 12	do 12	94	4	0	298	Fair...	49	18	50
Odessa...........	do 10	do 10	do 12	94	3	6	171	do	49	38	49½
Petschora..........	do 10	do 10	do 8	90	4	6	246	do	37	14	46
Guymalaye..........	do 10	do 17	do 14	96	3	6	263	do	41	2	59
Oderbruch..........	do 10	do 9	do 8	90	3	6	268	do	42	4	52½
Mensury............	do 10	do 11	do 8	90	4	0	307	do	38	16	46
Two-rowed sorts—											
Prize Prolific.......	do 10	do 19	do 19	101	3	6	338	Weak..	44	2	48
Danish Chevalier...	do 10	do 21	do 19	101	3	6	353	Strong..	54	28	51½
Goldthorpe..........	do 10	do 17	do 18	100	3	6	258	Weak..	48	46	49
Canadian Thorpe....	do 10	do 17	do 14	96	4	3	155	Strong..	43	36	49
Improved Chevalier.	do 10	do 17	do 18	100	3	6	438	do ..	42	4	51
Duckbill...........	do 10	do 17	do 16	98	4	3	233	do ..	50	20	50
Thanet......	do 10	do 18	do 19	101	4	0	368	Weak..	51	22	49
Kinver Chevalier....	do 10	do 18	do 18	100	4	0	358	do ..	54	38	48

TEST OF BROADCAST, PRESS DRILL AND ORDINARY DRILL.

In this test California Prolific was used. The soil, was a heavy clay loam which was fallowed the preceding year, and the seed was sown at the rate of two bushels per acre.

That put in by the Press-drill gave seven bushels more than that sown by the common drill, and 9 bushels and 28 pounds more than the plot sown with the broadcast seeder. The straw was longer where the press-drill was used and the grain ripened 3 days in advance of either of the other two.

Name of Variety.	Sown.		Headed.		Ripe.		Matured in.	Height.		Weight of Straw.	Yield per Acre.		Weight per Bushel
							Days.	Ft.	in.	Lbs.	Bush.	lbs.	Lbs.
California Prolific, press-drill.	May	8	July	20	Aug.	19	104	4	8	226	55	..	49
do common drill....	do	8	do	20	do	18	101	4	6	163	48	..	48
do broadcast seeder..	do	8	do	23	do	19	104	4	6	182	45	20	47½

TEST OF STUBBLE *VS.* FALLOW.

In this test four acres of stubble were ploughed in the fall of 1892 and four acres fallowed during the same year. Two bushels per acre of California Prolific Barley were sown by drill. The stubbleland used was in rather a low place and was situated alongside of a railway embankment, both of which helped the grain when the hot winds came. The embankment especially breaking the force of the hot blasts as they passed over.

Name of Variety.	Land.	Sown.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per Bushel.
					Days.	Ft.	in.	Bush.	lbs	Lbs.
California Prolific.	Fallow....	May 9..	July 20.	Aug. 14.	98	4	2	48	10	48
do ..	Fall ploughing of stubble................	do 9..	do 17.	do 12.	96	4	1	41	32	47

TEST OF SOWING DIFFERENT QUANTITIES OF SEED PER ACRE—ONE-TENTH ACRE PLOTS

In these experiments California Prolific was again used. The soil was a heavy clay loam, which had been fallowed and was in good order. Two bushels per acre gave the best return, and the crop matured in two days less time than either 1¾ or 1½ bushels.

Name of Variety.	Quantity of Seed per Acre.	Sown.	Headed.	Ripe.	Matured in.	Height.		Weight of Grain and Straw.	Yield per Acre.		Weight per Bushel.
	Bush.				Days.	Ft.	in.	Lbs.	Bush.	lbs.	Lbs.
California Prolific.......	2	May 8	July 20.	Aug. 14.	99	4	3	308	48	14	48½
do	1¾	do 8	do 20.	do 16.	101	4	3	316	44	28	49
do	1½	do 8	do 20.	do 16.	101	4	4	229	43	44	47

NEW HYBRID BARLEYS.

Two named and six unnamed hybrids were tested in the small plots. All are crosses between Swedish two-rowed female and Baxter's six-rowed male, recently produced at the Central Experimental Farm, but are of different types.

Name of Variety.	Cross between	Sown.	Headed.	Ripe.	Matured.	Yield per Acre.	Weight per Bushel.
					Days.	Bush. lbs.	Lbs.
Surprise	Swedish and Baxter's 6-rd..	May 15.	July 15.	Aug. 14.	91	39 ..	48
Summit	do ..	do 15.	do 17.	do 15.	92	40 32	46
Type D.	do ..	do 12.	do 10.	do 11.	91	....	48½
do P.	do ..	do 12.	do 12.	do 14.	94	Not threshed.	
Type A.	do ..	do 12.	do 9.	do 11.	91	....	47½
do 11	do ..	do 12.	do 10.	do 14.	94	....	48
do S.	do ..	do 12.	do 12.	do 14.	94	....	49½
do C.	do ..	do 12.	do 11.	do 11.	91	....	47

OATS.

Forty varieties of oats were tested the past season; all being sown on fallowed land. All the varieties were very heavy in straw and gave good returns with the exception of one 5-acre block which was sown on fall ploughing, and although it gave a fair crop of straw the grain was of poor quality.

The best return was obtained from $\frac{1}{10}$th acre plot of American Banner, sown by press drill on 12th May, which gave 100 bushels per acre. A field of Prize Cluster, 15 acres in extent, produced 77·10 per acre and Welcome on a 5-acre plot alongside the Cluster yielded 78·18 per acre. The grain in both these cases was very good.

FIELD PLOTS.

Field plots of 15 acres down to 2 acres were sown on different dates. All were very heavy in straw but some of the plots lodged more or less and the grain in these was light.

The heaviest crop was that of the Welcome, mentioned above which gave 78 bushels 18 lbs. per acre. The soil, which was a sandy loam was fallowed, and the land gang-ploughed twice in 1892. Two and one-half bushels of seed was sown per acre and put in by drill.

TESTS OF FIELD PLOTS OF OATS.

Name of Variety.	Acres.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bush.
					Days.	Ft. in.	Bush.	Lbs.
Welcome	5	May 10..	July 18..	Aug. 15..	98	4 3	78 18	43
Banner	5	do 6..	do 20..	do 17..	104	4 6	67 00	36
Bonanza	2	do 6..	do 15..	do 12..	99	4 2	60 00	40
Cluster	15	do 8..	do 15..	do 11..	96	4 4	77 10	40
Blk. Champion	2	do 12..	do 19..	do 16..	97	4 0	36 14	36
White Russian	2	do 12..	do 18..	do 14..	95	4 2	48 10	39
Improved Ligowo	2	do 12..	do 16..	do 14..	95	4 0	49 10	40½
English White	2	do 12..	do 19..	do 16..	97	4 0	46 00	39
Winter Grey	2	do 12..	do 17..	do 16..	97	4 4	50 31	40

RESULTS OF SOWING OATS AT DIFFERENT DATES, ONE-TENTH ACRE PLOTS.

Two varieties, Prize Cluster and American Banner, were chosen for this test and sown on fallowed land on April 24, and on the same day each week for six weeks ending May 29th. The quantity of seed used was 2½ bushels per acre which was sown by drill.

The first three dates of seeding gave the best results. The Cluster matured on an average 10 days earlier than the Banner but the latter produced the best crop. The following are the dates of seeding, yield, etc.:—

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bush.
				Days.	Ft. in.	Bush. lbs.	Lbs.
Cluster	April 24	July 13	Aug. 7	106	4 4	72 2	40½
do	May 1	do 15	do 8	100	4 4	66 6	42
do	do 8	do 16	do 8	93	4 4	60 30	41½
do	do 15	do 21	do 14	92	4 5	56 10	41
do	do 22	do 23	do 19	90	4 5	58 20	41½
do	do 29	do 26	do 22	86	4 3	46 6	40
Banner	April 24	do 17	do 17	116	4 6	88 28	34½
do	May 1	do 18	do 19	111	4 6	76 20	33
do	do 8	do 19	do 21	106	4 6	86 6	34
do	do 15	do 21	do 22	100	4 6	87 12	34
do	do 22	do 23	do 24	95	4 5	63 00	32½
do	do 29	do 28	do 31	95	4 5	61 26	33½

TEST OF SOWING DIFFERENT VARIETIES ON SAME DATE, ONE-TENTH ACRE PLOTS.

Forty varieties were selected for this test. All were sown on the same day by drill at the rate of 2½ bushels per acre. The land was a uniform sandy loam which had been fallowed. The Welcome and Winter Gray were the first to ripen. These varieties matured in 92 days; while last year they took 127 and 134 days respectively to do so. Six kinds gave over 400 pounds of straw on the tenth acre plot, and one variety produced 520 pounds. The weight of the grain is lower this year than for the last two years, caused, no doubt, by the hot winds.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Weight of Straw.	Character of Straw.	Yield per Acre.	Weight per Bush.
				Days.	Ft. In.	Lbs.		Bush.	Lbs.
Cluster	May 9	July 13	Aug. 10	94	4 6	423	Heavy	64·00	41
Welcome	do 9	do 12	do 8	92	4 6	383	do	78·18	42
Winter Gray	do 9	do 13	do 8	92	4 6	520	do	82·12	40½
Bonanza	do 9	do 10	do 7	91	4 6	355	do	66·16	41½
Improved Ligowo	do 9	do 10	do 16	100	4 3	300	Stiff	79·14	40½
American Beauty	do 9	do 16	do 17	101	3 6	285	do	77·32	31
White Russian	do 9	do 17	do 15	99	4 0	336	do	60·00	36
Abundance	do 9	do 17	do 16	100	4 0	320	do	70·20	31½
Gothland	do 9	do 19	do 16	100	4 6	422	do	76·00	39
English White	do 9	do 19	do 19	103	4 6	349	do	70·30	33½
Royal Doncaster	do 9	do 23	do 20	104	4 0	350	Straw very heavy	58·28	41
Giant Cluster	do 9	do 23	do 27	111	4 0	345	Stiff	65·20	32½
Archangel	do 9	do 13	do 14	98	5 0	365	do	70·20	32½
Cream Egyptian	do 9	do 15	do 10	94	4 6	477	do	74·14	40
White Wonder	do 9	do 15	do 10	94	4 6	390	do	55·20	40½
Columbus	do 9	do 17	do 18	102	4 0	220	do	58·28	31

TEST OF SOWING DIFFERENT VARIETIES OF OATS—*Con.*

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Weight of Straw.	Character of Straw.	Yield per Acre.	Weight per Bush.
				Days.	Ft. in.	Lbs.		Bush.	Lbs.
Challenge	May 9	July 13	Aug. 14	98	4 6	226	Stiff	60·15	42
American Triumph	do 9	do 19	do 18	102	4 6	340	do	58·28	31½
Siberian	do 9	do 19	do 24	108	4 3	378	do	59·14	37
Abyssinia	do 9	do 19	do 19	103	4 3	370	do	67 22	30
Scottish Chief	do 9	do 16	do 14	98	4 3	383	do	64·24	44
Poland White	do 9	do 17	do 14	98	4 0	299	do	65·02	40½
Rennie's Prize White	do 9	do 16	do 14	98	4 0	149	do	73·28	42
Victoria Prize White	do 9	do 19	do 14	98	4 8	259	do	66·16	41
Golden Beauty	do 9	do 19	do 19	103	4 8	384	do	78·08	36
Oderbruch	do 9	do 19	do 20	104	4 6	373	Weak	72·22	39
Holstein Prolific	do 9	do 18	do 19	103	4 6	370	Stiff	82·12	37
Wide Awake	do 9	do 19	do 20	104	5 0	361	do	76·06	38
Cave	do 9	do 19	do 20	104	4 6	368	do	77·02	38
Flying Scotchman	do 9	do 16	do 14	98	4 3	352	Fair	64·04	37
Early Blossom	do 9	do 19	do 27	111	4 0	343	do	60·30	37½
Rosedale	do 9	do 19	do 18	102	4 6	455	do	70·20	31½
Banner	do 9	do 17	do 15	99	4 3	405	do	66·06	31
Imported Irish	do 9	do 17	do 14	98	4 8	318	do	54·04	42
Hazlett's Seizure	do 9	do 17	do 14	98	4 6	336	do	60·00	41
Black Tartarian	do 9	do 23	do 27	111	4 3	357	Heavy	56·26	37½
California Prolific Black	do 9	do 19	do 27	111	3 6	367	Weak	56·26	37
Black Couloummiers	do 9	do 19	do 27	111	3 8	499	do	50·10	38½
Early Etampes	do 9	do 16	do 20	104	3 6	384	do	57·22	35
Joanette	do 9	do 16	do 20	104	3 6	413	do	52·02	31½

TEST OF FALL PLOUGHING, SPRING PLOUGHING, WITHOUT PLOUGHING, AND FALLOW.

This test was made to find out the yield from these four methods of growing oats. The stubble land used had a crop of Red Fife in 1892 and was fallowed in 1891. Five acres were sown in each test.

The fall ploughing was done in October 1892. The stubble was turned under 6 inches deep and one stroke of the harrow was given in the spring. It was sown by drill without harrowing after and 2½ bushels of seed used per acre.

The spring ploughing was done by gang plough, 3 inches deep at time of seeding. The seed was first sown, then ploughed in and harrowed.

In the third way, the grain was sown by drill without either ploughing or harrowing.

The fallowed land was gang-ploughed twice and harrowed twice the preceding year and was sown by drill without harrowing.

Following will be found the results of tests in detail:—

Name of Variety.	Mode of Cultivation.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.	Bush.	Lbs.
Welcome	Fall ploughing	May 13	July 18	Aug. 7	87	4 0	36	38½
do	Spring ploughing	do 13	do 15	do 7	87	4 2	66	40
do	Drill, without ploughing	do 13	do 15	do 8	88	4 2	62	40½
do	Fallow	do 10	do 18	do 15	97	4 6	78	43

TEST OF SEEDING, BROADCAST, DRILL AND PRESS-DRIL, ONE-TENTH ACRE PLOTS.

In this experiment the Banner oat was used. Two and one-half bushels per acre being sown in each case. The soil was a heavy clay loam.

The plot sown with press-drill ripened in 7 days less than that sown with the broadcast seeder and 1 day earlier than that sown with the common drill. The yress-drill gave 25 bushels per acre more than the broadcast seeding and 15 bushels more than the common drill.

Name of Variety.	Mode of seeding.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.	Bus. lbs.	Lbs.
Banner	Broadcast	May 12	July 23	Aug. 25	106	4 3	75 20	37
do	Drill	do 12	do 19	do 19	100	4 3	85 30	37½
do	Press-drill	do 12	do 18	do 18	99	4 6	100 ..	38

TEST OF SOWING AT DIFFERENT DEPTHS.

The Banner was used in this test also, the condition and character of soil being the same as in the previous test.

Name of variety.	Depth of Seeding.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.	Bush.	Lbs.
Banner	3 in. deep	May 12.	July 21.	Aug. 23.	103	4 3	87·20	38
do	2 in. do	do 12.	do 20.	do 23.	103	4 3	81·26	36

TEST OF SOWING DIFFERENT QUANTITIES OF SEED PER ACRE.

In this test the conditions were the same except the quantity of seed sown. Two bushels per acre gave the best return.

Name of Variety.	Quantity of Seed per Acre.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.	Bush.	Lbs.
Banner	2 bush. per acre	May 8.	July 18.	Aug. 17.	102	4 3	97·32	37
do	2½ do	do 8.	do 18.	do 18.	103	4 4	89·14	36½
do	2¾ do	do 8.	do 18.	do 18.	103	4 3	80·00	36½

TEST OF GROWING OATS WITH AND WITHOUT FERTILIZERS.

Three $\frac{1}{10}$th acre plots were sown with Banner Oats. On one plot 50 lbs. superphosphate of lime was sown; on the second, 60 lbs. field lime; and the third was untreated.

The plot with super-phosphate of lime gave 20 bushels per acre more than either of the other two, and ripened one day earlier. In this test in 1892, the super-phosphate of lime gave much the better result, but the untreated plot that season was badly injured by winds.

Name of Variety.	Treatment.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bushel.
					Days.	Ft. in.	Bush.	Lbs.
Banner.......	50 lbs. Super-phosph. lime.	May 10	July 20	Aug. 21	104	4 4	85·20	36
do	60 " Field lime.........	do 10	do 21	do 23	106	4 4	65·20	35½
do	Untreated	do 10	do 21	do 22	105	4 4	65.20	37½

PEASE.

Twelve varieties were sown in $\frac{1}{10}$ acre plots and 7 of these in acre plots.

The crop of straw from all the sorts was heavy but the hot winds injured them so much that the yield was very small. Unfortunately a heavy wind storm took place immediately after the pease were pulled, which mixed the varieties so much that out of 19 plots, returns for only 6 kinds can be given, and they are not accurate for the reason that all the plots were badly threshed out by winds.

Two of the sorts that were badly mixed, Centennial and Potter, were the best of all varieties sown. The Pride also was of good quality.

ONE ACRE PLOTS OF PEASE.

Name of Variety.	Sown.	Blossomed	Ripe.	Matured in.	Yield per acre.	Weight per bushel.	Remarks.
				Days.	Bushels.	Lbs.	
Pride....	May 5.	July 10.	Aug. 15	103	20·00	61	
White Marrowfat	do 5.	do 14.	do 23	111	14·10	63	
Black Eyed Marrowfat.....	do 5.	do 17.	do 23	111	11·40	61	
Mummy................ ..	do 5.	do 15.	do 16	104	16·40	62	
Prince Albert....	do 5.	do 16.	do 22	110	....	....	Mixed by winds.
Crown	do 5.	do 16.	do 16	104	....	....	do do
Multiplier.............. .	do 5.	do 18.	do 17	105	9·01	62½	

ONE-TENTH ACRE PLOTS OF PEASE.

Name of Variety.	Sown.	Blossomed	Ripe.	Matured in.	Yield per Acre.	Condition.
				Days.	Bush. lbs.	
Mummy....................	May 10.	July 14.	Aug. 16.	99	....	Mixed by winds.
Black Eyed Marrowfat.....	do 10.	do 16.	do 23.	106	....	do do
Pride....................	do 10.	do 10.	do 14.	97	....	Very fine, mix. by w.
White Marrowfat..........	do 10.	do 18.	do 23.	106	....	Mixed by winds.
Multiplier...............	do 10.	do 18.	do 21.	104	....	do do
Prince Albert............	do 10.	do 19.	do 21.	104	....	do do
Crown....................	do 10.	do 17.	do 16.	99	17·40	Small.
Potter...................	do 10.	do 16.	do 19.	102	....	Very fine, mix. by w.
Canadian Beauty..........	do 10.	do 18.	do 22.	105	....	Mixed by winds.
Centennial.......	do 10.	do 16.	do 17.	100	....	Extra fine, mix. by w.
Golden Vine..............	do 10.	do 17.	do 22.	105	....	Mixed by winds.
Prussian Blue............	do 10.	do 19.	do 23.	106	....	do do

FODDER-MIXTURES AND FODDER PLANTS.

As in previous years a good deal of ground was given to fodder mixtures. These were sown on stubble land and on fallow and on account of the very favourable season a heavy rank crop resulted. A portion of the crop was made into hay, a part cut green and put in silo and the remainder cut on the green side and bound into sheaves to be cut with straw-cutter and fed to horses and stock.

In previous years the bulk of these mixtures was made into hay. Last year a test was made of allowing the mixture to partially mature, then cut with a binder and after curing in stook the mixture was cut during the winter with straw-cutter and fed to stock. This method having proved very satisfactory, the bulk of the mixtures this year after filling the silo was cured in this way.

Spring rye alone made the best hay. Oats and barley made the best fodder mixture, and pease, wheat and oats gave the heaviest crop.

The following tables give the results of the tests:

FIELD PLOTS.

Names of Grain.	Sown.	Headed.	Ripe.	Weight per Acre of Cured Hay.	Cut for Silo.	Weight per Acre of Ensilage.
				Tons. lbs.		Tons. lbs.
1 Oats and Barley	May 4	July 18	Aug. 14	3 1,560	Aug. 1	6 1,200
2 do Barley and Spring Rye	do 4	do 15	do 15	3 100	do 1	5 1,800
3 do on Spring Rye land	do 5	do 20	do 16	2 1,100	do 1	4 1,000
4 Spring Rye on Fallow	April 29	June 26	do 1	2 1,400	do 1	5 100

ONE-TENTH ACRE PLOTS.

Names of Grain.	Sown.	Headed.	Cut for Hay.	Weight per Acre of Cured Hay.
				Tons. lbs.
5 Golden Vine Pea, 6 lbs.; Prize Prolific Barley, 5 lbs.; Banner Oats, 3½ lbs.	May 12	July 18	Aug. 4	3 500
6 Golden Vine Pea, 6 lbs.; Red Fife Wheat, 5 lbs.; Banner Oats, 3½ lbs.	do 12	do 21	do 4	4
7 Extra Early Peas, 7 lbs.; White Tares, 6 lbs.	do 12	....	do 15	2 1,000
8 Duckbill Barley, 6 lbs.; Spring Rye, 5 lbs.	do 12	July 1	do 4	3 200
9 Oats and Spring Rye	do 12	do 1	....	3 800

In addition to grain mixtures corn, horse beans and sunflowers were also sown for fodder.

The corn although promising at first gave very poor returns when cut. Nine varieties were planted. All were further advanced than in any previous year, but none produced corn fully developed.

The nine sorts were planted in hills 3 feet apart each way and the same sown by grain drill in rows 3 feet apart on fallowed land which was ploughed and harrowed before the seed was put in. All were put in the same day and the results show but little difference between the returns from the hill and drill planting.

One variety, North Dakota, was sown on potato land that had been well manured before potatoes were planted in 1893. This gave 8 tons 280 pounds per acre.

RESULTS OF TESTS OF VARIETIES OF CORN.

Name of Variety.	Planted or Sown.	Tasselled.	Cut.	Weight per Acre.	
				Tons.	lbs.
Planted in Hills, 3 ft. each way—					
North Dakota	May 26	Aug. 10	Aug. 28	4	1,900
Pearce's Prolific	do 26	do 10	do 28	4	1,020
Mastodon Dent	do 26	do 18	do 28	5	1,000
Rural Thoro'bred White Flint	do 26	do 16	do 28	4	1,350
Angel of Midnight	do 26	do 10	do 28	5	780
Compton's Early	do 26	do 2	do 28	5	1,000
Golden Dew Drop	do 26	do 6	do 28	5	450
Mitchell's Extra Early	do 26	do 8	do 28	4	1,680
Smut-nose Flint	do 26	do 8	do 28	4	1,900
Sown by Drill in rows, 3 ft. apart—					
North Dakota	do 26	do 10	do 28	5	340
Pearce's Prolific	do 26	do 10	do 28	4	1,900
Mastodon Dent	do 26	do 18	do 28	4	1,580
Rural Thoro'bred White Flint	do 26	do 16	do 28	4	1,900
Angel of Midnight	do 26	do 10	do 28	5	1,110
Compton's Early	do 26	do 2	do 28	5	1,000
Golden Dew Drop	do 26	do 6	do 28	5	1,200
Mitchell's Extra Early	do 26	do 8	do 28	4	1,080
Smut-nose Flint	do 26	do 8	do 28	5	1,770
Planted on Potato Ground of 1892—					
North Dakota	do 26	do 10	do 28	8	280

The horse-beans fully matured and were a fair crop. They were cut up along with the corn and put in the silo.

Between two and three acres of sunflowers were sown for the purpose of putting the heads along with the corn and beans in the silo. On account of taking longer to develop their seed, they were not far enough advanced when the corn and beans were ready and the frost killed them when only a small percentage of the heads were filled. The seed was probably put in too late, it will be sown earlier next year.

GRASSES.

In the spring of 1892, sixteen varieties of grass were sown in plots, and mixtures of these with native grasses were sown in the field with barley.

Most of the field plots were blown out and the balance killed by dry weather after the seed came up. Out of the sixteen sorts sown only two produced a crop the past season. They were Bromus Inermis and Muhlenbergia Sylvatica. The former gave a yield of 3 tons 1,200 pounds per acre, and the latter ¾ of a ton per acre.

As Bromus Inermis had stood two winters and each year given a good crop, and believing that it will be a very valuable hay for the North-west, a quantity of seed was procured and fifteen acres sown with it last spring, to which large additions will be made in the spring of 1894.

This grass has the advantage of starting to grow almost as soon as the snow is gone, and before a green blade is seen on the prairie or in any of the cultivated sorts, the Bromus Inermis is six inches high. In addition to this good feature, it appears to stand the winters and spring frosts to perfection ; at least it has done so for the last two years, and although this may not be long enough to establish a claim to absolute hardiness for years to come, it may safely be recommended as the best and surest grass so far tested on the experimental farm. Good points also in its favour are the ease with which a good catch can be obtained, and its ability to endure our dry warm months.

SPRING RYE.

Five acres of spring rye were sown for seed on April 29th. It came into head on June 26th, and ripened August 8th. Two acres were cut for hay on August 1st and the remaining three acres yielded 16½ bushels per acre.

FLAX.

Two plots of flax were sown on May 30th, which ripened on August 31st. The straw was short and the yield of both seed and straw small..

ROOTS.

The past season has been one of the worst since the farm was started, for field roots. All varieties tested made a good beginning, but on account of injury from a heavy wind soon after the young plants were thinned and a prolonged drought after the middle of July, the returns were small. All roots were sown on fallow land, which was ploughed and harrowed before sowing.

TURNIPS.

Twelve varieties were tested. The first seeding was done on 25th May, and the 12 sorts were again sown on 6th June. As will be seen, the first seeding gave the best returns.

Name of Variety.	Sown.	Pulled.	Yield per Acre.	
First Seeding.			Bush.	lbs.
Carter's Elephant	May 25..	Oct. 9..	623	20
Prize Winner	do 25..	do 9..	660	..
Rennie's Purple Top	do 25..	do 9..	407	..
Marquis of Lorne	do 25..	do 9..	322	30
Jumbo	do 25..	do 9..	476	40
Skirving's Purple Top	do 25..	do 9..	236	30
Monarch	do 25..	do 9..	472	40
Sutton's Champion	do 25..	do 9..	396	..
Mammoth Purple Top	do 25..	do 9..	375	50
Bangholm do	do 25..	do 9..	403	20
Selected Purple Top	do 25..	do 9..	491	20
East Lothian	do 25..	do 9..	386	50
Second Seeding.				
Carter's Elephant	June 6..	Oct. 9..	172	30
Prize Winner	do 6..	do 9 .	318	20
Rennie's Purple Top	do 6..	do 9..	227	20
Marquis of Lorne	do 6..	do 9..	243	50
Jumbo	do 6..	do 9..	330	..
Skirving's Purple Top	do 6..	do 9..	304	20
Monarch	do 6..	do 9..	282	20
Sutton's Champion	do 6..	do 9..	280	30
Mammoth Purple Top	do 6..	do 9..	221	50
Bangholm	do 6..	do 9..	320	50
Selected Purple Top	do 6..	do 9..	335	30
East Lothian	do 6..	do 9..	289	40

MANGELS.

Ten sorts of mangels were tested. Like the turnips they were sown on different dates, May 25 and June 6. The early seeding proved to be the best. Heavy frost in the latter part of September and early in October almost spoiled the crop.

Name of Variety.	Sown.	Pulled.	Yield per Acre.	
First Seeding.			Bush.	lbs.
Erfurt Model	May 25	Oct. 9	201	40
Gate Post	do 25	do 9	271	20
Canadian Giant	do 25	do 9	265	50
Orange Giant	do 25	do 9	193	30
Yellow Globe	do 25	do 9	282	10
Golden Tankard	do 25	do 9	165	..
Giant Yellow (intermediate)	do 25	do 9	256	40
Red-fleshed Tankard	do 25	do 9	348	20
Red Globe	do 25	do 9	238	20
Mammoth Globe	do 25	do 9	267	40
Second Seeding.				
Erfurt Model	June 6	Oct. 9	165	..
Gate Post	do 6	do 9	183	20
Canadian Giant	do 6	do 9	183	.
Orange Giant	do 6	do 9	146	40
Yellow Globe	do 6	do 9	192	30
Golden Tankard	do 6	do 9	135	40
Giant Yellow (intermediate)	do 6	do 9	172	20
Red Fleshed Tankard	do 6	do 9	181	30
Red Globe	do 6	do 9	146	40
Mammoth Globe	do 6	do 9	187	..

CARROTS.

Nine varieties were sown on two different dates, May 25 and June 6, but no variety on either date of seeding gave a crop worth taking up.

SUGAR BEETS.

Four varieties were tested, but late frosts injured them all. The earliest sowing gave the best results.

Name of Variety.	Sown.	Pulled.	Yield per acre.	
First Seeding.			Bush.	lbs.
French	May 25	Oct. 9	275	..
Klein Wanzleben	do 25	do 9	225	..
White Improved	do 25	do 9	192	30
Green Top Brabant	do 25	do 9	311	50
Second Seeding.				
French	June 6	Oct. 9	183	20
Klein Wanzleben	do 6	do 9	165	..
White Improved	do 6	do 9	132	..
Green Top Brabant	do 6	do 9	196	30

POTATOES.

Thirty-four varieties were tested and like the roots were the poorest crop we have had since the farm was established. Besides being light in yield, they were small in size, scabby and only fair in quality. The potato land was fallowed in 1892, ploughed before planting and well harrowed. The potatoes were dropped in rows 3 feet apart and 13 inches in the rows, harrowed after they came up and were run through with a scuffler each week. When tops got large enough they were hilled up with a plough.

Planted 26th May; taken up 5th Oct.

Name of Variety.	Yield per Acre.		Name of Variety.	Yield per Acre.	
	Bush.	lbs.		Bush.	lbs.
Crown Jewel	133	30	Early Sunrise	183	20
Empire State	91	40	Holborn Abundance	165	..
Thorburn	67	50	Northern Spy	150	20
Sharpe's Seedling	128	20	Dakota Red	155	50
Algoma No. 1	100	50	State of Maine	73	20
Early Ohio	91	40	Burpee's Extra Early	132	20
Early Rose	152	10	Polaris	152	10
Early Puritan	128	20	Green Mountain	124	20
Chicago Market	141	20	White Beauty	141	20
Beauty of Hebron	163	10	New Variety	146	40
Rural Blush	128	20	Pearce's Extra Early	143	..
Delaware	183	20	Toronto Queen	139	20
Lee's Favourite	124	40	Earliest of All	73	20
Vanguard	137	30	American Giant	135	40
Clarke's No. 1	165	..	Munroe Co.	205	..
Everett	183	20	Early Gem	139	20
Daisy	157	40	Sunlit Star	128	20

VEGETABLE GARDEN.

As in preceding years, tests were made with several sorts of many kinds of vegetables to find out the earliest and best for the North-west.

No special effort was made to produce large specimens or heavy crops, earliness and suitability being the main object. On account of protection afforded by the wind breaks, now established on the farm, the crop on the whole was the best and most satisfactory of any yet grown. This was especially the case with the onion crop.

ARTICHOKES

Did not do well. The tops grew to a good size but were hurt by frost in September and the bulbs were small.

Sown, 4th May; up, 22nd May.

ASPARAGUS.

The first cutting was had on May 27. It did well and gave a large crop all through the season.

BEANS.

Nine varieties were planted. The two best were Dwarf German White Wax and Wardell's Kidney. These with Yellow Six-weeks and White Kidney were the only ones that matured.

Name of Variety.	Sown.	Up.	Fit for use.	Remarks.
Lazy Wives	May 17	May 31	July —	No good. Did not pod.
Mammoth Red German Wax	do 17	do 31	do 28	Good.
Crystal White Wax	do 17	do 31	do 28	Very good.
Dwarf German White Wax	do 17	do 31	do 28	do
Wardell's Kidney	do 17	do 31	do 28	Fair.
Dwarf Triumph	do 17	do 31	do 28	Small.
Mohawk	do 17	do 31	do 7	Good.
Yellow Six-Weeks	do 17	do 31	do 7	do Ripened.
White Kidney	do 17	do 31	do 7	do do

BEETS.

Seven sorts were sown. All did well, but Edmonds Early and Black Knight were the best for the table.

The seven kinds were also transplanted. When so treated they grew larger than those left in the beds where sown, but were not fit for table use.

Name of Variety.	Sown.	Up.	Fit for use.	Lifted.	Bushels per acre.	Remarks.
Early Blood Turnip	May 15.	June 3.	Aug. 15.	Sept. 22.	701	Good shape ; light colour.
Edmund's Early	do 15.	do 3.	do 15.	do 22.	484	Extra good.
Rennie's Intermediate	do 15.	do 3.	do 15.	do 22.	666	Good shape.
Eclipse	do 15.	do 3.	do 15.	do 22.	726	Very good.
Arlington	do 15.	do 3.	do 15.	do 22.	556	do
Long Dark Red	do 15.	do 3.	do 15.	do 22.	635	do
Black Knight	do 15.	do 3.	do 15.	do 22.	302	Small ; good colour.

CAULIFLOWERS.

Twenty-two varieties were tested and a great difference in value was noted. Giant White Pearl and Thorburn's Large Early Dwarf Erfurt, Early Snowball and Gilt Edged Snowball being the best. Some others were as early but the flowers were small and open. Short Stemmed La Normande made large flowers but the colour was bad. All the late varieties gave good promise, but were destroyed by frost in September when beginning to make head.

CAULIFLOWERS.

Name of Variety.	Sown in Hot-bed	Up.	Trans-planted in Hot-bed.	Trans-planted in open Ground.	Fit for use.	Remarks.
Large Late Mammoth......	April 11	April 15	April 25..	May 29..	July 7	Small.
Veitch's Autumn Giant.....	do 11	do 16	do 25..	do 29..	Aug. 20	Hurt by frost.
Early Snowball...	do 11	do 16	do 21..	do 29..	July 14	Very good.
Gilt Edge Snowball.........	do 11	do 16	do 21..	do 29..	do 14	do
Ex. Ey. Dwarf Erfurt......	do 11	do 16	do 21..	do 29..	do 15	Small.
Nonpareil.................	do 11	do 16	do 21..	do 29..	....	No good.
Early Paris................	do 11	do 16	do 21..	do 29..	....	do
Early Walcheren...........	do 11	do 16	do 21..	do 29..	....	do
Extra Dwarf Erfurt.........	do 11	do 16	do 21..	do 29..	July 14	Very good.
Large Ey. Dwarf Erfurt.....	do 11	do 16	do 21..	do 29..	do 14	The best.
Half Ey. Dwarf French......	do 11	do 16	do 21..	do 29..	do 7	Very poor.
Large Algiers......	do 11	do 16	do 21..	do 29..	Aug. 10	Hurt by frost.
Italian Taranto..	do 11	do 16	do 21..	do 29..	do 12	Poor.
Large Early London	do 11	do 16	do 21..	do 29..	....	No good.
Stadtholder..............	do 11	do 16	....	....	....	Very poor and not put out.
Autumn Giant...	do 11	do 16	April 25..	April 29..	Aug. 20	Hurt by frost.
Short Stemmed La Normand.	do 11	do 16	do 25..	do 29..	do 8	Fair.
Gilt Edge..................	do 11	do 16	do 25..	do 29..	July 7	Very fine.
Imp. Earliest Dwarf Erfurt..	do 11	do 16	do 25..	do 29..	do 7	Small.
Early German Erfurt........	do 11	do 16	do 21..	do 29..	do 7	do
Giant White Pearl....	do 11	do 16	do 25..	do 29..	do 7	Very fine.
Ex. Ey. White Heads........	do 11	do 16	do 25..	do 29..	do 11	do

CABBAGE.

Twelve varieties were planted and all did well.

The Jersey Wakefield, Express and Henley's Champion were the earliest but were small. Burpee's All Head was the best cabbage this season. Early Summer, Surehead and Vandergraw being next.

Name of Variety.	Sown in Hotbed.	Up.	Trans-planted in Hotbed.	Trans-planted in Open Ground.	Fit for Use.	Taken up.
Burpee's All Head....	April 10..	April 14..	April 26..	May 29..	July 28..	Sept. 16..
New World Beater..................	do 10..	do 14..	do 26..	do 27..	Aug. 27..	do 16..
Henderson's Early Summer..........	do 10..	do 14..	do 26..	do 27..	July 28..	do 16..
Bridgeport Drumhead.	do 10..	do 14..	do 26..	do 27.	do 27..	do 16..
Imp. Jersey Wakefield	do 10..	do 14..	do 26..	do 29..	do 14..	do 16..
Imp. Am. Dun. Savoy..............	do 10..	do 14..	do 26..	do 29..	Aug. 27..	do 16..
Mam. Red Rock.....................	do 10..	do 14..	do 26..	do 29..	do 27..	do 16..
Henley's Champion.............. ...	do 19..	do 23..	May 5..	do 29..	July 14..	do 16..
Express.............	do 19..	do 23..	do 5..	do 29..	do 14..	do 16..
Vandergraw........	do 19..	do 23..	do 5..	do 29..	Aug. 27..	do 16..
Filderkraut	do 19..	do 23..	do 5..	do 29..	do 27..	do 16..
Surehead...........................	do 10..	do 14..	April 26..	do 27..	do 27..	do 16..

CUCUMBERS.

Four varieties of cucumbers were sown in pots in a hotbed on April 16th, and transplanted into frames in the garden on May 26th.

They gave a large crop. New Siberian is small but much the most prolific. Giant Pera is a good bearer and very large and well shaped. White Pearl is a poor producer but the pure white cucumber is very handsome and fine flavoured.

Those sown in the garden without any protection immediately about them did not produce as abundantly and were not so early.

SOWN IN POTS IN HOT-BED.

Name of Variety.	Sown in Hot-Bed.	Up.	Trans-planted in open.	Fit for use.	Ripe.
Giant Pera	Apr. 16	Apr. 22	May 26	June 22	....
New Siberian	do 16	do 22	do 26	do 20	Aug. 11
Burpee's White Pearl	do 16	do 22	do 26	do 22	....
White Spine	do 16	do 22	do 26	do 26	....

CUCUMBERS SOWN IN OPEN GROUND.

Name of Variety.	Sown.	Up.	Fit for use.
New Paris Pickling	Apr. 26	May 31	Aug. 29
Giant Pera	do 26	do 31	do 29
New Siberian	do 26	do 31	do 29

CELERY.

Eight varieties were tested. None of the sorts did as well as last year. Giant White, London Red, and White Plume were the best.

Name of Variety.	Sown in Hot-bed.	Up.	Trans-planted in Hot-bed.	Trans-planted in open.	Fit for use.	Lifted.
White Pascal	Apr. 11	May 1	May 20	July 4	Aug. 16	Sept. 20
Giant Pascal	do 11	do 1	do 20	do 4	do 16	do 20
Giant White	do 11	do 1	do 20	do 4	do 14	do 20
Paris Golden Yellow	do 11	do 1	do 20	do 5	do 16	do 20
New Rose	do 11	do 1	do 20	do 5	do 16	do 20
London Red	do 11	do 1	do 20	do 6	do 14	do 20
White Plume	do 11	do 1	do 20	do 6	do 14	do 20
Giant Golden Heart	do 11	do 1	do 20	do 6	do 16	do 20

CITRONS.

Citrons were sown in hot-bed and transplanted in frames in the garden and in open ground. Those in frames produced much the larger specimens, two citrons weighing fifteen pounds each.

The seed was obtained from W. F. Johnston, of the variety known as Colorado Preserving. They were sown April 17th, transplanted from hot-bed May 26th, and ripe August 20th.

TABLE CARROTS.

Five sorts were tested, Peer of All and Scarlet Nantes being the best.

Name of Variety.	Sown.	Up.	Fit for use.	Lifted.	Remarks.
Henderson's Intermediate	May 2	May 20	July 28	Oct. 14	Very fine.
Half-long Scarlet Carentan	do 2	do 20	do 28	do 14	Rough.
Peer of all	do 2	do 20	do 28	do 14	Very good.
New Long Red Meux	do 2	do 20	do 28	do 14	Stump rooted.
Scarlet Nantes	do 2	do 20	do 28	do 14	Very good.

KALE.

One variety, Plumage, was sown in hot-bed on April 19th, transplanted in hot-bed on April 26th, transplanted to open ground on May 29th, and taken up on September 16th.

KOHL-RABI.

Two sorts were tested. Both were a fair crop.

Purple Goliath, White Vienna, they were sown May 30th, came up June 5th, and were fit for use October 1st.

CORN.

Native corn known also as squaw corn, planted on May 25th, was fit for use on August 29th, and ripe on September 1st.

MUSHROOMS.

A mushroom bed was made in the potato cellar, and the spawn put in on April 8th. The first mushrooms came up on June 22nd, and the bed continued bearing all summer.

LETTUCE.

Four varieties were tested in a hot-bed, and three of these sown in open ground.

Sown in Hot-bed.	Sown.	Transplanted in Hot-bed.	Fit for use.	Remarks.
New Buttercup	Apr. 17	May 26	July 20	Good.
Denver Market	do 17	do 26	do 26	Good.
Golden Queen	do 17	do 26	do 18	Good.
Large Yellow Market	do 17	do 26	do 30	Good.

Sown in open.	Sown.	Up.	Fit for use.	Remarks.
Denver Market	May 2	May 8	Aug. 15	Good.
Large Yellow Market	do 2	do 8	do 15	Good.
New Buttercup	do 2	do 8	do 15	Good.

MUSK MELONS.

Three varieties of Musk Melons were tried. Sown in pots in a hot-bed and transplanted into frames in the garden. Emerald Gem and Banquet produced a fair crop. Pineapple did not come up. The two former were sown April 17th, came up April 24th, were transplanted May 26th; the Emerald Gem was ripe August 3rd, and the Banquet September 4th.

WATER MELONS.

Two varieties of Water Melons were sown in pots in a hot-bed, and transplanted into frames in garden. The Early Ripe produced a good crop of fair sized melons. The Early Canada was not so large, but produced more fruit. They were both sown April 17th, came up April 24th, were transplanted May 26th, and the Early Ripe was ripe September 2nd, the Early Canada September 4th.

ONIONS.

Eight varieties were sown in a hot-bed and transplanted into the garden, and eight sorts were sown in beds in the garden. All those transplanted did extra well. Three of the varieties sown in the open ground also did well. The best onions though not the largest were Mammoth Red Victoria, Prize taker, Giant Rocca and Red Globe Danvers. In the following table will be found full particulars of the results of this test.

Onions sown in hot-bed.	Sown.	Up.	Transplanted.	Fit for use.	Ripe.	Bushels per acre.
Mammoth White Victoria	Apr. 10	Apr. 16	May 5	July	Sept. 15	388
Mammoth Red Victoria	do 10	do 16	do 5	do	Oct. 12	677
Mammoth Pearl	do 10	do 16	do 5	do	do 12	435
Giant Prize Taker	do 10	do 16	do 5	do	Sept. 15	580
Giant Rocca	do 10	do 16	do 5	do	Oct. 12	629
Red Globe Danvers	do 10	do 15	do 5	do	do 12	580
Yellow Globe Danvers	do 10	do 15	do 5	do	Sept. 15	389
Red Wethersfield	do 10	do 17	do 5	do	do 15	411

Onions sown in open ground.	Sown.	Up.	Ripe.	Bushels per acre.	Remarks.
Red Globe Danvers	Apr. 19	May 23	Sept. 15	365	
Yellow Danvers	do 19	do 23	do 15	435	
Extra Early Red	do 19	do 23	do 15	504	
White Barletta	do 19	do 23	Aug. 30	242	
Scotch Leek	do 10	do 23			No good.
Salzers Earliest	May 27	June 28	Sept. 15	290	
New Queen	Apr. 19	May 23	Aug. 30	290	
Silver Skin	do 19	do 23	do 30	145	

PARSNIPS.

Three varieties were sown, the Intermediate, Student and Maltese. All produced a good crop, there being no perceptible difference in the three. They were sown May 1st, came up June 1st, and were gathered October 12th. The roots in each case were good and smooth.

PEPPERS.

Four sorts were tested, the Large Red Squash, Cardinal, Long Red and Monstrous Mammoth, but none matured.

PEASE.

Nine sorts were sown. Among the small varieties McLean's Little Gem, and American Wonder were best. Among the large sorts Champion of England and Yorkshire Hero were first.

Name of Variety.	Sown.	Up.	Pulled.	Remarks.
McLean's Little Gem	May 3	May 18	July 15	Very good.
New Queen	do 3	do 18	do 28	Large pods. Not well filled.
Early Star	do 3	do 18	do 28	Good.
Heroine	do 3	do 18	do 28	Not well filled.
Stratagem	do 3	do 18	do 28	Good.
Pride of the Market	do 3	do 18	do 28	Fair.
American Wonder	do 3	do 18	do 15	Very good.
Champion of England	do 3	do 18	do 28	Very good.
Yorkshire Hero	do 3	do 18	do 28	Fair.

RADISH.

Five sorts were tested, sown in a hot-bed, and four were sown in the garden. The two best in the hot-bed were Earliest White Forcing, and Earliest Carmine, olive shaped. The best in the garden were Rosy Gem and New Pearl Forcing.

Four kinds of Winter Radish were tested. One Long Red Chinese went to seed but the others did well.

Sown in hot-bed.	Sown.	Up.	Fit for use.	Remarks.
Carmine Olive Shaped	April 10	April 13	May 1	Good.
New Pearl Forcing	do 10	do 13	....	No good.
Olive Gem	do 10	do 14	May 10	Did not do well.
Earliest White Forcing	do 17	do 22	do 18	Very good.
Earliest Carmine, Olive Shaped	do 17	do 22	do 20	Very good.
Sown in open ground.	**Sown.**	**Up.**	**Fit for use.**	**Remarks.**
Rosy Gem	May 10	May 17	June 20	Extra fine.
Long Salmon	do 10	....	....	Did not come up.
White Forcing	do 10	May 17	June 20	Small.
New Pearl Forcing	June 10	June 17	July 20	Extra fine.
Winter Radish.	**Sown.**	**Up.**	**Fit for use.**	**Remarks.**
Long Black Spanish	May 30	June 5	Aug. 29	Large fine root.
Long White Spanish	do 30	do 5	do 29	Very large.
Long White Chinese	do 30	do 5	do 29	Fair size, straight.
Long Red Chinese	do 30	do 5	....	All went to seed.

RHUBARB.

Four varieties have been tested, Victoria, Linnæus, Carleton Club and Stotts' Mammoth.

Victoria and Linnæus have given the best results, and were fit for use May 31st. Although not as large as either Carleton Club or Stotts' Mammoth, they are of finer flavour. Carleton Club and Stotts' Mammoth are exceedingly large varieties; one stalk of the former measuring over 9 inches in circumference. Stotts' Mammoth apparently not so suitable to the climate, is gradually dying out.

SALSIFY.

White Salsify—Sown May 2nd; up May 18; fit for use October 12th; very rooty. A poor crop.

SPINACH.

Bloomsdale Savoy Leaved—Sown May 2nd; up May 14th. Frozen.

SAGE.

Sown May 2nd; up May 20th. A good crop.

SUMMER SAVORY.

Sown May 2nd; up May 20th. A good crop,

PARSLEY.

Moss Curled—Sown May 2nd; up June 2nd. Very good crop.

TOMATOES.

Eight sorts were tried. Earliest of All and Extra Early Atlantic were the best for colour, shape and quality of fruit.

Name of Variety.	Sown.	Up.	Transplanted in hot-bed.	In fruit.	Ripe.	Remarks.
Strawberry. Sown in ground	Apr. 10					No good.
Extra Early Atlantic	do 10	Apr. 15	May 15	June 26	Aug. 9	
Ponderosa	do 10	do 16	do 15	do 26		None ripened.
Early Ruby	do 10	do 17	do 15	do 26	do 12	
Extra Early Chemin	do 10	do 17	do 15	do 28	do 20	
Dwarf Champion	do 10	do 17	do 15	do 30	do 20	
Yellow Plum	do 10	do 17	do 15	do 26	do 7	
Earliest of All	do 10	do 15	do 15	do 22	do 4	

TURNIPS.

Four sorts of table turnips were sown, Early Snowball proving the best.

Name of Variety.	Sown.	Up.	Fit for use.	Remarks.
Red-top Strap-leaf	May 30	June 5	Aug. 9	No use for garden.
Early Snowball	do 30	do 5	do 9	Very fine.
Orange July	do 30	do 5	do 9	Good.
Breadstone	do 30	do 5	do 9	Should be "Greystone."

FLOWER GARDEN.

The flower garden suffered considerably from the dry weather, and especially from the hot winds in August. Although many of the flowers were good, some, such as the Pansies, were poor. Sweet Williams, Asters, Stocks, Drummond Phlox and Verbenas were extra fine.

Following are the names of the sorts grown, with remarks on each variety:—

Pansies.—Sowed twelve varieties of German Pansies, and one box seed from Ottawa. Did only fairly well.

Verbenas.—Sown in hot-bed April 12th. Planted in garden June 22nd. Did fairly well.

Pyrethrum.—Sown in hot-bed April 15th. Planted for borders June 15th. Did well; makes good border.

Scabiosa.—New Leviathan: Sown in hot-bed April 15th. Planted in garden June 14th. Bloomed July 20th. Very fine.

Scarlet Flax.—Sown April 15th. Planted in garden June 14th. Bloomed July 10th, till frozen.

Xeranthemum.—(Everlasting.) Sown April 15th. Planted in garden June 22nd. Bloomed August 1st. Good.

Abronia Umbellata.—Sown April 15th. Transplanted June 15th. Did not do well.

Petunia.—Sown April 15th. Transplanted June 22nd. Did well. Flowered throughout the season.

Sweet Peas.—Sown in garden on May 22nd. Did well.

Canna.—German seed. Sown April 15th. Only two plants came up.

Canna tubers from Ottawa.—Potted in hot-bed on April 27th. Planted June 8th. Flowered well.

Gladioli.—Potted in hot-bed April 27th. Planted June 8th. Flowered well till killed by frost in September.

Phlox Drummondi.—Sown in hot-bed April 15th. Fireball, Grandiflora, eight colours, and Nana Compacta, eight colours. Planted in garden June 8th. In bloom July 1st. Continued blooming throughout season. One of the best flowers for this country.

Stocks.—Dwarf German, ten weeks, eighteen colours. Dwarf German, eighteen colours. Large Flowering, eighteen colours. Sown in hot-bed April 16th. Planted June 8. Flowered July 1st. Mass of bloom all season. Large flowering made most show. One of the hardiest and best flowers for this climate.

Dianthus.—Dianthus Imperialis and Dianthus Heddewigii. Sown April 15th. Planted June 9th. In bloom July 10th. Flowered freely all summer. Stands winter well.

Aster.—Victoria, eight colours. Dwarf Bouquet, eight colours, and Truffauts Aster. Sown April 15th. Planted June 8th. In flower August 20th. Made good show till killed by frost.

Godetia—Eight varieties. Sown in hot-bed April 15th. Planted June 8th. Did not do as well as those sown in garden on May 23rd.

Mallow.—Makes good border. Flowers freely.

Zinnia Elegans.—Sown in hot-bed May 18th. Planted June 17th. Made a good show until frozen.

Mignonette.—Matchett, Aurea, Victoria, Pyramidalis and Common. Sown in garden May 23rd. Bloomed in July, and continued throughout the season.

Nasturtiums.—Dwarf and tall varieties did fairly well, but are rather tender for the North-west.

Flowering Flax.—Did well for large borders. Flowers freely and stands winter well.

Eschscholtzia.—Twelve colours. Sown in garden on May 23rd. Made a great show.

Poppy.—Three varieties. Sown May 22nd. Did fairly well.

Convolvulus Minor.—Sown May 22nd. Made a very showy bed. Bloomed all season.

Portulacca.—Sown May 22nd. Good show till first frost.

Carnation.—Sown in hot bed and transplanted. Flowered well and plants are in good shape for winter.

PERENNIALS.

Sweet William.—Stood winter well and made good show.

Larkspur.—Did well. Flowered all season.

Columbine.—Made good show and is quite hardy.

Tulips.—Did well. In bloom early in June.

Peony.—Hardy. Had some fine flowers this season.

Roses.—Only one plant (M. P. Wilder) lived through the winter. but it had some fine roses on during summer.

English Hollyhock.—Sowed seed in hot bed and transplanted into sheltered places. Plants in good shape for next season.

Hyacinthus Candicans.—Planted two bulbs in garden which made flower spikes three feet high.

Yellow Flax.—Stood winter well and made good show this season.

Lupins.—Sowed in hot bed and transplanted in garden. Plants look strong and healthy.

Lilium Thunbergianum.—Stood winter well and had some very fine flowers on this season.

FRUIT TREES.

Apple Trees.—Seven varieties of apple trees were planted in spring of 1892. Last spring every tree was dead. The varieties were Hare Pipka, Blushed Calville, Bodi, Red Raspberry, Little Hat, Sugar Sweet, and Saccharine, and as they were planted in a sheltered spot, hopes were entertained that better success might follow with them than with preceding trials, but the result was even worse, as not a live root was left.

The lonely Red Siberian Crab that has weathered four winters, and last year had a few blossoms on, succumbed this spring, and is now numbered with many others of its kind gone before.

Three varieties of Russian Dwarf apple trees, planted in 1889, made a good growth the past season. In previous years these trees were cut back repeatedly, but escaped last winter and are promising.

Last spring 27 varieties of apple trees were planted, consisting of 188 trees. Part of these were set out in a grove of young Manitoba maple trees or box elder, where ample shelter will be afforded them. Every tree is living at this date.

Several trees also of Transcendant crab were planted last spring.

Plums.—Four sorts were planted, consisting of Orleans Blue, Montmorency, Imperial Blue and 100 seedlings of the wild plum. All are alive and have made good growth.

In 1890 one variety of plum was received from Prof. Budd, Iowa. This variety Early Red has been cut back each winter excepting the past one, when the three trees have made a good growth and look promising.

Cherries.—In the spring of 1889, three trees of Blackhill Cherry were received from Prof. Budd, of Ames, Iowa. These have repeatedly been cut back until the past season, when, I have pleasure in reporting they bore fruit. This variety is I believe a native of the Western States but produces a large fruit; much larger than our native cherry, and the flavour being fairly good, it will be an acquisition to our list.

In spring of 1892, three varieties Lutovka, Vladimir and Bessarabian were planted. All were dead this spring.

Three varieties, Old French and Montmorency Cherries and a dwarf variety "Prunus Pumila" were planted the past spring.

SMALL FRUIT.

Currants.—All varieties of currants gave a most abundant crop the past season. All sorts were large and fine, but Fay's Prolific a red variety was ahead of all others in size. No protection was given the bushes. Last spring the following eleven varieties were added to the collection: Versaillaise, New Red Dutch, Odgen's Black, Baldwin's Black, Prince of Wales, Knight's Early Red, La Fertile, La Conde, La Hative, White Transparent and London Red.

The following is result of last season's crop of currants:—

BLACK CURRANTS.

Black Naples.—Ripened from 27th July to 10th August. Crop and currants large, but fruit did not ripen evenly.

Lee's Prolific.—Ripe 27th July. The fruit was of large size and the crop very heavy. Ripened evenly.

The following seedling black currants produced at the Central Experimental Farm have also been tested:

No. $\frac{1}{61}$.—Fairly early. Fruit medium in size and quantity.

Climax.—Ripened evenly on July 27th. Heavy crop of large fruit.

Charmer.—Poor crop of small fruit.

No. $\frac{2}{81}$.—Ripened July 27th. Heavy crop of large fruit.

No. $\frac{1}{12}$.—Poor crop. Medium sized fruit.

No. $\frac{1}{8}$.—Ripened unevenly. Medium crop of small fruit.

Beauty.—Ripened unevenly. Heavy crop of large fruit.

No. $\frac{1}{15}$.—Poor crop of poor fruit.

Dominion.—Ripened evenly. Well laden bushes of fine fruit. The best of all these new varieties with us.

Native Black.—Very large crop. Fruit small.

RED CURRANTS.

Fay's Prolific.—Ripened 5th August. Very large crop of extra sized fruit.

Red Grape.—Ripened evenly on 1st August. Heavy crop of medium sized fruit.

Red Dutch.—Ripened very evenly 1st August. Heavy crop of fine fruit. Bunches large.

Raby Castle.—Ripened evenly 5th August. Large crop of medium fruit.

WHITE CURRANTS.

White Grape.—Ripened 29th July. Bushes loaded down with large bunches of fine fruit.

White Dutch.—Ripe August 1st. A very heavy crop of large fine fruit.

RASPBERRIES.

All varieties of raspberries came through the winter in splendid condition. The crop of fruit was very large, but dry weather injured all but the earliest, and the hot wind which did so much injury all over the country, dried up all the late fruit.

All the canes were laid down before frost came and covered first with two inches of earth, and then with well rotted manure. The covering was left on until May 9th, and then dug in among the canes.

It is very important that the covering should be left on as late as possible, so as to retard the canes in commencing to bud till all danger of frost is past.

The following are the varieties at present under test here:—

Turner.—Large red. Ripe 29th July. A good crop. Stood the dry weather better than any other sort.

Philadelphia.—Large dark red fruit. Ripe 29th July. In the first part of the season the berries ripened well, but dry weather affected the fruit greatly later in the season.

Dr. Reeder.—Ripe 29th July. Heavy crop of fine fruit. Large red berry.

Cuthbert.—Large red berries. Ripe on 5th August. A good crop of well-flavoured fruit.

Caroline.—Fine large orange coloured berries. Heavy crop.

Golden Queen.—Ripe 27th July. Fruit was extra fine, but crop small.

Wild.—Fruit and crop large, but fruit of poor flavour.

STRAWBERRIES.

The old plots of Capt. Jack and New Dominion gave a large and fine crop of fruit, as did also the new plot of these sorts set out in spring of 1892. All the plants were covered with coarse manure during the winter.

GOOSEBERRIES.

These came through the winter fairly well, but some of the young wood was winter killed.

Smith's Improved.—Ripe August 20th. Produced a good crop of fine large berries.

Downing.—Ripe August 25th. Small crop of good sized berries.

HUCKLEBERRIES.

Ten bushes of huckleberries were planted last spring.

Six varieties of raspberries, 11 of currants, 21 of gooseberries, and 5 of strawberries were received and planted last spring, and will be reported on next year.

FOREST TREES.

The past season has been without exception the best for trees since the farm started.

Those that came through the winter of 1891–2 made a good growth, and ripened their wood so thoroughly that no variety was in the least injured last winter, severe though it was. Attention was drawn to this in my last report, and the trees proved to be in even better condition than was expected at that time.

The growth the past summer has been very great, Manitoba maple, willow, etc., growing from three to four feet, and apparently the wood has ripened as well as it did last year. The early part of the season was wet, causing rapid growth, and the latter part being dry, the ripening process was helped to a great extent.

Last spring 9,000 trees were transplanted into groves, shelter belts, windbreaks and along avenues—drawn from young plantations on the farm, and 8,525 trees received from the Central Experimental Farm, were planted principally in sheltered plots. These consisted of 500 elm, 3,000 oak, 3,000 maple, 1,000 Riga pine, 1,000 spruce and 25 Russian olive. A large number of the oak, Riga pine and spruce died after the dry weather set in.

By actual count there are at present living on the farm, not counting those received this spring from the Central Farm, the following number of trees:—In shelter belts, 46,675; in plantations, 15,800; in avenues, 1,960. These are principally maple grown from seed, and transplanted. In addition there are in lawns, gardens and other places, 270 Riga pine, 389 Norway spruce, 21 cedar, 128 mountain ash, 58 birch, 734 poplar, 650 willow, 25 Russian olive, 50 Russian poplar, 302 cottonwood, 3,500 Nebraska elm, 800 ash, 25 Buffalo berry, 300 elm, and 397 Artemisia. Besides these there are 5,000 three year old maples, 22,000 two year old, and from 10,000 to 15,000 seedlings ready to transplant; a grand total of from 110,000 to 115,000 trees, which as before stated, does not include the 8,525 trees received from Ottawa.

SHRUBS.

Of all the shrubs set out Caragana continues to give the best satisfaction for lawns, etc. The bushes planted in 1890 produced a considerable quantity of seed the past season.

Fig. 2 is from a photograph of one of these shrubs growing on the lawn near the superintendent's house.

FIG. 2. CARAGANA ARBORESCENS, SIBERIAN PEA TREE.
FROM PHOTOGRAPH OF A SPECIMEN AT EXPERIMENTAL FARM, INDIAN HEAD.

Artemisia Abrotanum (Russian) planted for a wind-break, is by far the most valuable shrub planted for that purpose on the Experimental Farm. It is easily propagated, a quick grower, and making a thick mat, is equally as good for a wind-break as for a snow collector, both of which are invaluable on our open prairies.

Thousands of cuttings were sent out to settlers last spring, and thousands are available for the same purpose the coming season.

GROUP OF CATTLE—EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

Acer Ginnala planted in 1889, though cut back in 1892, grew wonderfully the past season.

Spirea opulifolia, planted in 1889, was for two seasons cut back, but is now apparently hardy. In 1892 and the past season it flowered abundantly and is making a good low hedge.

Last spring the following shrubs were planted:—Nine varieties Lilac; six of Spirea, and five of Syringa. These will be reported on next year.

WIND-BREAKS.

The wind-breaks on the farm are already of great service, and during the past season saved the fruit and vegetable gardens from great injury if not from total loss.

As stated in my report of 1891, wind-breaks consisting of Manitoba Maple, Elm, Willow, Poplar and Artemisia Abrotanum (Russian) were planted around gardens and other plots in that year. The Elm trees have been kept back by rabbits eating the young growth, but all the other sorts grew and thickened up greatly the past season. So far as experience has shown the Artemisia hedge is first, Willow second, Maple third and Poplar fourth in usefulness. Some of the wind-breaks consist of three rows, others of two rows and some only of one row of trees. The trees are planted two and three feet apart in the rows.

Those already set out demonstrate that one row of Artemisia or Willow, with plants two feet apart in rows is ample, and one row of Maple or Poplar is also sufficient if the trees are cut back several times each season for a few years, so as to thicken up at the bottom.

I desire to call the attention of those in the North-west who may wish to have a small and pretty hedge on their lawn or elsewhere, to the fact that the Native Wolf Willow and Native Snowberry, both fonnd in abundance on the prairie, are excellent for that pnrpose. Either grown from seed or transplanted, they are cheaply and easily obtained and in two or three years, with prnning can be made as nice as any eastern hedge.

Two hedges made from transplanted plants of these shrubs, attract the attention of visitors to the farm, and besides being ornamental are useful as a windbreak around the flower beds and other plots.

CATTLE.

Stock of all kinds on the farm is at present in good health and condition. Since my last report three pure bred Shorthorns, one Polled Angus and six grades have been added to the herd. One Shorthorn cow "Wildflower" died in the summer of inflammation of the lnngs.

Fig. 3 shows a group of the cattle in the pasture. From a photograph.

Two experiments were made last winter to determine the relative values of such fodders as can be grown in the North-west. The first test was between ensilage made from oats and barley sown together and the same mixtnre cured as hay. The second test was between a cereal crop in the form of dry fodder and the best native hay. The cereal crop consisted of oats, barley and rye cnt by the binder while in a green state and before being fed cut by the straw cntter.

The tests were started rather late on account of not having the animals for the experiments, and the ensilage gave out when the tests had been under way three months, including the preparatory feeding. The records are therefore for only two months.

Besides the two tests as to the value of the feed, three grade steers and three grade heifers were fed for five months on the same rations to find out the gain of the animals of the different breeds. In addition to the five months of winter feeding the gain of the same six beasts is given for six months while on pastnre.

Records have also been kept as to the increase in weight of eight pure bred heifers for twelve months, six months of which they were stall fed and the other six months in pasture, particulars of this test are also given.

TEST OF FEEDING DRY COWS ON A MIXED CEREAL CROP MADE INTO ENSILAGE AGAINST THE SAME MIXTURE CURED AS HAY.

This test was made to find the relative value of the two kinds of feed, both of which can readily be obtained in the North-west. The mixed feed in each case was oats and barley sown together and cut green, one portion made into ensilage and the other into hay.

Hay.

The test was made also to find out whether or not it pays to feed animals during the winter months, so as to obtain not only an increase in weight, but a higher price on account of better quality of beef.

The four cows used in this test were the ordinary grades of the country, of the Durham breed, and in all respects were as nearly equal as it was possible to get them. Before the test was begun, a uniform preliminary feeding of one month was given all the animals.

Ration No, 1—

	Lbs.
Ensilage	35
Meal	5
Daily	40

Ration No. 2—

	Lbs.
Hay	15
Meal	5
Turnips	15
Daily	40

Cows fed on Ration No. 1—

	Lbs.
Weight of two cows, March 20	2,620
Weight of two cows, May 20	2,804
Gain	184

Cows fed on Ration No. 2—

	Lbs.
Weight of two cows, March 20	2,346
Weight of two cows, May 20	2,507
Gain	161

Cost of feed consumed in two months—

Ration No. 1—

2,100 lbs. ensilage, at $2 per ton	$ 2 10
300 lbs. meal, at 60 cents per cwt	1 80
	$3 90

Ration No. 2—

900 lbs. hay, at $4 per ton	$ 1 80
300 lbs. meal, at 60 cents per cwt	1 80
20 bushels turnips, at 10 cents	2 00
	$ 5 60
Cost in favour of ensilage	$ 1 70

Value of Cattle at commencement and at close of feeding—

Lot No. 1—Fed on ensilage and meal—

Weight at start of preliminary feeding, 2,450 lbs. at $2\frac{3}{4}$c...	$ 67	38
Weight at close of test, 2,804 lbs. at $3\frac{3}{4}$c....................	105	15
Gain..	$ 37	77
Less food consumed in preliminary feed, $2; test, $3.90...	5	90
Net gain..	$ 31	87

Lot No. 2.—Fed on hay, meal and turnips.

Weight at start of preliminary feeding, 2,272 lbs., value $2\frac{3}{4}$c.	$ 62	48
Weight at close of test, 2,507 lbs., $3\frac{3}{4}$c..........................	94	00
Gain..	$ 31	52
Less food consumed in prelim. feed, $2, in test, $5.60......	7	60
Net gain..	$ 23	92

This test seems to show, 1st, That cattle gain more on ensilage and meal, than on hay, meal and roots. 2nd. That the cost of ensilage and meal is less than that of hay, meal and roots, and 3rd. That a substantial gain is made in feeding cattle, not only in increase of weight, but in the higher price obtained for the better quality of beef.

TEST OF CEREAL CROP IN FORM OF DRY FODDER *VS.* NATIVE HAY.

Two 2-year old heifers in each lot. Uniform preliminary feeding one month, and test, 8 weeks.

Ration No. 1—

	Lbs.
Dry fodder..	18
Turnips..	20
Meal..	3
Daily..	41

Ration No. 2—

	Lbs.
Native hay..	18
Turnips..	20
Meal..	3
Daily..	41

Weekly gain of heifers fed on Ration No. 1—

	Lbs.
Weight of heifer No. 1—958, 970, 985, 997, 1,005, 1,017, 1,028. 1,042, 1,061 ....Total gain	103
Weight of heifer No. 2—1,203, 1,211, 1,223, 1,234, 1,245, 1,252, 1,276, 1,285, 1.300 ....Total gain	97
Total gain Ration No. 1..................................	200

Weekly gain of heifers fed on Ration No. 2—

	Lbs.
Weight of heifer No. 1—1,130, 1,142, 1,150, 1,159, 1,168, 1,175, 1,183, 1,199, 1,215........... ....Total gain	85
Weight of heifer No. 2—1,000, 1,009, 1,028, 1,037, 1046, 1,062½, 1,073, 1,081, 1,095.........................Total gain	95
Total gain Ration No. 2	180

The above test serves to show that a mixed crop made into hay gives as good results when fed to stock as the best native hay.

GAIN OF 3 GRADE STEERS AND 3 GRADE HEIFERS; FED 5 MONTHS IN STABLE AND 6 MONTHS OF PASTURE.

The sires were pure bred, and the dams grade Durhams.

WINTER RATIONS.

December 13th to January 13th—

	Lbs.
Cut feed	10
Turnips	4
Meal	2
Oil cake	1
Daily	17

January 13th to April 1st—

	Lbs.
Cut feed	11
Turnips	10
Meal	2½
Daily	23½

April 1st to May 13th—

	Lbs.
Ensilage	10
Cut straw	7½
Turnips	8
Meal	3½
Daily	29

WEIGHT EACH MONTH WHILE STALL FED.

Breed.	Dec. 13.	Jan. 13.	Feb. 13.	Mar. 13.	Apr. 13.	May 13.	Total gain.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Durham Steer	850	892	925	953	975	1,026	176
Holstein Steer	666	693	729	740	775	825	159
Polled Angus Steer	776	792	807	845	875	907	131
Durham Heifer	525	555	625	646	671	700	175
Holstein Heifer	673	700	725	750	775	815	142
Polled Angus Heifer	554	563	588	632	656	700	146

GAIN ON PASTURE—WITH TOTAL GAIN.

Breed.	May 13.	Nov. 13.	Gain on Pasture.	Gain in Stable.	Total gain 11 mos.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Durham Steer	1,026	1,240	214	176	390
Holstein Steer	825	1,055	230	159	389
Polled Angus Steer	907	1,077	170	131	301
Durham Heifer	700	917	217	175	387
Holstein Heifer	815	963	148	142	290
Polled Angus Heifer	700	870	170	146	316

Showing that the Durham grades gained more than either of the other two breeds, both in stall feeding and on pasture.

GAIN IN WEIGHT OF PURE-BRED HEIFERS.

The gain in weight of eight pure bred heifers for twelve months is given below.

From November 12th to May 12th, they were fed a daily ration of 9¼ pounds cut fodder (grain hay), 2½ pounds meal, 3 pounds turnips and as much wheat straw or chaff as they would eat. From May 12th to November 12th, they were on pasture alone, except the twelve days in November, when they were stabled at night.

Breed.	Born.	Weight Nov. 13.	Weight May 13.	Weight Nov. 13.	Gain in Stable.	Gain on Pasture.	Total.
Durhams.		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Prairie Wild Flower	May 18, 1891.	840	1,061	1,213	221	152	373
Prairie Rosebud	Mar. 26, 1892.	530	705	940	175	235	410
Polled Angus.							
Lady Eaton	Oct. 5, 1890.	1,010	1,147	1,285	137	138	275
Maid of Skene	Aug. 4, 1891.	675	785	950	110	165	275
Stella of Assiniboia	Oct. 10, 1891.	878	1,111	1,250	233	139	372
Pride of Assiniboia	Dec. 6, 1891.	730	930	1,070	200	140	340
Holsteins.							
Abi of Assiniboia	Feb. 10, 1891.	700	870	1,047	170	177	347
Queen of Assiniboia	Sep. 22, 1892.	290	670	890	380	220	580

PIGS.

The increase of pigs during the summer has, on the whole, been satisfactory, but the Yorkshire White litters have done very poorly. They do not appear to thrive as well as those of the Berkshire breed.

Having no suitable building in which to feed young animals, no tests were undertaken the past year, but on completion of the piggery, now in course of erection, feeding experiments will be carried on.

POULTRY.

Very great success cannot be reported in the poultry department for the past year. Although better than that of 1892, it was far from being satisfactory.

The Plymouth Rocks brought up the largest flock of young birds; White Leghorns second.

The Andalusians laid the finest eggs, but the Plymouth Rocks were first in number.

Thirteen settings were sent out to settlers in April and May last.

A better roof has been placed on the poultry building, and an addition made to its size, and the yards also have been enlarged. Though not very extensive, the building is now warm and comfortable.

STALLION.

The Clyde stallion Barlocco, sent by the Haras National Company from Montreal, reached the farm on 28th April last, and remained for three months, serving 52 mares during that time.

Barlocco captured the ninth prize for Clydesdales at the World's Columbian Exposition.

PREPARING LAND FOR CROP.

Three methods were followed in preparing land in the season of 1892 for the crop of the past year. 1st. To plough deep with a single plough soon after seeding and cultivate the surface afterwards with a spring-toothed harrow. 2nd. To gang plough 3 inches deep first, then cultivate the surface to keep down weeds, and after harvest plough deep. 3rd. To gang plough first and last 3 inches deep with surface cultivation between the ploughings.

Wheat, barley and oats were all sown on the three differently prepared soils, and at no time could any difference be observed in the crops. The early part of the growing season being so favourable, the crop of straw was equally heavy on all, and the hot winds did no more damage on the shallow prepared ground than on the deep.

It must, however, be understood that prior to 1892 the land had all been fallowed from 6 to 8 inches deep, and with a season like the past good crops could reasonably be expected on all the fallows.

The past season the land for next year's crop has been prepared in the same three ways, and should the growing season be different, as no doubt it will, a different result will in all probability follow.

MANURING.

The manure from stock during the winter of 1891 and the summer of 1892 was first drawn into one large pile, where it thoroughly rotted. It was then, after the other work on the farm was stopped by frost, drawn out and put on stubble land intended for fallow the past season. The same course will be adopted with manure made last winter and this summer.

DISTRIBUTION OF GRAIN, FOREST TREES, FRUIT BUSHES, TREE SEEDS AND POTATOES.

A distribution of grain, trees, fruit bushes, tree seeds and potatoes was made during March, April and May last.

Four hundred and thirty-one bags of grain, consisting of samples of wheat, barley, oats, pease, flax and spring rye were sent out by mail.

Two thousand five hundred trees, principally Manitoba Maple, or Box Elder, were distributed by mail. Elm, Ash, Poplar, Willow, Cottonwood, Caragana and Lilac were sent out in small lots.

A large number of cuttings of the Artemisia Abrotanum (Russian) were mailed to different parts of the Territories.

Tree seeds were forwarded to 200 applicants.

197 dozen Raspberry plants, 119 dozen Currants, 15 dozen Strawberry plants, 11 dozen Gooseberry and 17 dozen Asparagrus roots were distributed to settlers.

Two hundred and fifteen sample bags of Potatoes were also sent to applicants.

ENSILAGE.

The capacity of the silo having been found insufficient in 1892, an additional silo was built in time for the grain and corn crop this year.

The ensilage came out of the silo, last winter, in good condition, and proved very useful during the winter and early spring months when other succulent food was becoming scarce.

Although last winter was extremely cold no harm was done the ensilage by frost. At no time was there more than a thin crust over the top.

During the past season nearly twice the quantity of ensilage has been put in the silos as there was saved in 1892. At present the corn is being used and is found to be much better than last year, on account, no doubt, of its being further advanced when cut.

IMPROVEMENTS.

Silo.—During the past summer, as stated elsewhere, a silo was built 11 x 12 x 23 feet. Instead of sheeting inside and out with boards and paper before lining it up with siding, only one thickness of flooring was put in on the inside of the silo. So far as the ensilage is concerned this has proved sufficient.

Piggery.—A piggery 24 x 40 feet, one story high, was also built. The walls of this building are concrete, 1 part lime to 9 parts sand and small stones. The walls are 12 inches thick.

Henhouse.—A small addition was made to the hennery, as well as completing the building, which was not done last summer.

Reservoirs.—A large reservoir has been made in the pasture field this fall, as well as additions to the other reservoirs on the farm.

WORLD'S COLUMBIAN EXPOSITION.

As intimated in my last report, the different agricultural societies, towns and individuals, through direction of the North-west Government, sent during the early part of winter exhibits of roots, grain in straw, threshed grain, grasses, etc., to the Experimental Farm, to be cleaned and sorted, and then forwarded to Chicago for the World's Fair.

This work entailed, in connection with the Experimental Farm exhibit, which was prepared at the same time, a large amount of labour. The grain in straw was all carefully sorted, the threshed grain nearly all hand picked, and the grasses sorted and named. Exhibits continued coming in until early in March, when the entire lot was shipped to Chicago.

As soon as vegetables were ready to send this fall, collections were forwarded at different dates, until the season was over.

In the latter part of March I went to Chicago, under your instructions, and remained there several weeks, returning in time for the spring work. While in Chicago I was able to render assistance in installing the exhibits from the different Experimental Farms, and render aid otherwise in the preparation and placing of some of the exhibits from the North-west.

The Experimental Farm at Indian Head received awards for collection of cereals and grasses and collection of vegetables.

LOCAL EXHIBITIONS.

During the past fall a large collection of cereals, roots, grasses and other products of the farm was prepared for exhibition purposes. Only two points, Indian Head and Edmonton, could be reached, and on account of the high rate of express only a small portion of the exhibit could be sent to Edmonton. While in the Edmonton district I was able te attend a fair at St. Albert, but the exhibit of the products of the Experimental Farm did not reach Edmonton in time to permit of their being shown at St. Albert.

VISITORS TO THE EXPERIMENTAL FARM.

The number of visitors to the farm greatly increased during the past season. The change from a night to a day train service, by which visitors from a distance could come and go on the same day, was a very great convenience.

Besides having all the delegates from Great Britain and the United States pay the farm a visit, an excursion party from Moose Jaw and intermediate stations favoured the farm with its presence.

METEOROLOGICAL.

Temperature, maximum and minimum for 11 months; rainfall for the growing season; sunshine for the growing season.

TEMPERATURE.

Months.	Maximum,	Minimum.
January	26° on 20th	—46° on 31st.
February	32° on 18th	—52° on 1st.
March	38° on 31st	—25° on 15th.
April	55° on 30th	1° on 5th.
May	81° on 18th	22° on 24th.
June	92° on 13th	35° on 5th.
July	92° on 19th	36° on 9th.
August	103° on 6th	30° on 28th.
September	93° on 7th	15° on 27th.
October	67° on 19th	4° on 28th.
November to 15th	57° on 6th	3° on 2nd.

RAINFALL.

	Inches.
May	3·17
June	4·60
July	2·12
August	·12
September	·10
Total	10·11

SUNSHINE.

	Hours.
March	130·3
April	126·3
May	289·8
June	250·8
July	283·5
August	273·7
September	138·8
Total	1493·2

I have the honour to remain, sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 31st October, 1893.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report for 1893, being the fifth annual report of the work done on the Experimental Farm at Agassiz.

The winter of 1892 and 1893, was the severest known in 30 years, in the western part of British Columbia.

GENERAL VIEW, EXPERIMENTAL FARM, AGASSIZ, B.C.

The first sharp frost was on November 24th, when the temperature was 19 above zero, followed by two nights of 16 above, after which we had warmer weather with showers and light frosts, until December 21st, when we had a sudden drop to 12 above zero followed by 8 above on the night of the 22nd, and very high winds from the north. This was followed by milder weather, and warm showers, several days early in January showing a temperature ranging from 33 to 43, and the lowest recorded for January up to the 24th was 27 above zero. The 25th showed 15 above with a strong north wind, which continued blowing for several days, and on January 30th the temperature recorded here was 13 below zero, the lowest point reached. The weather began to grow milder early in February, but continued cold through that month and March, followed by a cold wet spring, delaying seeding, and early sown grain did not germinate for a considerable time.

The first grain was sown on April 10th, which was nearly one month later than last year, and vegetation was fully a month behind the average time. As the growth progressed, the damage done to fruit trees by the frost, and the long continued cold drying winds became more apparent.

The cold wet character of the spring continued up to the last of June, when it became warmer, and in July a drought of nearly six weeks set in, and as a consequence, late sown grain, of which there was a good deal, did not ripen early enough to escape the rains which set in early in September.

The hay crop is fair, but grain, roots and fruits are not nearly up to the average in quality or quantity.

This has been the most unfavourable year for farming operations, since the Experimental Farm was started.

Hops.

Hops, which I mentioned in my last report as being tried in several localities, have given good returns, and are commanding very fair prices. Preparations are being made in many places to plant yards on quite an extensive scale, as well as to add to those already planted. Reports as far as received are to the effect that the hop louse has given very little trouble this year, and in the few cases where they did appear, they received prompt attention.

Fruit.

Fruit, I am glad to report is receiving more attention each year. More trees have been planted this year in this province than in any previous year, and more interest is being taken in studying the best methods of cultivation, &c., as well as the best means of fighting the various fruit pests.

The severe weather injured the fall wheat crops on the Experimental Farm, but some varieties suffered much less than others, although all were treated exactly alike, as to time of sowing, soil, exposure, etc.

About ten acres of new land has been ploughed this season and probably nearly as much more will be broken up before the season is over. About twenty acres of land has been cleared of brush and timber, and this, when all is burned off, will be sown to grass seed and added to the pasture available for stock.

FALL WHEAT.

During the high winds in January, the earth was blown off the roots of the wheat plants, and a very large percentage of the crop perished, while those that lived did not start to grow until very late in the spring. Consequently the varieties were all late in ripening as shown by the accompanying table. There was no smut on the wheat this year.

Name of Variety.	Character of Head.	Sown.	Up.	Headed.	Ripe.	Length of Head.	Length of Straw.	No. of days to ripen.	Yield per acre. Bush.	Lbs.	Remarks.
						Inches.	Ft.		Bush.	Lbs.	
Plot No. 1. Canadian velvet chaff	Bald white chaff.	Oct. 19..	Nov. 7..	June 23..	Aug. 18..	3 to 5	4 to 4½	302	20	9	Straw stiff and bright; heads very close and compact. Grain bright, plump and fairly hard. Heads average size, long and well filled out to tip. Very thin on the ground, owing to causes referred to, which affected all alike.
Plot No. 2. Carter's K.	do ..	do 19..	do 7..	July 7..	do 23..	3 3½	4 4½	307	17	38	Straw stiff and bright. Heads medium length, but very well filled out; very plump and bright. This is the best of Carter's fall wheats; stooled well and stood up well.
Plot No. 3. Carter's J	do ..	do 19..	do 7..	do 4..	do 23..	2 3	4 4½	307	16	6	Heads short and pointed; stooled fairly.
Plot No. 4. Carter's H........	do ..	do 19..	do 7..	do 8..	do 21..	2 3½	3½ 4	305	9	15	A poor wheat, it kills very badly and does not stool well.
Plot No. 5. Carter's G	do ..	do 19..	do 7..	do 9..	do 24..	2½ 3	3	308	8	50	Heads square and well filled out with plump bright grain; did not stool well, badly winter killed.
Plot No. 6. Carter's F..	do ..	do 19..	do 7..	June 22..	do 17..	3 4	4	301	10	55	Heads very open and pointed; did not winter kill as badly as some others, but does not stool well.
Plot No. 7. Carter's E	do ..	do 19..	do 7..	July 2..	do 23..	3½ 4½	4 4½	307	14	17	Heads long and well filled out; very small, white and plump, stands up well and stools fairly.
Plot No. 8. Carter's D	Slightly bearded white chaff.	do 19..	do 7..	do 9..	do 23..	3 3½	3½ 4	307	13	52	Stands up well; heads long and well filled out; stooled fairly well.
Plot No. 9. Carter's C	Bald red chaff ..	do 19..	do 7..	do 5..	do 24.	3 4	3½ 4	308	19	19	Heads well filled out with plump grain; stands up well; stools well; straw bright and stiff.
Plot No. 10. Carter's B	Bald white chaff.	do 19..	do 8..	do 10..	do 22..	2 3	4½ 5	306	18	29	Straw bright and stiff. Heads well filled out; grain plump; stooled fairly well.
Plot No. 11. Carter's A	Bald red chaff. .	do 19..	do 7..	do 6..	do 23..	3½ 4	3½ 4	307	15	58	Straw stiff, standing up well; heads well filled out to tip.

Plot No. 12. Democrat....	Bearded white chaff.	do	19..	do	9.	June	20..	do	18..	3	4	4		302	17	38	Heads fair in length, but very open; not filled out well; did not stool; straw soft.
Plot No. 13. Tasmania......	Bearded red chaff	do	19..	do	7..	do	6..	do	16..	2½	3	4		300	16	48	Heads very open, and not very well filled out; did not stool; stands up well.
Plot No. 14. Martin's Amber..........	Slightly bearded white chaff.	do	19..	do	8..	do	29..	do	22..	2	3	3	3½	306	11	20	Did not stool well. Heads not well filled out to tip.
Plot No. 15. Early Red Clawson	Bald red chaff...	do	19..	do	7..	do	13..	do	15..	3	3½	3½	4	299	12	36	Stands up well; heads well filled out to tip; did not stool well.
Plot No. 16. Fill Measure	Bald white chaff.	do	19..	do	8..	July	3.	do	21..	2½	3	3½	4	305	5	53	Heads well filled to tip; very plump, and straw stiff and bright, but was nearly all winter killed.
Plot No. 17. Volunteer	Bearded red chaff	do	19..	do	7..	June	24..	do	17..	2½	3½	3½	4	301	16	23	Heads compact and well filled out to tip; straw bright and stands up well.
Plot No. 18. Manchester	Slightly bearded red chaff.	do	19..	do	7..	do	17..	do	16..	3	4	3½		300	24	22	Heads quite open, and not very well filled out; stands up well and very well stooled.
Plot No. 19. Royal Prize Red	Bald red chaff ..	do	19..	do	7..	July	10..	do	24..	3½	4	3½		308	15	57	Heads well filled out, but did not stool; straw bright and stiff.
Plot No. 20. Square Head.....	Bald white chaff.	do	19..	do	7..	do	5..	do	19..	2½	3	3		303	19	50	Only a very small quantity of this variety was available for seed. The head is short, square and generally well filled; straw strong; stands up well.
White Queen	do .	do	19..	do	7..	do	7..	do	20..	2½	3	3½		304	19	50	Only a few heads of this variety were saved last year and a very small plot sown this year, with the result shown. Too tender for this climate, as it killed badly every year. Heads long and fairly well filled out; grain plump; stands up well.
Plot No. 21. Golden Cross............	Bearded red chaff	do	19..	do	8..	June	17..	do	16..	3	4	3½		300	23	31	Long heads well filled to tip; stands up well.

Spring Wheat.

Thirty varieties of spring wheat were tested in plots of $\frac{1}{20}$ of an acre. The land for these plots had been very rough. Several large fir stumps had been grubbed out, and in consequence a good deal of levelling had to be done which caused a very uneven growth, and very materially reduced the yield in almost every plot.

Name of Variety.	Sown.	Up.	Headed.	Ripe.	Height.	No. of days to mature.	Yield per Plot.	Yield per Acre.		Remarks.
					ft.		lbs.	bush.	lbs.	
Plot No. 1—Azima	May 5..	May 13..	July 20..	Aug. 28..	2 to 2½	115	17¼	5	45	Bearded; did not stool well.
do 2—Abundance	do 5..	do 13..	do 15..	do 26..	2	113	31¾	10	35	Bearded; did not stool well; heads very short.
do 3—Alpha	do 5..	do 13..	do 14..	do 30..	2½ to 3	117	35	11	40	Bald; heads fair length and well filled.
do 4—Albert	do 5..	do 13..	do 12..	do 26..	2½ to 3	113	40	13	20	Bearded; did not stool well; heads short but well filled.
do 5—Advance	do 5..	do 13..	do 16..	do 28..	2½ to 3	115	58	19	20	Bearded; did not stool well; heads 2 to 3 inches long; well filled.
do 6—Beta	do 5..	do 13..	do 12..	do 28..	2½ to 3	115	51¾	17	15	Bearded; heads short, but well filled out.
do 7—Black Sea	do 5..	do 13..	do 11..	do 16..	3 to 3½	103	53¾	17	55	Bearded; stooled fairly well.
do 8—Carleton	do 5..	do 13..	do 16..	do 26..	2½ to 3	113	50	16	40	Bearded; heads 2½ to 3 inches long and well filled.
do 9—Crown	do 5..	do 13..	do 13..	do 28..	3 to 3½	115	55¼	18	25	Bearded; heads 3 inches long; very even and well filled.
do 10—Colorado	do 5..	do 13..	do 15..	Sept. 2..	3 to 3½	120	63¼	21	5	Bald; heads 3 inches long; fairly well filled.
do 11—Gehun	do 5..	do 13..	do 13..	Aug. 3..	2 to 2½	117	37¾	12	35	Bald; heads short, but well filled; did not stool well.
do 12—Great Western	do 5..	do 13..	do 16..	Sept. 2..	3 to 3½	120	65¼	21	45	Bearded; heads 3 to 3½ inches long; straw soft and easily broken down.
do 13—Hungarian Mt.	do 5..	do 13..	do 16..	Aug. 30..	2½ to 3	117	51	17	..	Bald; heads short and well filled.
do 14—Ottawa	do 5..	do 13..	do 15..	do 28..	3 to 3½	115	40¼	13	25	Bearded; heads 2 to 3 inches long, and well filled.
do 15—Hueston's	do 5..	do 13..	do 17..	Sept. 1..	3 to 3½	119	52¾	17	35	Bald; heads long and plump; did not stool well; very thin crop.
do 16—Ladoga	do 5..	do 13..	do 12..	Aug. 26..	2½ to 3	113	43½	14	30	Bearded; heads medium in length; well filled.
do 17—Pringle's Champlain.	do 5..	do 13..	do 14..	Sept. 2..	2½ to 3	120	39¾	13	15	Bearded; heads short; well filled.
do 18—Prince	do 5..	do 13..	do 15..	Aug. 27..	2 to 2½	114	51½	17	10	Bearded; heads short.
do 19—Preston	do 5..	do 13..	do 13..	do 30..	2½	117	70¼	23	25	Bearded; heads short but well filled; grain plump.
do 20—Red Fife	do 5..	do 13..	do 17..	Sept. 2..	2½ to 3	120	45¾	15	15	Bald; heads short but well filled.
do 21—Rio Grande	do 5..	do 13..	do 16..	do 2..	3 to 3½	120	55¾	18	35	Bearded; heads 3 to 3½ inches long; straw weak and lodged.
do 22—Red Fern	do 5..	do 13..	do 15..	Aug. 30..	2 to 2½	117	44	14	40	Bearded; heads short; not well filled.
do 23—Stanley	do 5..	do 13..	do 12..	do 31..	3	118	57¾	19	15	Bald; heads long and well filled.
do 24—Campbell's Triumph.	do 5..	do 13..	do 13..	do 26..	3 to 3½	113	49	16	20	Bald; heads fair length and well filled.

do	25—White Fife...	do	5..	do	13..	do	15..	Sept.	1..	3 to 3½	119	50	16	40	Bald; heads fair length and well filled.
do	26—Wellman's Fife......	do	5..	do	13..	do	16..	do	2..	3 to 3½	120	47¾	15	55	Bald; heads 3 to 3½ inches long; well filled.
do	27—Campbell's White Chaff	do	5..	do	13..	do	11..	Aug.	26..	2½ to 3	113	39½	13	10	Bald; heads short.
do	28—White Russian	do	5..	do	13..	do	14..	Sept.	2..	3	120	43½	14	30	Bald; heads short.
do	29—White Connell......	do	5..	do	13..	do	14..	do	2..	2½ to 3	120	45¼	15	5	Bald; heads 2 to 2½ inches long.
do	30—Carter's I., or Anglo Canadian.........	do	5..	do	13..	do	19..	do	2..	3 to 3½	120	40¾	13	35	Bearded; heads 2 to 2½ inches long; not well filled.

BARLEY.

Twenty varieties of barley were tested in plots of $\frac{1}{20}$ of an acre each. The soil and treatment were the same in each case. Below are given the yields as well as other particulars of growth, ripening, etc.

Name of Variety.	Sown.	Up.	Headed.	Ripe.	Height.	No. of days to mature.	Yield per Plot.	Yield per Acre.		Remarks.
					ft.		lbs.	bush.	lbs.	
Plot No. 1—Duckbill	May 8	May 16	July 15	Aug. 25	2½ to 3	109	58	24	8	Stands up well; no smut; did not stool well.
do 2—Danish Chevalier	do 8	do 16	do 16	do 25	3	109	74	30	40	Heads long; stooled fairly well.
do 3—French Chevâlier	do 8	do 16	do 17	do 24	2½ to 3	108	61¼	25	25	Heads only medium; did not stool well.
do 4—Golden Grains	do 8	do 16	do 17	do 25	3½	109	82½	34	18	Heads long; straw long and soft; easily lodged.
do 5—Goldthorpe	do 8	do 16	do 20	do 29	3½	113	74¼	30	45	Heads medium; straw stiff and bright.
do 6—Kinver Chevalier	do 8	do 16	do 17	do 24	2½ to 3	108	53½	22	14	Heads medium long; straw stiff and bright.
do 7—Canadian Thorpe	do 8	do 16	do 17	do 25	2½ to 3	109	59½	24	38	Heads long and plump; straw stiff.
do 8—Thanet	do 8	do 16	do 19	do 25	2 to 2½	109	49½	20	30	Heads long; did not stool well.
do 9—Newton	do 8	do 16	do 20	do 22	2 to 2½	106	40	16	32	Heads medium; did not stool well.
do 10—Improved Chevalier	do 8	do 16	do 20	do 28	2½	112	49¼	20	25	Did not stool well.
do 11—Prize Prolific	do 8	do 16	do 20	do 28	2 to 2½	112	40½	16	42	Heads medium; did not stool well.
do 12—Golden Melon	do 8	do 16	do 23	do 29	2½ to 3	113	69½	28	46	Heads medium length; straw weak and soft.
do 13—Baxter's Six-rowed	do 8	do 16	June 30	do 18	3	102	61	25	20	Heads medium; did not stool well.
do 14—Common Six-rowed	do 8	do 16	July 3	do 25	2½ to 3	109	86	35	40	Heads long and well filled; did not stool well
do 15—Mensury	do 8	do 16	June 28	do 16	3	100	60¼	25	5	Heads medium; did not stool well.
do 16—Oderbruch	do 8	do 16	July 9	do 18	2½ to 3	102	67¼	28	1	Heads short; did not stool well.
do 17—Odessa	do 8	do 16	do 1	do 17	2½ to 3	101	54¾	22	39	Heads medium; very thin stand.
do 18—Petschora	do 8	do 16	do 6	do 18	2½ to 3	102	57	23	36	Heads short; very thin stand.
do 19—Rennie's Improved	do 8	do 16	do 6	do 16	3 to 3¼	100	57¼	23	41	Heads medium; stooled fairly well.
do 20—Six-rowed wh't-barley	do 8	do 16	do 12	do 19	2½ to 3	103	48¾	20	15	Heads medium; did not stool well.

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OATS.

Forty-one varieties of oats were tested in plots of $\frac{1}{20}$ of an acre each.

They were all sown on the same day, treated in every way alike, the soil was of the same character throughout and fairly uniform. The yield is not very large in any case, but I have no doubt that it would have been much larger could the seed have been sown several weeks earlier.

Name of Variety.	Sown.	Up.	Headed.	Ripe.	Height.	No. of days to maturе.	Yield per Plot.	Yield per Acre.		Remarks.
					Ft.		Lbs.	Bush.	lbs	
Plot No. 1—American Beauty	May 17	May 21	July 27	Aug. 31	2½ to 3	106	79	46	16	
do 2—Canadian Triumph	do 17	do 21	do 21	do 23	3 to 3½	98	52	30	20	Did not stool.
do 3—Banner	do 17	do 21	do 26	do 30	2 to 2½	105	68	40	00	Grain plump; straw stiff and bright.
do 4—Black Brie	do 17	do 21	do 30	Sept. 2	2½ to 3½	108	68	40	00	Straw and heads very uneven in length.
do 5—Black Coulommiers	do 17	do 22	do 29	do 3	2 to 3	109	60	32	12	Heads short and light.
do 6—Prolific Black Tartarian	do 17	do 21	do 29	do 2	3	108	85	50	00	Grain plump and straw stiff.
do 7—Bonanza	do 17	do 21	do 22	Aug. 28	3 to 3½	103	71	41	08	Heads medium; grain plump.
do 8—Prolific Black California	do 17	do 21	do 30	Sept. 1	2½ to 3	107	67	39	14	Straw soft and weak.
do 9—Early Archangel	do 17	do 21	do 24	Aug. 30	2½ to 3	105	68	40	00	Inclined to lodge.
do 10—Cream Egyptian	do 17	do 21	do 28	do 31	3 to 3½	106	75	44	00	A fair stand; grain plump.
do 11—Challenge	do 17	do 21	do 27	do 31	3 to 3½	106	63	37	02	Heads short; did not stool well.
do 12—Early Blossom	do 17	do 21	do 31	do 31	2½ to 3½	106	87	51	06	do long; grain plump; straw stiff and bright.
do 13—Early Etampes	do 17	do 21	do 24	do 16	2½ to 3	91	69	40	20	Very early; straw stands up well.
do 14—Early Gothland	do 17	do 21	do 28	do 31	3 to 3½	106	77	45	10	Grain plump; straw bright and stiff.
do 15—Flying Scotchman	do 17	do 21	do 26	do 30	2 to 2½	105	55	32	12	Heads short; did not stool well.
do 16—Golden Side	do 17	do 21	do 30	do 31	2 to 2½	106	60	35	10	do do
do 17—Giant Cluster	do 17	do 21	do 31	Sept. 4	3 to 3½	110	93	54	24	Heads long and close; grain plump.
do 18—Golden Beauty	do 17	do 21	do 26	Aug. 28	3 to 3½	103	98	57	22	Heads very uneven in length, but long and grain plump.
do 19—Hazlett's Seizure	do 17	do 21	do 21	do 26	3½ to 4	98	88½	52	02	A fair stand; heads short; stooled fairly well.
do 20—Holstein Prolific	do 17	do 21	do 27	Sept. 1	2½ to 3	107	84	49	20	Heads medium in length, but did not stool well.
do 21—Abundance	do 17	do 21	do 27	Aug. 30	2½ to 3	105	68	40	00	Straw bright; stands up well.
do 22—Improved Ligowo	do 17	do 21	do 26	do 29	2½ to 3	104	63	37	02	Did not stool well; heads fair.
do 23—Joanette	do 17	do 21	do 27	Sept. 2	2 to 2½	108	60	32	12	Heads and straw short.
do 24—Oderbruch	do 17	do 21	do 30	do 6	3½ to 4	112	95	55	30	do long; straw soft and lodged.
do 25—Poland White	do 17	do 21	do 18	Aug. 26	3½ to 4	101	99	58	08	do and straw long, and stands up well.
do 26—Prize Cluster	do 17	do 21	do 21	do 25	3 to 4	100	80	42	02	Grain plump; stands up well, but did not stool well.

Name of Variety.	Sown.	Up.	Headed.	Ripe.	Height.	No. of days to mature.	Yield per Plot.	Yield per Acre.		Remarks.
					ft.		lbs.	bush.	lbs.	
Plot No. 27—Rosedale	May 17	May 21	July 28	Aug. 31	2½ to 3	106	88	51	26	Straw bright and stiff; heads medium; grain plump.
do 28—Scottish Chief	do 17	do 21	do 19	do 24	2½ to 3	99	56	32	32	A very uneven stand; heads short and light.
do 29—Siberian	do 17	do 21	Aug. 1	Sept. 4	3 to 3½	110	78	45	30	Heads fair length; grain plump.
do 30—Victoria Prize White	do 17	do 21	July 28	Aug. 26	3½ to 4	101	74	43	18	do medium; straw stiff and bright.
do 31—Welcome	do 17	do 21	do 27	Sept. 1	3 to 3½	107	81	47	08	Straw soft and lodged.
do 32—White Russian	do 17	do 21	do 27	Aug. 31	3	106	74	43	18	Grain plump, but a thin stand.
do 33—Cave	do 17	do 21	do 30	do 30	2 to 2½	105	72	42	12	Did not stool well; heads short.
do 34—Abyssinia	do 17	do 21	do 29	do 31	2½ to 3	106	68	40	00	A light crop; heads short and poor.
do 35—Royal Doncaster	do 17	do 21	do 31	Sept. 2	3 to 3½	108	74	43	18	Grain plump; straw stiff; did not stool well.
do 36—Winter Grey	do 17	do 21	do 26	Aug. 23	3 to 4	98	68	40	00	Stands up well, but a very thin stand.
do 37—Imported Irish	do 17	do 21	do 27	do 23	3 to 4	98	63	37	02	Did not germinate well; crop patchy.
do 38—Columbus	do 17	do 21	do 26	do 30	2½ to 3	105	66	38	28	Very thin stand.
do 39—White Wonder	do 17	do 21	do 27	do 22	2½ to 3	97	49	28	28	Thin stand; did not stool well; grain plump; straw stiff and bright.
do 40—Rennie's Prize White	do 17	do 21	do 27	do 23	3 to 3½	98	62	37	02	Did not stool well; heads short.
do 41—American Triumph	do 17	do 21	Aug. 2	Sept. 2	2½ to 3	108	51	30	00	Straw soft and lodged; heads poor.

Cross-bred Wheats.

Name of Variety.	Amount of Seed.	When Sown.	Up.	Headed.	Ripe.	Length of Head.	Length of Straw.	No. of days to mature.	Yield per Plot.	Remarks.
Plot No. 1.	Oz.					Ins.	Feet.		Lbs.	
Red Fife female with Club Bombay male, plant No. 1...	1	May 2.	May 10.	July 11.	Aug. 25.	3½ to 4	4 to 4½	115	7½	Slightly bearded; red chaff; straw soft and inclined to lodge; heads long but rather open; stooled well; grain medium long but not plump; bright amber and medium hard.
Red Fife female with Club Bombay male, plant No. 2...	1	do 2.	do 10.	do 12.	do 27.	4 to 4½	4½ to 5	117	6	Bald; heads long, tapering and loose; stooled very well; straw soft; grain plump, dark and hard.
Red Fife female with Ladoga male, plant No. 1	1	do 2.	do 10	do 9.	do 29.	4½	3½ to 4	119	7¼	Slightly bearded; heads close and well filled out; straw rather weak and inclined to lodge; stooled well; grain rather soft and dull coloured but plump.
Red Fife female with Ladoga male, plant No. 2..........	1	do 2.	do 10.	do 12.	do 25.	4½ to 5	3 to 4	115	5	Bald; heads compact, well filled and grain plump; straw stiff and stands up well; amber, plump and hard.
Red Fife female with Ladoga male, plant No. 3............	1	do 2.	do 10.	do 9.	do 24.	4 to 4½	3 to 3½	114	4¼	Bald; stooled well and stands up well; heads close and well filled out.
Anglo Canadian female with Indian Karachi male.......	1	do 2.	do 10.	do 3.	do 23.	2½ to 4	1 to 3	113	3¼	Bearded; very uneven in growth of head and straw; heads fairly close and compact; straw soft and lodged; grain pale amber, plump and quite hard.
Bed No. 7—Hungarian........	1	do 2.	do 10.	....	....	....	....	....	....	This is evidently a fall wheat, as it has not yet headed out.
Bed No. 8—Spiti Valley female with Red Fife male.........	1 lb.	do 4.	do 13.	July 15.	Aug. 27.	2½ to 3½	3½ to 4	115	....	This plot stooled well but sported a great deal, giving bearded and bald white chaff, and the same varieties of red chaff; some ripened much earlier than others. Not threshed; will hand pick this plot to separate different varieties of grain and make clean samples for next year.

HYBRID BARLEYS (sown at the rate of 1½ bushels per acre).

The land for these tests had been in roots in 1892, and for that crop had received a light dressing with fish guano from the canneries, both of which, no doubt, contributed to the excellent showing made.

Name of Variety.	Amount Sown.	Date of Sowing.	Date of coming up.	Headed	Ripe.	Length of Head.	Length of Straw.	Number of Days to Ripen.	Yield per Plot.	Yield per Acre.		Remarks.
	Lbs.					Inches.	Feet.		Lbs.	Bu.	Lbs.	
No. 1.—Surprise, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	April 25	May 8	June 30	Aug. 19	3	2½ to 3	116	28	42	00	Stands up well; no smut.
No. 2.—Summit, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 25	do 3	July 4	do 20	3 to 5	3	117	68	102	00	Stands up well; stooled very well; heads long and well filled out to tip; no smut.
No. 3.—Type A., six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	May 4	do 13	do 3	do 17	3½	2½ to 3	105	44	66	00	Stands up well; heads long and well filled; no smut.
No. 4.—Type 11, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 4	do 11	do 8	do 17	3 to 4	3	105	55	82	24	Stooled well; stands up well; heads long and filled out to tip; no smut.
No. 5.—Royal, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 4	do 12	do 5	do 16	3 to 4½	3 to 3½	104	74	111	00	An extra fine plot; straw bright and stiff; heads long and very well filled; stooled very well; no smut.
No. 6.—Type P., six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 5	do 12	do 10	do 21	3 to 4	2½ to 3	109	60	90	00	Stands up well; stooled well; heads wel filled out to tip; no smut.
No. 7.—Type S., two-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 5	do 12	do 13	do 22	4½ to 5½	3 to 3½	110	39	58	24	Stooled well and heads fair length, but straw soft and crinkled down.
No. 8.—Trooper, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	½	do 15	do 24	do 18	do 22	2 to 3	2 to 2½	100	22	66	00	Stooled well and heads long; straw stiff.

TESTS OF SPRING WHEAT, BARLEY AND OATS SOWN AT DIFFERENT DATES.

These plots were one-tenth of an acre each, and were sown in six successive sowings, one week apart. These plots were all treated alike, and the soil was of the same quality and character, but when each plot was sown the remaining unsown plots were carefully harrowed to kill weeds. This, I think, in part accounts for the heavier yields of the late plots, they also had more favourable growing weather. The earlier sown plots had very cold wet weather which delayed germination and weakened the plants.

SPRING WHEAT—RED FIFE—(Sown at the rate of 1½ bushels per acre).

Date of Sowing.	Date of coming up.	Heading out.	Harvested.	Length of Head.	Length of Straw.	No. of days to ripen.	Weight of Grain.	Bushels per Acre.		Remarks.
				inches.	feet.		lbs.	bush.	lbs.	
Plot No. 1. April 19......	April 27..	July 4..	Aug. 28..	3 to 3½	3	131	160¼	26	42	Stands up well; heads well filled out to tip; no smut.
Plot No. 2. April 26.....	May 8..	do 11..	do 30..	2½ to 3	3½	126	160	26	40	Heads not so long as No. 1, but well filled out; stands up well; no smut.
Plot No. 3. May 3.....	do 12..	do 15..	Sept. 2..	2 to 3	3	121	154	25	40	Straw long and bright; heads medium length and well filled; no smut.
Plot No. 4. May 10.....	do 18..	do 20..	do 4..	2½	2½ to 3	116	149	24	50	Stands up well; did not stool well; no smut.
Plot No. 5. May 17.....	do 23..	do 24..	do 7..	3	2½	112	81½	15	15	Straw and heads short; did not stool well.
Plot No. 6. May 24.....	June 1..	do 29..	do 12..	2½	2½	110	127½	21	15	Straw short; did not stool well; heads fairly well filled.

CAMPBELL'S WHITE CHAFF—(Sown at the rate of 1½ bushels per acre).

Date of Sowing.	Date of coming up.	Heading out.	Harvested.	Length of Head.	Length of Straw.	No. of days to ripen.	Weight of Grain.	Bushels per Acre.		Remarks.
Plot No. 1. April 19......	April 26..	July 1..	Aug. 22..	3½ to 4	3 to 3½	125	102	17	00	Straw long and stiff; heads long and well filled to tip; a little loose smut.
Plot No. 2. April 26.....	May 7..	do 7..	do 24..	3½	3 to 3½	122	132	22	00	Straw bright and stiff; heads long and well filled.
Plot No. 3. May 3......	do 10..	do 14..	do 28..	3 to 3½	3½	118	93½	15	35	Straw long, bright and stiff; heads well filled out to tip; a little loose smut.

CAMPBELL'S WHITE CHAFF—(Sown at the rate of 1½ bushels per acre.)—*Concluded.*

Date of Sowing.	Date of coming up.	Heading out.	Harvested	Length of Head.	Length of Straw.	No. of days to ripen.	Weight of Grain.	Bushels per Acre.		Remarks.
				inches.	feet.		lbs.	bush.	lbs.	
Plot No. 4. May 10......	do 18..	do 17..	do 30..	2 to 2½	2½ to 3	112	105	17	30	Straw stands up well; did not stool well; a little smut.
Plot No. 5. May 17......	do 24..	do 23..	Sept. 2..	3	2½ to 3	108	56	9	20	Did not stool well; a little loose smut; did not germinate well; heads very short and not filled out.
Plot No. 6. May 24 .	do 31..	do 30..	do 4..	3	2½ to 3	103	95¼	15	52½	Did not stool well; heads short.
BARLEY-BAXTER'S SIX ROWED—(Sown at the rate of 2 bushels per acre.										
Plot No. 1. April 19.. ..	April 24..	June 29..	Aug. 17..	......	2 to 2½	121	100	20	40	Straw and heads short; did not stool well.
Plot No. 2. April 26......	May 8..	July 4..	do 19.	....	2½	116	84	17	24	A poor stand; did not stool well; heads very short.
Plot No. 3. May 3......	do 10..	do 9..	do 22..	....	2	112	78	16	12	A very poor crop; short straw, and did not stool well.
Plot No. 4. May 10......	do 18..	do 13 .	do 24..	....	2 to 2½	107	82	17	04	Straw and heads short; did not stool well.
Plot No. 5. May 17.. ...	do 24..	do 17..	do 25..	....	2½ to 3	101	90	18	36	Stood up well, but did not stool well; heads short.
Plot No. 6. May 24......	do 31..	do 19..	do 26..	....	2½	95	88	18	16	Heads short; a poor stand.
DUCKBILL—TWO ROWED—(Sown at the rate of 2 bushels per acre.)										
Plot No. 1. April 19......	April 26..	July 2..	Aug. 21..	....	2½ to 3	125	91	18	46	Only five plots were sown in this instance. None of them stooled, and all were a poor stand.
Plot No. 2. April 26... .	May 9..	do 11 .	do 23..	....	3 to 3½	120	83	17	14	

Plot No. 3. May 3......	do 12..	do 14..	do 26..	....	3 to 3½	115	83	17	14	Only five plots were sown in this instance. None of them stooled, and all were a poor stand.
Plot No. 4. May 10.....	do 17..	do 19..	do 28..	....	3 to 3½	110	69	14	8	
Plot No. 5. May 17......	do 24..	do 24..	Sept. 3..	....	2½ to 3	109	102	21	12	

OATS—AMERICAN BANNER—(Sown at the rate of 2½ bushels per acre).

Plot No. 1. April 19........	April 25..	July 12...	Aug. 19..	....	3½ to 4	122	162	47	22	Straw long and stiff; heads long and well filled with plump grain; did not stool well.
Plot No. 2. April 26........	May 7...	do 15...	do 24..	....	3½ to 4	120	167	49	4	Straw long, bright and stiff; standing up well; grain plump.
Plot No. 3. May 3..........	do 10...	do 19...	do 28..	....	3½ to 4	117	175	51	16	Long full heads; plump grain; straw stiff.
Plot No. 4. May 10.........	do 18...	do 23...	do 30..	....	3½ to 4	112	197	57	32	Good full heads; straw stiff; stooled a little.
Plot No. 5. May 17.........	do 24...	do 27...	Sept. 2..	....	3½ to 4	108	224	64	24	Straw bright and stiff; heads good; stooled fairly well.
Plot No. 6. May 24.........	June 1....	do 31...	do 4..	....	3½ to 4	103	231	67	32	Good well filled heads; straw bright and stiff; stooled fairly well.

PRIZE CLUSTER—(Sown at the rate of 2½ bushels per acre).

Plot No. 1. April 19........	April 26..	July 9...	Aug. 19..	....	3½ to 4	122	123	36	6	Stands up well; did not stool well; a thin stand; heads fair.
Plot No. 2. April 26........	May 7...	do 13...	do 23..	....	3½ to 4	119	164	48	8	Stands up and stooled fairly well.
Plot No. 3. May 3..........	do 10...	do 18...	do 24..	....	3½ to 4	113	144	42	12	Did not stool very well; heads short.
Plot No. 4. May 10...	do 18...	do 20...	do 26..	....	3½ to 4	108	144	42	12	Straw bright and clear; did not stool well.
Plot No. 5. May 17.........	do 26...	do 24...	do 29..	....	3½ to 4	104	146	42	32	Stands up well; heads short.
No. 6.—May 24.	do 31...	do 30...	Sept. 1...	....	3½ to 4	100	179	52	22	Stooled fairly well; heads short.

FIELD PEASE.

Twelve varieties of field pease were sown, at the rate of from 2½ bushels per acre for small pease, to 3½ bushels per acre for the larger varieties.

Name of Variety.	Seed per acre.	Sown.	Ripe.	Length of straw.	Length of pod.	Yield per plot.	Yield per acre.
	Bushels.			Feet.	Inches.	Lbs.	Bush. lbs.
Multiplier	2½	May 15	Sept. 5	3	2	128½	21 25
Mummy	3	do 15	do 2	3½ to 4	2 to 2¼	126½	21 5
New Potter	2½	do 15	Aug. 30	3½	2½ to 3	119½	19 55
Crown	2½	do 15	do 29	2½	2	70¼	11 42½
Centennial	3	do 15	do 30	4½	2¼	102	17
Prussian Blue	2½	do 15	do 31	4	2	120½	20 05
Pride	3	do 15	Sept. 1	2½	2½	117	19 30
Prince Albert	2½	do 15	do 3	3	2	94	15 40
Golden Vine	2½	do 15	do 4	3½	1½	94½	15 45
Rennie's No. 10	3½	do 15	do 1	3½	2	122½	20 25
Black-eyed Marrowfat	3½	do 15	Aug. 28	3½	2	101½	16 55
White Marrowfat	3½	do 15	do 29	3½	1¾	80½	15 05

CORN.

Eleven varieties of corn were planted in rows three feet apart, and the stalks thinned out to four to six inches in the row.

The same varieties were planted in hills three feet apart each way, leaving two to four stalks in the hill.

The drills are the least trouble to plant, and there does not appear to be any advantage to compensate for the extra trouble of planting in hills.

The season has been a very poor one for corn, the wet weather in the spring rotted some of the seed, and retarded the growth of that which did germinate.

CORN.

Name of Variety.	Planted.	Up.	Tasselled.	Early Milk.	Late Milk.	Height.	Cut.	Weight per acre.	Remarks.
						Feet.		Tons. Lbs.	
Rural Thoroughbred, in rows	May 30	June 8	Aug. 30			6 to 8	Oct. 16	20 808	Just showing silk, October, 16th.
do in hills	do 30	do 8	do 30			do	do 16	19 963	
North Dakota, in rows	do 30	do 9	do 24	Oct. 8		5 to 6	do 16	13 1,000	
do in hills	do 30	do 9	do 24	do 8		do	do 16	13 700	
Great Northern, in rows	do 30	do 16	do 24	Sept. 16	Oct. 10	5 to 7	do 16	15 485	Ears large and well filled out; stalks leafy.
do in hills	do 30	do 16	do 24	do 16	do 10	do	do 16	15 670	
Gold Coin, in rows	do 30	do 8	do 23	do 20	do 16	5 to 6	do 16	15 500	Ears 4 to 5 inches long and well filled out; stalks very leafy.
do in hills	do 30	do 8	do 23	do 20	do 16	do	do 16	14 900	
Angel of Midnight, in rows	do 30	do 12	do 20	do 12	do 5	6 to 7½	do 16	16 1,196	Ears long and well filled.
do in hills	do 30							16 307	
Compton's Early, in rows	do 30	do 10	do 23			6 to 8	do 16	20 65	Cobs formed but not in early milk when cut.
do in hills	do 30	do 10	do 23			do	do 16	17 1,930	
Mitchell's Extra Early, in rows	do 30	do 10	do 6	do 4	do 1	4 to 5	do 16	8 1,420	Corn glazed when cut; ears 4 to 5½ in. long, and well filled out.
do in hills	do 30	do 10	do 6	do 4	do 1	do	do 16	8 960	
Pearce's Prolific, in rows	do 30	do 13	do 24	do 25	do 12	5½ to 7	do 16	17 840	Ears long and well filled; stalks leafy.
do in hills	do 30							16 1,768	
Smut Nose Flint, in rows	do 30	do 12	do 26	Oct. 4	do 6 to 7.	6 to 7½	do 16	22 1,163	Ears long and fine, but late.
do in hills	do 30	do 12	do 26	do 4		do	do 16	22 73	
Golden Dew Drop, in rows	do 30	do 15	do 28	do 1		6 to 8	do 16	23 1,938	Ears long; stalk stout and leafy.
do in hills	do 30	do 15	do 28	do 1		do		20 1,760	
Mastodon Dent, in rows	do 30	do 15	Sept. 4			7 to 10	do 16	37 75	Stalk very large and leafy, but cob only formed; no corn.
do in hills	do 30	do 15	do 4			do	do 16	36 850	

BROOM CORN.

Three varieties of broom corn were planted on May 24th, and came up June 5th, but as they did not mature sufficiently to be of use as broom corn, only about two per cent being headed out October 16th, the crop was cut and put into the silo. The varieties planted were Early Bush Evergreen, Improved Dwarf and California Golden Long Brush.

TESTS OF MIXTURES OF GRAIN CUT GREEN, AND CURED FOR FEED—ONE-TENTH ACRE PLOTS.

Mixture No. 1.—Contained pease, barley and oats in the following proportions, 6 pounds of pease, 5 pounds of Prize Prolific barley and 3½ pounds of oats, or at the rate of 1 bushel of each per acre. This was cut when the pease were nearly fit for table. The yield per acre green was 5 tons, 1,793 pounds, and when dried 2 tons 1,903 pounds.

Mixture No. 2.—Six pounds of Golden Vine Pease, 6 pounds of Red Fife Wheat, 3½ pounds of Banner Oats. This was cut when the wheat had formed, and was in early milk stage, and gave at the rate of 6 tons 73 pounds, green; and when dried 2 tons 1,407 pounds, losing rather more than No. 1, perhaps on account of being cut a little greener.

The stock ate both mixtures greedily and wasted none.

LATHYRUS SYLVESTRIS WAGNERI.

This has again been allowed to ripen its seed for distribution. I distributed all that was produced last season, but have not yet had any reports.

Neither our cattle nor horses care for it when green. They were led to the plot during June and July, but in no case would they eat it, but preferred the green grasses growing alongside.

In this climate where the clovers, timothy, rye grass and other valuable grasses, grow and produce excellent crops, it does not appear to be worth cultivating.

It may however prove valuable in the interior, where there is a scarcity of rain. As it is said to withstand drought, and if fed a little at a time, cattle might grow to like it.

TURNIPS.

Eleven varieties of turnips were sown alongside, and under precisely similar conditions as to land and treatment.

The sowings were made, as in the case of the mangels, two weeks apart, and the result shows in favour of early sowing.

Name of Variety.	Date of Sowing.	Up.	Yield per Plot.	Yield per Acre.	
			Lbs.	Bush.	Lbs.
Rennie's Prize Purple Top, 1st sowing	May 13..	May 21..	420	616	
do do 2nd do	do 26..	June 1..	197	288	56
Sutton's Champion, 1st sowing	do 13..	May 26..	325	478	30
do 2nd do	do 26..	June 1..	272	398	56
Mammoth Purple Top, 1st sowing	do 13..	May 22..	267	391	36
do 2nd do	do 26..	June 3..	237	347	36
Carter's Prize Winner, 1st do	do 13..	May 20..	308	485	4
do 2nd do	do 26..	June 1..	227	339	56
Selected Purple Top, 1st sowing	do 13..	May 21..	339	497	72
do 2nd do	do 27..	June 2..	252	369	36
Jumbo, 1st sowing	do 13..	May 21..	291	426	48
do 2nd do	do 27..	June 1..	202	296	16
Carter's Elephant, 1st sowing	do 13..	May 21..	390	572	10
do 2nd do	do 26..	June 1..	252	374	
Bangholm Improved, 1st sowing	do 13..	May 21..	400	586	40
do 2nd do	do 27..	June 1..	251	368	8
Selected East Lothian, 1st sowing	do 13..	May 21..	305	447	20
do 2nd do	do 27..	do 31..	188	275	44
Skirving's Purple Top, 1st sowing	do 13..	do 29..	340	498	40
do 2nd do	do 27..	June 12..	242	354	56
Monarch 1st sowing	do 24..	May 31..	320	469	20
do 2nd do	June 7..	June 12..	212	310	56

Three additional plots of turnips were sown on June 14th.

Two new varieties were sent by Mr. Simmers, seedsman, Toronto, and for comparison Rennie's Prize Purple Top was sown alongside. As the quantity of seed of the new varieties was limited, it was all sown on the same day. All of these varieties would have given a heavier crop if sown a month earlier.

Name of Variety.	Date of Sowing.	Date of coming up.	Yield per Plot.	Yield per Acre.		Remarks.
			Lbs.	Bush.	Lbs.	
Simmers' Champion	June 14..	June 18..	308	451	44	Round, smooth roots; small tap root; top small and close to the bulb; very fine even crop.
Simmers' Giant	do 14..	do 18..	336	492	48	Long, well formed, smooth bulb; top strong and healthy.
Rennie's Prize Purple Top	do 14..	do 18..	422	618	56	Bulb smooth, well shaped and even.

ROOT CROPS.

Two sowings each of mangels, turnips and carrots were made.

MANGELS.

Ten varieties of mangels were sown. Two sowings were made two weeks apart. The season has been a very poor one for mangels, the spring growth was very slow, and when the drouth set in they almost stopped growing.

It will be seen that the late sown seed produced a much lighter crop than the earlier sown, with two exceptions, viz., Erfurt Model and Canadian Giant:—

Name of Variety.	Date of Sowing.	Date of coming up.	Yield per Plot.	Yield per Acre.	
			Lbs.	Bush.	Lbs.
Erfurt Model, 1st sowing	May 12	May 22	164	240	32
do 2nd do	do 26	June 4	183	268	24
Mammoth Long Red or Gate Post, 1st sowing	do 12	May 21	206	302	12
do do 2nd do	do 26	June 4	112	164	16
Canadian Giant, 1st sowing	do 12	May 22	158	231	44
do 2nd do	do 26	June 3	176	258	08
Giant Yellow Intermediate, 1st sowing	do 12	May 23	188	275	44
do do 2nd do	do 26	June 2	130	190	40
Champion Yellow Globe, 1st sowing	do 12	May 23	126	184	48
do do 2nd do	do 26	June 5	102	149	36
Red Globe, 1st sowing	do 12	May 22	88	129	04
do 2nd do	do 26	June 5	80	117	20
Golden Tankard, 1st sowing	do 12	May 21	74	108	31
do 2nd do	do 26	June 4	60	88	00
Red Fleshed Tankard, 1st sowing	do 12	May 22	90	132	00
do 2nd do	do 26	June 3	78	110	44
Warden Orange Globe, 1st sowing	do 12	May 22	120	176	00
do do 2nd do	do 26	June 4	80	117	20
Mammoth Long Red, 1st sowing	do 12	May 21	110	161	20
do do 2nd do	do 26	June 3	94	121	18

CARROTS.

Nine varieties of carrots were sown on land that had been in pease the year previous, and in fodder corn in 1891, and had never had any manure. This, with the unfavourable year and late sowing, accounts for the light yield.

Name of Variety.	Date of Sowing.	Up.	Pulled.	Yield per Plot.	Yield per Acre.
				Lbs.	Tons. Lbs.
Improved Short White, 1st sowing	May 15	May 25	Oct. 31	171	12 1,080
do do 2nd sowing	do 22	June 7	do 31	80	5 1,733
Early Gem, 1st sowing	do 15	May 26	do 31	101	7 813
do 2nd sowing	do 29	June 8	do 31	74	5 852
Mammoth White Intermediate, 1st sowing	do 15	May 25	do 31	130	9 1,067
do do 2nd sowing	do 29	June 8	do 31	132	9 1,353
Carter's Orange Giant, 1st sowing	do 15	May 25	do 31	120	8 1,600
do do 2nd sowing	do 29	June 7	do 31	103	7 1,105
Chantenay ½ long Scarlet, 1st sowing	do 15	May 24	do 31	114	8 720
do do 2nd sowing	do 29	June 7	do 31	82	6 27
White Belgian, 1st sowing	do 24	do 2	do 31	124	9 186
do 2nd sowing	June 7	do 13	do 31	102	7 960
White Vosges, 1st sowing	May 24	do 1	do 31	134	9 1,653
do 2nd sowing	June 7	do 13	do 31	88	6 907
Long Red Coreless, 1st sowing	May 24	do 2	do 31	106	7 1,573
do 2nd sowing	June 7	do 13	do 31	78	5 1,388
Danvers Orange, 1st sowing	May 24	do 2	do 31	140	10 533
do 2nd sowing	June 7	do 13	do 31	90	6 1,200

SUGAR BEETS.

Four varieties of sugar beets were sown. Two sowings of each variety were made in rows 30 inches apart and the plants thinned to about 6 inches in the rows. Three rows 66 feet long were weighed and the yield per acre computed.

The following is the yield per plot and per acre:—

Name of Variety.	Date of Sowing.	Up.	Pulled.	Yield per Plot.	Yield per Acre.
				Lbs.	Tons. Lbs.
Klein Wanzleben, 1st sowing	May 24	June 3	Nov. 1	102	4 976
do 2nd sowing	June 7	do 16	do 1	72	3 336
White Improved (Vilmorin's), 1st sowing	May 24	do 3	do 1	124	5 912
do do 2nd sowing	June 7	do 17	do 1	102	4 976
Greentop Brabant, 1st sowing	May 24	do 3	do 1	98	4 624
do do 2nd sowing	June 7	do 16	do 1	74	3 522
French (very rich), 1st sowing	May 24	do 4	do 1	98	4 624
do do 2nd sowing	June 7	do 15	do 1	64	2 1,642

POTATOES.

Thirty-one varieties of potatoes were planted this year, some of them have been tested before, but many of them for the first time. Owing to cold wet weather in spring, and a period of very hot dry weather when it did clear up, the potato crop is rather light in this locality.

Name of Variety.	Planted.	Date of coming up.	Growth.	Matured.	Size.	Weight.	Yield per acre.	Market-able.	Rotten.
						2 rows, 66 ft. Lbs.	Bush.	per cent.	Lbs.
Everett	May 16	June 8	Slender	Early	Medium	108	216	80	
Daisy	do 16	do 6	do	do	Small	60	120	75	7
Early Sunrise	do 16	do 6	do	do	Medium	100	200	75	10
Sharpe's Seedling	do 16	do 7	Medium	do	do	80	160	60	
Crown Jewel	do 16	do 6	Slender	do	do	83	166	70	
Holborn Abundance	do 16	do 8	Strong	Late	Large	145	290	80	
						1 row, 66 ft.			
Northern Spy	do 16	do 7	Medium	Early	Medium	42	168	80	
						2 rows, 66 ft.			
Dakota Red	do 16	do 9	do	Late	do	124	248	80	
State of Maine	do 16	do 6	Slender	do	do	106	212	70	13
Burpee's Extra Early	do 16	do 7	Medium	Early	do	86	172	60	4
Polaris	do 16	do 7	Slender	do	Small	90	180	50	3½
Bruces W. Beauty	do 16	do 9	Medium	do	Medium	96	192	60	
						1 row, 66 ft.			
Pearce's Prize Winner	do 16	do 8	do	do	do	60	240	70	1½
						1 row, 33 ft.			
Toronto Queen	do 16	do 9	Slender	do	do	24	192	75	1
						1 row, 33 ft.			
Earliest of all	do 16	do 6	do	do	do	21	168	75	
American Giant	do 16	do 8	Medium	Late	do	24	192	80	
						1 row, 66 ft.			
New Variety No. 1	do 16	do 9	Strong	do	do	54	216	90	
I.X.L.	do 16	do 9	Medium	do	do	54	216	90	
Chicago Market	do 16	do 11	do	do	do	74	296	80	
						1 row, 33 ft.			
Green Mountain	do 16	do 8	Slender	do	do	38	304	75	2
Rural Blush	do 16	do 12	do	do	Small	25	200	70	
						1 row, 66 ft.			
Early Rose	do 16	do 6	Medium	Early	Medium	58	232	80	
						2 rows, 66 ft.			
Clarke's No. 1	do 16	do 9	do	Late	do	140	280	80	3
Vanguard	do 16	do 11	Slender	Early	do	100	200	75	3

						1 row, 66 ft.			
Empire State	May 16	June 9	Strong	Late	Large	94	376	80	6½
						2 rows, 66 ft.			
Algoma No. 1	do 24	do 18	Slender	Early	Small	52	104	60	....
Delaware	do 24	do 20	Medium	do	do	54	108	75	2
Lee's Favorite	do 24	do 19	do	Late	do	40	80	60	....
Early Puritan	do 24	do 20	do	Early	do	54	108	75	2½
						1 row, 66 ft.			
Munro County	do 24	do 21	Slender	do	do	35	140	70	....
Lizzie's Pride	do 24	do 20	Medium	do	Medium	34	136	75	....

TEST WITH BORDEAUX MIXTURE.

Only one plot of potatoes was tested with Bordeaux mixture this year. The Dakota Red, which was planted in a dry loam, being used for this test and although there was no rot in either plot, the results show an advantage, more than sufficient to cover the cost of spraying, especially where potatoes are planted in low ground.

The potatoes were sprayed on July 20th, August 10th and 24th, and September 8th. This was oftener than necessary, but there was a considerable quantity of blight on the unsprayed alongside, and the last two sprayings were given to protect from that danger.

The tops of the sprayed remained healthy and vigorous until ripe, there being no blight on the foliage.

—	Date of Planting.	Up.	Size.	Yield per plot.	Yield per acre.	Marketable.	Rotten.
				Lbs.	Bushels.	Per cent.	
Potatoes not sprayed.	May 24..	June 18..	Medium........	124	248	75	
Potatoes sprayed.....	do 24..	do 18..	Above medium .	135	270	85	

HYBRIDS PRODUCED AT AGASSIZ, 1892.

The crosses made last summer by Mr. A. P. Saunders, B.A., and myself, were sown last spring, from which we have quite a number of new varieties of wheat, barley and pease, some of which it is hoped may be useful additions to the lists of these grains.

A number of crosses were made this summer, a few of which have been successful.

Twenty-four varieties of seedling potatoes have been selected from a lot produced from seed, in the summer of 1891. These will be planted another year, and any of sufficient merit will be distributed for testing on other farms.

CAULIFLOWERS.

Fifteen varieties of cauliflowers, were sown in a hot-bed in spring, and transplanted as soon as the plants were large enough.

The varieties were:—Walcheren, Le Normand Short Stem, Autumn Giant, Italian Taranto, Large Algiers, Half Early Dwarf French, Early Dwarf Erfurt, Large Early London, Stadtholder, Early Paris, Thorburn's Nonpariel, Extra Large Erfurt, Gilt Edged Snowball, Early Snowball, Large Early Dwarf Erfurt.

Early Snowball was fit for use August 2nd, which was the earliest, followed by Large Early Dwarf Erfurt, August 10th, and Thorburn's Nonpareil, August 17th; Lenormand's Short Stem, September 1st. Autumn Giant is the latest and one of the best, being large, crisp and fine, and keeps for a longer time than any of the others.

MILLETS.

Three varieties of millet were sown, Pearl Millet, White French Millet and American Millet. Neither Pearl nor White French Millet were worth anything, only growing from two to five inches high and not heading out. The American grew from nine to fifteen inches, but did not head out nor did it stool. It yielded less than one ton per acre.

HEMP.

A small plot of hemp was sown, but it did not do very well, it grew fifteen to twenty-four inches high and very slender.

JUTE.

A plot of this plant was sown, but it only grew from six to ten inches high, and an early frost in October killed it.

PEANUTS.

A small quantity of peanuts were planted in warm sandy loam on the bench. Above ground the growth has only been from six to ten inches, and below, the nuts did not develop larger than small pease.

SUNFLOWERS.

Five pounds of Giant Russian Sunflower seed was sown in May. It was sown at the rate of nearly ten pounds per acre with a Planet Jr. seed drill in rows three feet apart, and thinned when about a foot high to about twelve inches in the row.

On October 16th and 17th the heads were taken off, to mix with the corn in the silo. The weight of heads produced was 9,690 pounds, or at the rate of over eight tons per acre.

APPLES.

The severe winter no doubt shortened the apple crop, but otherwise there was no damage done to the trees on the Experimental Farm.

Although some of the varieties were brought from as far south as Texas, they have made a strong growth, and appear to be equal to any demands made on them by the climate here.

Quite a number of the trees planted in the spring of 1890 fruited this year, and we were able to contribute some fine apples, as well as plums, to the Experimental Farm Exhibit at Chicago, and also to make a small exhibit of fruit at some of the British Columbia Exhibitions.

The following varieties fruited this year:—

Red Astrachan, Fameuse, Wealthy, Alexander, Ben Davis, Baldwin, Yellow Transparent, Tetofsky, Maiden's Blush, Duchess of Oldenburg, American Golden Russet, Gravenstein, Spitzenburg.

These fruited freely, and are too well known in British Columbia, to need any comment on them.

Ribston Pippin.—This has proved with us to be a very desirable apple. It fruits young, fruit above medium size, and is free from spot or scab, and is of first quality, keeps well up to the middle of March.

Hurlbut.—Is an apple not very well known in British Columbia. Fruited first time with us this year, fruit above medium size and rather handsome, yellow with red stripes, and although not yet fit for use, promises to be a very desirable early winter apple, either for dessert or cooking.

Colvert.—Above medium, very irregular in shape, not of very high quality.

Red Bietigheimer.—A very large handsome fruit, liable to spot.

Warner's King.—Very large, green with a blush on the sunny side; may be valuable for cooking.

McMahan's White.—Large and very handsome, a free producer, and a strong vigorous grower; may be desirable as a cooking apple.

St. Lawrence.—Productive and handsome, a medium sized winter apple.

Red Canada.—Small medium; productive, a winter apple.

Hastings.—A medium sized winter apple.

Fanny.—Of medium size and productive.

Keswick Codlin.—Large and a free producer, handsome, and a desirable fall cooking apple.

Walbridge.—Medium size. Tree vigorous, but not very productive when young. The Walbridge trees were three years old when planted (the only trees of that age put out) and only produced about five apples each this year.

Seek-no-Further.—A large fine cooking apple, moderately productive, quality good. Season September to November.

Longfield.—A very handsome medium sized apple. Bears young, and apt to be very small unless severely thinned; a juicy pleasant late fall and early winter dessert apple.

Bombshell.—Above medium in size, very irregular in shape, a fall apple, not valuable.

Cooper's Market.—Above medium in size, a winter apple.

Grimes Golden.—Medium. Very clean and free from blemishes. Tree vigorous and productive, at this date very hard, a winter apple.

Fall Jenneting.—Of large size and inclined to spot. Tree vigorous and fairly productive, a fall apple.

Haas.—Fruit above medium size, tree vigorous and productive; a fall apple.

Jonathan.—Small. Tree a slow grower, and not very productive.

Salome.—Medium size. Tree vigorous, very few apples this year.

Waxen.—Medium to large, tree vigorous, a very few apples.

Wellington.—Large tree, vigorous, only a few apples.

Sweet Bough.—A large handsome apple, useful for dessert.

Golden Sweet.—Medium large, desirable for early autumn; dessert.

Talman Sweet.—Medium in size. Tree a moderate grower. productive.

Quite an additional number of varieties produced two or three apples, these will be referred to later when the crop is larger.

A large number of varieties have been planted this year, some of which have been obtained from England and others from different American nurseries.

From England.

Ashmead's Kernel Improved, Bismarck, Claygate Pearmain, Cockle Pippin, Cox's Orange Pippin, Devonshire Quarrenden, Dutch Mignonne, Golden Harvey, Golden Nonpareil, Juneating Red, King of the Pippins, Mannington's Pearmain, Margil, Peasgood's Nonesuch, Rosemary Russet, Tyler's Kernel, Washington, Wyken Pippin, Yellow Ingestre.

From other sources:

Golden, Stone Niemetz, No. 331, Early Bogdanoff, Renaud's Seedling, Arabka Winter; Walworth Pippin, Simbirsk No. 11, Stone Antonovka, Crimean Bogdanoff, Bogdanoff, Royal Table, Blushed Calville, Golden Reinette, Early Strawberry, Early Pennock, Golden Sweet, Summer Pippin, Summer Redstreak, Sops of Wine, Sweet June, Trenton Early, Cole's Quince, Dyer, Fall Wine, Fall Winesap, Fall Orange, Fulton, Flora Belle, Porter, Ramsdell's Sweet, Switzer, Shockley, Arkansas Beauty, American Beauty, Bauman's German, Borsdorf, Black Twig, Big Romanite, Carthouse, Clayton, Day, Fink, Iowa Blush, Ishams Sweet, Ingram, June Market, Lansingburgh, Milan, Minkler, Missouri Superior, Perry Russet, Plum's Cider, Price's Sweet, Pumpkin Sweet, Roman Stem, Rubicon, Red Winter Pearmain, Shannon Pippin, Sweet Spitzenburg, Shackelford, Smoke House, Utter's Large Red, Vandevere Pippin, White Winter Pearmain, Wythe, Waxy Juicy, Western Beauty, Yellow Newtown Pippin, Rebel, Frazer River Beauty, British Columbia, Clayton, Garfield Sugar, Lindsay, Cross, Grandmother, Volga Anis, Streaked Sweet, No. 379, Champagne, Romna, Striped Anis, Hebron, Klinett, Which with those previously planted, makes 289 varieties of apples.

PEARS.

This has been a decidedly poor year for pears in this valley. Very few trees bore any fruit this year, but we have no losses to report, and the severe winter did not affect the growth which has been strong and vigorous.

Large additions have been made to the pear orchard, trees having been received from England and from different nurseries in America, Amongst others from England this year are two William's Bon Chrétien, or Bartlett. It will be interesting to note what difference, if any, climate has made in this popular variety. The trees previously planted, having been obtained from trees many years in America.

New varieties planted in 1893 *imported from England.*

Aston Town,	Bergamotte d'Esperin.	Gansel's Bergamot,
Huyshe's Bergamot,	Beurre Baltet Père,	Beurre Brown,
Beurre d'Amanlis,	Beurre d'Aremberg,	Beurre de Capiaumont,
Beurre Rance,	Bon Chrétien,	Catillac,
Chaumontel,	Citron des Carmes,	Colmar d'Eté,
Compte de Lamy,	Conseiller de la Cour,	Dr. Jules Guyot,
Doyenne d'Alencon,	Doyenne du Comice,	Durondeau,
Fondante d'Automne,	Fertility,	Forelle,
General Todtleben,	Glou Morceau,	Gratiole of Jersey,
Hacon's Incomparable,	Hessle,	Jargonelle,
Madam Treyve,	Magnate,	Marie Benoist,
Marie Louise d'Uccle,	Knight's Monarch,	Nouvelle Fulvie,
Nouveau Poiteau,	Princess (Rivers),	St. Swithin's,
Thompson's,	Triomphe de Vienne,	Uvedale's St. Germain.
Van Mons,		

From American nurseries we have received :—

P. Barry,	B. S. Fox,	Lucy Duke,
Wilder Early,	Directeur Alphande,	Col. Wilder,
Giffard,	Vermont Beauty,	Smith's Hybrid,

Japan Golden Russet, and Seneca.

All of these, notwithstanding the long time some of them were in transit, are alive and have made substantial growth. There are now 112 varieties of standard pears in the orchard.

Dwarf Pears.

The dwarf pear does not seem to endure severe cold so well as standards of the same varieties. Several of the dwarf trees in the orchard died after leafing out this spring, and last year's growth was seriously injured in every case.

PLUMS.

The collection of plums has also been increased by importation from England, and from several other sources, including the Central Experimental Farm

The names of those received this year are as follows :—

From England—

Angelina Burdett, Belgian Purple, Belle de Louvain, Belle de Septembre, Bittern, Cox's Emperor, Curlew, Diamond, Early Favourite, Early Prolific, Early Transparent Gage, Gisborne's, Goliath, Grand Duke, Heron, Huling's Superb, Ickworth's Imperatrice, July Green Gage, Kirke's, New Late Transparent, Magnum bonum Red, Magnum bonum White, Mallard, Mitchelson's, Monarch, Orleans Old, Orleans New, Oullins Golden Gage, Pershore, Reine Claude Rouge, Stint, Sultan, The Czar, Transparent Gage, Cluster Damson, Frogmore Prolific Damson, King of the Damsons, Prune Damson, River's Early Damson.

From other sources:—

Decaisne, Glass Seedling, Forest Rose White Nicholas, Milton, De Soto, Wolf, Early Red, Rockford. Yellow Voronesh, Wyant,

From Messrs. McGill and McDonald, Tenant Prune.

The plum orchard now contains 124 varieties.

Plums.

Quite a number of the plum trees planted three years ago, fruited this year and some varieties were heavily laden, viz.: Moore's Arctic, Lombard, Pond's Seedling, Gueii, Munroe, Duane's Purple, Smith's Orleans, Victoria, Prune d'Agen, and Hudson River Purple Egg.

Name of variety.	Ripe.	Remarks.
Saunders	Aug. 20	Fruit medium size; long, yellow, and of good quality.
Moore's Arctic	Sept. 4	Fruit above medium in size; dark purple; good flavour; tree a very free producer.
Gueii	do 23	Fruited first time this year; averaging 55 lbs per tree; fruit bluish purple of fair quality.
Victoria	do 20	Fruit very large; light red; very handsome and of fair quality. Averaged about 45 lbs. per tree.
Prune d'Agen	do 21	Fruit medium. A free producer; averaging 40 lbs. per tree.
Pond's Seedling	do 28	Fruit large and handsome; egg shaped light red; flesh rather coarse; a free producer; 50 lbs. per tree.
Lombard	do 21	Fruit medium in size; round; pleasant flavour; productive; over 100 lbs. per tree.
Smith's Orleans	do 23	Above medium in size; reddish purple; fine flavour; productive.
Duane's Purple	do 25	Above medium in size; reddish purple. Good quality. Average over 45 lbs. per tree.
Hudson River Purple Egg	do 23	Fruit medium in size. Good quality. Average over 45 lbs. per tree.

THE following trees produced a few plums each.

Varieties.	Ripe.	Remarks.
Peters' Yellow Gage	Sept. 20	Medium to large.
Yellow Egg	do 22	Very large.
Sugar Plum	do 16	Medium.
Damson	Oct. 3	Small.
Reine Claude	Sept. 24	Medium.
Fellenberg	do 18	do
Peach Plum	Aug. 20	Very large.
Coe's Golden Drop	do 26	Large.
Bleeker's Gage	do 20	Medium.
Red Egg	do 20	Large.
Washington	do 19	Above medium.
German Prune	do 26	Medium.
Bradshaw	Sept. 14	Large.
Imperial Gage	do 13	Above medium.
Italian Prune	do 24	Medium.
Columbia	do 20	Very large.
Jefferson	do 12	Medium.
General Hand	do 27	Medium to large.
Niagara	do 14	Large.
Moyer	do 16	Medium.
Large Golden Prolific	do 21	Above medium.
Shippers' Pride	do 24	do

CHERRIES.

The cherries blossomed very freely last spring, but only a few set fruit, and almost all of the fruit fell off when about a quarter grown.

Fig. 1 is from a photograph of a cherry tree at the Experimental Farm, Agassiz, second year from planting, showing the character of the growth.

The extreme cold of last winter, followed by the cold wet weather which continued all through the blossoming season, proved unfavourable for this fruit.

The cherry trees have, however, shown no lack of wood growth, and judging from the fruit buds, there is promise of an abundant crop of this, as of all other fruits next season.

The following additional varieties have been planted this year :—

Arch Duke,	Downton,	Early Lyons,
Early Rivers,	Nouvelle Royal,	Royal Duke,
White Heart,	Shadow Amarelle,	Orel No. 24,
Rose,	Koslov Morello,	Heart Shaped Weichsel,
Gruner Glass,	Glaskirsch Doppelte,	Orel 19,
Strauss Weichsel,	Koeper,	King's Morello.
Orel No. 20,		

There are now 67 varieties of cherry trees in the orchard.

NECTARINES.

Nectarines suffered severely from the cold of last winter. On nearly every tree the previous year's growth was killed and had to be removed, and in young trees that is nearly all the growth there is the first spring. Most of the trees have, however, made a fairly strong growth this year.

The new varieties planted this spring are :—

Albert Victor, Humboldt, Hunt's Tawny, and Pine Apple; there are now in all 16 varieties in the orchard.

PEACHES.

Like the Nectarines and Apricots, the peaches suffered very severely from the cold winter. Almost every tree lost the growth of 1892, and several trees of the previous spring's planting died. This did not, in many cases, appear to be due to tenderness of the variety, as in several varieties one tree died and the other lived (in most instances there are only two trees of a variety) and made in some cases a very vigorous growth.

Fig. 2 represents a peach tree, second year from planting, from a photograph.

FIG. 1. CHERRY TREE, SECOND YEAR FROM PLANTING, EXPERIMENTAL FARM, AGASSIZ, FROM A PHOTOGRAPH.

Where the trees were severely pruned back early in spring, they appear to have recovered sooner, and have made better growth than when the pruning was light.

The curl leaf in the peach and nectarine trees was worse this year than it has ever been before, the Malta being the only variety on the level land that was entirely healthy.

The varieties received in spring from England and planted on the level land were just as badly affected as the others. Among those affected, those that suffered least, were: Crawford's Early, Redcheek Melocoton, and Lemon. The first and second bench orchards suffered alike with those on the level ground, but the orchard highest up at an elevation of about 800 feet had no curl in any case, and the trees appear to have suffered less from the cold than those lower down.

The varieties of peaches in this orchard are:

Early Crawford, Hilborn, Mountain Rose, Crane's Early Yellow, Lewis Seedling; of Nectarines the Boston is the only sort planted there.

These varieties were procured from the same source as those in the orchards on the lower levels, were planted about the same time, and the conditions as to soil, aspect and protection, are very much the same, the only difference being in elevation.

The additions in 1893 to the collection are the following:—

Barrington, Crimson Galande, Condor, Dr. Hogg, Grosse Mignonne, Noblesse, Sea Eagle, Stirling Castle, Sulhampstead, Violette Hative, Walburton Admirable.

These were from England; and Longhurst and Fitzgerald, Canadian; making now 139 varieties in all.

FIG. 2. PEACH TREE, SECOND YEAR FROM PLANTING, EXPERIMENTAL FARM, AGASSIZ, B.C.. FROM A PHOTOGRAPH.

APRICOTS.

The Apricots suffered severely from the cold winter. A few feeble blossoms appeared, but no fruit set, and some of the trees have made very feeble growth. Three have died, quite a number have lost several large limbs, but I hope these may recover.

Only two new varieties have been planted this year: Harris and Misch Musch.

FIGS.

All but two fig bushes died from the effects of the cold weather, the survivors are: One Brown Turkey and one Early Violet which were only killed to the ground and have sent up strong shoots. The others have since been replaced with the following varieties:—

Roi du Noir, Brown Ischia, Madeleine, Pregussata, Brown Turkey, Col de Signora Bianca, White Genoa, Castle Kennedy, Black Ischia.

There are now 10 varieties of figs in the plantation, all looking well.

BENCH PLANTING.

The Apple, Pear, Plum, and Cherry Trees, in all of the bench orchards have made a vigorous growth this year, and the peaches as mentioned elsewhere have been entirely free from curl leaf on the highest bench.

There has been planted on the benches a large number of nut bearing trees of different varieties. Black Walnut, Butternut, Hickory nut, Chestnut, and between three and four thousand timber trees, such as different varieties of Ash, Elm, Oak, Maple, White Pine, Black Cherry, Locust, Beech and Birch. These are doing well and making satisfactory growth although there was no preparation of the ground, or care of the trees after planting, the only expense being in planting carefully, and then letting the trees take their chances. In all about 4,000 forest trees have been planted on the bench.

GRAPES.

No new additions have been made to the collection of grapes, and only three varieties have had any fruit this season, in no case were the bunches or berries perfect, and none of them ripened. The cold wet weather delayed growth so much and there was not heat enough to ripen the fruit, the collection consists of 90 varieties embracing most of the desirable sorts.

NUTS AND MULBERRIES.

An orchard has been planted containing a few trees each of English, American and Japanese Walnuts; Spanish, American and Japanese Chestnuts; Hickory, Chinquapin and Pecan nuts; Downing's everbearing New American, Black and White English Mulberries. These were put out last spring and have made good growth.

Also an orchard of hard and soft shell and Lanquedoc Almonds, and Cosfords, Pearson's Dwarf Red, White and Cut leaved filberts. These have all made satisfactory progress, and the Cosford filbert although transplanted from the nursery row very late, has borne very fine nuts this season.

The almond appears to be hardier than the peach, as the last year's growth of the trees was not seriously injured, and they do not appear to have any leaf disease.

There are now twenty varieties of nuts in the collection.

GOOSEBERRIES.

A large number of gooseberries were received from England last spring, and a few from nurseries in America.

The Downing and Golden Prolific gave a small crop this year. They were sprayed with the Bordeaux mixture which appeared to check the mildew very considerably, but it was not received in time to spray early in spring, and perhaps on that account the benefit was not so great as it would otherwise have been.

The varieties received this year are as follows:—

From England:—Speedwell, Leader, King of Trumps, High Sheriff, Bobby, Blackley Hero, Beauty, Leveller, White Champagne, Red Warrington, Red Champagne, Queen Victoria, Pitmaston Green Gage, Lancashire Lad, Improved Early Hedgehog, Green Overall, Governess, Early Sulphur, Dublin, Bonny Lass, Companion, Eva.

From other sources—Red Jacket, Mountain, Columbus and Oregon Seedling. Which makes in all 38 varieties now in the collection.

CURRANTS, RED AND WHITE.

Owing to the severe cold weather last winter and spring the old currant bushes did not fruit freely this year: their growth during summer has been healthy, and all are promising well for 1894.

The following is a list of the new varieties which have been added this year:—

La Conde, Raby Castle, Knight's Early, White Gondoin, La Hative, Prince Albert, White Transparent, La Fertile, New Red Dutch, London Red. Making 21 varieties in all.

BLACK CURRANTS.

The black currants were a very poor crop, the berries were small and lacking in flavour, and some of them dried up before ripening. The bushes have made a vigorous growth.

The following new varieties have been added to the collection:—Prince of Wales, Russian Black Currant, Baldwin's and Crandall. Making in all 39 varieties.

RASPBERRIES.

Besides those mentioned in my report of 1892, only five new varieties have fruited this year. Of the red berries, the Cuthbert and Saunders' Seedling, Sarah proved the best, and Golden Queen the best of the yellow ones. Several of the newer black caps fruited sparingly, viz.

Cromwell.—Beginning to ripen July 12th. Fruit medium size, only fair in quality, canes vigorous and prolific.

Progress.—Canes vigorous, not very prolific, berry good size, firm and of fair quality. Ripening July 10th.

Thompson.—Fruit small and poor, may be better next year, canes only medium growers. Ripening July 13th.

Palmer.—Vigorous grower, and prolific; berries large, sweet, and of good flavour. Ripening July 8th.

Eight varieties of Raspberries were received from England, and a large number from different nurseries in America, including twelve of the new seedlings from the Central Experimental Farm, giving sixty-three varieties of Red, Yellow and Black Raspberries on trial at present.

The following is a list of those received since 1891:—

Early Ohio, Carman, Nemaha, Champlain, Crimson Beauty, Baumforth's Seedling, Belle de Fonteney, Lord Beaconsfield, Northumberland Fill Basket, White Antwerp, Carters Prolific, Superlative, Fastolf, Muriel, Trusty, Mary, Empire, Duncan, Sir John, Carleton, Lady Anne, Sharpe, Craig, Garnet, Gladstone, Muskingum, Hilborn, Rancocas, Reider, Tyler and Muskegon.

BLACKBERRIES.

Four varieties of Blackberries fruited this year. Agawam, Taylor and Snyder, which were reported as bearing last year and the Kittatinny, which fruited for the first time this year. Each of these varieties produced berries of good size and quality.

The growth this year has been vigorous, and all on hand are likely to fruit next year.

There are now in the collection 26 varieties, of which the following is a list:—

Agawam,	Dallas,	Crystal White,
Dorchester,	Early Harvest,	Child's Everbearing,
Early Cluster,	Gainor,	Early King,
Erie,	Lawton,	Kittatinny,
Minnewaska,	Nevada,	Lovett's Best,
Snyder,	Taylor's Prolific,	Stone's Hardy,
Wilson Junior,	Wilson's Early,	Tecumseh.
Wachusett Thornless,	Thompson's Early,	Western Triumph,
Bruntun,		Evergreen Blackberry.

LUCRETIA DEWBERRIES.

Last year's report of these berries must be repeated this year.
Fruit irregular in size, berries imperfect, and flavour poor.

STRAWBERRIES.

The weather of last winter and spring was very injurious to the strawberry and the crop was light and poor.

None of the later additions to the collection, bore fruit this season.

Another year's experience with the varieties that fruited last year confirms the opinion then formed, that of the number tested, Bubach, Wonderful, Sharpless, Jessie, and, if heavily manured, the Wilson, are the most profitable for market, and for home use, Maggie, Cumberland Triumph and Gandy. These are all very desirable berries.

The following varieties from the Central Experimental Farm, England, and other sources have been added this year:

From the Central Experimental Farm:—

Miller's Seedling, 02,	Westlawn,	Beder Wood,
Staymans No. 1,	Auburn,	Van Deman,
Princess,	Beverly,	Westbrook,
Middlefield,	Martha,	Crawford,
Cameronian,	Gillespie,	Miller's Seedling, H.H.
Ruby,	Yale.	Haverland,
Mrs. Cleveland,	Pearl,	Shirts,
Eureka,	King of the North,	Mammoth,
John Little,	Parker Earle,	Hautbois,
Windsor Chief,	Daisy,	Moore's Prolific,
Sunrise,	Surprise,	Turner's Beauty,
Governor Hoard,	Hoffman's Seediing.	Advance,
Ottawa,	Garibaldi,	Derby,
Castle,	Flora,	Edith,
Ruth,	Countess,	Stanstead,
Early Canada,	Paul,	Bartons,
Nicanor,	Cohansick,	Boynton,
Lady Rusk,		

From England:—

Alexander II.,	Alpha,	Bonny Lass.
British Queen,	Dr. Hogg,	Eclipse,
Empress Eugenie,	John Ruskin,	Laxton Jubilee,
Amateur,	Laxford Hall Seedling,	Sir Joseph Paxton.

From J. T. Lovett, Iowa Beauty, Chairs.

Making 54 varieties, in addition to those already reported on.

FLOWERS AND SHRUBS.

Nearly all of the roses were killed to the ground last winter, but a large number came up from the roots. And in addition, a large collection was received from England in the spring, and they have with very few exceptions, made a fair growth. Such shrubs as the ivy, holly, laurels, ceanothus and wistarias were killed to the ground. Many of these have sent up strong shoots, and will soon recuperate.

Many of the bulbs, such as hyacinths, crocuses, snowdrops, squills and tulips planted last fall were injured, and although many of them bloomed, the flowers were feeble and inferior to those of the previous season.

A fine assortment of gladiolus and dahlia bulbs were received in spring. These made a splendid show in their season. A fine selection of annual flower seeds forwarded from the Central Farm was received and sown, and produced a splendid display of flowers all summer.

HEDGES.

The osage orange hedge planted in the spring of 1892 stood the winter very well, and made a fine growth this summer.

About 600 yards of native cedar have been set out along the road fence, and although the summer has been very unfavourable for transplanted trees and shrubs less than a dozen trees will replant all that are dead.

Thirty-one hedges, of ornamental shrubs, each 66 feet long, were set out last spring and all excepting the Siberian pea have grown with scarcely a gap.

The shelter belt mentioned in my last report has done very well and will soon occupy all the ground. Only about a half dozen trees were required to fill vacancies last spring. A row of maple trees has been planted on both sides of the road which leads from the Harrison Hot Springs road to the buildings, all of which have done well.

A large number of shrubs of various kinds were planted about the grounds, near the buildings and are doing well, and in another year will be an attractive feature of the farm.

LIVE STOCK.

All the live stock continue healthy, and I have to report a good demand for young bulls old enough for service. Since my last report two Shorthorn bulls and one Ayrshire bull have been sold at fair prices.

There have been many inquiries after young pigs, which I hope to be able to supply next season.

The Dorset horned sheep mentioned in my last report, have not yet been very prolific, one lamb is all the produce as yet from the two ewes.

The poultry have suffered from hawks and weasels. These dangers will be lessened when the new poultry house, now in course of construction, is completed.

STALLION.

The Haras National Co. sent out a very good Clyde stallion, and many people expressed a desire to patronize him, but in some instances contracts had been made with owners of other stallions before this one arrived, which necessarily limited the service.

FENCING.

About half a mile of fence has been built, during the last year; and more will be put up as opportunity offers.

EXHIBITIONS.

Quite an assortment of fresh fruit was sent to the Chicago Exhibition for which the Agassiz Experimental Farm received a special award. Exhibits of fruit, and of grain in the straw and cleaned were also made at local exhibitions.

Several exhibitions in various parts of the province were attended, and a marked improvement in many departments noticed, over exhibitions of the past two or three years. Although the fruit exhibit was small, the quality even this year was excellent, and in the interior where irrigation is carried on, the roots were magnificent.

WEATHER.

Months.	Date of Lowest Temperature.	Date of Highest Temperature.	Number of days on which it rained.	Total Rainfall.	Number of Days when Sunshine was Recorded.	Total amount of Sunshine.	Number of Snow Storms.	Amount of Snow which fell.
1893.	°	°		Inches.		Hrs. Min.		Inches.
January........	31st 13	53	11	$4\cdot\frac{24}{100}$	19	67 03	2	1
February.......	2nd 12	20th 52	10	$3\cdot\frac{21}{100}$	14	49 27	9	34
March.........	20th 29	5th 63	14	$6\cdot\frac{74}{100}$	21	87 06	2	1
April..........	18th 32	26th 72	23	$5\cdot\frac{82}{100}$	14	42 33	4	22
May...........	24th 39	27th 80	23	$6\cdot\frac{67}{100}$	21	105 30		
June...........	3rd 39	5th 90	15	$5\cdot\frac{44}{100}$	26	137 42		
July...........	24th 41	30th 91	8	$1\cdot\frac{55}{100}$	29	195 12		
August.........	25th 41	31st 97	6	$1\cdot\frac{83}{100}$	29	244 14		
September......	23th 37	1st 87	14	$4\cdot\frac{98}{100}$	20	107 21		
October........	23rd 29	28th 67	17	$6\cdot\frac{24}{100}$	20	63 00		
November 1st to 15th..........	1st 29	13th 55	11	$7\cdot\frac{11}{100}$	7	27 18	1	$2\frac{1}{2}$

DISTRIBUTION OF GRAIN.

A considerable quantity of grain was distributed last spring, but owing to the lateness of the harvest very few have their threshing done, and in consequence I have only received reports from a few farmers.

VISITORS.

I am pleased to report that the interest taken in the farm is increasing, as evidenced by the greater number of visitors and increase of correspondence.

I have the honour to be, sir

Your obedient servant,

THOS. A. SHARPE,

Superintendent.

Statement of Expenditure on the Dominion Experimental Farms, for the Year ending 30th June, 1893.

CENTRAL EXPERIMENTAL FARM.

Expenditures, 1st July, 1892, to 30th June, 1893.

	$ cts.
Live stock	299 00
Feed for stock, including experimental feeding of steers and swine; also veterinary services	681 57
Seed grain, trees, shrubs, &c	1,301 97
Implements, tools, hardware and supplies	883 43
Draining and drain tiles	184 91
Manure and fertilizers, including wages of teamsters drawing manure from city during winter	1,840 80
Travelling expenses	585 91
Exhibition expenses	88 75
Blacksmithing, repairs to wagons, vehicles, &c.; also harness supplies and repairs	466 01
Books, periodicals and newspapers	212 23
Telegrams and telephones	185 35
Wages, farm work, including experimental work with grain and other farm crops; also salaries of farm foreman and director's assistant in experimental work	6,123 27
Wages, care of stock, including experiments in feeding cattle and swine	1,905 66
do horticultural department, including salary of horticulturist	2,788 47
Poultry department, including salary of poultry manager	1,348 35
Care of forest plantations, grounds and shrubbery	614 34
Dairy department	728 35
Extension of water pipes to buildings	281 13
Contingencies, including building sidewalks, $77.17	459 15
	20,978 65

EXPERIMENTAL FARM, MARITIME PROVINCES.

Expenditures, 1st July, 1892, to 30th June, 1893.

	$ cts.
Feed for stock and veterinary services	44 97
Seed grain, trees, shrubs, &c	132 28
Implements, tools, hardware and supplies	201 42
Draining and drain tiles	660 63
Manure and fertilizers	387 70
Travelling expenses	48 02
Exhibition expenses	36 06
Blacksmithing and repairs	61 24
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,381 48
do care of stock	692 11
do office help	100 00
Contingencies	79 69
	5,225 60

EXPERIMENTAL FARM, MANITOBA.

EXPENDITURES, 1st July, 1892, to 30th June, 1893.

	$ cts.
Feed for stock and veterinary services	64 43
Seed grain, trees, shrubs, &c	441 74
Implements, tools, hardware and supplies	1,096 43
Draining and drain tiles	118 12
Manure and fertilizers	153 93
Travelling expenses	135 65
Exhibition expenses	93 25
Blacksmithing and repairs	291 17
Telegrams and telephones	57 42
Distribution of seed grain	90 56
do forest trees	265 28
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	3,063 03
do care of stock	804 12
do forestry, tree planting	337 50
do office help and mail messenger	230 77
Contingencies, including material and labour in construction of poultry building, $462.31	681 87
	9,325 27

EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

EXPENDITURES, 1st July, 1892, to 30th June, 1893.

	$ cts.
Live stock	389 20
Feed for stock and veterinary services	297 70
Seed grain, trees, shrubs, &c	462 05
Implements, tools, hardware and supplies	691 85
Manures and fertilizers	149 50
Travelling expenses	50 60
Exhibition expenses	113 82
Blacksmithing and repairs	244 67
Distribution of seed grain and forest trees	71 45
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	3,083 23
do care of stock	1,019 50
do forestry, tree planting	136 50
do office help	110 00
Contingencies, including internal fences, $121.49	384 53
	8,604 60

EXPERIMENTAL FARM, BRITISH COLUMBIA.

EXPENDITURES, 1st July, 1892, to 30th June, 1893.

	$ cts.
Live stock	2,112 00
Feed for stock and veterinary services	854 66
Seed grain, trees, shrubs, &c	810 01
Implements, tools, hardware and supplies	944 92
Manure and fertilizers	119 71
Travelling expenses	121 32
Blacksmithing and repairs	21 50
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,844 25
do care of stock	147 30
do forestry, tree planting	131 35
do clearing land, stumping, &c	392 64
do office help	120 00
Contingencies	127 66
	10,147 32

SUMMARY.

TOTAL Expenditure for Experimental Farms, 1892–93.

	$ cts.
Central Experimental Farm, Ottawa	20,978 65
Experimental Farm for Maritime Provinces, Nappan, N.S.	5,225 60
do Manitoba, Brandon	9,325 27
do North-west Territories, Indian Head	8,604 60
do British Columbia, Agassiz	10,147 32
General Expenses.	
Printing and stationery	2,914 24
Seed grain distribution	3,283 44
Forest tree distribution	832 02
Salaries	4,000 00
Chemical department, including salaries of chemist and assistant chemist	2,622 56
Entomological and botanical department, including salaries of entomologist and botanist and assistant	2,455 52
Office help, distribution of reports and bulletins, including salaries of accountant, director's secretary and French correspondents	3,927 55
Testing the vitality of agricultural seeds, &c	683 23
	75,000 00

WM. SAUNDERS,

Director Experimental Farms.

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