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

1891

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APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

OTTAWA, 20th March, 1892.

SIR,—I have the honour to submit for your approval my fifth annual report of the work done and in progress at the several experimental farms, which have, under your instruction, been 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.

These reports will be found to cover experimental work and carefully conducted observations in almost every department of agriculture and horticulture. They also contain much information relating to those branches of chemical work which have a direct bearing on agriculture, and to those departments of entomology and botany which are of practical importance to the farmers of this country.

It is hoped that the facts submitted, and the results of the experimental work recorded in this report, may be helpful to all those engaged in cultivating the soil, and that they may thus aid in furthering the agricultural and horticultural interests of the Dominion.

I have the honour to be, Sir,

Your obedient servant,

WM. SAUNDERS.

The Honourable
The Minister of Agriculture,
Ottawa.

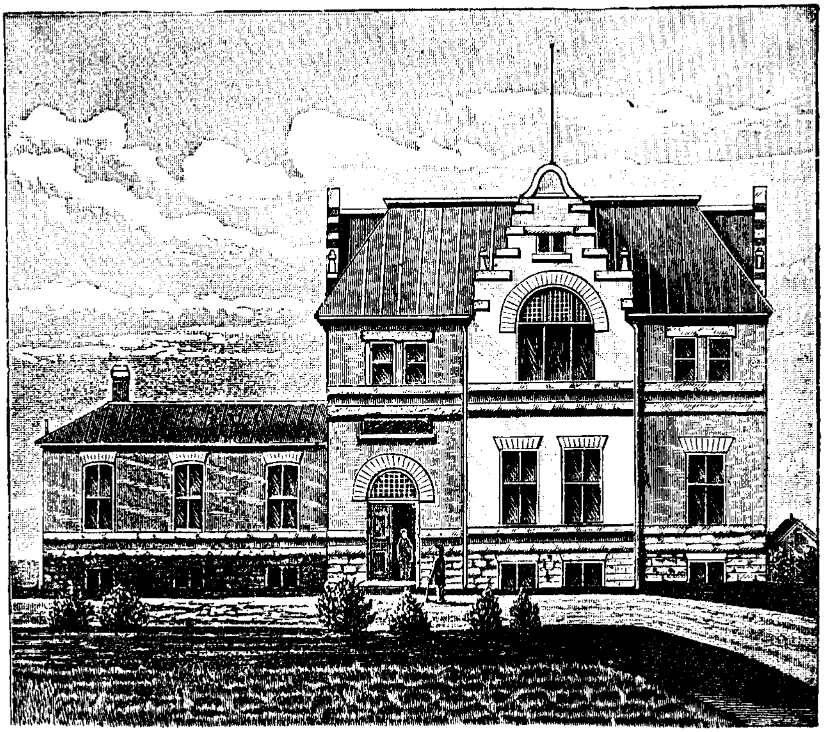

Figure 1.—Office Building, Museum and Chemical Laboratory of the Central Experimental Farm.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS.

REPORT OF THE DIRECTOR.

During the season of 1891 farmers in almost every part of the Dominion of Canada have been blessed with bountiful crops. With few exceptions favourable weather for seeding, growth and harvesting has prevailed from the Atlantic to the Pacific, and the results have been such as to provoke a general spirit of thankfulness among those engaged in agricultural pursuits. Compared with the average of the past nine years, the statistics of Ontario show an increase for the past year in that province in fall wheat of 5·7 bushels per acre; in spring wheat, 5·4 bushels; barley, 3·2; oats, 5·7; peas, 3·6, and of corn in the ear of 9·8 bushels per acre. In turnips the crop has been increased above the average for the period named by 136 bushels per acre; mangels, 76 bushels; carrots, 36 bushels; and potatoes, 28·9 bushels, the only items where there has been any falling off being in beans and hay. The former is less than the average by 1·3 bushels per acre, and the latter by about four-tenths of a ton per acre. This last has no doubt been due to the very dry weather which prevailed generally during the month of June. Farmers have also had favourable results in the Maritime Provinces. In Manitoba and the North-West Territories, notwithstanding the strong winds which prevailed in the spring and the early frosts in autumn, the returns on the whole have been most bountiful. The stores of fertility laid up by nature with so liberal a hand in the soil of those fertile plains promise food and plenty in the future to in-coming multitudes. In British Columbia also almost every sort of crop is said to have been above the average. The outlook from an agricultural standpoint is most encouraging for Canada, for it will be found that associated with the favourable season there have been improvements in the preparation of the soil, in the selection of the seed and in the general management of the crops, showing that increased intelligence is being brought to bear on farm work. The stores of fertility in the soil are being more carefully husbanded by a judicious succession of crops, and greater pains are taken to replace the elements which repeated cropping has removed. The mental inactivity of the past is fast being replaced by a spirit of enquiry which augurs well for the future.

That much may still be done by the farmer to improve his condition and add to his profits will scarcely admit of a doubt, and while there are some conditions which affect his crops which are beyond his control, the intelligent application of improved methods will enable him to make the very best of every favourable circumstance which may arise. One of the most important means of improvement within his reach is the selection of good seed, and it is worth while to pause to consider how much may be involved in this one point, hitherto so often neglected. Every seed has an individuality of its own impressed on it by nature, which, under favouring conditions, will manifest itself. Each is provided with a germ wherein lies this impress of individuality, and this germ is imbedded in a store of such food as is best suited to stimulate the growth of the young plant. When the seed is plump that food supply is bountiful, and the infant plant so nourished makes rapid headway, but where the seed is shrunken and imperfectly developed the store of nourishment is much lessened. After the young plant has begun to grow a period of comparative rest is needed, during which growth above is scarcely perceptible, until the roots are sufficiently extended to gather food for further development; the rapidity with which this progress is made depends very much on the plumpness and inherent vigour of the seed. Crops are thus often enfeebled at the start and delayed in ripening by the use of poor seed, or they ripen unevenly and lack that vigour so necessary to a liberal return.

As an illustration we may take the oat crop. How often it has occurred that farmers have held over for seed such oats as were too poor in quality to sell to advantage, thinking that any sort was good enough for this purpose, and how frequently has the yield been poor and the grain of light weight. It is not unusual for good farmers who provide good seed of fertile sorts to have crops of this grain of from 50 to 60 bushels per acre, while the average is about 35 bushels; by the exercise of greater care in this respect the average production may be materially increased, and every additional bushel per acre would in Ontario alone add to the returns of the farming community nearly $625,000 a year. Or, taking the improvement in another line, it is well known that some farmers by the selection of good plump seed and thorough preparation of the soil grow oats from four to eight pounds heavier per bushel than many of their neighbours. It should not be forgotten that with an equal yield in measured bushels per acre an average increase in the single province of Ontario of one pound per bushel in weight in the entire crop would be a gain to the farmers, basing the estimate on the crop of last year, of $750,000 per annum. An addition of one bushel per acre on the wheat crop of Ontario, including both fall and spring wheat, would in like manner add to the gains of the farmers over $1,300,000 in a single season. These statements respecting wheat and oats will apply with more or less force to every other crop.

Good varieties of grain sometimes deteriorate by long and careless cultivation to such an extent as to make them unprofitable, when they are usually replaced by other sorts. Judicious selection and change of seed would no doubt conserve this fertility and add greatly to the length of life of such varieties. New sorts are obtained either by careful selection and cultivation, by the preservation of occasional sports which occur in nature or by artificial crossing. The watchful farmer may do much to improve his own grain, and furnish good seed to his less thoughtful neighbours by the first method, and occasionally secure new varieties by the second, but the third requires much more skill and care and is usually practised only by the expert in such matters. On the experimental farms all these methods are in operation, and in a very few years a large number of new sorts which have been originated in this climate will be available for test in different parts of the Dominion.

DISTRIBUTION OF SEED GRAIN.

In view of the importance of placing within the reach of Canadian farmers the best varieties of seed grain obtainable, all the most promising sorts are yearly brought together and tested at the experimental farms. The crops of such sorts as are likely to be generally useful are preserved, and under instruction of the Minister of Agriculture distributed the following season to those who apply for them as long as the supply lasts. The character of this free distribution is sometimes misunderstood. Some farmers think they have the right to demand samples of the seed of every sort of grain and crop grown on the farm, and lists are often received covering several pages of a letter enumerating all sorts of grain, vegetable seeds, bulbs, flowers, &c., which they desire to have sent them; others, again, will ask for seed sufficient for from 10 to 50 acres of land. It is not intended that this branch of the work of the experimental farms should in any way interfere with the business of the seedsmen, but to limit the distribution mainly to such varieties of seed grain as are not easily obtainable in the ordinary channels of commerce. The weight of each sample is limited to three pounds, and the number sent to each farmer is usually two or at most three, so that the supply available may be made to cover every year a large area in the country.

The samples sent out in the early months of 1891 were distributed as follows:—

Prince Edward Island.

Oats	107
Barley	50
Wheat	64
Peas	18
Indian corn	225
Potatoes	4
	468

Number of applicants supplied, 256.

Nova Scotia.

Oats	343
Barley	285
Wheat	300
Peas	63
Indian corn	695
Spring rye	27
Potatoes	31
	1,744

Number of applicants supplied, 1,000.

New Brunswick.

Oats	174
Barley	51
Wheat	88
Peas	55
Potatoes	1
	369

Number of applicants supplied, 244.

Quebec.

Oats	1,380
Barley	960
Wheat	296
Peas	280
Spring rye	109
Potatoes	89
Indian corn	2
	3,116

Number of applicants supplied, 1,205.

Ontario.

Oats	1,880
Spring wheat	950
Barley	860
Peas	440
Spring rye	4
Indian corn	10
Potatoes	105
	4,249

Number of applicants supplied, 1,575.

Manitoba.

Oats	468
Wheat	251
Barley	159
Peas	154
Indian corn	21
Potatoes	2
	1,055

Number of applicants supplied, 406.

North-West Territories.

Oats	267
Barley	260
Wheat	210
Peas	149
Indian corn	6
Potatoes	3
	895

Number of applicants supplied, 313.

British Columbia.

Oats	109
Barley	179
Wheat	62
Peas	30
Spring rye	9
Potatoes	1
	390

Number of applicants supplied, 141.

The following list shows the number of 3-lb. packages of the different varieties which have been distributed:—

Oats.

Prize Cluster	2,801
Victoria Prize	540
Flying Scotchman	531
Bonanza	383
Banner	378
American Triumph	71
Egyptian	24
Total	4,728

Barley—Two-rowed.

Carter's Prize Prolific	801
Danish Chevalier	650
Golden Melon	399
Webb's Kinver Chevalier	359
Carter's Goldthorpe	275
Saale	190
Beardless	46
Large Two-rowed Naked	20
Total	2,740

Barley—Six-rowed.

Baxter's Six-rowed	40
Indian from Spiti valley	24
Total	64

Spring Wheat.

Campbell's White Chaff	983
Ladoga	956
Red Fife	268
Johnston's Defiance	9
Total	2,221

Peas.

Multiplier	1,189

Indian Corn.

Pearce's Prolific Red Cob Ensilage Canada Yellow	885
Thoroughbred White Flint	74
Total	959

Rye.

Spring rye	149

Potatoes.

Chicago Market	96
Early Ohio	70
Early Sunrise	68
Rural Blush	1
Total	235

Total number of samples distributed, 12,285.

Number of applicants supplied, 5,140.

REPORTS RECEIVED FROM SAMPLES DISTRIBUTED, WITH SOME RESULTS OF FIELD CROPS.

PRIZE CLUSTER OATS.

This variety of oats has again given good returns. At the Central Experimental Farm the yield has varied on different soils from 84 bushels and 4 lbs. to 28 bushels 28 lbs., weighing about 42 lbs. per bushel. A large field averaged 48 bushels 24 lbs., and it was considered that one-fourth of the grain was beaten out by a hail storm, which occurred after cutting and while the grain was in stook. On the experimental farm at Nappan, N. S., the yield in plot culture has been quite phenomenal, having reached 104 bushels 19 lbs. per acre, weighing 38½ lbs. per bushel. At Brandon, Man., these oats have given 54 bushels 15 lbs. per acre, weighing 39 lbs. per bushel, and at Indian Head, N.W.T., 82 to 86 bushels per acre, the grain having reached the extraordinary weight of 47 to 48½ lbs. per bushel. At Agassiz, B. C., the return has been smaller, being 28 bushels 28 lbs. per acre. These oats maintain their character for earliness, ripening usually from two or three days to a week earlier than many other sorts. In the following series of results by provinces, a summary is first given, followed by extracts from a few of the reports received from those farmers who have had the largest yields from the 3-lb. samples:—

PRINCE EDWARD ISLAND.

Number of reports received, 16; average yield from 3 lbs., 63$\frac{13}{16}$ lbs.; average weight per bushel, 43$\frac{1}{16}$ lbs. The heaviest sample weighed 45 lbs. per bushel, and was grown by Robert Wood, of Mount Herbert, who reports a yield of 60 lbs.

John Clark, of Alberton, had 85 lbs. from the 3 lbs. sown, and says: "Sown broadcast on heavy clay land 29th April; harvested 25th August; no rust or smut; straw very strong and white. This grain ripens ten days earlier than any other." The sample returned weighed 42½ lbs. per bushel.

Robert Shaw, of Piusville, reports a yield of 70 lbs. He says: "Sown broadcast 2nd June on heavy land newly burnt; harvested 5th September; no rust or smut; straw bright; ripens earlier than any other oats sown and gives double the yield. Would like you to favour me with some more samples." This grain weighed 44 lbs. per bushel.

NOVA SCOTIA.

Number of reports received, 50; average yield, 63¼ lbs.; average weight per bushel, 40¼ lbs. The heaviest sample was grown by Andrew McFarlane, of Antigonish; it weighed 44¼ lbs. and the yield was 55 lbs.

James Northrup, of Harbourville, reports a yield of 155 lbs. from a sowing of ⅞ths of 3 lbs. of seed, and says: "Sown in drills 25th May on dry, loamy soil; harvested 14th September; there was no rust, but some smut; straw very stout; several days earlier than the Banner or any other kind that I sowed, and heavier. I consider them very fine oats." The sample returned weighed 39 lbs. per bushel.

H. Sabean, of New Tusket, harvested 150 lbs. from 3 lbs. sown, and reports as follows: "Sown broadcast 3rd May on gravelly loam; harvested 12th August; no rust or smut; straw very stout; ripens early; heavier than any other sort sown." Sample returned weighed $42\frac{1}{4}$ lbs. per bushel.

Jabez McLennan, of North Brookfield, reports a yield of 143 lbs. from 3 lbs. sown, and says: "Sown broadcast 10th May on rich, dry, loamy soil, top dressed with ashes; harvested 15th August; no smut or rust; straw very bright; stood up well; ripened about as other grain alongside; weighed much heavier, the heaviest oats I have ever seen." The sample returned weighed $42\frac{3}{4}$ lbs. per bushel.

NEW BRUNSWICK.

Number of reports received, 31. The average yield was $63\frac{1}{31}$ lbs. and the average weight 40 lbs. per bushel. The heaviest sample weighed $43\frac{3}{4}$ lbs. This was grown by H. V. Price, of Rogersville, who had a yield of 59 lbs.

J. E. Babineau, of Robichaud, reports a yield of 163 lbs. from 3 lbs. sown. He says:—Sown with the hand on heavy damp soil on the 27th of May; harvested 2nd September; no rust or smut; straw very large; ripens a little sooner than other oats, and much heavier." The weight of the sample returned was 40 lbs. per bushel.

William McCullough, of Manners Sutton, had 111 lbs. from 3 lbs. sown, and says: "Sown broadcast 24th May on light loam, top dressed; harvested 25th September; no rust; a little smut; straw very coarse; not as early as other grain, but ripened even." Weight of sample returned, $38\frac{1}{4}$ lbs. per bushel.

David Cunningham, of Hanwell, had a crop of 90 lbs., and reports as follows:—"Sown broadcast 12th May, on black loam; harvested 21st August; no rust or smut; straw very stout; as early as other sorts, with a better yield. I think them a good oat for this place." Weight of sample returned, 40 lbs. per bushel.

QUEBEC.

Number of reports received, 171; average yield, $70\frac{1}{2}$ lbs.; average weight per bushel, $39\frac{5}{28}$ lbs. The heaviest sample weighed $44\frac{1}{4}$ lbs. per bushel, and was grown by Joseph Guay, of Piopolis, who reports a yield of 85 lbs.

M. Godmer, of Ste. Adèle, reports a yield of 297 lbs. from 3 lbs. sown. He says: "Sown broadcast 8th May, on sandy loam, 86 x $86\frac{1}{2}$ feet; harvested 29th August; no rust or smut; straw much the same as others; grain heavier and earlier." The sample returned weighed $40\frac{1}{4}$ lbs. per bushel.

S. Audette, of St. Ubalde, had a yield of 220 lbs., and reports as follows: "Sown broadcast 20th May, on clay soil; harvested 10th September; there was much rust but no smut; earlier than other sorts and heavier also. If straw had kept straight up think I would have had 100 lbs. more." The sample returned weighed $34\frac{1}{2}$ lbs. per bushel.

George Maynard, of St. Foy, reports a yield of 162 lbs. from 3 lbs. of seed. He says: "Sown broadcast 8th May, on sandy soil, which grew oats last year; harvested 24th August; no rust or smut; straw of good quality; grain heavier and earlier than other sorts." The sample returned weighed $42\frac{1}{4}$ lbs. per bushel.

ONTARIO.

Number of reports received, 183; average yield, $89\frac{17}{18}$ lbs.; average weight per bushel, $38\frac{3}{4}$ lbs. The heaviest sample weighed $45\frac{1}{2}$ lbs. per bushel and was grown by P. Meiklejohn, of Sargison, who reports a yield of 129 lbs.

P. Generaux, of Nosbonsing, reports a yield from 3 lbs. sown of 6 bushels and 17 lbs. (221 lbs.) He says: "Sown 14th May on heavy sandy loam, 64 x 64 feet; harvested 25th August." The sample he returned weighed $39\frac{1}{2}$ lbs. per bushel.

John Edwards, of Rockland, had 190 lbs., and says: "Sown 29th April on clay loam, spring ploughed and top dressed with manure; plot 24 x 180 feet; harvested

5th August; no rust or smut; straw grew about 3 feet high and stood well. This grain is better than any ever raised on the farm." The weight of the sample returned was 36¾ lbs. per bushel.

Wm. Dunn, Sweet's Corners, had 170 lbs. from 3 lbs. sown, and says: "Sown in drills 1st May, on clay loam; sod ploughed in the fall; plot 33 x 154 feet; harvested 14th August; no rust; no smut; nice bright straw, 3 feet high. I think they are very fine oats. I will have enough to sow two acres next year." The sample returned weighed 37 lbs. per bushel.

John Wiley, of Foye's Hill, had 168 lbs. of oats, after cleaning, from 3 lbs. sown. He says: "Sown 12th May, on clay loam, top dressed; harvested 18th August; no rust; no smut; straw very long and stiff, clean and bright; ripened ten days earlier than our other oats and are heavier. They are the best oats grown in this section; took first prize at two of our township fairs." The weight of the sample returned by Mr. Wiley was 42½ lbs. per bushel.

MANITOBA.

Number of reports received, 25; average yield, 88½ lbs.; average weight per bushel, 37⅓ lbs. The heaviest sample weighed 44¼ lbs., and was grown by A. Malcolm, of Oak Lake, who reports a yield of 20 lbs., and says that blackbirds destroyed most of the crop. George Forbes, of Rothwell, reports a yield of 200 lbs. from 3 lbs. He says: "Sown 27th April, on rich black loam; size of plot, 30 rods, and the width of a Patterson drill, every second cup stopped, and set at 1 bushel per acre; afterwards hoed between the rows. Harvested 1st September; had eleven stooks; badly rusted; no smut; straw very strong, over 6 feet long; think I would have had 400 or 500 lbs. only for rust and blackbirds. Am very proud of these oats; will give them a better chance next year and report again." The sample returned weighed 36½ lbs. per bushel.

Chas. E. Ivens, of Virden, had a yield of 192 lbs. He says: "Sown 7th May, in drills 14 inches apart, on black loam 2 feet deep; 624 square yards; harvested 27th August; no smut or rust; straw long and soft. Ten days later than Bonanza, but the Bonanza was sown much thicker." Weight of sample returned, 40¼ lbs. per bushel.

R. Grun, of Emerald Hill, had 180 lbs. from 3 lbs. sown, and says: "Sown 8th May in drills, with press drill, on 9 square rods, on sandy loam; harvestel 19th August; a little rust, nothing to hurt; no smut; straw very heavy and rank; ripened twenty days earlier than our other oats; they appear to be just what we want." The sample returned weighed 39 lbs. per bushel.

NORTH-WEST TERRITORIES.

Number of reports received, 21; average yield, 70½ lbs; average weight per bushel, 38¾ lbs. The heaviest sample, which weighed 44¼ lbs. per bushel, was grown by T. G. Cooney, of Wascana, who reports a crop of 230 lbs.

T. G. Cooney, of Wascana, reports a yield of 230 lbs. from 3 lbs. of seed. He says: "Sown in drills 27th April, on very heavy clay soil; plot about 1 rod wide and 16 rods long; harvested 25th August; no rust or smut; straw from 5 to 6 feet high; leaves measured 1½ inches in width; it partly lay down; ripens early and compares favourably with other varieties." The sample returned weighed 44¼ lbs. per bushel.

Chas. Gilroy, of Regina, had a yield of 128 lbs., and says: "Sown broadcast 16th April on heavy clay soil; size of plot, 16½ x 130 feet; harvested 22nd August; no rust; no smut; straw coarse, 44 inches long." The sample Mr. Gilroy returned weighed 42 lbs. per bushel.

J. J. Porter, of Boharm, had 104 lbs. from 3 lbs. of seed, and says: "Sown with drill 24th April on rich loam; size of plot, 3 x 100 yards; harvested 5th September; some rust; no smut; ripened very uneven; lodged some; yield would have been much heavier had it ripened evenly; some of it was shelled before the balance was ripe." The sample returned weighed 42½ lbs. per bushel.

BRITISH COLUMBIA.

Number of reports received, 2; average yield, 79 lbs.; average weight per bushel, 41½ lbs. The heaviest sample was grown by Hector Ferguson, of Port Haney, who reports a yield of 90 lbs., weighing 41½ lbs. per bushel.

Hector Ferguson, of Port Haney, had a yield of 90 lbs. from 3 lbs. of seed, and says: "Sown broadcast 8th May on an alluvial deposit of sand and clay; size of plot about 50 square yards; harvested 9th September; no rust or smut; straw good; ripens about the same time as the Bonanza, and is a first-class oat." The sample returned weighed 41½ lbs. per bushel.

Hugh Nichol, of Mission, had a crop of 68 lbs. He says: "Sown broadcast 10th April on sandy loam; size of plot, 7 yards by 12; harvested 8th August; no rust or smut; straw strong; ripens early; crop good. I am very well pleased with these oats." The sample returned weighed 40¾ lbs. per bushel.

Victoria Prize.

This is a short, plump, white oat, much like the Prize Cluster, but is not uniformly so good a cropper. On the Central Experimental Farm a yield of six acres averaged 26 bushels 29 lbs. per acre, weighing 39¾ lbs. per bushel. At the branch farm at Nappan, N.S., the experimental plots yielded 88 bushels 8 lbs. per acre, and at Agassiz, B.C., 25 bushels 30 lbs. per acre.

D. Collins, of Mink River road, P.E.I., had a crop of 67 lbs. from 3 lbs. of seed, and says: "Sown broadcast 5th May on light soil; size of plot, 20 square yards; harvested 19th August; no rust or smut; bright, clean straw; ripens about the same as our common black oats." The sample returned weighed 42¼ lbs. per bushel.

V. Penny, of Murray Harbour S., P.E.I., had 45 lbs. He says: "Sown broadcast 12th May on light soil; size of plot, 10 x 15; harvested 25th August; no rust or smut; straw soft; about six days earlier than other varieties." The weight of the sample returned was also 42¼ lbs. per bushel.

Hedly V. Price, of Rogersvile, N.B., had a yield of 83 lbs. from 3 lbs. of seed. He reports as follows: "Sown broadcast 27th May on sandy loam; size of plot, 12 x 100 feet; harvested 25th August; no rust; no smut; straw strong and stout; earlier than our black oats." The sample returned weighed 40½ lbs. per bushel.

Harvey Nesbit, of Manners Sutton, N.B., had 67 lbs. He says: "Sown broadcast 12th May, on heavy soil; size of plot, 6 x 30 yards; harvested 21st August; no rust; some smut; straw very coarse; is earlier than the other sorts we had." Weight of sample returned, 42¼ lbs. per bushel.

J. B. Hamblen, of Pictou, N.S., had a yield of 127 lbs., and says: "Sown broadcast 7th May on sandy loam; size of plot, 30 x 80 feet; harvested 26th August; no smut; no rust; straw tall, 5 feet high; very stout; it became so heavy that it lay down; not any earlier than other sorts." The weight of sample returned was 38½ lbs. per bushel.

W. B. Wallace, of Avondale, N.S., had 122 lbs. He says: "Sown broadcast about the last of May on clay loam; size of plot, 12 x 200 feet; do not know date of harvesting; no rust; no smut; straw remarkably strong; stood up well, better than Prize Cluster; think very favourably of these oats." Weight per bushel, 40 lbs.

A. E. Guerin, of St. Isidore, Quebec, had a yield of 87 lbs. from 3 lbs. of seed. He says: "Sown in drills 30th April, on sticky black soil; size of plot, 5 perches; harvested 10th August; no rust; some heads of smut; straw very strong and good; earlier and heavier than our other oats; a very useful sort for farmers." The sample returned weighed 39½ lbs. per bushel.

D. Leclair, of Ste. Thérèse de Blainville, Que., had 82 lbs., and reports as follows: "Sown broadcast 1st May on rich clay soil; size of plot, 12 x 108 feet; harvested 3rd August; no rust; some heads of smut; straw long, strong and hard." The weight of sample returned was 41½ lbs. per bushel.

Simeon Roberts, of Columbus, Ont., reports a yield of 205 lbs. He says: "Sown broadcast 21st April on clay loam; size of plot, 20 x 230 feet; harvested 17th August;

no rust; no smut; a good stiff straw; two days earlier than the Egyptian." The weight of the sample returned was 41½ lbs. per bushel.

J. D. Wager, of Enterprise, Ont., had 190 lbs., and says: "Sown broadcast 20th April on clay loam; size of plot, 15 x 35 yards; harvested 3rd August; no rust; no smut; big straw; about a week earlier than the Banner sown same date." Weight of sample returned, 39 lbs. per bushel.

L. Cameron, of Elder's Mills, Ont., had 162 lbs. He says: "Sown broadcast 21st April on clay loam; size of plot, 2½ x 4 rods; harvested first week in August; no rust; no smut; the best straw and oats that I ever had, and as early as any; I have been farming 35 years." Weight of sample returned was 39¾ lbs. per bushel.

A. Hobson, of Killarney, Man., had a yield of 170 lbs. He says: "Sown in drills 27th April on sandy loam; size of plot, $\frac{1}{20}$th of an acre; harvested 10th August; there was some rust; no smut; straw very strong and tall, and lodged badly." No sample received.

John Fizell, of Holmfield, Man., had 136 lbs., and says: "Sown by hand 23rd April on heavy black loam; size of plot, 25 x 72 feet; harvested 15th August; rusted badly; no smut; straw very heavy, about 6 feet high. I believe it was the heaviest crop cut in Manitoba; ripened a week earlier than Egyptian." No sample received.

J. J. Porte, of Boharm, N.W.T., had a crop of 98 lbs. He says: "Sown in drills 24th April, on loamy soil; size of plot, 3 x 100 yards; rusted a little; a few heads of smut; straw stout, 4½ feet long." Weight of sample returned, 41¾ lbs. per bushel.

C. Elton, Pincher Creek, N.W.T., had a yield of 91 lbs., and says: "Sown broadcast 24th April on sandy loam; size of plot, 39 x 39 feet; harvested 23rd September; very little rust and a little smut; straw strong, 4½ feet high." Weight of sample returned, 37½ lbs. per bushel.

Thomas James, of Spulmacheen, B.C., had a crop of 289 lbs. from 3 lbs. of seed. He says: "Sown broadcast 30th April on sandy loam; size of plot about ⅙th of an acre; harvested 11th August; no rust; a little smut; straw very good; about one week earlier than White Cave." The weight of the sample returned was 37½ lbs. per bushel.

Flying Scotchman.

This is a white oat, a little longer in the kernel than Prize Cluster or Victoria Prize, which has made a good record for itself, having proven generally prolific, healthy and vigorous. At the Central Experimental Farm it has varied from 48 bushels and 26 lbs. per acre to 29 bushels and 7 lbs. At Nappan, N.S., the experimental plots have returned at the rate of 95 bushels 10 lbs. per acre, and at Agassiz, B.C., 58 bushels 8 lbs. per acre.

John Clark, of Alberton, P.E.I., had a yield of 118 lbs. from 3 lbs. of seed. He says: "Sown broadcast 29th April on heavy clay soil; size of plot, 12½ x 15 yards; harvested 25th August; no rust; no smut; straw large and bright; much earlier than any other sort." The sample returned weighed 38½ lbs. per bushel.

J. B. R. Lea, of Victoria, P.E.I., had 89 lbs., and reports as follows: "Sown broadcast 23rd May on sandy loam at the rate of 2½ bushels to the acre; harvested 29th August; no rust; no smut; straw a fine growth, but broke down a week before harvest; earlier than most other sorts." The sample returned weighed 44½ lbs. per bushel.

Josiah Wood, M.P., of Sackville, N.B., had a crop of 78 lbs., and says: "Sown broadcast 16th May on sandy loam; size of plot, 13 x 120 feet; harvested 10th September; a little rust; no smut; straw tall and very stout; ripens earlier than other sorts we have been sowing. Our neighbours' hens and geese got in to this grain, otherwise we should have had a much larger yield." The sample returned weighed 36 lbs. per bushel.

H. Sabean, of New Tusket, N.S., had a yield of 125 lbs., and writes thus: "Sown broadcast 3rd May on gravelly loam; size of plot, 20 x 33 paces; harvested 12th

August; no rust; a little smut; straw stout; think very favourably of this oat, but it is not so heavy as Prize Cluster." The weight of the sample returned was 36½ lbs. per bushel.

F. Beaton, of Alexander, N. S., had 86 lbs., and says: "Sown broadcast 12th May on dry, loose soil; size of plot, 5 square rods; harvested 4th September; no rust; no smut; straw heavy and perfectly sound; a week later than Prize Cluster. The samples of Prize Cluster and Flying Scotchman are the best oats I ever raised." The weight of the sample returned was 39 lbs. per bushel.

Julien Beauvais, of Ste. Adèle, Que., had a crop of 138 lbs. from 3 lbs. of seed, and says: "Sown broadcast 10th May, on yellow soil; size of plot, 20 x 90 feet; harvested 27th August; no rust or smut; straw good and clean; is earlier and heavier than other varieties." The sample returned weighed 41¼ lbs. per bushel.

Isidore Plouffe, of Ste. Agathe, Que., had a yield of 129 lbs. He says: "Sown broadcast 15th May, on yellow soil; size of plot, 20 x 40 feet; harvested 20th August; no rust; no smut; straw long, fine and strong; ripened 15 days sooner than our other sorts; I counted 220 grains in one head." The weight of the sample returned was 38¼ lbs. per bushel.

Revd. S. A. Moreau, of Ste. Agathe, had a crop of 100 lbs. and says: "Sown broadcast 12th May, on yellow soil, well manured; size of plot, 18 x 40 feet; harvested 13th August; no rust or smut; straw long and very good; earlier than ordinary sorts. Farmers here preserve their yield from the samples as something very precious, and thank the experimental farm, as I do myself." The weight of the sample returned was 37½ lbs. per bushel.

A. R. McTavish, of Loch Garry, Ont., had a yield of 190 lbs. He writes thus: "Sown broadcast 29th April; on sandy soil, mixed with gravel; size of plot, 27 x 210 feet; harvested 14th August; no rust; no smut; straw bright and stands well; ripens earlier than any other sort I had. I am very well pleased with the oats." The weight of the sample returned was 38¼ lbs. per bushel.

John Lawrence, of Mandamin, Ont., had 166 lbs., and says: "Sown broadcast 22nd April, on sandy loam; size of plot, 360 square yards; harvested 8th August; no rust; no smut; straw very heavy, half lying down; four or five days later than Prize Cluster." The weight of the sample returned was 38½ lbs.

Jas. Callagher, of Bethany, Ont., had 135 lbs. He says: "Sown broadcast 25th April, on clay loam; size of plot, 5 x 50 yards; harvested 10th August; no rust; no smut; straw bright and strong; ripens six to eight days earlier than my other oats, and heavier in crop and weight of grain; a remarkably fine variety of oats for this part; I think they will prove to be the leading oat here." The weight of the sample returned was 39¾ lbs. per bushel.

John Clarkson, of Elkhorn, Man., had a yield of 170 lbs. He says: "Sown broadcast 13th April, on black sandy soil; size of plot, 480 square yards; harvested 20th August; no rust; no smut; straw 4 feet long, medium thickness; compares favourably with other oats, and yields better than any other sort I have." The weight of the sample returned was 34 lbs. per bushel.

Charles Gilroy, of Regina, N.-W.T., had a yield of 93 lbs., and says: "Sown broadcast 16th April, on heavy clay soil; size of plot, 16½ x 130 feet; harvested 24th August; no rust; no smut; straw coarse, and about 44 inches long." The weight of the sample returned was 38¾ lbs. per bushel.

Bonanza.

This is another white oat of fair promise, but closely resembles Prize Cluster and Victoria Prize. On the Central Experimental Farm it gave a crop in 1891 of 23 bushels and 30 lbs. per acre; at Nappan, N.S., 77 bushels 32 lbs.; at Indian Head, 72 bushels 22 lbs., and at Agassiz, B.C., 37 bushels 12 lbs.

Wm. G. Taylor, of North Bedeque, P.E.I., had a crop of 84 lbs., and says: "Sown broadcast 11th May, on light soil; size of plot, 210 square yards; harvested 20th August; no rust; no smut; straw coarse and bright; ripens about same time as Prize Cluster, and about ten days earlier than Egyptian. I consider the Bonanza to be far superior to any other kind of white oats I have ever sown. I took first prize for sample at exhibition in October last." The sample returned was an excellent one, weighing 44¾ lbs. per bushel.

George E. Baxter, of Perth Centre, N.B., had a yield of 82 lbs., and says: "Sown broadcast 26th May, on a light loam; harvested the 4th September; no rust or smut; straw large and bright; very early; good yield." The sample returned weighed 38½ lbs. per bushel.

J. R. Taylor, of Rockland, N.B., had 77½ lbs., and reports as follows: "Sown broadcast 23rd May, on rather heavy loam; size of plot, 195 square yards; harvested 8th September; no rust or smut; straw stout and strong; about the same as others as regards earliness of ripening, but the grain is much heavier than what we usually raise here." The sample returned was very fine and weighed 43¼ lbs. per bushel.

John R. McKenzie, of Millsville, Pictou, N.S., had a yield of 74 lbs., and says: "Sown in drills 15th May, on gravelly loam; size of plot, about 40 feet square; harvested 25th August; no smut or rust; straw strong; did not lodge; the earliest I have ever sown, and never had such a yield before. If these oats do not run out they will be a great acquisition." The sample returned was an excellent one, weighing 43½ lbs. per bushel.

Henry C. Sabean, New Tusket, N.S., had 70 lbs., and says: "Sown broadcast 1st May, on gravelly loam; size of plot, 35 x 48 feet; harvested 18th August; some rust; no smut; straw stout, and stood up well." No sample was received in this instance.

E. Laferrière, of St. Sebastien, Quebec, had a yield of 92 lbs., and says: "Sown broadcast 13th May, on a mixed grey and yellow soil; size of plot, 18 x 126 feet; harvested 13th August; no rust; no smut; straw fairly good; ripened earlier than other varieties." The weight of this sample was also 43½ lbs. per bushel.

William Worden, of St. Paul's Station, Quebec, had 80 lbs., and writes: "Sown broadcast 25th April, on loamy clay soil; size of plot, 7 square rods; harvested 8th August; slightly rusted; no smut; straw coarse; among the earliest, and heavy." The weight of the sample returned was 39¼ lbs. per bushel.

L. Cameron, of Elder's Mills, Ont., had a crop of 152 lbs. from 3 lbs. of seed, and says: "Sown broadcast 21st April on clay loam; size of plot, 2½ x 4 rods; no rust; no smut; straw good and clean; I never had a finer yield." The weight of sample returned was 40 lbs. per bushel.

James Calwell, of Varna, Ont., had a yield of 122 lbs. He says: "Sown broadcoast 23rd April, on clay loam; size of plot, 540 square yards; date of harvesting not given; no rust or smut; straw a fair length; a little earlier than others." The sample returned in this instance also weighed 40 lbs. per bushel.

Allyn Hobson, of Killarney, Man., had a crop of 170 lbs., and says: "Sown in drills 27th April, on sandy loam; size of plot, $\frac{1}{20}$ of an acre; harvested 10th August; plenty of rust; no smut; straw very strong and tall, but badly broken down." The sample returned weighed 39 lbs. to the bushel.

James Reid, of Carman, Man., had 71 lbs., and says: "Sown in drills 8th May, on black loam; size of plot, 7 rods; no rust; no smut; straw strong and stiff; ripened two weeks earlier than black oats and as early as Prize Cluster. They are the best oats I ever sowed." The sample returned weighed 41 lbs. per bushel.

C. Eaton, of Pincher Creek, N.W.T., had a crop of 89 lbs., and writes: "Sown broadcast 24th April on sandy loam; size of plot, 39 x 39; harvested 22nd September; about 10 per cent slightly rusted; a few heads of smut; straw strong and bright, 5 ft. 3 in. in height; ripens about same date as the Banner and gives about same weight of crop." The sample returned weighed 37¼ lbs. per bushel.

L. Zuichon, Port Guichon, B.C., had a yield of 164 lbs. from 3 lbs. of seed, and says: "Sown broadcast 29th April on delta lands; size of plot, 15 x 49 ft.; harvested 15th August; no rust or smut; average weight, good; first class seed." The sample returned was an excellent one, weighing 44¼ lbs. per bushel.

J. M. Sweetman, of Chilliwack, B.C., had 85 lbs. He says: "Sown broadcast 17th April on sandy clay soil; harvested 10th August; no smut or rust; straw long and heavy; ten days earlier than the Banner." The sample returned in this instance was also first-class, weighing 43½ lbs. per bushel.

Banner.

This very promising variety has made a good record for itself during the past season. It is a branching oat, with a long kernel, not very plump or heavy, but very vigorous and productive; on the Central Experimental Farm it has varied in yield on different soils from 87 bushels 22 lbs. to 37 bushels 13 lbs. per acre. At the branch farm at Nappan, N.S., it has given on experimental plots at the rate of 94 bushels 4 lbs. per acre; at Brandon, Manitoba, 81 bushels 33 lbs.; at Indian Head, N.W.T., 86 bushels 24 lbs., and at Agassiz, B.C., 73 bushels 32 lbs. per acre.

A. A. Moore, of Pownal, P.E.I., reports a yield of 136 lbs. from a 3-lb. bag of seed. He says: "Sown broadcast 11th May, on clay loam; size of plot, 12 x 18 yards; harvested 30th August; no rust or smut; straw strong and bright." The weight of the sample returned was 36½ lbs. per bushel.

O. J. McLean, of Little Sands, P.E.I., had 102¾ lbs., and says: "Sown broadcast 23rd May on good soil; size of plot, 15 x 125 feet; harvested 9th September; no rust or smut; straw stout and clean. I find these oats to be the best of all I have grown." The sample returned weighed 35 lbs. per bushel.

Walter Piercy, of Manners Sutton, N.B., had a yield of 158 lbs. from 3 lbs. sown. He reports as follows: "Sown 11th May, broadcast, on sandy loam; size of plot, 500 square yards; no rust; some smut; straw 5 feet long; bright yellow. I like the oats well." The sample returned weighed 35¼ lbs. per bushel.

A. T. Fawcett, of Sackville, harvested 86 lbs., and says: "Sown broadcast 27th April, on sandy loam; size of plot, 5 x 35 yds.; harvested 24th August; no rust or smut; straw 3 feet long, rather inclined to go down." The weight of the sample returned was 34¼ lbs. per bushel.

John Lacey, of West Caledonia, N.S., had 119 lbs. from 3 lbs. of seed, and says: "Sown broadcast 4th May on sandy loam; size of plot 2 rods by 4; harvested 17th August; no rust or smut; straw tall and bright. Not quite so early as some other varieties, but somewhat heavier." No sample was received with this return.

John McBride, of Whitburn, N.S., had a yield of 74 lbs., and says: "Sown broadcast 9th May; size of plot, 1 rod by 8; harvested 9th September; no rust or smut; straw good, heavy and tall. I am pleased with the Banner oats." The sample returned weighed 34¼ lbs. per bushel.

Narcisse Barry, of Ste. Anne de la Pérade, Quebec, reports a yield of 202 lbs. He says: "Sown broadcast 20th May; size of plot, 30 x 20 feet; harvested 25th August; no rust or smut; straw good, and notwithstanding it is coarse the animals eat it well; the yield is extraordinary, and in two or three years I can sow my farm with this variety alone." The weight of the sample returned was 31¾ lbs. per bushel.

H. Newham, of Upper Thorn Centre, Quebec, had a yield of 100 lbs., and says: "Sown broadcast 5th May on sandy loam; size of plot, 6 x 55 yards; harvested 29th August; no rust; no smut; straw long and white; ripened about the same time as other sorts." The weight of the sample returned was 34¾ lbs. per bushel.

B. Bouck, of Inkerman, Ont., reports a yield of 130 lbs. He says: "Sown broadcast 9th May, on gravelly soil; size of plot, 1 rod by 10; harvested 22nd August; no rust or smut; straw coarse." The weight of the sample returned was 35¼ lbs per bushel.

Thos. Grant, of Sheffield, Ont., had 127½ lbs., and says: "Sown in drills 4th May, on sandy loam; size of plot, 2 x 62 yards; harvested 14th August; very little rust; no smut; straw pretty strong, 3½ to 4 feet high; about six days later than Flying Scotchman; would have been much heavier if they had not been so much lodged." Weight of sample returned, 34 lbs per bushel.

Geo. Barclay, of Morris, Man., had 103 lbs. He says: "Sown 5th May, on black loam, with press drill; size of plot, 2 x 99 yards; harvested 20 August; no rust or smut; straw strong and stiff; three days later than Prize Cluster, 4 days earlier than Egyptian; good yielder; stood up well." Weight of sample returned, 36 lbs. per bushel.

A. Hobson, of Killarney, Man., reports a yield of 100 lbs., and says: "Sown broadcast 15th May, on sandy loam; harvested 4th September; no rust or smut; straw strong and clean." Weight of sample returned, 34 lbs. per bushel.

American Triumph.

A few reports have been received, giving the results of the test of samples of this grain. They nearly all speak of the variety as being late, and this agrees with our experience in Ottawa. The largest yield reported from Quebec is 60 lbs., the lowest 33 lbs.; the largest yield from Ontario, 110 lbs., and the lowest 24 lbs.; all the samples returned were deficient in weight. At the Central Experimental Farm it has given a crop of 37 bushels 16 lbs. per acre. At the branch farm, at Nappan, at the rate of 77 bushels 22 lbs.; at Brandon, Man., 59 bushels 26 lbs., and at Agassiz, B.C., 39 bushels 24 lbs. As there are many earlier-ripening varieties which have given on the average much better results, there seems no special reason for continuing the distribution of the American Triumph.

No reports have yet been received relating to the few samples of Egyptian oats distributed.

TWO-ROWED BARLEY.

Prize Prolific (Carter's.)

This useful variety has been widely distributed, and the reports of the past season are on the whole very favourable. In some localities the straw is reported to be weak, a failing which in wet seasons seems to be common to all the two-rowed barleys of the Chevalier type, not because the straw is less stout than other sorts, but because the *pendant* head when weighted with water proves a much greater strain on the straw than do the more upright heads which characterize the Duckbill, Goldthorpe, Italian and other sorts of that class. At the Central Experimental the Prize Prolific barley has yielded in different fields and plots from 33 bushels 18 lbs. to 65 bushels 10 lbs.; at the branch farm, at Nappan, N.S., 50 bushels; at Brandon, Man.; 75 bushels 34 lbs.; at Indian Head, N.W.T., from 45 to 54 bushels 28 lbs., and at Agassiz, B.C., 32 bushels 39 lbs.

A. A. McNeill, of Alberton, P.E.I., had a crop of 125 lbs. from 3 lbs. seed, and says: "Sown broadcast 5th May, on sandy loam; size of plot, 5 x 50 yards; no rust or smut; straw clean and bright; about 5 days earlier than other barley. I never saw better heads and stems; stood up well and ripened even." The sample returned weighed 53½ lbs. per bushel.

Isaac M. Doughart, of Long River, New London, P.E.I., had 100 lbs. He says: "Sown broadcast 27th May on sandy loam; harvested 13th September; no rust or smut; straw bright yellow; ripens no earlier than our own." The sample returned weighed 48¼ lbs. per bushel.

James Friar, of Shediac, N.B., had a yield of 52 lbs., and says: "Sown broadcast 6th June, on sandy loam, on 100 square feet; harvested 16th September; no rust or smut; straw long and stout, but rather soft; ripens later than most varieties." The sample returned weighed 47¾ lbs. per bushel.

Percy Randall, of Bayfield, Antigonish, N. S., had a crop of 51 lbs. He says: "Sown broadcast on 6th June on light sandy loam; size of plot, 7 x 26 yards; harvested 28th September; no rust or smut; straw bright and heavy; compares favourably with other sorts." The sample returned weighed 48¾ lbs. per bushel.

Peter Devoe, of Little Bras d'Or (south side), N.S., had 42 lbs., and says: "Sown broadcast 16th May, on dry sandy soil; harvested 4th September; no rust or smut; straw coarse; ripens about the same time as other sorts." Sample returned weighed 52¼ lbs. per bushel.

George Maynard, of St. Foy, Que., reports a yield of 180 lbs. from 3 lbs. of seed. He says: "Sown broadcast 26th May, on gray sticky soil; size of plot, 45 x 135 feet;

harvested 20th August; no rust or smut; straw soft. I prefer the six-rowed barley." The weight of the sample returned was 51¾ lbs. per bushel.

E. Lafférière, of St. Sebastien, Que., had 90 lbs. and says: "Sown broadcast 13th May, on grey soil; size of plot, 18 x 126; harvested 18th August; no rust or smut; straw fairly good; is a good weight, but takes longer to ripen than the six-rowed." The sample returned weighed 52¾ lbs. per bushel.

S. Rennie, of Millikin, Ont., had 132 lbs., and says: "Sown broadcast 21st April on clay loam; harvested 5th August; no rust or smut; straw very soft and weak; about 2 days later than the Duckbill and about 3 bushels less per acre in yield." Sample failed to reach us.

A. R. McTavish, of Loch Garry, Ont., had a yield of 126 lbs. He says: "Sown broadcast 29th April on sandy soil mixed with gravel; size of plot, 19 x 210 feet; harvested 12th August; no rust or smut; straw long and clean." The sample returned weighed 52¼ lbs per bushel.

Wm. A. Wallis, of Humber, Ont., had a crop of 120 lbs. He says: "Sown in drills 22nd April on good clay loam; size of plot, 8 square rods; harvested 11th August; no rust or smut; straw not so strong as Chevalier or Duckbill, and several days later." The sample returned weighed 52 lbs. per bushel.

Samuel Finnegan, of Freshfield, Man., had a yield of 82 lbs. and says: "Sown in drills 1st May on sandy loam; size of plot, 12 x 87 feet; harvested 22nd August; no rust or smut; straw stiff, and 3 feet long; has eclipsed all other sorts in this neighbourhood." The weight of the sample returned was 54 lbs. per bushel.

James H. Fry, of Virden, Man., had 62 lbs., and says: "Sown broadcast 13th April on sandy loam; size of plot, 2 x 16 rods; harvested 8th August; no rust or smut; straw strong and bright, 39 inches high; three days earlier than other sorts." Weight of sample returned, 54 lbs. per bushel.

L. Zuichon, of Port Guichon, B.C., reports a yield of 158 lbs. from 3 lbs. sown, and says: "Sown broadcast 29th April on delta lands; size of plot, 37 x 43 feet; harvested 15th August; no rust or smut; grain heavier than average; profitable seed for British Columbia." The weight of the sample returned was 55 lbs. per bushel.

J. McSweetman, of Chilliwack, B.C., had 70 lbs., and says: "Sown broadcast 17th April on sandy clay; size of plot, 4 square rods; harvested 10th August; no rust or smut; straw good, but it lodged; is earlier than common." The weight of the sample returned was 51¼ lbs. per bushel.

Danish Chevalier.

At the Central Experimental Farm this variety gave crops varying from 41 bushels 40 lbs. to 43 bushels 41 lbs. At the experimental farm at Nappan the crop was 44 bushels 8 lbs.; at Brandon, Man., 68 bushels 16 lbs.; at Indian Head, N.W.T., 44 bushels 20 lbs.; and at Agassiz. B.C., 33 bushels 36 lbs.

A. A. Moore, of Pownal, P.E.I., had a crop of 67 lbs. from 3 lbs. of seed, and says: "Sown broadcast 11th May on clay loam; size of plot, 12 x 18 yards; harvested 25th August; no rust or smut; straw nice and bright, but soft." No sample received.

E. Lunden, of Canterbury, N.B., had a crop of 39 lbs., and says: "Sown in drills 14th May on sandy loam; size of plot, 17 x 71 feet; harvested 17th August; no rust or smut; straw medium height and good size, but lodged." The weight of the sample returned was 53 lbs. per bushel.

W. Dukeshire. of Maitland, N.S., had a crop of 60 lbs., and says: "Sown broadcast 20th May on light, loamy soil; harvested 16th August; no rust or smut; straw good; it exceeds any other we have." The sample returned weighed 51¼ lbs. per bushel.

Allan McLennan, of North Brookfield, N.S., had a yield of 57 lbs., and says: "Sown broadcast 10th May on clay loam; size of plot, 9 square rods; harvested 28th August; no rust or smut; straw rather short; a little later than other sorts." The sample returned weighed 50½ lbs. per bushel.

Pierre Zippens, of Roberval, Lake St. John, Que., reports a yield of 187 lbs. from 2½ lbs. of seed sown, and says: "Sown broadcast 10th June, on clay soil; size of plot, 30 x 40 feet; harvested 15th October; no rust; straw good." The weight of the sample returned was 51¾ lbs. per bushel.

J. A. Villeneuve, of Charlesbourg, Que., had a crop of 75 lbs., and says: "Sown broadcast 16th May, on virgin soil; size of plot, 15 x 150 feet; harvested 29th August; no rust or smut; straw ordinary." Weight of sample returned, 50¼ lbs. per bushel.

Roderick McLennan, Paisley, Ont., had a yield of 145 lbs. from 3 lbs. sown, and says: "Sown broadcast 1st May, on loamy soil; size of plot, about 10 square yards; harvested 16th August; no rust or smut; very long straw; grain very late, and met with bad weather." Weight of sample sent, 47½ lbs. per bushel.

Robert Davidson, of Bowsville, Ont., had 125 lbs., and says: "Sown broadcast 1st May, on clay soil; harvested 13th August; no rust or smut; straw good; as to time of ripening, just the same as our own." The weight of this sample was 52 lbs. per bushel.

A. Hobson, of Killarney, Man., had a yield of 150 lbs. He says: "Sown in drills 27th April, on sandy loam; size of plot, $\frac{1}{20}$ of an acre; harvested 10th August; no rust or smut; a fine straw, but lodged badly." The weight of the sample returned was 52¼ lbs. per bushel.

John Clarkson, of Elkhorn, Man., had 108 lbs., and says: "Sown broadcast 13th April, on black sandy soil; harvested 21st August; no rust or smut; straw medium length; later in ripening than six-rowed, and 20 bushels per acre less than Prize Prolific last year." Weight of sample returned, 50¾ lbs. per bushel.

T. G. Cooney, of Wascana, N.W.T., reports a yield of 263 lbs. from 3 lbs. of seed, and says: "Sown in drills 27th April, on heavy clay; size of plot, 1½ x 16 rods; harvested 25th August; no rust or smut; straw medium height, partly lodged. I think this a very excellent barley for this part of the country." The sample returned weighed 51 lbs. per bushel.

George Byers, of Red Deer, N.W.T., had 68 lbs. He says: "Sown broadcast, 20th April, on sandy loam; size of plot, 144 square yards; harvested 14th August; no rust; about 1 per cent of smut; straw bright and clean, but inclined to lodge." The weight of the sample returned was 52¼ lbs. per bushel.

Hugh Nichol, of Mission, B.C., had a crop of 56 lbs., and writes: "Sown broadcast 10th April, on sandy loam; size of plot, 10 x 12 yards; harvested 1st August; no rust or smut; straw fine." No sample received.

Golden Melon.

The yield of this variety has varied on different plots on the Central Experimental Farm from 21 bushels 9 lbs. to 43 bushels and 40 lbs. per acre. At Nappan the yield has been 52 bushels 4 lbs. per acre; at Indian Head, N.W.T., 42 bushels 10 lbs., and at Agassiz 36 bushels and 2 lbs. per acre.

C. A. Hardy, of Joggin Bridge, N.S., had a yield of 138 lbs., and says: "Sown broadcast 6th May, on light dry soil; size of plot, 11 square rods; harvested 24th August; no rust or smut; straw brittle; I think this is the largest yield of barley in this neighbourhood." Weight of the sample returned, 50¼ lbs. per bushel.

S. Audette, of St. Ubalde, Que., had a yield of 115 lbs. He says: "Sown broadcast 20th May, on black soil; size of plot, 20 x 180 feet; harvested 1st September; no rust or smut; straw good; it seems finer than other sorts." Weight of sample returned, 47½ lbs. per bushel.

L. Langevin, Baie des Pères, Que., had a crop of 99 lbs., and writes: "Sown broadcast 27th April, on sandy clay soil; size of plot, nearly 30 feet square; harvested 27th August; straw of good growth; a little late, but a heavy crop." Weight of sample returned, 49 lbs. per bushel.

J. S. McDonald of Ripley, Ont., had a yield of 110 lbs. from 3 lbs. of seed. He says: "Sown broadcast 17th May, on clay loam; harvested 23rd August; no rust or smut; straw of good size; two weeks later than six-rowed; harvest season very wet." Weight of the sample returned 50½ lbs. per bushel.

A. A. Moody, of Brock Road, Guelph, Ont., had 83½ lbs., and writes: "Sown broadcast 6th May, on clay loam; size of plot, 27 x 66 feet; harvested 22nd August; no smut; no rust; straw a good length; head very long." No sample received.

A. Ferguson, of Virden, Man., had a crop of 65 lbs., and says: "Sown broadcast 20th April, on heavy black loam; size of plot, 7 x 216 feet; harvested 19th August; no smut; no rust; straw very good and bright; a few days earlier than Danish Chevalier, and stood up better." No sample received.

James Speers, of Wapella, N.W.T., had a crop of 72 lbs. He says: "Sown broadcast 14th April, on black loam; size of plot, 160 square yards; harvested 6th September; no rust or smut; straw very soft. Ten days later than another variety I had." Sample received weighed 48¼ lbs. per bushel.

Webb's Kinver Chevalier.

A supply of this fine variety of barley, which has carried off so many prizes in England, was purchased early in the year from Edward Webb & Son, of Wordsley, England. On arrival part of the seed was divided among the experimental farms for test; the remainder furnished material for a limited distribution among farmers in the several provinces of the Dominion. At the Central Experimental Farm the crop on one field was 42 bushels and 36 lbs. per acre, on another 58 bushels and 2 lbs. At Nappan, N. S., the yield was 48 bushels 16 lbs.; at Brandon, Man., 61 bushels 17 lbs., and at Agassiz, 20 bushels and 40 lbs. per acre.

M. D. Blue, of Little Sands, P.E.I., had a yield of 42 lbs. from 3 lbs. of seed, and says: "Sown broadcast 4th June, on clay land; size of plot, 10 x 20 yards; harvested 9th September; no rust or smut; straw white. I believe it is suitable for this locality." The weight of the sample returned was 50½ lbs. per bushel.

David Cunningham, of Hanwell, N.B., had a crop of 76 lbs. He says: "Sown broadcast 12th May, on black loam; size of plot, 18 x 75 feet; harvested 21st August; no rust or smut; straw good and strong. I think this will be a good kind for this place." Weight of sample returned, 53½ lbs. per bushel.

John Lacey, of Caledonia, N. S., had 56 lbs., and says: "Sown broadcast 4th May, on sandy loam; size of plot, 1½ x 4 rods; harvested 14 August; no rust or smut; straw very short and bright; not so early by five days as other barley grown here." The weight of the sample returned was 53 lbs. per bushel.

B. Paquette, of St. Nicholas, Quebec, had a yield of 78 lbs. He says: "Sown broadcast 12th May, on dry soil; size of plot, 10 x 160 feet; harvested 29th August; no rust or smut; straw very good. This grain is to be recommended; the yield is very satisfactory." Sample returned weighed 52 lbs. per bushel.

R. W. Ralph, of Shawville, had 70 lbs., and reports as follows: "Sown broadcast 1st May, on sandy loam; size of plot, 204 square yards; harvested 6th August; no rust or smut; straw very short." The weight of the sample returned was 52½ lbs. per bushel.

Walter H. Percival, of Burritt's Rapids, Ont., reports the extraordinary yield of 336 lbs. He says: "Sown by hand 9th April, on clay loam; size of plot, 3 rods square; harvested 17th August; no rust or smut; straw long and bright, standing up well. I sowed it very thin; it was a heavy crop. I like it remarkably well and will sow no other barley next year." The weight of the sample returned was 54¼ lbs. per bushel.

John McCullam, of Belgrave, Ont., had a crop of 103 lbs., and says: "Sown broadcast 25th April, on dark clay loam (date of harvesting is not given); no rust of any account; no smut; straw a good length, bright and strong; cut same time as the Prize Prolific. I think this is a very good barley." The sample sent back weighed 54 lbs. per bushel.

Goldthorpe.

This variety of two-rowed barley was imported from James Carter & Co., of London, England, two years ago. It very much resembles the Duckbill in habit of growth, but the grain is said to be superior, with a thinner skin on the kernel. The crop has varied on different soils on the Central Experimental Farm, from 49 bushels 28 lbs. to 29 bushels and 6 lbs. per acre. On the Nappan N.S., farm it has yielded at the rate of 47 bushels per acre; at Brandon, Man., 65 bushels 21 lbs.; and at Agassiz, B.C., 42 bushels and 4 lbs. per acre.

James T. Barnes, of Sussex, N. B., had a crop of 113 lbs., and says: "Sown broadcast 2nd June, on clayey soil; harvested 15th September; no rust or smut; straw short, but clean and bright; much later than six-rowed." Weight of sample returned, 48 lbs. per bushel.

William C. Burgman, of Tatamagouche, N.S.; had 48 lbs., and says: "Sown broadcast 15th June, on intervale soil; harvested 22nd September. A heavy wind a week before harvest blighted it some; no smut; straw very heavy; two weeks later than six-rowed. I think it is a very fine barley."

A. Lacroix, of Scott's Junction, Que., had a yield of 122 lbs. from 3 lbs. of seed. He says: "Sown broadcast 1st June, on clay soil; plot not measured; harvested early in August; no rust or smut; straw of good quality. I found it superior to other sorts." The weight of the sample returned was 50 lbs. per bushel.

Louis Fournier, of St. Andrews, Que., had a crop of 100 lbs., and says: "Sown broadcast 20th May, on loamy clay; size of plot, 36 x 45 feet; (date of harvesting not given); no rust or smut; straw good." Weight of sample returned, 51 lbs. per bushel.

Samuel A. Zinkinson, of Ashton, Ont., had a crop of 98 lbs., and says: "Sown broadcast 29th April, on clay loam; size of plot, 7 x 21 yards; no rust or smut; straw long and strong." No sample received.

Chas. Scott, White Oak, Ont., had a yield of 90 lbs., and says: "Sown in drills 2nd May, on clay loam; size of plot, 6½ x 165 feet; harvested 10th August; a little rust; no smut; straw long, with heavy heads." Weight of sample returned, 50½ lbs. per bushel.

J. B. Clabb, of Melita, Man., had a yield of 150 lbs. He says: "Sown broadcast 12th May, on clay loam; harvested 12th September; no rust or smut; straw very bright; stood erect. There would have been fully 200 lbs., but for the friendliness of my neighbour's cow." No sample received.

A. Hobson, of Killarney, Man., had 120 lbs., and says: "Sown in drills 27th April, on sandy loam; size of plot, $\frac{1}{20}$th of an acre; harvested 10th August; no rust or smut; straw clean and strong; stood up well. This is my favourite barley for this part." The weight of the sample returned was 51 lbs. per bushel.

Henry M. Hayward, of Hayward, N.W.T., had a crop of 75 lbs. He reports as follows: "Sown broadcast 16th May, on black loam, with gravelly sub-soil; size of plot, 5 x 20 yards; harvested 4th September; no rust or smut; straw long and very strong, with ears remarkably upright. Is earlier and much stronger than Chevalier or Prize Prolific; the two latter were very badly laid by a storm, but Goldthorpe growing alongside stood up well." The weight of the sample returned was 50½ lbs. per bushel.

Francis Pow, of Wolseley, reports a yield of about a bushel, and says: "Sown broadcast 25th April, on black loam; size of plot, 5 x 7 yards; harvested 5th September; no rust; very little smut; straw long and bright; ten days later than six-rowed barley in same field." The weight of sample returned was 54½ lbs. per bushel.

Saale.

This well-known and highly esteemed sort was imported from England two years ago, and tested in 1890 on the Central Farm, when it gave very good returns. During 1891 it has yielded on this farm 47 bushels and 20 lbs. per acre. At the branch farm at Nappan, N.S., the yield has been 51 bushels 32 lbs., and at Agassiz, B.C., 33 bushels 26 lbs.

W. J. Fraser, of North River, Lot 32, P.E.I., had a yield of 106 lbs. and says: "Sown broadcast 2nd May, on sandy loam; size of plot, 8 x 12 yards; harvested 26th August; no rust or smut; straw strong and clean; matures early. This barley is the best I have ever harvested. I think it will suit our climate well." The weight of the sample returned was 50½ lbs. per bushel.

Allan McLean, of Cornwall, P.E.I., had 76 lbs. He writes: "Sown broadcast 7th May, on clay loam; size of plot, 3 x 35 yards; harvested 22nd August; no rust or smut; straw very bright and good. I gave this sample a fair trial, no better than when sowing a large quantity." The weight of the sample returned was 53½ lbs. per bushel.

Honoré Lorlie, of the Quebec Seminary, Quebec, had a crop of 153 lbs. He says: "Sown broadcast 9th May, on grey soil; size of plot, 24 x 89 feet; harvested 10th August; no rust or smut; straw of medium strength, good and bright. I think this barley suitable for this district, and very profitable." The weight of the sample returned was 52¾ lbs. per bushel.

Pierre Mompetel, of Beauharnois, Que., had a yield of 102 lbs., and says: "Sown broadcast 24th April, on grey soil; size of plot, 14 x 100 feet; harvested 14th August; no rust or smut; straw good. Ripens sooner than the other two-rowed I had from you, and is heavier." Weight of sample returned, 50¼ lbs. per bushel.

John Marion, of Marion, Ont., reports a yield of 143 lbs., and says: "Sown broadcast 6th May on clay soil; size of plot, 20 x 50 yards; harvested 22nd August; no rust or smut; straw very long." The sample returned weighed 50 lbs. per bushel.

George Hume, of Ashgrove, Ont., had a crop of 92 lbs. He says: "Sown broadcast 25th April, on clay soil; size of plot, 18 x 105 feet; harvested 15th August; no rust or smut; straw, long, good and stiff; ten to twelve days later than six-rowed, but a much heavier crop." The weight of the sample returned was 53½ lbs. per bushel.

Chas. E. Ivans, of Virden, Man., reports a yield of 232 lbs., and says: "Sown in drills 14 inches apart 16th April, on deep black loam; size of plot, 540 square yards; harvested 24th August; no rust or smut; straw long and soft; was badly laid by rain storm." Weight of sample received, 49¾ lbs.

Spring Wheat.

Ladoga.

This early-ripening wheat continues to give good returns in many parts of the Dominion, succeeding best on comparatively light soils and in those districts where the summer season is short. On the Central Experimental Farm the yield has varied on different soils from 28 bushels 32 lbs. to 21 bushels 7 lbs.; at the branch farm, in Nappan, N.S., it has given a return of 30 bushels; at Brandon, Man., it has yielded 33 bushels; at Indian Head, on different plots, from 36 bushels 46 lbs. to 33 bushels 20 lbs., and at Agassiz, B.C., 18 bushels and 20 lbs. per acre.

Peter Chaisson, of Tignish, P.E.I., had a yield of 95 lbs. from 3 lbs. of seed. He says: "Sown by hand 20th May, on dry, loamy soil; size of plot, 21 x 60 ft.; harvested, 28th August; no rust or smut; straw 5 ft. long, coarse and bright. I find the Ladoga ripens 9 days earlier than any other kind I have, and yields heavier." The weight of the sample returned was 61 lbs. per bushel.

M. D. Blue, of Little Sands, P.E.I., had a crop of 73½ lbs., and reports as follows: "Sown broadcast 4th June on clay land; size of plot, 200 square yards; no rust; some smut; harvested a week earlier than other sorts sown same day. I believe it is suitable for this locality." The sample returned weighed 60 lbs. per bushel.

A. T. Fawcet, of Sackville, N.B., harvested 94 lbs., and writes: "Sown broadcast 27th April, on sandy loam; size of plot, 5 x 35 yards; no rust; considerable smut; straw bright and good, 3 ft. high; earlier than any other kind grown here. I am well pleased with the grain." The weight of the sample returned was 61¼ lbs. per bushel.

George Oulton, of Little Shemogue, N.B., reports a yield of 78 lbs., and says: "Sown broadcast 8th May, on clay loam; size of plot, 15 x 160 ft.; harvested 28th August; no rust or smut; good straw; seven days earlier than White Fife; yields about twice as much ; I am well pleased with the wheat." The sample returned weighed 63 lbs. per bushel.

Walter Lawrence, of Cheticamp, N.S., had a crop of 135 lbs. He says: "Sown in drills 12th May, on dry, sandy soil; size of plot, 316¾ square yards; harvested 4th September; no rust on grain, a little on straw; no smut; straw long and fairly strong." Sample returned weighed 60 lbs. per bushel.

A. Thomas, Milford, N.S., reports a yield of 110 lbs., and says: "Sown broadcast 22nd April, on sandy loam; size of plot, 3½ x 5½ rods; harvested 25th August; no rust or smut; straw very stout; ripens earlier than any other wheat." The sample returned weighed 63 lbs. per bushel.

James Cuthbertson, of Maple Ridge, Que., reports a yield of 221 lbs. He says: "Sown in drills 8th May, on clay loam; size of plot, 13 x 30 yards; harvested 18th August; no rust or smut; eight days earlier than White Fife, and a good deal heavier." The sample returned weighed 60½ lbs. per bushel.

R. Langlais, St. Philip, Que., had a yield of 114 lbs., and writes as follows: "Sown broadcast 12th May, on sandy soil; harvested 15th August; no rust or smut; straw long and white. This wheat is superior in earliness and weight." No sample received.

F. H. Doyle, of Lindsay, Ont., had a crop of 84 lbs., and says: "Sown broadcast 22nd April, on clay loam; harvested 5th August; no rust or smut; straw bright and stiff; about one week earlier in ripening than others. This wheat suits the land here well." The sample returned weighed 59¾ lbs. per bushel.

James McGahey, of Eden Valley, Ont., had 76 lbs. He says: "Sown broadcast 20th April, on heavy clay soil; size of plot, 20 x 60 feet; harvested 19th July; no rust; a little smut; straw stiff and good; was ripe 12 days earlier than Colorado sown same day; it will suit this land well." The sample returned weighed 61¼ lbs. per bushel.

Wm. Smith, of Griswold, Man., had a crop of 85 lbs., and says: "Sown broadcast 24th April, on sandy loam; size of plot, 25 x 80 feet; no rust; very smutty; straw long, and fairly strong growth. It did not ripen quite as early as Red Fife sown same time, and does not weigh as well." Weight of sample returned, 60 lbs. per bushel.

Thos. C. Boulton, of Nelson, Man., had a crop of 75 lbs. He says: "Sown broadcast 24th April, on clay loam; harvested 21st August; some rust; no smut; straw rather weak; ripened a week earlier than Red Fife sown same time." Weight of sample returned, 56½ lbs. per bushel.

G. Miller, of Carrsdale, N.W.T., had a yield of 105 lbs. from 3 lbs. of seed. He writes: "Sown broadcast 6th April; cannot give date of harvesting; was about a week earlier than White Fife sown same time; no rust or smut; straw bright and strong; it pleases me better than any other I have sown." The sample returned weighed 62½ lbs. per bushel.

Wm. Gobbett, of Dunmore Junction, N.W.T., had a crop of 80 lbs., and says: "Sown broadcast 23rd April, on clay loam; size of plot, 50 x 80 feet; no rust; some smut; straw clean, bright and strong, of medium length; ripened ten days earlier than any other wheat I had." The sample returned weighed 63½ lbs. per bushel.

L. Zuichon, of Port Guichon, B.C., had a yield of 143 lbs. from 3 lbs. of seed. He says: "Sown broadcast 29th April, on delta land; size of plot, 15 x 40 feet; harvested 20th August; no rust or smut; straw light." The sample returned weighed 64 lbs. per bushel.

John Callaghan, of Port Hammond, B.C., had 66 lbs., and says: "Sown broadcast 13th April, on sandy loam; size of plot, 20 x 80 feet; harvested 2nd August; some smut; straw fine." The weight of the sample returned was 62½ lbs. per bushel.

Campbell's White Chaff.

This variety of spring wheat, so promising for the eastern provinces, has again proved very productive. It is not, however, as yet a variety to be recommended for

Manitoba or the North-West Territories. It is too soft, and lacks that proportion of gluten which would make strong flour. On this account but very few samples have been sent to the western plains—only sufficient to test its productiveness there. At the Central Experimental Farm the crop has varied from 47 bushels and 50 lbs. per acre to 25 bushels and 23 lbs. At Nappan, N.S., it has yielded at the rate of 37 bushels 20 lbs.; at Brandon, Man., 43 bushels 45 lbs.; at Indian Head, on different plots, from 52 bushels to 33 bushels 56 lbs.; and at Agassiz, B.C., 21 bushels 10 lbs.

W. J. Fraser, of North River, Lot 32, P.E.I., had a yield of 90 lbs. from 3 lbs. of seed, and says: "Sown broadcast 2nd May, on sandy loam; size of plot, 8 x 12 yards; harvested 26th August; no rust or smut; straw bright and strong; ripens about the same time as White Russian. It is quite a success with me." The sample returned weighed 60¼ lbs. per bushel.

George McDougall, of Bangor, P.E.I., had 87 lbs. He says: "Sown broadcast 25th May, on rich sandy loam; size of plot, 160 square yards; harvested 7th August. A slight rust on part of crop; no smut; straw strong growth; none broken or lodged; ripened five days before White Russian." The weight of the sample returned was 62½ lbs.

J. B. Hamblen, of Pictou, N.S., reports a yield of 120 lbs. from 3 lbs. of seed. He says: "Sown broadcast 7th May, on sandy loam; size of plot, 30 x 80 feet; harvested 29th August; no rust or smut; straw 4½ feet high; does not ripen any earlier than other sorts, but gives a heavier yield." The weight of sample returned was 56½ lbs. per bushel.

R. D. Ross, of Bayview, N.S., had a crop of 70 lbs., and says: "Sown broadcast 7th May, on clay land; harvested 26th August; no rust; some smut; stra v bright and very strong; eight days earlier than White Fife, sown same day. I consider this a very good variety of wheat. I took first prize at provincial exhibition at Halifax for best bushel white spring wheat with Campbell's White Chaff.

E. Lafférière, of St. Sébastien, Que., had a yield of 100 lbs. from 3 lbs. of seed. He says: "Sown broadcast 13th May, on grey soil; size of plot, 18 x 171 feet; harvested 31st August; no rust; some heads of smut; straw fairly good; ripened five or six days later than a bearded sort which I sowed. This which you sent is preferable." The sample returned weighed 61¼ lbs. per bushel.

R. A. Ralph, of Shawville, Que., had 90 lbs., and says: "Sown broadcast 1st May, on sandy loam; size of plot, 245 square yards; 1 bushel per acre; harvested 6th August; no rust or smut; straw short, clean and white; ripened about 6 days earlier than White Russian sown beside it, and I think yields about half as much more. I am proud of my wheat; would not take $5 for what I have from the 3 lbs." The weight of the sample returned was 61½ lbs. per bushel.

James McGuire, of Brinston's Corners, Ont., had a yield of 140 lbs. He writes: "Sown broadcast 22nd April, on gravelly soil; size of plot, 20 x 160 feet; harvested 8th August; no rust; a few heads of smut; straw good; is better than our own wheat grown alongside of it." The weight of the sample returned was 61 lbs. per bushel.

James Adams, of Newcastle, Ont., had 130 lbs., and says: "Sown broadcast 17th April, on clay loam; size of plot, 40 x 120 feet; harvested 10th August; no rust or smut; straw good; ripens early; a good wheat." The weight of the sample in this case was 60½ lbs. per bushel.

J. D. Wager, of Enterprise, Ont., had a crop of 92 lbs. He says: "Sown broadcast 17th April, on clay loam; size of plot, 15 x 30 yards; harvested 3rd August; no rust or smut; straw short, being parched by drought; about a week earlier than Fife wheat sown in same field." Weight of sample returned, 62 lbs. per bushel.

John Menary, of Holmfield, Man., had a crop of 75 lbs., and says: "Sown in drills 7th April, on clay loam; size of plot, 9 x 160 feet; badly rusted; a little smut; straw long; 8 days earlier than Red Fife; will try it again." No sample received.

Thomas James, of Spulmacheen, B.C., reports the extraordinary yield of 454 lbs. from 3 lbs. of seed. He says: "Sown by hand 30th April, on sandy loam; size of plot, ⅙ of an acre; harvested 22nd August; no rust or smut; straw grew rank, and lodged by heavy rain; ripens about the same time as ordinary wheat in this section; a much heaver yielder." The sample returned weighed 62¼ lbs. per bushel.

Hector Ferguson, of Port Haney, B.C., had a crop of about 100 lbs., and says: "Sown broadcast 9th May, on alluvial deposit; size of plot, about 50 square yds.; harvested 9th September; no rust; a little smut; straw strong and very good; about seven days later than the Ladoga. This is one of the best varieties I have seen, and yields far better than Ladoga or Red Fife." The sample returned weighed 61 lbs. per bushel.

Red Fife.

The Red Fife as grown in the Canadian North-West is one of the best wheats which the world produces. As grown there it is of the highest quality; is productive, and comparatively free from rust; when grown in the eastern provinces it is much less desirable. At the Central Experimental Farm it has during the last year produced a crop of 22 bushels and 25 lbs. per acre. At the experimental farm at Brandon, Man., it has varied on different soils from 29 bushels and 40 lbs. to 52 bushels 55 lbs.; at Indian Head, N.W.T., from 38 bushels 20 lbs. to 51 bushels 10 lbs.; and at Agassiz, B.C., it has yielded 21 bushels and 40 lbs. per acre.

James Boulter, of Little Pierre Jacques, P.E.I., had a crop of 70 lbs., and says: "Sown broadcast 12th May, on dry hardwood land; size of plot, ⅛ acre; harvested 10th September; some rust; no smut; straw rusty in spots. I think it will do well here on a dry season, but if wet I think it will rust." Weight of sample received, 61 lbs. per bushel.

John Rutherford, of Tweedside, N.B., had a yield of 96 lbs. from 3 lbs. of seed, and says: "Sown broadcast 20th May, on dark heavy loam; harvested 20th September; no rust or smut; straw bright, tall, and stood up well." No sample was received.

John Corregan, of Caledonia, N.S., had 80 lbs. He says: "Sown broadcast 21st May, on heavy soil; size of plot, 2 x 6 rods; harvested 8th September; no rust or smut; straw heavy and coarse." The sample returned weighed 61 lbs. per bushel.

P. Beauchamp, of Valencay, Que., had a crop of 40 lbs., and says: "Sown broadcast 8th May, on clay soil; size of plot, 15 x 100 feet; harvested 4th September; a little rust or smut; straw medium." The sample returned weighed 59 lbs. per bushel.

Augustine Doyon, of St. Frederick Station, Que., had a yield of 38 lbs. He says: "Sown broadcast 15th May, on sandy soil; harvested 3rd September; no rust or smut; straw good and white." The weight of the sample returned was 62½ lbs. per bushel.

John Leach, of Cape Amable, Ont., had a yield of 60 lbs. He says: "Sown broadcast 4th May, on sandy loam; size of plot, 11 x 30 yards; harvested 10th September; no rust or smut; straw short and stiff." The weight of this sample was 61 lbs. per bushel.

Ernest Morgan, of Kerwood, Ontario, reports also a yield of 60 lbs., and says: "Sown in drills 28th April, on clay loam; size of plot, 12 x 165 feet; harvested 10th August; no rust or smut; straw bright and clean, and a good length." This was cut before it was ripe, and the sample returned was shrunken, and weighed 57¼ lbs. per bushel.

MULTIPLIER PEAS.

This promising variety of pea, which has produced very good crops on the experimental farms, was distributed in limited quantity for test.

Wm. Clark, of North Wiltshire, P.E.I., had a crop of 60 lbs. from 3 lbs. of seed, and says: "Sown 30th May; cut 15th September." The weight of the sample returned was 65¼ lbs. per bushel.

J. R. Taylor, of Port Elgin, N.B., had 100 lbs. He says: "Sown 6th May, on loamy soil; size of plot, 14 x 100 feet." Date of harvesting is not given. The weight of the sample returned was 64 lbs. per bushel.

W. J. Renyston, of Harmony Mills, N.B., had a crop of 90 lbs., and says: "Sown 2nd May, on loamy soil; harvested 15th August." Weight of sample returned, 66¾ lbs. per bushel.

John Smith, of Indian Brook, N.S., had a yield of 80 lbs., and says: "Sown 12th June, on dry soil; size of plot, 80 x 100 feet; harvested 16th September." The weight of the sample returned was 66¾ lbs. per bushel.

Donald McInnes, of North Branch, Baddeck (C.B.), N.S., had also a yield of 80 lbs. He says: "Sown 28th May, on rich deep soil; size of plot, about 2 square rods; harvested 12th September." The sample returned weighed 65½ lbs. per bushel.

Denis Côté, of La Baie, Que., reports a yield of 216 lbs. from 3 lbs. of seed. He says: "Sown 30th April, on strong heavy soil; size of plot, 12 perches; sown very thin; harvested 15th August; much earlier than varieties here." No sample was returned in this case.

George Myrand, St. Foy, Que., had a crop of 180 lbs., and says: "Sown 8th May, on loamy soil; size of plot, 20 x 90 feet; harvested 28th August; straw long and excellent. I prefer these to any other variety." The sample returned weighed 66¼ lbs. per bushel.

Wm. Dunn, of Sweet's Corners, Ont., had a crop of 214 lbs., and says: "Sown 1st May, on clay land; size of plot, 26 x 87 feet; no manure used; harvested 14th August; straw short, and well loaded with pods." I think these peas will do well here. The weight of the sample returned was 64½ lbs. per bushel.

J. C. Duhame, of Crysler, Ont., harvested 185 lbs. He says: "Sown 15th May, on yellow clay soil; harvested 15th September." No sample received.

Stephen Thompson, of Beaver Creek, Man., had a crop of 58 lbs. He says: "Sown 6th May, on sandy loam; size of plot, 5 x 100 feet; harvested 16th September; the spring was dry and unfavourable for this crop." The sample returned weighed 66 lbs. per bushel.

D. Berger, Langenberg, N.-W.T., had a yield of 90 lbs., and says: "Sown 16th April, on sandy loam; size of plot, 10 x 30 feet; harvested 20th August; has done better than other sorts grown here." The weight of the sample returned was 64½ lbs. per bushel.

Indian Corn.

Most of the samples of corn referred to in the list of grain sent out were distributed by J. A. Robertson, Agriculturist of the Experimental Farm and Dairy Commissioner of the Dominion, during a visit paid by him to the Maritime Provinces in June last. Sample bags containing 3 or 4 pounds each were given to any farmers present at the meetings which he attended who were willing to test the value of corn for fodder purposes.

F. G. Borger, of Georgetown, P.E.I., writes on 13th October, 1891: "The fodder corn I got from you is a real success; good judges put the crop at over 20 tons to the acre."

Cyrus Shaw, of New Perth, P.E.I, writes, 5th December: "I take this opportunity of bearing testimony to the success of the corn distributed by you last spring, in our neighbourhood; the result is all that could be desired. I intend to plant 2 acres next spring."

John Hamilton, of New Perth, P.E.I., says: "Your corn has exceeded our expectations and may become one of our staple crops in future. Next year the planting of fodder corn will be undertaken here on a large scale."

Benjamin Murray, of Bedeque, P.E.I., "planted the contents of the sample bag he received on the 12th June, and by careful hand-planting it was sufficient for six rows, each 4 chains in length. It was cut on the 10th October and was an excellent crop." He intends growing corn extensively next year.

Similar experience has been had in Nova Scotia.

Potatoes.

A limited distribution of potatoes was made in small bags containing 3 lbs. each, and quite a number of encouraging reports have been received, of which the following are examples:—

Chicago Market.

J. C. McNair of Perth Centre, N.B., received a sample bag of 3 lbs., from which he had a crop of 120 lbs. He says: "Planted 5th June, on light soil; harvested 10th October; earlier and better weight than other potatoes; am well pleased with the variety."

P. Fortien, of St. Fabien, Que., had a yield of 145 lbs. He says: "Planted 1st June, on yellow soil, dressed with manure; harvested 25th September. These potatoes are the finest of this year's harvest."

Joseph Marcott, of St. Albans, Que., had 83 lbs., and writes: "Planted 1st June, on grey soil; harvested 22nd September."

Thomas Bradley, of Minden, Ont., had a crop of 105 lbs. He says: "Planted 29th May, on sandy loam; harvested 15th October. These yielded about the same as the Rose."

Early Ohio.

R. R. Colpitts, of Forest Glen, N.B., had a crop of 50 lbs. He says: "Planted 25th May, on intervale loam; harvested 4th October; they had not a fair chance; soon after they came up the potato beetle almost destroyed them."

D. V. Gagné, of Sturgeon Falls, Ont., had a yield of 103 lbs., and writes: "Planted 28th May, on yellow soil manured; harvested 4th September; they are not as early as Early Rose but give double the yield here."

S. J. Ryan, of Head Lake, Ont., had 75 lbs., and says: "Planted 1st June, on rich clay loam; harvested 1st September; ripe two weeks earlier than Early Rose and fully double the yield."

Early Sunrise.

Phileas Fortien, of St. Fabien, Que., reports a yield of 120 lbs. from 3 lbs. received, and says: "Planted 30th May, on rich yellow soil; harvested 28th September. These potatoes are very good, are as early as Early Rose and promise well."

T. J. Amey, of Camden East, Ont., had a crop of 106 lbs., and says: "Planted 21st May on clay loam." The date of harvesting is not given.

Wm. Holmes, of Kirkfield, Ont., had a yield of 100 lbs. He says: "Planted 15th May, on clay loam; harvested 23rd September; they did better than any other sort we planted."

DISTRIBUTION OF FALL WHEAT.

CANADIAN VELVET CHAFF.

Early in the autum of 1890 there was distributed in those districts of Ontario where fall wheat is successfully grown 519 3-lb. samples of the Canadian Velvet Chaff, a very promising variety of fall wheat. This wheat was tested at several points in Ontario, during 1890, and turned out remarkably well. It is a fine plump wheat and a heavy cropper. A large number of excellent reports have been received from the farmers to whom the samples were sent, from which the following have been selected :—

T. S. Brant, of Whitby, had a crop of 330 lbs. from 3 lbs. of seed, and says: "Sown broadcast 20th Sept., 1890, on clay loam, after barley; size of plot, $\frac{1}{10}$ acre; harvested 20th August, 1891; no smut or rust; straw stiff and bright; hardly so early as other varieties, but gives a better yield. I have sown the yield of the 3 lbs. sent on five acres." The weight of the sample returned was $60\frac{1}{4}$ lbs. per bushel.

Thos. Harris, of Hagersville, had a yield of 299 lbs. from 3 lbs. of seed. He says: "Sown broadcast 12th September, 1890, on sandy loam; size of plot, $\frac{1}{8}$ of an acre; harvested 17th July, 1891; no rust; a few grains of smut; straw rather coarse and soft; a day or two later than other varieties." The weight of the sample returned was 62 lbs. to the bushel.

John Grooms, of Bothwell, had 270 lbs. He says: "Sown broadcast 9th September, 1890, on clay loam; size of plot, 44 x 115 feet; harvested 19th July, 1891;

no rust or smut; straw coarse and of medium length; some 3 or 4 days later than the Scott wheat, but far superior." The sample returned weighed 61 lbs. per bushel.

Mark Crawford, of Whitby, had a crop of 251 lbs. from 3 lbs. of seed. He says: "Sown in drills 9th September, 1890, on strong clay land; size of plot, $\frac{1}{11}$ of an acre; harvested 25th July, 1891; no rust; no smut; straw medium, with very large head; was fully as early as any other sorts grown in this locality; am very much pleased with the wheat; it stood the winter well, started early in the spring and produced a heavy crop." The weight of this sample was 62¾ lbs. per bushel.

Samuel Alton, of Belfast, also had a yield of 251 lbs., and says: "Sown broadcast 10th or 12th Sept., on clay loam; size of plot, $\frac{1}{17}$ of an acre,; harvested 23rd July, 1891; no rust; some smut; straw bright and soft; was ripe as soon as the Star and Democrat, sown 10 or 12 days earlier; the yield was immense." The sample returned weighed 62 lbs. to the bushel.

Welcome Marr, of Glanford Station, had 186 lbs., and says: "Sown broadcast 8th Sept., 1890, on clay loam; size of plot, 6 x 60 yards; harvested 24th July, 1891; some rust; no smut; straw much like Clawson; four days later than Clawson or Golden Cross." The sample returned weighed 61 lbs. per bushel.

George H. Thompson, of Guelph, had a yield of 156 lbs. He says: "Sown in drills 9th Sept., 1890, on clay loam; size of plot, $\frac{1}{20}$ of an acre; harvested 28th July, 1891; no sign of rust; slightly affected with smut; straw bright, standing well; compares very favourably with other sorts; I think it will do well in this section." Sample returned weighed 61¾ lbs.

V. E. Kincade, of Wisbeach, had a crop of 151 lbs., and reports as follows: "Sown broadcast Sept., 1890, on light clay soil, mixed with gravel; size of plot, 1½ x 7 rods; harvested 21st July, 1891; no rust, but a large quantity of smut; straw bright, long and strong; compares favourably with other sorts grown by me." The weight of the sample returned was 58¾ lbs. per bushel.

EXPERIMENTS WITH OATS.

During the season of 1891 forty-eight varieties of oats have been tested on the Central Experimental Farm, 29 of which have been grown in field crops, the remainder in small plots, chiefly in plots of $\frac{1}{20}$ of an acre each. Thirty-six varieties were sown side by side, all on the same day, on plots of $\frac{1}{20}$ of an acre. The land used for this purpose was the same as that used for the $\frac{1}{10}$ acre plots in 1890. This field was ploughed in the autumn of 1890, and manured in the spring of 1891, with about twenty two-horse loads of stable manure to the acre.

This was spread in the spring, lightly ploughed under and the land harrowed before sowing. These plots were arranged so as to have the oats follow wheat. These were all sown on the 28th of April, on sandy loam with a clay subsoil, but many of them rusted badly, which lessened the crops and reduced the weight per bushel very much, and caused the grain to ripen prematurely, so that the normal dates of ripening could not be accurately determined. For this reason the time of harvesting and the number of days maturing have been omitted.

TEST of Varieties of Oats, all sown same day.

—	Yield per Acre.		Weight per Bushel.
	Bush.	lbs.	Lbs.
American Beauty	30	03	23½
American Triumph	21	14	
Bonanza	23	30	29
Banner	37	14	23¼
Badger Queen	27	29	31½
Black Tartarian	22	..	21
" Prolific (Webb's)	20	33	20½
Challenge White Canadian	24	14	27¼
Canadian Triumph	31	28	39
Cream Egyptian	57	12	34½
Early Archangel	33	13	36¾
Early Race-horse	36	24	33¼
Early Blossom	38	18	26½
English Potato	38	08	28¼
Flying Scotchman	48	26	32
Giant White Side	21	24	19
Hazlett's Seizure	11	06	27
Holstein Prolific	45	..	26¾
Hungarian White	30	28	34
Georgia Early White	32	32	31½
Longfellow	42	..	30½
New Zealand	14	29	36½
Oderbruch	29	32	30½
Prize Cluster	28	28	27¾
Rennie's Prize White	25	13	29¾
Rosedale	27	32	27¾
Siberian	34	02	32½
Victoria Prize	18	33	30
Wide Awake	24	16	24
White Russian	15	12	32¼
Welcome	37	30	34
White Dutch	32	32	33¾
White Giant	36	24	24½
Waterloo	37	15	24¼
White Egyptian	49	32	29¾
English White	21	08	32½

This list cannot be taken as a fair index of the fertility and quality of the different varieties, but since most of the plots were subject to the same unfavourable conditions, it was thought best to publish this comparative table. The field plots which follow, not having suffered so much with rust, make a much better showing and are more reliable as regards the comparative value of the different sorts.

LARGER FIELD PLOTS.

When the words "no manure" are used in the following records, it should be understood to mean that no manure has been applied to the lands spoken of since the experimental farm was purchased in 1887. We have no records of the treatment of such portions of the land as were under cultivation prior to this. When the word "manure" is used it means an application of about twenty two-horse loads per acre. Where reference is made to the preparation of the soil, it should be understood that in all cases where the disc harrow is used that it is followed with the ordinary toothed or smoothing harrow run crosswise before the grain is sown.

Banner.—On light sandy soil; manured in the spring of 1890; ploughed in the autumn of 1890, and disc harrowed in the spring of 1891; seven acres; sown 2nd May; 2¼ bushels per acre; ripe 15th August; time to mature, 105 days; yield per acre, 44 bushels 31 lbs.; weight per bushel, 36¼ lbs. Oat long, white; length of panicle, 6 to 7 inches; straw, 3 feet high, bright, with scarcely any rust. The crop in this instance would have shown a larger result, but for a hail storm, which threshed a portion of the grain out while in stook.

Bonanza.—On sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890, and disc harrowed in the spring of 1891; 5½ acres; sown 4th May; 1¾ bushels per acre; ripe 5th August; time to mature, 93 days; yield per acre, 39 bushels 28 lbs.; weight per bushel, 42¼ lbs.; oat short, plump, white; length of panicle, 8 to 8½ inches; straw not strong or coarse, but standing well, 3 to 3½ feet long; considerably rusted.

Canadian White.—On light sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890, and disc harrowed in the spring of 1891; 2 acres; sown 24th April; 2 bushels per acre; ripe 18th August; time to mature, 116 days; yield per acre, 52 bushels 2 lbs., weighing 39 lbs. per bushel; oat long, not very plump, white; length of panicle, 8 to 9 inches; straw, 3 to 3½ feet long; slightly rusted but standing well.

Challenge White Canadian (Webb's).—On clay loam; land ploughed in the autumn of 1890; manured in the spring of 1891, when it was ploughed again and harrowed; half an acre; sown 29th April; 1¾ bushels per acre; ripe 3rd August; time to mature, 96 days; yield per acre, 34 bushels 12 lbs.; weight per bushel, 33 lbs.; length of panicle, 8 to 10 inches; branching; length of straw, 4½ to 4¾ feet; badly lodged, and so badly rusted that it ripened prematurely.

Cream Egyptian.—On soil partly sandy, partly peat; no manure; fourth crop since clearing; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 2½ acres; sown 4th May; 1¾ bushels per acre; ripe 17th August; time to mature, 105 days; yield per acre, 43 bushels 31 lbs.; weight per bushel, 38¼ lbs.; oat of medium length, fairly plump, white; length of panicle, 8 to 9 inches; sided; straw, 3½ to 4 feet long, standing fairly well; two small spots lodged; very slightly rusted.

Early Archangel.—On sandy loam, mixed with clay; no manure; some artificial fertilizer applied in 1889 for potatoes; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; ¾ acre; sown 30th April; 1¾ bushels per acre; ripe 14th August; time to mature, 106 days; yield per acre, 48 bushels 8 lbs.; weight per bushel, 38¾ lbs.; oat of medium length, plump, white; length of panicle, 7½ to 9 inches; branching; straw, 3½ to 4 feet long; bright, with scarcely any rust; stands fairly well.

English Potato.—On sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 1 acre; sown 6th May; 1¾ bushels per acre; ripe 14th August; time to mature, 100 days; yield per acre, 48 bushels 9 lbs.; weight per bushel, 37¼ lbs.; oat short, fairly plump, white; length of panicle, 8 to 8¼ inches; sided; straw 4 feet long; lodged considerably; slightly rusted.

Early Race-horse.—On light sandy soil; no manure; this was the 4th crop from clearing; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 5 acres; sown 8th May; 1¾ bushels per acre; ripe 12th August; time to mature, 96 days; yield per acre, 26 bushels 23 lbs.; weight per bushel, 42¼ lbs.; oat short, plump, white; length of panicle, 8 to 9 inches; straw, 3 to 3¼ feet long, very badly broken by hail and rain; slightly rusted; about one-fourth of the grain was beaten out by a hail storm, which lessens the recorded yield.

Flying Scotchman.—On light sandy soil; no manure; has been cropped for four years; ploughed in the autumn of 1890, and disc harrowed in the spring of 1891; 5½ acres; sown, 8th May; 1¾ bushels per acre; ripe, 11th August; time to mature, 95 days; yield per acre, 29 bushels 7 lbs.; oat short to medium in length, plump, white; length of panicle, 8 to 9 inches; branching; straw, 3 to 3¼ feet long; badly broken by hail storm, but not lodged, and about one-fourth of the grain threshed out; slightly rusted; land very poor and sandy.

Georgia Early White.—On light sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 1¼ acres; sown 24th of April; 1¾ bushels per acre; ripe 10th August, time to mature, 108 days; yield per acre, 42 bushels 29 lbs.; weight per bushel, 41 lbs.; oat of medium length, plump, white; length of panicle, $8\frac{1}{2}$ to $9\frac{1}{4}$ inches; branching; straw $3\frac{1}{2}$ to 4 feet long, standing fairly well; lodged at one end; slightly rusted.

Giant Swedish.—On sandy loam mixed with clay; no manure; artificial fertilizer applied in 1889 for potatoes; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; one acre; sown 30th of April; 2 bushels per acre; ripe 23rd August; time to mature, 115 days; yield per acre, 67 bushels 26 lbs.; weight per bushel, $32\frac{3}{4}$ lbs.; oat long, fairly plump, yellow; length of panicle, 9 to 10 inches; sided; straw 4 to $4\frac{1}{4}$ feet long, bright, free from rust aud all standing.

Golden Beauty (Pearce).—On sandy loam, mixed with clay; no manure; artificial fertilizer applied in 1889 for potatoes; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $\frac{1}{3}$ acre; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 12th August; time to mature, 110 days; yield per acre, 64 bushels 32 lbs.; weight per bushel, 35 lbs.; oat medium to long, pale yellow; length of panicle, 7 to 8 inches; branching; straw 4 feet long, rather dark in colour; considerably rusted but standing fairly well.

Hazlett's Seizure.—Soil and preparation same as Golden Beauty; $\frac{3}{4}$ acre; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 8th August; time to mature, 100 days; yield per acre, 44 bushels 14 lbs.; weight per bushel, 42 lbs.; oat short, plump; length of panicle, 7 to 8 inches; branching; straw, 3 to $3\frac{3}{4}$ feet long, rather weak; partly broken down about 1 foot from base; slightly rusted.

Holstein Prolific.—Soil and preparation same as Golden Beauty; $\frac{4}{5}$ acre; sown 30th April; 2 bushels per acre; ripe 11th August; time to mature, 103 days; yield per acre, 51 bushels 30 lbs.; weight per bushel, 35 lbs.; oat long, plump, pale yellow; length of panicle, 7 to 8 inches; branching; straw, 3 to $3\frac{1}{2}$ feet long; standing fairly well; very slightly rusted.

Hungarian White.—Soil and preparation same as Golden Beauty; $\frac{1}{2}$ acre; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 25th August; time to mature, 117 days; yield per acre, 65 bushels 8 lbs.; weight per bushel, $30\frac{3}{4}$ lbs.; oat medium length, rather thin, white; length of panicle, 8 to 9 inches; branching; straw, $3\frac{1}{2}$ to $3\frac{3}{4}$ feet long; standing well; slightly rusted; some grain beaten out by storm.

Longfellow.—On light, sandy soil; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $1\frac{1}{3}$ acres; sown 6th May; $1\frac{3}{4}$ bushels per acre; ripe 17th August; time to mature, 103 days; yield per acre, 33 bushels 30 lbs.; weight per bushel, $33\frac{1}{4}$ lbs.; oat small size, black, keeps its colour well; length of panicle, 5 to 6 inches; branching; straw, $2\frac{1}{4}$ to $2\frac{1}{2}$ feet long; all standing; no rust; grain considerably beaten out by hail.

Oderbruch.—On soil partly sandy and partly clay loam; no manure; 4th crop; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $1\frac{1}{6}$ acres; sown 16th May; $1\frac{3}{4}$ bushels per acre; ripe 20th August; time to mature, 96 days; yield per acre, 84 bushels 33 lbs.; weight per bushel, 29 lbs.; oat medium length, fairly plump, white; length of panicle, 8 to 9 inches; half-sided or sided; straw 4 to $4\frac{1}{4}$ feet long, standing fairly well; considerably rusted but very promising.

Poland White.—On light sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $1\frac{3}{4}$ acres; sown 24th April; $1\frac{3}{4}$ bushels per acre; ripe, 10th August; time to mature, 108 days; yield per acre, 49 bushels 8 lbs.; weight per bushel, 34 lbs.; oat short, plump, white; length of panicle, 8 to 9 inches; branching; straw, $3\frac{1}{2}$ to 4 feet long; considerably lodged and slightly rusted.

Prize Cluster.—On sandy loam; part of this field was manured in the spring of 1889, the remainder in the spring of 1891; ploughed in the autumn of 1890; that part manured in 1889 was disc harrowed in the spring of 1891; the recently manured portion ploughed and harrowed; $11\frac{3}{4}$ acres; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 8th August; time to mature, 100 days; yield per acre, 48 bushels 24 lbs.; weight per bushel, $43\frac{1}{4}$ lbs. About one-fourth of this grain was beaten out while in stook by a bail storm, otherwise the recorded yield would have been larger. Oat short, plump, white; length of panicle, 7 to 8 inches; branching; straw $3\frac{1}{2}$ to 4 feet long; standing fairly well; lodged very slightly in spots; not much rust.

Rosedale.—On sandy loam mixed with clay; no manure; artificial fertilizer applied in 1889 for potatoes; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; half an acre sown 30th April, 1¾ bushels per acre; ripe 10th August; time to mature, 102 days; yield per acre, 83 bushels 6 lbs.; weight per bushel, 37¾ lbs.; oat short to medium, plump and white; length of panicle, 8 to 8½ inches; sided or slightly branching; straw 3½ to 4 feet long, standing fairly well; lodged in a few spots only; almost free from rust.

Rennie's Prize White.—On soil part sandy loam, part peaty; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; 3½ acres; sown 6th May, 1¾ bushels per acre; ripe 5th August; time to mature, 92 days; yield per acre, 39 bushels 23 lbs.; weight per bushel, 42 lbs.; oat short, plump and white, much like Prize Cluster; length of panicle, 8 inches, branching; straw, 3½ feet long; slightly rusted.

Triumph Canadian.—On sandy loam; no manure; ploughed in the autumn of 1890 and again lightly in the spring of 1891 and harrowed; 2 acres; sown 29th April, 1¾ bushels per acre; ripe 3rd August; time to mature, 96 days; yield per acre, 18 bushels 15 lbs.; weight per bushel, 39¼ lbs.; oat short, plump and white; length of panicle, 9 to 10 inches, branching; straw 4 to 4½ feet; rusted very badly and on this account ripened prematurely.

Triumph American.—On soil partly sandy and part clay loam; no manure; fourth crop; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 6 acres; sown 16th May, 2 bushels per acre; ripe 23rd August; time to mature, 99 days; yield per acre, 37 bushels 16 lbs.; weight per bushel, 34¼ lbs.; oat short, fairly plump and white; length of panicle, 7 to 8 inches, branching; straw 4 feet long; slightly rusted; lodged.

Tartarian Prolific Black (*Webb's*).—On clay loam, manured in the spring of 1891; ploughed in the autumn of 1890 and ploughed again and harrowed in the spring of 1891; two thirds of an acre; sown 29th April, 2 bushels per acre; ripe 11th August; time to mature, 104 days; yield per acre, 38 bushels 3 lbs.; weight per bushel, 33¾ lbs.; oat long, not plump, tawny colour; length of panicle, 7 to 8 inches, sided; straw 4 to 4½ feet long, very weak; much broken about one foot from base; partly lodged; very much rusted.

Tartarian Black.—On light sandy soil, manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; 1⅓ acres; sown 6th May, 1¾ bushels per acre; ripe 15th August; time to mature, 101 days; yield per acre, 38 bushels 26 lbs.; weight per bushel, 33¾ lbs.; oat long, tawny to black; length of panicle, 6 to 7 inches, sided; straw 3 to 3¼ feet long, standing well; no rust; grain partly threshed out by hail.

Victoria Prize White.—On sandy loam mixed with clay, manured in the spring of 1890; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 6 acres; sown 2nd May, 1¾ bushels per acre; ripe 7th August; time to mature, 97 days; yield per acre, 26 bushels 29 lbs.; weight per bushel, 39¾ lbs.; oat short, plump and white, closely resembling Prize Cluster; length of panicle, 8 inches, branching; straw 3½ feet long, standing fairly well; one end of field lodged; very little rust.

Welcome.—On soil part sandy and part peaty; no manure; fourth crop from clearing; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 1¼ acres; sown 4th May, 1¾ bushels per acre; ripe 5th August; time to mature, 93 days; yield per acre, 53 bushels 9 lbs.; weight per bushel, 37 lbs.; oat short, plump, white; length of panicle, 8 to 8½ inches, branching; straw 3¼ to 3½ feet long; more or less rusted; standing well.

White Russian.—Soil and preparation same as Welcome; 3 acres; sown 4th May, 1¾ bushels per acre; ripe 19th August; time to mature, 107 days; yield per acre, 37 bushels 31 lbs.; weight per bushel, 38 lbs.; oat long, fairly plump, whitish yellow; length of panicle, 8 to 9 inches, sided; straw 3 to 4 feet long, partly lodged and slightly rusted.

ADDITIONAL SMALL PLOTS OF OATS.

The seed of the following varieties was obtained in the spring of 1891 from Vilmorin, Andrieux & Co., the well-known seedsmen of Paris, France. They were all sown on sandy loam; the land where the first four plots were sown was manured in 1890; the others were manured in 1889; all were ploughed in the autumn of 1890 and disc harrowed twice in the spring of 1891.

Early Etampes.—Size of plot, 49 x 132 feet. Sown 6th May, 1¾ bushels per acre; ripe 27th August; time to mature, 113 days; yield per acre, 37 bushels 22 lbs.; weight per bushel 30 lbs.; oat medium to long, not very plump, black; length of panicle, 8 inches, branching; mixed with a considerable proportion of sided oats; straw 3½ to 4 feet long, thin and weak; considerably lodged; slightly rusted.

Californian Prolific Black.—Size of plot, 43 x 132 feet; sown 6th May, 1¾ bushels per acre; ripe 25th August; time to mature, 111 days; yield per acre, 44 bushels 31 lbs.; considerably threshed out by hail storm; weight per bushel, 26½ lbs.; oat medium length, slender, tawny; length of panicle, 11 inches, sided; straw coarse, considerably lodged and more or less rusted, but promising.

Black Coulommiers.—Size of plot, 37 x 132 feet; sown 6th May, 1¾ bushels per acre; ripe 25th August; time to mature, 111 days; yield per acre, 48 bushels 27 lbs.; oat short, plump, black; panicle branching.

Joanette.—Size of plot, 60 x 132 feet. Sown 6th May, 1¾ bushels per acre; ripe 25th August; time to mature, 111 days; yield per acre, 56 bushels 26 lbs.; weight per bushel, 31¼ lbs.; oat medium to long, tawny to black; length of panicle, 7 to 8 inches, branching; straw 4 to 4¼ feet long, rather thin; badly lodged and slightly rusted.

Abundance.—Size of plot, 12 x 590 feet. Sown 6th May, 1¾ bushels per acre; ripe 18th August; time to mature, 104 days; yield per acre, 64 bushels 27 lbs.; weight per bushel, 30¼ lbs.; oat long, rather slender, yellowish white; length of panicle, 8½ to 9 inches, branching; straw 4½ feet long, strong; stands well; slightly lodged at one end; very slightly rusted.

Black Brie.—Size of plot, 12 x 590 feet. Sown 6th May, 1¾ bushels per acre; ripe 25th August; time to mature, 111 days; yield per acre, 45 bushels 33 lbs.; weight per bushel, 21½ lbs.; oat medium to long, slender, tawny to black; length of panicle, 12 inches, branching; straw 5 feet long; considerably rusted.

Improved Ligowo.—Size of plot, 24 x 590 feet. Sown 6th May, 1¾ bushels per acre; ripe 19th August; time to mature, 105 days; yield per acre, 55 bushels 10 lbs.; weight per bushel, 34½ lbs.; oat medium to long, plump, white; length of panicle, 8½ inches, branching; straw 4½ feet long, standing well, but considerably rusted.

Giant Cluster.—Size of plot, 12 x 490 feet. Sown 6th May, 1¾ bushels per acre; ripe 24th August; time to mature, 110 days; yield per acre, 62 bushels 33 lbs.; weight per bushel, 23½ lbs.; oat long, rather slender, deep yellow; length of panicle, 11½ inches, sided; straw 4 feet long, stiff; did not lodge; very little rust.

Small quantities of the following varieties were also tested :—

Early Gothland.—Two pounds of these oats sent by Steele Bros., of Toronto, for test, were sown on 30th April, on sandy loam; size of plot, 22 x 60 feet. Shortly after sowing a considerable portion of the seed was blown out by a heavy wind, which will probably account for the light crop; ripe 27th August; time to mature, 119 days; yield, 24 lbs.; oat short to medium, white; length of panicle, 9 to 10 inches, sided; straw 3 feet 8 inches to 4 feet 10 inches long; considerably rusted, but standing well.

Black Bourbonnaire, from P. Delorme, Ohlen, N.W.T.; 1½ lbs. was sown 1st May; ripe 27th August; time to mature, 118 days; yield, 52 lbs.; oat medium length, slender, tawny to black; length of panicle, 7 to 8 inches, branching; straw 3 feet 9 inches to 4 feet long, thin; slightly lodged and slightly rusted.

Scottish Chief.—Seven ounces of these oats were received from Mr. W. T. Hyman, of London, Ont.; they were sown 30th April; ripe 9th August; time to mature, 101 days; yield, 20 lbs.; weight per bushel, 39½ lbs.; oat short to medium, plump, white; length of panicle, 10 inches, branching; straw 4 to 4½ feet long; lodged badly, and considerably rusted.

EXPERIMENTS WITH BARLEY.

TWO-ROWED VARIETIES.

Adjoining the one-twentieth acre plots of oats was a similar series of plots of barley, all sown the same day. The particulars as to the character of the soil and its preparation are given under "Experiments with Oats." The barley plots consisted of 26 two-rowed varieties and 19 six-rowed; in rotation of crop they followed oats.

TEST of Varieties of Barley, all sown same day.

Varieties.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel. Lbs.
Beardless	April 28	Aug. 11	105	34	28	51¾
Besthorns	do 28	do 12	106	46	28	53
Duckbill	do 28	do 6	100	.....	.....	52¼
Danish Chevalier	do 28	do 11	105	41	40	52
Danish Printice Chevalier	do 28	do 12	106	49	30	52¼
Dutch	do 28	do 7	101	41	44	52
Early Minting	do 28	do 10	104	42	24	52
Goldthorpe (resembles Duckbill)	do 28	do 13	107	49	28	52¾
Golden Melon	do 28	do 11	105	43	40	52¾
Italian (resembles Duckbill)	do 28	do 5	99	49	36	51¾
Kinver Chevalier	do 28	do 12	106	42	36	52¼
Golden Grains (Webb)	do 28	do 12	106	32	32	53¼
New Zealand	do 28	do 6	100	42	04	52¾
Odessa (two-rowed)	do 28	July 31	94	31	10	53¼
Prize Prolific	do 28	Aug. 12	106	33	18	53
Peacock (resembles Duckbill)	do 28	do 9	103	43	20	52½
Peerless White	do 28	do 11	105	37	2	52¼
Prolific	do 28	do 6	100	38	10	53¼
Phœnix Von Thalen	do 28	do 4	98	54	32	53½
Rice or Fan	do 28	do 4	98	34	20	49¾
Saale	do 28	do 12	106	47	20	51
Selected Chevalier	do 28	do 8	102	41	24	52¼
Sharpe's Improved Chevalier	do 28	do 9	103	43	16	52¼
Swedish	do 28	do 10	104	48	16	53¼
Thanet	do 28	do 9	103	41	40	52¼
Large Two-rowed Naked	do 28	do 3	97	27	26	60¼

The Duckbill barley was, unfortunately, lost after threshing, before it was weighed; hence we have no record of the yield of that variety. The Duckbill, Goldthorpe, Italian and Peacock resemble each other very much. They have the heads nearly erect, like wheat, and usually stand up well. The Rice or Fan has a similar habit, but the head is short and spreading. All the other sorts are of the Chevalier type, with long pendant heads, for which reason they are more liable to lodge.

Larger Field Plots.

Danish Chevalier.—On sandy loam mixed with clay; manured in the spring of 1890; sown with peas and ploughed under in 1890; ploughed again in the autumn of 1890, and disc harrowed in the spring of 1891; 2¾ acres; sown 1st May, 2 bushels per acre; ripe 12th August; time to mature, 103 days; yield per acre, 43 bushels 41 lbs.; weight per bushel, 49½ lbs.; length of head, 3½ to 4 inches; straw 2½ to 3 feet long, standing fairly well.

Danish Printice Chevalier.—On sandy loam mixed with peat; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; ½ acre; sown 1st May, 2 bushels per acre; ripe 18th August; time to mature, 109 days; yield per acre, 29 bushels 10 lbs.; weight per bushel, 48¾ lbs.; length of head, 4 inches; straw 2¾ to 3 feet, all standing very well. This plot was rather low in spots and was badly injured by frost in the spring.

Duckbill.—On sandy loam; manured in the spring of 1888; ⅑ acre; sown 21st April, 1¾ bushels per acre; ripe 6th August; time of maturing, 107 days; yield per acre, 69 bushels 27 lbs.; weight per bushel, 51 lbs.; length of head, 2¾ to 3 inches; straw 3 to 4 feet; stands well; slightly lodged in one corner; leaves considerably rusted; stem clean.

Early Minting.—On sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; ½ acre; sown 1st May; 2 bushels per acre; ripe 14th August; time to mature, 105 days; yield per acre, 39 bushels 10 lbs.; weight per bushel, 49½ lbs.; length of head, 3½ inches; straw 2½ to 3 feet long, standing fairly well; no rust.

Goldthorpe.—On sandy loam, mixed with clay; a small part of this field manured in the spring of 1890; larger part unmanured; fourth crop; 4½ acres; sown 1st May, 2 bushels per acre; ripe 18th August; time to mature, 109 days; yield per acre, 29 bushels 6 lbs. Land very poor, which will account for small crop. Weight of grain per bushel, 50¼ lbs.; length of head, 3¼ inches; straw 2¼ to 2½ feet long, good and strong; only one spot lodged, all the rest standing; very little rust.

A second plot of ⅑ acre, on a better quality of sandy loam, manured in the spring of 1888, was sown 22nd April; ripe 9th August; time to mature, 109 days; yield per acre, 73 bushels 14 lbs.; weight per bushel, 49¾ lbs.

Golden Melon.—On sandy loam mixed with clay, adjoining Goldthorpe; no manure; 4th crop; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; 1½ acres; sown 1st May; 2 bushels per acre; ripe 10th August; time to mature, 101 days; yield per acre, 21 bushels 9 lbs.; weight per bushel, 49 lbs.; length of head, 3½ to 4 inches; straw 3¼ to 3½ feet long; considerably broken down but not lodged; very little rust.

Golden Grains (Webb). — On sandy loam mixed with clay. About ¼ of this field was manured in the spring of 1889, remainder no manure; 4th crop; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; ¾ acres; sown 7th May, 1¾ bushels per acre; ripe 10th August; time to mature, 95 days; yield per acre, 28 bushels 40 lbs.; weight per bushel, 47½ lbs.; length of head, 4 inches; straw 3 to 3½ feet long, standing fairly well; slightly rusted.

Kinver Chevalier (Webb).—On sandy loam; had a light coating of manure in the spring of 1891, after which it was ploughed and harrowed; 2 acres; sown 24th April, 1½ bushels per acre; ripe 8th August; time to mature, 105 days; yield per acre, 58 bushels 2 lbs.; weight per bushel, 52¼ lbs.; length of head, 4 to 5 inches; straw 3½ feet long; bright, but badly lodged.

A second field of this variety was sown adjoining Golden Grains, to which the reader is referred for particulars as to soil and preparation; 1¼ acres; sown 7th May, 1¾ bushels per acre; ripe 12th August; time to mature, 97 days; yield per acre, 41 bushels 23 lbs.; weight per bushel, 51½ lbs.; length of head, 3 to 4 inches; straw 2¾ to 3 feet long, standing fairly well; lodged in spots; slightly rusted.

Two acres of similar land adjoining was sown on the same date with the same variety of grain. To this there was applied 400 lbs. per acre of the Royal Canadian fertilizer made by the Nichols Chemical Co., of Capelton, Que. The yield of this field was 56 bushels 10 lbs. per acre; weight per bushel, 51½ lbs.

Prize Prolific.—On clay loam mixed with sand; manured in the autumn of 1887, ploughed in the autumn of 1890, disc harrowed in the spring of 1891; 7½ acres; sown 15th May, 2 bushels per acre; ripe 20th August; time to mature, 97 days; yield per acre, 41 bushels 39 lbs.; weight per bushel, 49¼ lbs.; length of head, 4 to 4½ inches; straw 3 to 3½ feet long; standing fairly well, but slightly rusted.

A second field of this variety was sown on heavy sandy loam mixed with peat; 2¾ acres; no manure; 4th crop with similar cultivation. The yield in this instance was 34 bushels 36 lbs. per acre.

Selected Chevalier.—On sandy loam; manured in the spring of 1890, ploughed in the autumn of 1890, disc harrowed in the spring of 1891; ⅜ acre; sown 1st May, 2 bushels per acre; ripe 14th August; time to mature, 105 days; yield per acre, 38 bushels 7 lbs.; weight per bushel, 50 lbs.; length of head, 3¼ to 3¾ inches; straw 2½ to 3 feet long, standing well; no rust.

SIX-ROWED VARIETIES.

The following were sown on one-twentieth acre plots adjoining those of the two-rowed oats:—

——	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush. lbs.	Lbs.
Baxter's six-rowed	April 28	July 26	89	40 00	51¾
Common six-rowed	do 28	do 25	88	46 26	53½
Guymalaye (hulless)	do 28	Aug. 6	100	45 12	59½
Greek six-rowed	do 28	do 3	97	24 44	47½
Hulless Black (hulless)	do 28	July 31	94	34 22	62½
Kangra Valley	do 28	do 26	89	29 30	50¼
Lahoul (hulless)	do 28	Aug. 10	104	25 04	58¾
Mensury	do 28	July 29	92	45 36	50½
Moultan	do 28	do 25	88	26 40	50¾
Mardan	do 28	do 25	88	30 26	51½
Oderbruch	do 28	do 27	90	51 32	53¼
Odessa six-rowed	do 28	Aug. 1	95	43 24	49¾
Palampur	do 28	July 31	94	38 42	49¾
Petschora	do 28	do 23	86	32 14	47¾
Rennie's Improved	do 28	do 27	90	41 32	53
Spiti Valley (hulless)	do 28	do 24	87	22 14	58¼
Sialkot	do 28	do 25	88	34 26	49¼
Simla	do 28	....	....	34 22	47½
Seoraj	do 28	Aug. 1	95	34 26	46¼

Larger Field Plots.

Baxter's Six-rowed.—On good sandy loam; had a light coat of manure in the spring of 1891, when it was ploughed and harrowed before seeding; 1½ acres; sown 24th April, 1½ bushels per acre; ripe 28th July; time to mature, 95 days; yield per acre, 51 bushels 35 lbs.; weight per bushel, 51¼ lbs.; length of head, 2¼ to 2¾ inches; straw 3 to 3½ feet long, considerably lodged. This barley was much affected with smut.

A second plot of $\frac{1}{20}$ of an acre, on sandy loam, was sown 21st April, 1¾ bushels per acre; ripe 29th July; time of maturing, 99 days; yield per acre, 30 bushels 28 lbs.; weight per bushel, 51 lbs.

Rennie's Improved.—Adjoining Baxter's; similar soil and similar treatment; ⅛ of an acre; sown 24th April, 1½ bushels per acre; ripe 28th July; time to mature, 95 days; yield per acre, 77 bushels 24 lbs.; weight per bushel, 52 lbs.; length of head, 3 to 4 inches; straw 3 feet long; a strong, even growth; slightly lodged at one end.

A second plot of $\frac{1}{20}$ acre on sandy loam; was sown 22nd April, 1¾ bushels per acre; ripe 29th July; time of maturing, 98 days; yield per acre, 38 bushels 22 lbs.

Norway House Barley—On sandy loam; $\frac{1}{10}$ acre. Sown 22nd April, 1¾ bushels per acre; ripe 23rd July; time of maturing, 92 days; yield per acre, 49 bushels 10 lbs.; weight per bushel, 50½ lbs.; length of head, 2½ inches; straw 3 feet 1 in.; stands well but slightly rusted.

EXPERIMENTS WITH SPRING WHEAT.

Adjoining the $\frac{1}{20}$ acre plots of oats and barley there was a similar group of plots of spring wheat, all sown on the same day. The particulars as to the character of the soil and its preparation are given under experiments with oats. The wheat plots, which consisted of 38 varieties, followed barley.

TEST of Varieties of Spring Wheat, all sown same day.

—	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre. Bush.	Yield per Acre. lbs.	Weight per Bushel. Lbs.
Australian	April 29	Aug. 13	106	13	22	50
Anglo Canadian	do 29	do 13	106	15	27	54¾
Bearded Red	do 29	do 10	103	28	54	56¾
Calcutta Club (Indian)	do 29	do 4	97	15	12	59½
Calcutta Hard (Indian)	do 29	do 3	96	13	06	58½
Connell White	do 29	do 13	106	30	16	58
Connell Red	do 29	do 14	107	26	39	58¼
Colorado	do 29	do 10	103	27	34	58¼
California White	do 29	do 14	107	18	00	56
Delhi White	do 29	do 11	104	13	41	59
Defiance (Johnston's)	do 29	do 18	111	19	17	57¾
Democrat Spring	do 29	do 20	113	32	19	56¾
Fife Red	do 29	do 14	107	22	35	55¾
Fife White	do 29	do 16	109	26	07	57¼
Fife (Wellmans)	do 29	do 15	108	27	07	57½
Gehun (Indian)	do 29	do 9	102	13	30	57¾
Goose	do 29	do 20	113	33	35	57¼
Great Western	do 29	do 16	109	29	57	59
Green Mountain	do 29	do 14	107	19	19	53¼
Galician Summer	do 29	do 17	110	24	30	56½
Herison's Beardless	do 29	do 13	106	15	48	54
Hungarian Mountain	do 29	do 14	107	24	06	59
Huestons	do 29	do 13	106	25	27	56½
Judket	do 29	do 16	109	25	46	57½
Karachi (Indian)	do 29	do 10	103	8	20	54¾
Kangra Valley (Indian)	do 29	do 10	103	6	25	55½
Ladoga	do 29	do 5	98	21	07	57½
Lahoul (Indian)	do 29	do 6	99	18	47	52¾
Pringle's Champlain	do 29	do 12	105	31	59	57¾
Palampur (Indian)	do 29	do 4	97	18	05	59
Rio Grande	do 29	do 17	110	35	07	59¼
Russian Hard Tag	do 29	do 13	106	30	05	58½
Red Fern	do 29	do 17	110	35	30	58½
Saxonka	do 29	do 11	104	19	13	55½
Triumph (Campbell's)	do 29	do 9	102	15	35	56¼
Trimenian Sicilian	do 29	do 18	111	19	33	53¾
White Chaff (Campbell's)	do 29	do 9	102	25	13	56¼
White Russian	do 29	do 13	106	27	59	57½

The weight of the grain in these plots, and in some instances the yield also, was lessened by the prevalence of rust, from which nearly all the varieties suffered more or less.

Larger Field Plots.

Anglo Canadian.—On sandy loam mixed with peat; no manure; fourth crop; ploughed in the autumn of 1890, disc harrowed in the autumn of 1891; ⅜ acre. Sown 2nd May, 1½ bushels per acre; ripe 19th August; time to mature, 109 days. Yield per acre, 20 bushels 42 lbs.; weight per bushel, 57¼ lbs. Length of head, 3½ inches; bearded; straw 3½ to 3¾ feet long, all standing well; slightly rusted.

Judket.—On clay loam; no manure; fifth crop; ploughed in the autumn of 1890, disc harrowed in the spring of 1891; ¾ acre. Sown 25th April, 1½ bushels per acre; ripe 15th August; time to mature, 112 days; yield per acre, 31 bushels 22 lbs.; weight per bushel, 59 lbs. Length of head, 3 to 3¼ inches; beardless; straw 3½ feet long, standing well; slightly rusted.

Johnston's Defiance.—Soil and treatment the same as Judket; ½ acre. Sown 25th April, 1½ bushels per acre; ripe 14th August; time to mature, 111 days; yield per acre, 45 bushels 21 lbs.; weight per bushel, 59 lbs. Length of head, 3 inches; beardless; straw 3½ feet long, all standing; slightly rusted; a promising variety.

Ladoga.—Soil and treatment the same as Judket; ¾ acre. Sown 25th April, 1½ bushels per acre; ripe 7th August; time to mature, 104 days; yield per acre, 28 bushels 32 lbs.; weight per bushel, 59¾ lbs. Length of head, 3 to 3¼ inches, bearded; straw 3½ feet long, standing fairly well; lodged in one spot only; slightly rusted.

Red Connell.—Soil and treatment the same as Judket; ¾ acre. Sown 25th April, 1½ bushels per acre; ripe 14th August; time to mature, 111 days; yield per acre, 28 bushels 47 lbs.; weight per bushel, 58¼ lbs. Length of head, about 3 inches, beardless; straw 3 feet long, standing well; slightly rusted.

Rio Grande.—Soil and treatment the same as Judket; 1¼ acres. Sown 25th April; 1½ bushels per acre; ripe 15th August; time to mature, 112 days; yield per acre, 26 bushels 20 lbs.; weight per bushel, 59½ lbs. Length of head, 3¼ to 4 inches, bearded; straw 3¾ to 4 feet long; strong bright; all standing well; slightly rusted; a promising variety.

Triumph (*Campbell's.*)—Soil and treatment the same as Judket; 1¼ acres. Sown 25th April, 1½ bushels per acre; ripe 10th August; time to mature, 107 days; yield per acre, 23 bushels 58 lbs.; weight per bushel, 55¼ lbs. Length of head, 2¾ to 3¼ inches, beardless; straw 3 feet long; considerably rusted.

White Chaff (Campbell's.)—Soil and treatment the same as Judket; 3 acres. Sown 24th April, 1½ bushels per acre; ripe 9th August; time to mature, 107 days; yield per acre, 28 bushels 51 lbs.; weight per bushel, 58 lbs. Length of head, 3½ to 3¾ inches, beardless; straw 3 to 3¼ feet; fairly stiff and standing well; considerably rusted.

White Fife.—Soil and treatment the same as Judket; ½ acre. Sown 25th April; 1½ bushels per acre; ripe 14th August; time to mature, 111 days; yield per acre, 29 bushels 30 lbs.; weight per bushel, 58¾ lbs. Length of head, about 3 inches, beardless; straw 3¼ to 3½ feet long; all standing; slightly rusted.

White Connell.—Soil and treatment the same as Anglo Canadian; ½ acre. Sown 2nd May, 1½ bushels per acre; ripe 20th August; time to mature, 110 days; yield per acre, 21 bushels 39 lbs.; weight per bushel, 57½ lbs. Length of head, about 3 inches, beardless; straw 3 to 3¼ feet long; all standing well; very slightly rusted.

Hard Calcutta (from India).—Soil and treatment the same as Judket; ½ acre. Sown 25th April, 1½ bushels per acre; ripe 5th August; time to mature, 102 days; yield per acre, 14 bushels 33 lbs.; weight per bushel, 60¾ lbs.; length of head, 2 to 2½ inches, bearded; straw 2 to 2¼ feet long; slender, weak growth.

EXPERIMENTS WITH PEAS.

Ten varieties of peas were sown in field plots, all on sandy loam.

Black-eyed Marrowfat.—On sandy loam mixed with clay; manured in the spring of 1890; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; ¾ acre; sown 23rd April, 4 bushels per acre; ripe 17th August; time to mature, 116 days; yield per acre, 39 bushels 21 lbs.; weight per bushel, 61½ lbs.; vines made a very strong growth.

A second plot of this variety on sandy loam; no manure; 4th crop; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; ¾ acre; sown 27th April; 3½ bushels per acre; when about 3 inches high the plants were entirely eaten off 24th to 26th May, by cut-worms, but they very soon started a second growth; were ripe 19th August; time to mature, 114 days. This plot yielded 29 bushels 59 lbs. per acre, weighing 61½ lbs. per bushel; strong growth.

Crown.—Soil and treatment the same as second plot of Black-eyed Marrowfats; ½ acre. Sown 27th April, 2½ bushels per acre. This plot also was partly eaten off by cut-worms, 24th to 26th May, but the plants soon started a vigorous second growth; the peas were ripe 16th August; time to mature, 111 days; yield per acre, 47 bushels 11 lbs.; weight per bushel, 62 lbs.; very strong growth.

Daniel O'Rourke.—Soil and treatment the same as second plot of Black-eyed Marrowfat; ⅓ acre. Sown 27th April, 2½ bushels per acre; ripe 3rd August; time to mature, 98 days; yield per acre, 38 bushels 54 lbs.; weight per bushel, 62 lbs.; fair growth.

Mummy.—Soil and treatment the same as second plot of Black-eyed Marrowfats; ⅜ acre. Sown 27th April, 2½ bushels per acre; eaten off by cut-worms, 24th to 26th May; soon started a vigorous second growth; ripe 17th August; time to mature, 111 days; yield per acre, 39 bushels 13 lbs.; weight per bushel, 62¼ lbs.; a very strong growing variety.

Multiplier.—Soil of same character and treatment as second plot of Black-eyed Marrowfats, but a poorer piece of land; 3⅜ acres. Sown 27th April, 2½ bushels per acre; ripe 16th August; time to mature, 110 days; yield per acre, 27 bushels 12 lbs.; weight per bushel, 62½ lbs.; a fairly strong-growing sort.

Pride.—Soil and treatment the same as second plot of Black-eyed Marrowfats; ⅜ acre. Sown 27th April, 2½ bushels per acre; completely eaten off by cutworms, 24th to 26th May; a vigorous second growth soon started and the peas were ripe 15th August; time to mature, 109 days; yield per acre, 37 bushels 55 lbs.; weight per bushel, 64¼ lbs.; a strong-growing and promising variety.

Prussian Blue.—Soil and treatment the same as Pride; ½ acre. Sown 27th April, 2½ bushels per acre; also eaten off by cutworms; started a good second growth and ripened 20th August; time to mature, 114 days; yield per acre, 28 bushels 20 lbs.; weight per bushel, 63 lbs.

Prince Albert.—Soil and treatment the same as Pride; ½ acre. Sown 27th April, 2½ bushels per acre; yield per acre, 40 bushels 2 lbs.; not injured by cut-worms; ripe, 17th August; time to mature, 111 days; weight per bushel, 62 lbs.; a strong growing sort.

White Marrowfat.—Soil and treatment the same as Pride; ⅜ acre. Sown 27th April; 3½ bushels per acre; eaten off by cut-worms, 24th to 26th May; ripe 20th August; time to mature, 114 days; yield per acre, 18 bushels 54 lbs., weighing 59 lbs. per bushel; a very strong-growing variety.

Golden Vine.—Soil and treatment the same as Pride; ½ acre. Sown 27th April, 2½ bushels per acre; not injured by cut-worms; ripe 17th August; time to mature, 111 days; yield per acre, 44 bushels 7 lbs.; weight per bushel, 63¼ lbs.

EXPERIMENTS WITH TURNIPS.

The turnips grown on the experimental plots during 1891 were very much injured by a species of rot, which was very prevalent in the neighbourhood of Ottawa. Some varieties were affected more than others, but the injury was very general and resulted in the destruction of a large proportion of the crop. As it is impossible, under such circumstances, to give correct returns of the relative yield of the different sorts, the results of this crop are omitted as far as the experimental plots are concerned. Some particulars will be found regarding the crop obtained on some of the field plots in the 40 acres reported on by the agriculturist.

EXPERIMENTS WITH MANGELS.

Fifteen varieties of mangels were sown in rows 2½ feet apart, and cultivated with a horse cultivator. The soil was sandy loam, manured in 1888, dressed with a coating of unleached ashes; 150 bushels to the acre, in 1889, and 400 lbs. per acre, in 1891, of Royal Canadian fertilizer. There were two series of plots; the first was sown on the 8th of May, the second on the 18th, and both were pulled on 15th and 16th October. The yield per acre has been calculated from the crop of three rows, each 66 feet long. As stated in the report for 1891, estimates based on the returns from small plots usually show a relatively greater yield than when founded on the results of larger areas, but since all the varieties were treated alike and the soil was very similar throughout, these figures form a fair basis for the comparison of varieties. In this instance, quite a number of the plots were injured, and some of them entirely destroyed by cut-worms. On this account the records are incomplete; only two of the varieties named in the second series are found in the first.

—	Yield per Acre.		Yield per Acre.	
First Series of Plots, Sown 8th May.	Tons.	lbs.	Bush.	lbs.
Mammoth Yellow Intermediate	32	20	1,067	
Mammoth Long Red or Gatepost	30	720	1,012	
Mammoth Long Red	30	324	1,005	24
Kinver Yellow Globe	28	496	941	36
Mammoth Long Red	27	252	904	12
Yellow Flesh Tankard	26	1,328	888	48
Golden Flesh Tankard	22	1,672	761	12
Giant Yellow Globe	21	1,560	726	
Yellow Intermediate or Ovoid	21	1,296	721	36
New Giant Yellow Intermediate	20	1,712	695	12
Mammoth Long Red Selected	20	392	673	12
Second Series of Plots, Sown 8th May.				
Yellow Intermediate	29	1,796	996	36
Mammoth Long Red	26	8	866	43
Champion Yellow Globe	25	1,612	860	12
Golden Tankard	25	1,612	860	12
Kinver Yellow Globe	23	1,652	794	12
New Giant Yellow Intermediate	22	1,804	763	24
Golden Tankard	22	1,540	759	
Golden Tankard	22	1,276	754	36
Crimson Tankard	21	768	712	48

EXPERIMENTS WITH SUGAR BEETS.

Ten varieties of sugar beets have been tested. They were sown in rows 18 inches apart, with the Planet Junior seed drill, adjoining the experimental plots of mangels. The character of the soil and its treatment will be found under that heading. The yield per acre has been calculated from two rows, each 66 feet long, a basis of estimation which is fairly reliable for the purpose of comparing varieties, but one which usually figures up a larger yield than can be got where such roots are grown by the acre. The proportion of sugar contained in each sort has been determined by the Chemist of the Experimental Farms, and the particulars will be found in his report appended. Two of the varieties were kindly supplied by Alfred Musy, Esq., manager of the beet sugar factory at Farnham.

The seed was sown at two different periods, the first set of plots on the 9th and the second on the 19th May. They were all pulled 19th October. On some of the plots the young plants were devoured by cut-worms as soon as they appeared above ground; for this reason the records are not complete.

—	Yield per Acre.		Yield per Acre.	
First Series of Plots, Sown 9th May.	Tons.	lbs.	Bush.	lbs.
Vaurica Yellow Giant (Vilmorin)	31	920	1,048	40
"I. B." from A. Musy, Farnham	27	560	909	20
Green Necked Brabant (Vilmorin)	25	1,480	858	
"C. H." from A. Musy, Farnham	21	1,340	722	20
Klein Wanzleben	18	080	601	20
Second Series of Plots, Sown 19th May.				
Dippe's Klein Wanzleben	39	1,640	1,327	20
Bulteau Desprez, from United States Department of Agriculture	37	1,020	1,250	20
Vaurica Yellow Giant	30	280	1,004	40
"I. B." from A. Musy, Farnham	25	820	847	
Vilmorin No. 1 (Vilmorin)	23	420	773	40
"B. D." from A. Musy, Farnham	22	1,760	762	40
Large Sugar (W. Skaife)	22	1,100	751	40
Klein Wanzleben	19	280	638	
Vilmorin's Improved White (Vilmorin)	18	1,840	630	40
Green Necked Brabant (Vilmorin)	18	080	601	20

EXPERIMENTS WITH CARROTS.

The carrots were also sown in rows 18 inches apart, with the Planet Junior seed drill, and were cultivated by hand with the Planet Junior cultivator. The character of the soil and its treatment was the same as that for mangels. The yield per acre has been calculated from three rows, each 66 feet long. The first series of plots was sown on the 8th May, the second on the 18th May, and all were pulled on the 30th and 31st of October. These plots were less injured by cut-worms than any of the other roots, hence the record is more complete.

—	Yield per Acre.		Yield per Acre.	
First Series of Plots, Sown 8th May.	Tons.	lbs.	Bush.	lbs.
Half Long Red Obtuse	28	1,346	955	46
Half Long White Lisse	27	1,880	931	20
Early Gem or Guerande	23	1,226	783	06
Long Red Obtuse	23	200	770	
Yellow Intermediate	23	053	767	33
Giant White Belgian	22	1,320	755	20
Half Long Red Chantenay	20	1,360	689	20
Half Long Chantenay	20	040	667	20
Large Green Top White Vosges	19	573	642	53
James' Intermediate	19	280	638	
Large White Vosges	18	080	601	20
Long Red St. Valery	17	1,640	594	
Long Red	16	560	542	40
Long Orange Belgian	14	1,626	493	46
Second Series of Plots, Sown 18th May.				
Guerande or Ox Heart	32	973	1,082	53
Large Green Top White Vosges	28	466	941	06
Early Gem or Guerande	27	1,440	924	
Giant White Belgian	27	1,440	924	
Half Long Red Obtuse	27	1,000	916	40
Improved Short White	26	506	875	06
James' Intermediate	23	346	772	26
Yellow Intermediate	23	053	767	33
Long Red St. Valery	22	1,906	765	
New Intermediate	22	1,173	752	53
Large White Vosges	22	880	748	
White Vosges	21	386	706	26
Half Long Red Nantais	20	1,946	699	06
Half Long Chantenay	20	1,360	689	20
Large White Vosges	19	1,453	657	33
Long Orange Belgian	18	666	611	
Orange Giant	17	1,760	579	20
Scarlet Perfection	17	613	576	53
Selected Altringham	14	746	479	06

EXPERIMENTS WITH POTATOES.

One hundred and eleven named varieties have been tested during 1891, and 153 seedlings. The soil and treatment was the same as that described under mangels. They were planted in rows 2½ feet apart. The dates of planting and harvesting are given in the tables, the size of the plots, the yield per acre in bushels and pounds, the proportion of marketable and unmarketable potatoes—all those of 2 inches in diameter and upwards being regarded as marketable. The total yield is given, also the weight of the diseased tubers. The results obtained from the named varieties only are submitted in the tables. The yield per acre in most cases has been calculated from the product of two rows, each 86 feet in length :—

Variety.	Date of Planting.	When Harvested	Size of Plot.	Total Yield per Acre.		Yield per Acre of Marketable Potatoes.		Yield per Acre of Unmarketable Potatoes.		Weight of Diseased Tubers in lbs. per Plot.
	1891.	1891.	Feet.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Lbs.
Daisy	May 11..	Oct. 5..	172 x 2½	534	22	476	7	58	15	8
State of Maine	do 9..	Sept. 9..	do	471	3	454	10	16	53	7
Gleason's Late	do 9..	do 10..	do	470	10	406	54	63	19	2½
Chas. Downing	do 8.	do 8..	do	464	18	396	46	67	32	3½
Frame Early	do 9..	Oct. 5..	do	460	5	413	39	46	26	7½
Summit	do 11..	Sept. 8..	180 x 2½	450	8	414	38	35	30	22
Sharpe's Seedling	do 12.	do 10..	28 x 2½	445	58	..	....	..	...	1
Delaware	do 8..	do 7..	172 x 2½	441	31	334	18	107	13	6
Lee's Favourite (Mrs. Foster)	do 11..	Oct. 5..	86 x 2½	440	40	391	42	48	58	4½
Early Puritan	do 9..	Sept. 9..	172 x 2½	432	14	373	8	59	6	18½
Algoma No. 1.	do 7..	do 7..	do	428		392	33	35	27	0
Burpee's Seedling	do 8..	do 10..	do	425	29	388	20	37	9	11
Green Mountain.	do 8..	do 11.	do	423	47	366	23	57	24	16½
Halton Seedling	do 9..	do 10..	do	422	56	350	20	72	36	15½
Early Sunrise	do 11..	do 11..	do	422	6	366	23	55	43	9½
Alexander Prolific.	do 9..	do 9..	do	415	21	356	15	59	6	17½
Late Goodrich	do 8..	do 11..	do	403	31	348	39	54	52	2½
Early Ohio	do 11..	Oct. 5..	do	400	59	373	8	27	51	10½
Pearl of Savoy	do 9..	Sept. 8..	do	397	36	330	55	66	41	3
Pootaluck	do 15..	Oct. 7..	do	395	56	315	44	80	12	2
Select Magnum Bonum.	do 11..	Sept. 9..	do	391	42	334	18	57	24	0
Lee's Favourite	do 7..	do 7..	do	389	10	301	22	87	48	0
Wonder of the World	do 9..	Oct. 5..	do	382	25	360	28	21	57	5½
Early Albino	do 8..	Sept. 10..	do	379	2	319	6	59	56	8
Rural Blush	do 8..	do 10..	do	375	40	346	58	28	42	4
Holborn Abundance	do 9..	Oct. 5..	do	375	39	332	36	43	3	1½
Burpee's Extra Early	do 15..	do 7..	do	374	49	333	27	41	22	½
White Star from Dewar	do 9..	Sept. 10..	do	373	59	308	8	65	51	7
Rennie's Stray Beauty	do 11..	Oct. 5..	do	366	22	325	51	40	31	0
May Queen Early	do 11.	Sept. 10..	do	364	42	315	44	48	58	0
Dakota Red	do 7..	do 7..	do	362	9	303	54	58	15	¼
Clarke's No. 1.	do 8..	do 11..	do	360	44	339	22	21	22	18½
Empire State	do 11..	do 8..	do	360	28	281	57	78	31	24
Vermont	do 8..	do 11..	do	358	47	298	51	59	56	20
Thorburn	do 18..	Oct. —..	86 x 2½	357	56	327	33	30	23	0
Sukreta	do 11..	Sept. 8..	172 x 2½	357	6	313	12	43	54	5
Ohio Gunner	do 8..	do 9..	do	354	34	298	51	55	43	18½
Dumfries Early White	do 11..	do 9.	do	353	42	299	41	54	2	14½
Burpee's Surprise	do 11..	do 9..	do	352	52	300	32	52	20	29
Algoma No. 2.	do 8..	do 9..	do	349	29	289	33	59	56	1
Crown Jewel	do 9..	Sept. 10..	do	347	48	295	28	52	20	2
Beauty of Hebron	do 11..	Oct. 5..	do	347	48	295	28	52	20	1
Flower of Eden	do 8.	Sept. 10..	do	347	48	307	17	40	31	16½
Prairie Seedling	do 11..	do 8..	do	341	3	300	32	40	31	0
Early Eating	do 11..	do 11..	do	339	22	279	26	59	56	10
Gov. H. Foraker	do 9..	do 10..	do	326	42	286	11	40	31	0
Vanguard	do 7..	do 7..	do	323	20	240	36	82	44	2
Blue Bell	do 9..	do 9..	do	321	38	297	9	24	29	3½
Early Rose	do 11..	do 9..	do	315	44	273	31	42	13	2½

RESULTS obtained from named varieties of potatoes, &c.—*Concluded.*

VARIETY.	Date of Planting.	When Harvested	Size of Plot.	Total Yield per Acre.		Yield per Acre of Marketable Potatoes.		Yield per Acre of Unmarketable Potatoes.		Weight of Diseased Tubers in lbs. per Plot.
	1889.	1889.	Feet.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Lbs.
Emperor William	May 8	Sept. 8	172 x 2½	302	54	271	50	31	4	2½
Algoma No. 3	do 15	Oct. 7	do	302	13	255	47	46	26	8½
Chicago Market	do 11	Sept. 9	do	301	23	252	25	48	58	8½
Compton's Surprise	do 9	do 10	do	301	22	251	34	49	48	6½
Rose's New Giant	do 11	do 8	do	296	18	282	48	13	30	½
Rosy Morn	do 11	do 11	do	295	28	244	49	50	39	2½
Richter's Improved	do 11	do 10	do	293	47	256	38	37	9	4½
St. Patrick	do 9	Oct. 5	do	284	30	189	57	94	33	45½
White Star	do 8	Sept. 10	do	276	3	207	40	68	23	8
Carter's Sukreta	do 7	do 8	do	274	21	224	33	49	48	2
London	do 9	do 10	do	271	50	222	52	48	58	7
Brownell's Winner	do 9	do 9	do	270	59	235	32	35	27	7
McIntyre	do 15	Oct. 7	do	269	18	230	28	38	50	0
Rural No 2	do 15	do 7	do	262	32	241	26	21	6	0
Prime Minister	do 11	Sept. 8	do	260	51	210	12	50	39	4½
Minister	do 8	do 8	do	260		224	33	35	27	0
Corona Beauty	do 8	do 8	do	254	57	211	3	43	54	10½
Beauty of Beauties	do 8	do 11	do	254	57	195	51	59	6	2
Cosmopolitan	do 7	do 7	do	254	57	189	57	65		½
International Seed Co	do 8	do 9	do	253	15	233	50	19	25	0
Rose's New Invincible	do 8	do 7	do	250	43	200	55	49	48	2
Sugar	do 11	do 10	do	248	12	204	18	43	54	1
Richter's Schneerose	do 11	do 11	do	247	21	193	19	54	2	6
Carter's Delight	do 7	do 8	do	246	30	189	6	57	24	½
Early Callao	do 9	Oct. 5	do	244	48	211	53	32	55	1
Early Maine	do 9	Sept. 8	do	240	36	215	16	25	20	0
Carter's Surprise	do 11	do 11	do	235	32	167	9	68	23	¼
Carter's First Crop, Ash Leaf	do 11	do 10	do	228	46	195	51	32	55	0
Thorburn's Paragon	do 8	do 8	do	225	25	175	35	49	48	1
Ruby	do 11	do 10	do	223	42	158	42	65		0
Brownell's Best	do 8	do 9	do	216	5	172	13	43	52	4½
Great Eastern	do 11	do 8	do	205	59	182	21	23	38	2½
Snowflake	do 8	do 9	do	193	19	140	59	52	20	4½
King of the Earlies	do 9	do 9	do	193	19	163	46	29	33	3
Ruper Eating Crane	do 8	do 8	do	192	28	156	10	36	18	¼
Bliss' Triumph	do 8	do 9	do	168		155	20	12	40	0

SEED TESTING.

The testing of the vitality or germinating power of samples of seed grain sent by farmers from all parts of the Dominion has been continued. During the season 2,957 samples were tested, which is more than double the number which was tested in 1890. Among these there were more than 1,200 samples of two-rowed barley, chiefly from Ontario, which showed an excellent average of about 95 per cent. The house, which was built partly for this purpose, is shown in Fig. 2; it is commodious and

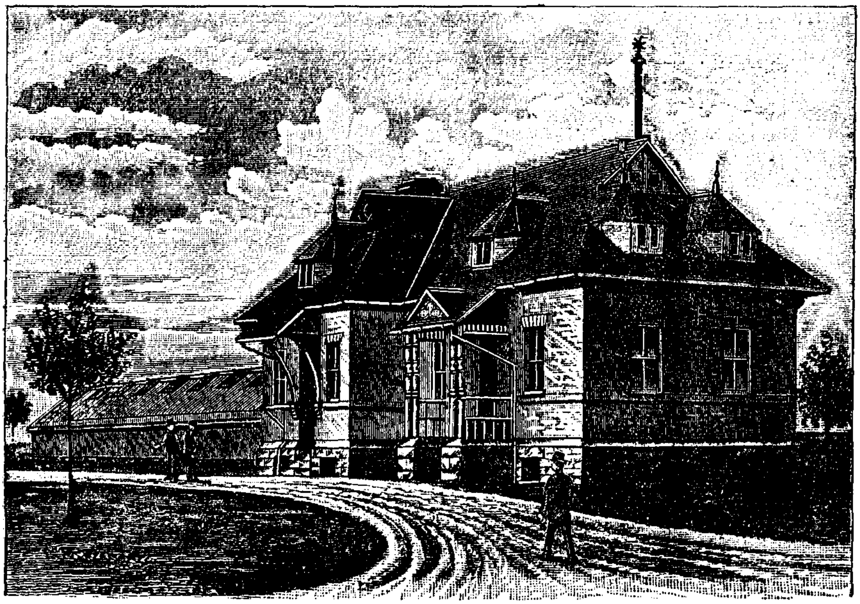

FIG. 2.—Building for seed testing and seed grain distribution.

well adapted for the work. The hinder portion consists of two glass structures, each about 75 feet long, one of which is devoted to seed testing and propagating; the other contains a most instructive collection of named plants and shrubs from all parts of the world. The front part is used for storing seed grain, and it is from this building that the large annual distribution of seed grain is made to applicants from every part of the country, from the Atlantic to the Pacific.

RESULTS of grain tests, 1890–91.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Average Vitality.
Wheat	561	100	1	82·3
Barley	1,556	100	4	92·3
Oats	262	100	6	88·8
Corn	82	100	0	66·7
Rye	9	91	66	81·0
Millet	2	75	75	75·0
Buckwheat	10	100	60	84·6
Grass	29	98	0	45·6
Turnips	28	100	0	78·8
Peas	37	100	20	79·9
Carrots	26	84	0	44·6
Clover	9	87	57	66·6
Beans	18	100	2	59·7
Beet	16	68	18	37·1
Mangel	15	94	12	61·8
Chana	2	38	0	19·0
Sugar cane	2	41	19	30·0
Rhubarb	3	29	8	15·6
Onions	3	80	0	45·0
Flax	5	95	75	88·6
Parsnips	4	85	45	60·5
Cabbage	23	92	2	51·6
Cauliflower	5	71	33	51·4
Radish	8	93	31	67·0
Spinach	2	42	23	32·5
Tomato	7	91	31	56·4
Celery	2	18	1	9·5
Lettuce	2	84	60	72·0
Flower seeds	7	87	0	42·7
Tares	1	....	....	94·0
Canary seed	1	....	....	96·0
Hemp	1	....	....	0·0
Asparagus	1	....	....	92·0
Pumpkin	1	....	....	80·0
Cress	1	....	....	68·0
Parsley	1	....	....	4·0
Sage	1	....	....	6·0
Thyme	1	....	....	5·0
Ash	1	....	....	0·0
Maple	1	....	....	0·0
Fir	1	....	....	0·0
Total number of samples tested, highest and lowest percentage, and average vitality	2,757	100	0	85·6

TWO-ROWED BARLEY.

In the annual report of the experimental farms for 1890 reference is made to the importation from England by the Government of a large lot of one of the best varieties of two-rowed barley for seed, which was sold to farmers at less than the cost of importation, in order to thoroughly test the value of this grain in all parts of the Dominion. It is there stated that a shipment of 50 quarters, 400 English bushels, of the barley grown from that seed, weighing about 52 lbs. per bushel had been forwarded to London, England, to be malted and brewed by one of the leading brewers there. This barley consisted of five or six lots, grown in different parts of Ontario. It was all forwarded to Ottawa, where the barley was thoroughly cleaned and mixed under my supervision, and the small kernels and as much as possible of the broken grain removed by passing it through a Sizer or Boby machine, so that the sample was fairly uniform in character.

The following report was received in October last by the High Commissioner of Canada, through Mr. A. F. Dale. It contains the result of the brewing of this barley conducted at the brewery of J. Flinn, Esq., of Bishops Stortford, England, and the report is signed by Mr. Arthur O. Stopes, of Colchester:—

"In compliance with your request, I have pleasure in stating to you my opinion of the sample of malt sent me on 23rd May last, which I understand was made exclusively from Canadian barley sent you by the Dominion Government.

"From careful examination of this malt, and from information furnished me by brewers well acquainted with the use of Canadian malt in the Dominion, and also from suggestions made by the well-known brewery expert, Mr. Frank Faulkner, I felt justified in using this malt exclusively without any mixture of other malts. I therefore proved its brewing qualities entirely upon its own merits, and, to test it as severely as possible, I brewed a pale ale from it, although I fear the colour is a little higher than I generally get from malt made from English or European barleys.

"The brewing worked easily, and I liked the handling of the goods in tun and the way they spent, indicating from the initial stages the quality of the malt. Each successive stage followed in proper sequence in exceedingly good form; the fermentation was practically perfect, and the condition of the beer at racking was exceedingly good. The final attenuation also was just as I wished, and, as a consequence, I think the brewing operations were those well adapted to the malt, and it must have been of good quality to have given such satisfactory results at every stage.

"The stability I have proved to be exceedingly good, indicating soundness of material.

"The extract was equivalent to 87 lbs. per quarter; and, coupling all the preceding facts with the judgment I formed of the malt, irrespective of its use, I assay its value 35s. to 36s. per quarter. I may say that had I wished to obtain a greater extract, so as to attain the maximum amount possible, I could readily have increased it, but I deemed it under the circumstances preferable to secure quality rather than quantity.

"The beer after racking has remained entirely satisfactory, and the very numerous people who have tasted it have been almost without exception of opinion that it is exceedingly good.

"Should you wish to have fuller and more complete notes of a more technical class, either as to the nature of the water employed in the brewing and of the malt itself, I shall be happy to place them at your disposal. I assume the above report is sufficient for your present purposes, and I have much pleasure in testifying, as a practical brewer, to the value that good malt of this class would prove to the brewers who understood it use.

"October, 1891."

This report is highly satisfactory and shows that good two-rowed barley, such as will meet the approval of the English brewer, can be grown in Canada, and many samples, much better in quality and heavier than this shipment referred to, have been received of late at the Experimental Farm from farmers in Ontario, the growth of 1891.

Favourable reports as to the yield of the barley have been received from every hand, and it is the general opinion that the crop of the two-rowed has averaged much better than the six-rowed. Many reports of yields of 40 to 50 bushels per acre have been received from different points in Ontario, although some of the samples sent in have been light in weight and much discoloured. The buyers in the barley districts in Ontario paid up to the close of navigation from 8 to 12 cents more per bushel for the two-rowed than was offered for the six-rowed; but in many instances no care seems to have been taken to grade the purchases, but light and heavy, bright and discoloured lots, were all mixed together, making a very uneven sample. Much broken grain was also found in some lots. The returns received for some of the shipments are said to have been very unsatisfactory, having resulted in loss to the shippers. This disappointment, however, is clearly traceable to want of care in threshing, cleaning and grading the grain. The fault lies partly with the farmer, who must exercise more care in handling this crop if it is to bring him its full value. In a letter written by a practical Canadian maltster who recently visited England in connection with the barley business of his firm, he says, when referring to the disappointing sales: "Shippers have not kept faith with the brokers or purchasers as to quality, the bulk was not equal to the sample." Again, "All brewers who saw the Government farm samples at the brewers' exhibition were charmed with them, and millions could have been sold, but the general crop did not equal the samples. I may say that unless the Canadian barley can be threshed so as to avoid the large proportion of half and broken grains, which cause excessive mould on the floors, the trade won't materialize. All English maltsters agree on this point." This gentleman speaks quite hopefully of the Canadian six-rowed barley for the English market, and says it is beginning to find favour with several maltsters who have tried it.

Other Canadian dealers speak more hopefully of the two-rowed barley trade. One says: "The two-rowed barley we have handled this season, grown from English seed, has given us the best of satisfaction, and I believe that all that has gone forward to the old country would have done likewise had it not been badly mixed."

Another buyer who visited England in connection with his barley business writes: "In November sales were made in Great Britain by sample to arrive of both two-rowed and six-rowed. The former was received with much favour by maltsters; the latter did not attract much attention. I am not, however, surprised that the demand for export has fallen off, for many sales were filled with shipments quite inferior to the sample; the result was disappointment and resentment on the part of the receivers." He says, further: "It is a mistake to suppose that the English maltster does not require colour; he does, and the bright sample will in every case take the market there, as in the United States. I desire to impress strongly on farmers the necessity of growing from pure seed, and in harvesting and threshing to carefully avoid mixing. I found a very kindly feeling expressed towards Canada, and a marked desire to trade with her. I am convinced that if we can grow as good barley as we have done this year, and if it is kept pure, we will work into a good trade with the English maltsters."

Enough has, I think, been said to show that if the Canadian farmer will exercise the requisite care in the selection of good, clean seed and in the cultivation of this grain, also in threshing and cleaning it for the market, avoiding all mixing; and if the shipper will see that the bulk of the grain he sends is equal to the samples forwarded, there seems no reason to doubt that a satisfactory trade in two-rowed barley can be established. The maltster in Great Britain is willing to pay a good price for a first-class article.

RESULTS OF EARLY, MEDIUM AND LATE SOWING.

Experiments in this important line of work have been continued, but the same varieties of grain have not been used in every instance. In the experiments conducted in 1890 the Red Fife and Ladoga were the sorts of spring wheat chosen; in 1891 the varieties were Campbell's White Chaff and White Connell. The oats in 1890 were Prize Cluster and Early Race Horse, in 1891 Prize Cluster and Banner, and the barleys which, in 1890, were two varieties of two-rowed, the Prize Prolific and Danish Chevalier, were changed in 1891 to one of two-rowed, the Prize Prolific, and one of six-rowed, the Baxter.

The method adopted in 1890 of six successive sowings a week apart was repeated in 1891, the first sowing in each case being made as soon as the land was fit to receive the seed. The same land was used in both instances, but the arrangement of the plots was changed, so that the oats followed wheat, barley followed oats and wheat followed barley. The land was ploughed in the autumn of 1890, and received a coating of manure of from 20 to 24 tons to the acre in the spring of 1891, which was promptly covered after spreading by a light ploughing.

In the following table the results are presented in a form convenient for comparison:

—	Sown, April 21. — Yield, per Acre.	Sown, April 28. — Yield, per Acre.	Sown, May 5. — Yield, per Acre.	Sown, May 12. — Yield, per Acre.	Sown, May 19. — Yield, per Acre.	Sown, May 26. — Yield, per Acre.
Spring Wheat.	Bush. lbs.	Bush. lbs.	Bush. lbs.	Bush. lbs.	Bush. lbs.	Bush. lbs.
Campbell's White Chaff...	47 50	32 50	27 30	29 30	28 30	19 10
White Connell....	35 50	26 40	30 00	23 20	23 40	27 10
Oats.						
Prize Cluster............	59 24	84 04	54 24	33 08	53 03	40 00
Banner...	76 01	79 24	86 26	87 22	78 18	55 30
Barley.						
Prize Prolific.	65 10	55 35	50 20	51 37	40 40	37 14
Baxter's Six-rowed.......	55 35	67 04	56 32	42 39	34 08	35 30

The crops on the plots for 1891 were much heavier than those gathered in 1890; the difference may be partly accounted for by the liberal dressing of manure which the land received, but probably a greater allowance should be made for the character of the season, which was very favourable in 1891 and very unfavourable in 1890. There are some seeming contradictions in the results for 1891 which can be explained and others for which at present no full and satisfactory explanation can be offered.

The plots of Prize Cluster oats and Baxter's barley which were sown the first week were at the northern end of the series, and were exposed to the full force of a storm of wind, which carried much sand with it, and which swept over the part where these plots were situated a few days after the grain was up. This cut the tender blades almost to the ground and permanently injured the plots. The Prize Prolific barley, Banner oats and the two varieties of wheat were partly sheltered by a slight depression in the land, and thus escaped much injury. From the results of the tests for both years it is evident that the oat crop is less influenced by delay in sowing than either wheat or barley. Some of the other apparent irregularities were partly due to the results of a hailstorm which passed over the farm when the grain from some of these plots was standing, and a part of it was beaten out and lost. This will account for the difference between the crops from the fourth and fifth sowings of the Prize Cluster oats.

Taking the returns of the two years together, the average falling off from week to week in the yield of the four varieties of wheat as compared with the crop from the first sowing is, for the first week 27 per cent., for the second 30, third 43, fourth 45, and for the fifth 52 per cent. Calculating the average loss on the barley in the same manner we find it to be as follows: First week 13 per cent, second 26, third 36, fourth 51, and for the fifth 52 per cent. Leaving out of consideration the first series of oat plots on account of their abnormal character in 1891 and their partial character in 1890, and taking the crop from the second sowing as the basis for comparison, we find the falling off in the successive weeks to be 12 per cent, 24, 26, and for the last sowing 43 per cent, showing that even with the oat crop delay in sowing cannot be practised without loss.

When we consider that the value of the spring wheat crop for the past year, of Ontario alone, taking it at 85 cents per bushel, was $9,104,807; that of barley at 45 cents per bushel, $7,263,856; and that of oats at 30 cents per bushel, $22,502,862—or putting these three together, nearly thirty-nine millions of dollars—the percentage of loss which occurs between the first and second, or first and third sowings, represents a sum so large that the importance of early seeding cannot be too strongly urged.

FORESTRY.

Tree-planting in the forest belts on the Central Experimental Farm has been continued, and about 3,100 trees have been set out along the northern boundary of the farm. It is proposed to continue this planting until the whole length of this side of the farm is furnished with a continuous shelter belt. This will eventually prove a very attractive feature, and also furnish important data in regard to the relative growth of the more important trees of economic value in this country, so that information may be available to those who may need in the future to plant trees either for shelter, ornament, fuel or timber.

The belts already planted are making good growth; the avenues and hedges are also doing well. The clumps of ornamental trees and shrubs about the buildings and along the roads have become well established, and already add much to the appearance of the place.

In this connection I desire to acknowledge the kindness of Prof. Sargent, of the Arnold Arboretum, Jamaica Plains, Mass., who has generously donated to the experimental farms 81 species of trees and shrubs, many of them rare sorts. A part of these are suitable for planting at Ottawa; the more tender sorts have been forwarded for test to the experimental farm at Agassiz, British Columbia. To Mr. L. Jackson Dawson, the efficient superintendent of the arboretum, my thanks are also due for his kindness in making the selection, comprising varieties so well adapted to our needs.

The distribution of forest trees and forest-tree seeds to settlers on the North-West plains has been continued. In the report of the Horticulturist particulars will be found of the distribution of about 2,000 mail packages of seedling forest trees, also of 4,053 packages of tree seeds, chiefly those of the box elder, Manitoba ash, oak and cherry. This part of the experimental farm work has awakened in the Canadian North-West a very general interest in tree-planting. From the large number of young groves which are thus being established at different points on the great plains, belts and plantations of trees will shortly be planted about dwellings and farm buildings which, in process of time, will afford desirable shelter for man and beast and much improve the general appearance of the country. In a very few years many of these young groves will produce seed, and with tree seeds in plenty, available at so many points, tree culture on the plains will no doubt make rapid advancement.

BUILDINGS.

The extension to the poultry building mentioned in the last annual report has been completed, and will furnish pens for both breeding and laying, as well as some for experiments with cross breeds. The necessary buildings for carrying on the work on the Central Experimental Farm are now nearly completed. They consist of a barn about 145 x 50 feet, with a wing on either side of 100 x 25 feet, one of which is u ed for the farm horses; the other is fitted up for bulls. This commodious building is shown in Fig. 3:

The silos are attached to one end of this; also an engine-house, from which shafting is run the full length of the barn. There is also an implement house, granary, root-house and piggery. The poultry building has been already referred to; the building for seed testing and the distribution of seed grain is shown on page

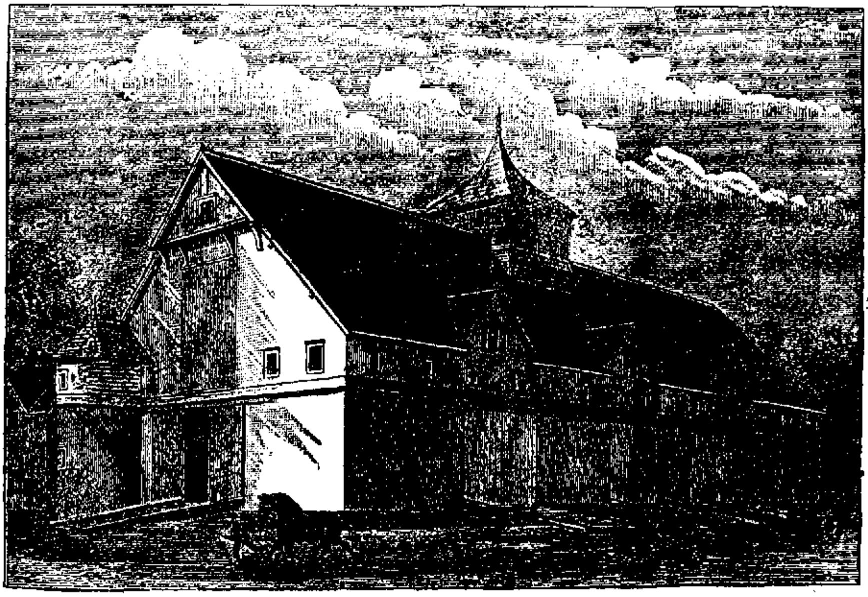

FIG. 3.—Barn and Stables, Central Experimental Farm, Ottawa.

46, Fig. 2. That containing the offices and chemical laboratory forms the frontispiece, Fig. 1. The dairy building is represented on page 88, Fig. 4. The only other building for which there is now a pressing need is one for sheep, which should also have some additional accommodation for young stock.

ANNUAL VISITS TO THE BRANCH EXPERIMENTAL FARMS.

NAPPAN.

The experimental farm for the the Maritime Provinces, located at Nappan, N.S., was twice visited during the year. The first visit was during the planting season, in the spring, when opportunity was afforded for arranging the various clumps of trees and shrubs which are to serve the purposes of ornament and shelter about the buildings, also the avenues and shelter belts along the boundaries of the farm. These will greatly help in beautifying the place, and in a very few years, from the shelter they will afford, prove useful as well as ornamental. The second visit was paid in the autumn. The grain crops were all gathered before my arrival, and they were unusually good, as will be seen from the report of the superintendent. I had the privilege of inspecting the crop of roots, of which there were about five acres. They were all good, the turnips especially so; these latter averaged over 1,000 bushels to the acre. The farm is improving in appearance and fertility from year to year, and that part of the land which at the time of purchase was believed by the neighbours to be almost worthless from exhaustion, has, with proper working and manuring, become quite fertile, and produces now some of the best crops grown on the farm.

BRANDON.

The journey westward was begun on the 11th of August, and Brandon was reached on the 16th. As viewed from the hotel in the city, it was evident that the young avenues had made good progress and that the trees and shrubs generally were making satisfactory growth. One of the most striking features from this distant view was a field of Ladoga wheat, which extended from the base of one of the gradually-rising bluffs on the valley bank some distance up its side. Part of it was cut, and that which was standing was of that warm brown colour which indicated ripeness, while the other varieties on either side appeared comparatively green.

On closer inspection everything was found to be progressing satisfactorily. The grain crops were nearly all more or less lodged, as the result of a severe rain and wind storm which had occurred a day or two previous. The straw was long and the heads heavy, which prevented most of the grain from rising again, and thus somewhat lessened the yield. The returns, notwithstanding, are exceedingly good. The forest belts and young fruit trees were carefully examined and notes taken of the most promising sorts. The barn and stable was completed and ready for occupation. Several of the most useful breeds of stock have since been supplied, which makes this now one of the most interesting and instructive features of the farm work. The superintendent's residence was also finished, and was occupied shortly after.

A constantly increasing interest is manifested by the farmers of Manitoba in the operations going on at this farm, and the number of visitors who go there to gain information and experience each year is now very large. The experimental work carried on under Mr. Bedford's superintendence is favourably spoken of on all hands, and the experiments tried from year to year are proving a valuable guide to the farming community.

VISIT TO MELITA.

The day after my arrival in Brandon, the Souris section of the western division of the Canadian Pacific Railway was opened, and by kind invitation of the assistant superintendent, Mr. J. Murray, I was privileged to travel with the first regular train as far as Melita, 66½ miles from Brandon. For the first 8 miles to Kenmay the train runs over the main line, then turning south 16 miles brings the traveller to the Souris river, whose wooded banks lend a charm to the scenery. Another 14 miles brought us to Hartney, one of the new towns recently started, and after journeying 26 miles further, Melita, the present terminus, was reached. This town, which was said to be only one year old, had a population of about 300, and seemed to be growing rapidly. Through the courtesy of one of its enterprising residents, Mr. G. L. Dodds, I was driven to see several of the neighbouring farms, where the crops gave promise of an excellent yield. The country looked well the whole length of the route; most of the land seemed to be good, and settlement was progressing rapidly. Several new towns seen along the line, from two weeks to two or three months old, were struggling rapidly through their babyhood; most of them could boast of an elevator built or building, and one or more stores, surrounded by dwellings of that diversified character so general in the newly-established towns of the west.

INDIAN HEAD.

On the 20th of August the farm for the North-West Territories was reached, where the field and garden crops, the forest trees and fruits were examined, and their condition and progress recorded. The grain was all standing well, and gave promise of an abundant harvest, but in consequence of the moisture of the soil, resulting from an unusual rainfall and cool damp weather, the grain was from a week to ten days later than usual. For this reason some of the crops did not ripen early enough to entirely escape the frost, although it did not reach this district until about two weeks after it had occurred in Manitoba. A very large proportion, however, of the grain ripened here before frost.

The forest trees planted in blocks and shelter belts are making good progress, but are not growing so rapidly as those at Brandon. The results of the tests of fruit trees have not thus far been very encouraging; but most varieties of small fruits grow well in the rich soil found here, and many of them are proving hardy.

The herd of cattle is increasing, and the animals doing well. The use of the bulls is a great advantage to the farmers of the district.

On the 22nd some of the neighbouring farms were visited and the crops examined. Several miles of luxuriant wheat fields were seen on the Bell farm and on the recently established farm of Lord Brassey. The crops on many smaller places were also inspected. Everywhere the wheat looked well, and the growth was luxuriant, but it was noticed here as well as in Manitoba, that wheat on summer fallow where the land was heavy and had been well farmed was much later than that growing on lighter and poorly worked soil. This was a result of the unusual rainfall, and should not lessen confidence in summer fallowing, as such a condition may not occur again to the same extent for years.

Leaving Indian Head on the 23rd, a day was spent in the Regina district, where the crops were also very promising; a drive of about 40 miles enabled us to see many of the neighbouring farms, on most of which the farmers subsequently reaped a rich harvest.

VISIT TO PRINCE ALBERT.

On the 25th an early start was made for Prince Albert. After leaving the Qu'Appelle valley the land along the line of railway seemed light and gravelly, but after crossing the river near Saskatoon the soil looked much more fertile. Soon the appearance of the country was entirely changed as we entered on what is called the fertile belt, which extends from south of Duck Lake to a long distance beyond Prince Albert. This district is in many parts well wooded and intersected with lakes and streams, and most of the soil is a rich, black, sandy loam. Prince Albert was reached about dusk.

The next day a drive of about 40 miles was taken, covering part of the country on either side of the town. A number of farms were visited, among the rest those of Mr. T. Mackay, Mr. T. Miller Mr. Wm. Plaxton and Mr. T. Scott. Much of the Ladoga wheat grown in this section had been cut and some of the Red Fife was nearly ready. Nearly all the wheat was subsequently harvested without injury from frost. The country is remarkably pretty and park-like, undulating, and intersected at many points by groves of woodland and belts of timber, consisting of spruce, jack pine, tamarack, poplar, birch and other trees. The Saskatchewan here is a fine navigable river. In the evening a gathering of townspeople and farmers assembled to listen to a talk on the work of the experimental farms. The opportunity was also improved by pointing out the advantages of mixed farming, for which, from the presence of abundant shelter, the luxuriant growth of grasses, and a plentiful supply of water for stock, this part of the country seems specially adapted.

Returning the next day, Moose Jaw was reached on the 28th, where another drive of about 30 miles was taken among the neighbouring farms. The crops here, as at Regina and Indian Head, were excellent, but they were later than those at Prince Albert.

THE SPULMACHEEN AND OKANAGON VALLEYS.

Journeying westward, the next point of divergence was Sicamous, B.C., from which point entrance can be made to the fertile Spulmacheen and Okanagon valleys. The conveyance for the first part of the journey, which was begun on the 3rd of September, was a steam hand-car, which made a daily trip to Enderby over the new line of railway then under construction to Vernon. This was an open conveyance with two seats, capable of accommodating six passengers and the engine driver, who stood behind to feed the little engine with fuel and regulate the speed of travel. Such a conveyance afforded a full view of the scenery, which was very fine. Lake, woodland, mountain and valley in rapid succession, or combined in endless variety of form, made up the ever-changing panorama. Smoke from some burning woods in the neighbourhood sometimes interfered with the view; but for this, the bright sunny day would have been perfect. A ride of 25 miles in the steam hand-car brought us to Enderby, a thriving village in the Spulmacheen valley, where there is a large milling industry which supplies the greater part of the flour used on the Pacific coast. Here a vehicle was waiting to take us to Lansdowne, another village six miles distant, where another conveyance and driver was engaged for the whole journey to Mission and return to Enderby. From Enderby to Lansdowne the road passes through a beautiful part of the valley, where there are some very fine farms, on some of which the grain had been harvested and stacked ; on others the golden sheaves were still stooked in thickly-set groups over the fields. A visit was paid to the farm of M. Lumby, Esq., who has a very fine estate of 1,200 acres. Most of his grain was housed, but from the appearance of the bright and thickly-set stubble on his fields it was evident that he had gathered a bountiful harvest. His crops are all grown without irrigation. Near his residence, which is prettily situated near the bank of a small stream, are some groups of magnificent specimens of the "bull pine" (*Pinus ponderosa*), a variety with very long needle-like leaves, one of the most useful of all the trees found here in the valleys and on the hill sides. They grow to a great height and large size, and an average tree when felled will make several large logs for the lumberman.

At Lansdowne several small orchards were seen. The apples, pears and plums were making thrifty growth, and some of the young trees were bearing fruit. On the journey from Enderby to Vernon a team was passed drawing a large waggon loaded with watermelons which had been raised on a ranch near by, and which were being taken to Enderby for shipment to distant points. Vernon, the terminus of the new line of railway, was reached about 7 p.m., after a delightful drive through a charming country.

Many new buildings were going up in this thriving town, which promises in the near future to be an important place in the Okanagon valley. It is well situated, on a level plain, well watered by a mountain stream which affords facilities for irrigation, without which fruit-growing or gardening is somewhat uncertain here.

On the morning of the 4th a journey to Mission was undertaken. The first part of the road lay over the hills, which rise to the height of 600 or 700 feet, from the summit of which a lovely view is had of a charming sheet of water known as Long Lake, and for many miles the road lay very near its banks. About three miles north of Mission a halt was made to inspect a promising young orchard on the ranch of Mr. Whelan, in which was found many varieties of apples, pears, plums and cherries, all making very thrifty growth. Many of the apple, pear and plum trees were well laden with fruit. Several peach trees were seen on this place, but no peaches, excepting on one tree, where there were several small specimens, which looked like a seedling fruit. There was an almond tree also here with a few almonds growing on it. On arrival at Mission early in the evening a visit was paid to the ranch recently purchased by Lord Aberdeen. This is a fine piece of valley land, nearly level and well watered by Mission creek, so that irrigation is practicable over the greater part of it. Several acres were already planted with large and small fruits, and we were informed that it was intended to plant much more largely during the coming season. That part of the Okanagon valley of which Mission is the centre is said to be about 16 miles long and 5 or 6 miles wide. There is a small orchard on the property adjoining Lord Aberdeen's, on which there was some very fine apples and Bartlett pears. There were also a few trees fruiting well in the garden worked by the Brothers at the Mission. A limited amount of grain is grown, stock-raising being the principal industry. Much of the soil in these valleys is a rich black loam with a clay subsoil; most of that along the hill-sides is lighter. Heavy crops can be grown wherever water for irrigation is available, and it is said that grain and other farm crops can be grown as far as Vernon without irrigation; but south of this the returns are very uncertain where no water is at command.

Returning to Vernon the following day we found a very fine collection of young bearing fruit trees in the garden of Price Ellison, Esq., a gentleman who kindly volunteered to go with us to Mission. To this genial companion we owe a debt of gratitude; but for his guidance and thorough knowledge of the country, we should have missed many an important fact and had a much less enjoyable time.

AGASSIZ.

This most westerly of the experimental farms is improving rapidly. More than one hundred acres are now under cultivation, several large orchards have been planted, and many fruit trees and vines have been put out on the bench land, about the base of the mountains. Many additions have been made to the list of fruit trees, vines, forest and ornamental trees and shrubs—the collection now includes nearly all the varieties at present obtainable, which promise to be useful to the country. The value of this farm as a testing ground for that part of the province lying within the coast climate will be very great, and the information which will soon be available will be highly prized both by old residents and incoming settlers.

A commodious and conveniently-situated dwelling has been erected for the superintendent, and a barn and stable contracted for which, it is expected, will be completed in July next.

SUMMARY OF REPORTS OF OFFICERS.

REPORT OF THE AGRICULTURIST.

The important topics discussed in the report of the Agriculturist are presented in five divisions, each of which contains much valuable information. In the first division, headed "cattle," the value of different sorts of food for the economic feeding of cows and the fattening of steers is treated of, and the relative cost of the different rations. The results of experiments in varying the quantity of meal in the rations are also given. The information gained points clearly to the great value of corn ensilage as a cheap and nutritious food, of that succulent character most desirable for winter feeding.

Part 2 contains valuable data in reference to the fattening of swine, with such particulars as to the cost of producing pork, from certain kinds and mixtures of food, as will make this section of the report very serviceable to farmers in all parts of the Dominion. The great stimulus which has been given to the production of pork during the past year will make this information most timely and useful.

The results of the experimental dairy work embodied in Part 3 point to the most economical methods of treating milk for the manufacture of butter. The varying conditions brought about by different sorts and combinations of food, by advancement in the period of lactation, and the variations in the quantity and quality of these products arising from treatment by different methods, from peculiarities of constitution in the cow or from other factors not yet fully understood, make this chapter most interesting and useful to all those who are engaged in the dairy industry.

The setting aside of forty acres of land for a special line of work, with the view of showing how many cows can be maintained with the crops which that acreage will produce, forms the subject of Part 4. Judging from the experience thus far gained, it would appear that on most farms a larger number of cattle than are now kept might be maintained, bringing increased gain to the farmer.

In the 5th division, which treats of fodder corn and the silos, the results of the many tests which have been made during the past year are given. There will also be found the yields of the different varieties under different methods of cultivation, experiments in making ensilage, with particulars as to the character of the products obtained, with much other useful information on this very important subject.

REPORT OF THE HORTICULTURIST.

The report prepared by Mr. John Craig, the Horticulturist of the Central Experimental Farm, contains a large fund of useful information related to the growing of fruit and vegetables. The results of the experience gained during the past few years, both in Canada and the United States, with the hardier forms of Russian apples, and the particulars regarding the quality and relative hardiness of the different sorts, will be read with much interest by those who desire to cultivate apples in the more northern portions of the Dominion. The remarks on hardy sorts of plums, pears and cherries will also repay a careful perusal.

The very full notes given by Mr. Craig on the many varieties of grapes which were ripened on the Central Farm last year will be very valuable to those engaged in growing this fruit for market, as well as to amateurs, and to many readers it will no doubt be a revelation to learn that so many fine sorts of this refreshing fruit can be ripened at Ottawa. That portion of the report which treats of the different varieties of small fruits will, it is hoped, be acceptable also to a large class of readers.

The comparative tests of varieties of beets, cabbage, celery, pease, peppers and tomatoes, as well as the results of the influence of certain fertilizers on the latter vegetable, will be a valuable guide to many.

Details concerning the distribution of seedling forest trees to the settlers on the North-West plains and to some other remote points for test will also be found in this report, with a brief summary of the results as far as they have yet been reported. Reference is also made to a further distribution of tree seeds and of small fruits for test in the more remote districts, where they are less easily obtainable through the ordinary commercial channels.

A report is also given of further experiments which have been carried on during the past year, with the use of fungicides, in the treatment of apple scab and grape and gooseberry mildews; also on the effect of using Paris green for the apple worm, mixed with the fluids to be used for the scab. Plain instructions, which any intelligent fruit-grower can follow, are given for the preparation of the various mixtures recommended.

REPORT OF THE CHEMIST.

The first division of this report gives the results of the analyses of 24 samples of soil from differents parts of the Dominion, many of them representing large areas in the localities from whence they were taken. One represents that part of the alluvial soil in the valley of the Fraser, in British Columbia, known as the delta lands Two analyses are reported on from the North-West Territories, one of black sandy loam, which is a sample of the black soil in what is commonly designated the fertile belt, the other the underlying subsoil. This formation is more or less continuous over a wide area of country from the western part of Lake Manitoba, through Prince Albert and Edmonton to the foot-hills of the Rocky Mountains. These samples are from Yorkton, Assa. Three others are alkaline soils from Manitoba and the North-West Territories. There are also included in the list soils from Ontario, Quebec and Nova Scotia.

Swamp mucks, muds and peats are referred to in Part 2, where the results of the analyses of twenty-one samples are given. These show that both muck and peat are usually of considerable value as fertilizers, and especially is this the case when they are composted with manure from the stable or barn yard. An analysis of gas liquor is also submitted, and its probable value as a fertilizer discussed. A considerable number of analyses of roots used as food for cattle are reported on, viz., of carrots, turnips, mangels and sugar beets. The results of some further work on corn are also given, showing its comparative value at different stages of growth; samples of ensilage have likewise been examined and their constituents determined.

The component parts of several samples of "condensed milk" of the most popular brands have also been ascertained. Tests have been made of the character and relative purity of twenty-nine samples of well water from farmers in different parts of the Dominion and information of much value furnished. Practical tests have also been made with mixtures of solution of soap and Paris green, with the view of determining whether a combination of this sort would lessen the poisonous effects of the Paris green. The results show that this useful insecticide may be mixed with soap solutions without materially interfering with its strength.

REPORT OF THE ENTOMOLOGIST AND BOTANIST.

In the entomological part of this report attention is called again to the importance of spraying with Paris green and water for certain insect pests, and evidence is given of the fallacy of some statements lately made in an English paper as to the danger of using fruit from trees so sprayed. The facts cited by Mr. Fletcher show that no injury whatever can arise from such use.

Reference is made to damage during the past year caused by several injurious insects, among others, the Eye-spotted Bud Moth, which injures the apple tree; the Pear Leaf Blister, a small gall on the leaf of the pear produced by a very tiny mite; the Clover Root Borer, an insect not recorded as occurring in Canada before; and the Pea Weevil, which is said to be on the increase in some parts of the country. An account is also given of the occurrence of the Red Turnip Beetle, which attacks turnips and radishes in different parts of the North-West Territories.

The botanical portion contains an article on smut in grain with details of the most useful remedies. This will commend itself especially to the farmers of the North-West, where the "bunt" or "stinking smut" has of late been so prevalent and so detrimental to the crop.

In the experience given of the tests of native and foreign grasses at Ottawa during the past season, Mr. Fletcher has presented many useful facts. Some of the experiences of settlers in Manitoba who have tried some of these varieties is also related. This subject is deserving of careful attention and study.

A most important chapter to farmers is that on weeds. The necessity for information as to the proper treatment of these pests, with a view to their eradication, must be generally admitted. A weedy crop seldom gives satisfactory returns; the loss which arises depends partly on the fact that weeds take from the soil some of the elements of fertility which the growing crop requires, and also for the reason that the presence of numerous and thrifty-growing weeds prevents the free access of air and sunlight, so necessary to vigorous growth.

REPORT OF THE POULTRY MANAGER.

This report opens with a discussion of the subject of the winter laying of fowls, where some useful data is given with reference to the effects of different methods of feeding in the production of eggs. The breeds of fowls which have been found to lay best at the Central Experimental Farm during the winter are enumerated, and the proportion of eggs hatched from sittings of eggs of the various sorts of fowls is also given, with the most successful methods of treatment of the young chickens after they are hatched.

Particulars are given with regard to the dates at which the young pullets in the poultry house began to lay, showing that the White Leghorns, Wyandottes and Plymouth Rocks are among the earliest in this respect. The diseases of poultry are also discussed and remedies suggested. Further details are given of the examination of eggs long kept, which, with the results of the tests made last year, go to show that eggs when kept under the conditions described are not so perishable as is commonly supposed. These experiments have not as yet thrown much light on the question as to how eggs become offensive and putrid.

The important subject of the weight of eggs is dealt with at some length, and particulars are given of the weights per dozen of those from the fowls of all the leading breeds.

EXPERIMENTAL FARM, NAPPAN, N.S.

In the report of the superintendent of the experimental farm for the Maritime Provinces, the results of some instructive tests are given of varieties of wheat, many of which have yielded good returns. The crops which have been gathered from the experimental plots of oats are exceptionally large, showing that the season has been very favourable at Nappan for this grain. Some large yields of barley have also been obtained, although most of the samples are deficient in weight.

The tests conducted with a number of different sorts of corn indicate that the growth of this useful crop for ensilage purposes in the Maritime Provinces is likely to be attended with success. The experiments with mangels, turnips and carrots have also been very successful.

The advantage resulting from the draining of so large a part of the land under cultivation begins now to be apparent in the increased crops.

The useful breeds of dairy cattle which have been provided at this experimental farm for the Maritime Provinces will, it is hoped, aid in the improvement of the stock of these provinces for dairy purposes, and will doubtless prove of special value to those farmers who are near enough to Nappan to avail themselves of the facilities for improvement which the presence of these animals will give.

EXPERIMENTAL FARM, BRANDON, MANITOBA.

In the report of the superintendent of this farm, Mr. S. A. Bedford, there will be found a large array of useful facts, the results of much careful work, which will be valuable to the settlers in Manitoba. The many tests with wheat, oats and barley, showing the length of time required to mature the different sorts, the varying results obtained by sowing on different classes of soil, by cutting the grain at different periods of ripeness; comparisons of the results of the use of the disc harrow with spring ploughing; of different methods of treating summer fallowed land; the use of different quantities of seed per acre; the relative returns from the use of the ordinary drill, the press drill and the broadcast seeder, and the yields from fall and spring ploughing, will all be read with much interest by the farmers of that province, as well as by those of the North-West generally. The results of experiments with smudges are also given in this report.

One of the most important series of results which Mr. Bedford has reported on relates to the growing of mixed grain, and cutting and curing it in the green state as hay for the winter feeding of cattle. The problem of supplying a sufficient quantity of winter food for the rapidly increasing herds of stock in the North-West was a pressing one, and the practical way in which it has been solved by the tests made at the experimental farms will have an important bearing on the stock and dairy interests of the future in these fertile portions of the Dominion. Mr. Bedford has shown that by sowing a mixture of oats and tares more than five tons per acre of nutritious hay can be produced in a favourable season, that such a crop can be sown after the grain is all in, and harvested before the grain harvest begins, and thus ample provision may be made by the use of comparatively few acres of land for the winter sustenance of a large herd of cattle.

The successful growing of fodder corn and the making of ensilage therefrom will prove another useful factor in developing the dairy interests of Manitoba, while the experiments with native and hardy imported grasses and clovers promise eventually to provide improved pasturage for the summer months. The satisfactory crops reported of mangels, carrots and turnips indicate that there need be no lack of variety in the food which can be stored for the winter feeding of cattle if farmers will only avail themselves of the advantages which the country offers.

The strains of dairy and beefing breeds of cattle which have been introduced during the past year at the Brandon experimental farm will it is believed offer good facilities for improving the stock in that part of the province. The use of frozen wheat and the coarser grains for feeding pigs and steers will also it is hoped show a more profitable way of disposing of these low-priced products at home than by shipping them out of the country.

Further reports on the tests of large and small fruits are also given, which are on the whole encouraging; so also are the results of further experiments with forest and ornamental trees and shrubs. The preliminary lists which Mr. Bedford has prepared of the hardy, half hardy and tender sorts, as a guide to settlers who desire to ornament their homes or provide wind-breaks for their dwellings and out-buildings, are deserving of careful perusal by all who take an interest in this subject.

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

The report of the experimental work carried on at the farm for the North-West Territories contains much that will be useful to the settlers who are farming in that part of the country. There are so many variations in climate on those vast plains that the results of tests made in eastern Assiniboia cannot always be repeated to the same advantage in Saskatchewan or Alberta, while other classes of experiments may be carried on with greater success. Nevertheless, much of the more important work which is being done at Indian Head under the superintendence of Mr. A. Mackay may be followed with advantage by the farmers in most parts of the Territories.

Much of the experimental work with grain which has been referred to when speaking of the farm at Brandon is being conducted on very similar lines at Indian Head. All the more promising varieties of cereals are being tested here, also the different systems of treatment and methods of cultivation, with the view of ascertaining what sorts of grain and what plan of procedure promises the best results.

In addition to what has been referred to, experiments have been made in sowing wheat at different depths in the soil, to ascertain the results of sowing different grades of frozen wheat as seed, comparing the returns from grain grown on land which has been fall ploughed with those from summer fallow, also the results of sowing after roots as against summer fallow. Smudges have also been tried as a protective measure against autumn frosts, and evidence submitted which shows that when a sudden drop in temperature of 8 or 9 degrees of frost takes place, as was the case at Indian Head, smudges are of no avail. Whether they will prove useful or not when the frosts are less severe has not yet been fully determined.

One of the most important series of experiments conducted at Indian Head during the past year is that with smutted grain. The "bunt" smut has been a very serious pest for many years past and has been more prevalent than usual during 1891. The wheat grown by many farmers which would otherwise have realized the best prices has, from this cause, been much depreciated in value, and in some instances become quite unsaleable. The total annual loss to the farming community in the North-West from smut is immense, and would be difficult to estimate. Mr. Mackay selected for his test one of the worst samples of smutty wheat to be found, and in sowing this untreated, about one-half of the crop consisted of smutted ears. By the use of blue stone (sulphate of copper) dissolved in water and applied to the grain in the proportion of one pound of the chemical to ten bushels of seed, the proportion of smutted heads was reduced to less than 15 per cent, and by using the same quantity in the treatment of five bushels the proportion was reduced to less than one per cent. Results very similar to these were obtained last year by Mr. Bedford at the Brandon experimental farm, and this disease may now be regarded as one which the farmer can himself control by taking the precautions referred to. The fact that smutty ears often occur in grain grown from seed believed to be quite free from smut would indicate that smut spores in the soil may attack the grain and bring on the disease. Seed treated with the sulphate of copper would in all probability be able to resist attack in this direction also. As no farmer would think of sowing seed so very smutty as that which was used in the experiment referred to, it is probable that the use of one pound of the sulphate of copper to ten bushels of seed grain would be sufficient to ensure almost entire freedom from this trouble.

Indian corn has not been found so satisfactory a crop at Indian Head as at Brandon; it has not attained the same weight of growth or degree of advancement. Excellent results have, however, been obtained by growing different mixtures of grain to be cut green and cured for winter fodder; and this part of the report will be read with great interest by the farming community.

The tests with garden vegetables, fruits, forest trees and flowers, will prove a comparatively safe guide to those who desire to enter there on any of these branches of work. The stock department at the Indian Head farm is already beginning to demonstrate its usefulness, and has become an attractive feature in connection with the general experimental work.

EXPERIMENTAL FARM, AGASSIZ, B.C.

The report of the progress made at this farm is also very gratifying. Since the work was begun in August, 1889, 105 acres have been cleared of brush and stumps and brought under cultivation, 26 acres of which have been planted with fruit. Taking into consideration the condition of the land, the crops reported may be considered as very good.

The yield of wheat, barley and oats, sown in successive crops a week apart, for six weeks, seems to show that, as far as these cereals are concerned, there is no special advantage in early sowing in that part of British Columbia. During the early part of last year, when the weather was cold and wet, much of the seed early sown was injured by these unfavourable conditions; a repetition, however, will be needed of such experiments for several years, before any general conclusions can be drawn from them.

There being more than the usual amount of summer heat last year, the season was favourable for corn, and the crop of the heavier-yielding sorts ranged from 20 to 28 tons per acre. It is worthy of notice that the corn planted in hills, in nearly every instance, exceeded in weight of crop that sown in rows, showing the great advantage to the plants of plenty of air and light.

The yield of the plots of pease was quite phenomenal. The heaviest crop was given by the Mummy pea, 128 bushels 51¼ lbs. per acre; next in order was the Crown, with 116 bushels 15 lbs. per acre, closely followed by the Prince Albert, with 115 bushels and 25 lbs. per acre.

A new fodder plant which has been largely advertised, *Lathyrus Sylvestris Wagneri*, has produced seed quite freely at Agassiz, while at Ottawa it was almost an entire failure in this respect. The vines also made a very strong and vigorous growth, but Mr. Sharpe was unable to induce either the cattle or horses to eat any of it.

The crops of turnips, mangels, carrots and sugar beets have been excellent, and the heavy weights produced per acre of these succulent nutritive roots, and the ease with which they can be preserved in that mild climate, is a most encouraging indication of the future possibilities of dairying and stock-raising in British Columbia. The experimental plots of potatoes have also yielded remarkably well. The prevalence of rot in some of the varieties shows the importance of thoroughly testing the sulphate of copper as a remedy, which is now being so extensively used in Europe for this disease.

The results of the planting of fruits have been most encouraging. The growth of the trees has been very luxuriant, and it is expected that a large number of the varieties planted will bear fruit during the coming season. The future prospects for fruit production in that province are very bright, and no effort will be spared in the endeavour to made the testing grounds at the experimental farm as useful as possible to the settlers. From the particulars given by the superintendent in his report, it will be seen that examples of every promising sort which could be obtained are under trial there.

EXHIBITIONS.

Extensive collections of the products of the experimental farms were shown at several of the larger exhibitions. At Montreal an excellent display was made; so also at Toronto, London and Ottawa. These collections do not compete in any way with other exhibitors, and are so arranged as to make them as instructive as possible. In this way many farmers who visit these fairs become familiar with the work of the experimental farms, and the opportunity is afforded them of seeing many new and useful varieties of farm products. For the preparation of these exhibits and the successful carrying out of the arduous task of putting them in place, and of giving information at the fairs to all enquirers, we are indebted mainly to the farm foreman, Mr. John Fixter, to my assistant in the experimental department, Mr. W. T. Macoun, and to the accountant, Mr. W. H. Hay. These officers have been untiring in their devotion to this work, and much of the success which has attended these exhibits has been due to their persistent efforts and to the taste and skill which they have shown in the arrangement of the displays.

Similar work has been carried on by the superintendents of the several branch farms, references to which will be found in their reports.

CORRESPONDENCE.

The following is a summary of the mail matter received and despatched at the Central Experimental Farm during the year 1891:—

—	Letters Received.	Letters Sent.
Director	7,544	5,256
Agriculturist and Dairy Commissioner	2,752	2,349
Horticulturist	891	1,307
Chemist	592	771
Entomologist and Botanist	1,894	1,727
Poultry Manager	363	356
Accountant	1,191	1,082
Total	15,227	12,848
Bulletins, reports, &c., sent out 203,353.		

This work is particularly heavy on all the officers during the early spring months, when the mails frequently bring to the office from 150 to 200 letters a day. Many of these require time and research to obtain the information asked, and it is not possible, with the limited staff available for the work, to answer every letter promptly, but answers are forwarded as fast as the work can be overtaken.

ACKNOWLEDGMENTS.

Before closing this report for the year, I take much pleasure in acknowledging my indebtedness to all the officers of the Central and branch experimental farms for the zeal they have manifested and the care they have exercised in bringing to a successful issue the different branches of work which have engaged their attention. To the foremen and employés acknowledgements are also due for faithful services. The valuable services rendered by the farm foreman, Mr. John Fixter, and my assistant in the experimental work, Mr. W. T. Macoun, deserves special commendation. To their constant vigilance and careful records I am again indebted for most of the particulars relating to the experimental work at the Central Farm. I desire also to again bear testimony to the useful service rendered by Mr. Wm. Ellis, who has had charge of the seed-testing house, also the care and propagation of the economic and other plants which are under cultivation, all of which has been managed with skill and has had much careful attention.

WM. SAUNDERS,
Director Experimental Farms.

REPORT OF THE AGRICULTURIST.

(JAS. W. ROBERTSON.)

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

SIR,—I have the honour to report upon the progress of the work which has been under my charge at the Central Experimental Farm during 1891. The duties of my office, as Dairy Commissioner for the Dominion, engrossed the major share of my attention, and occupied the most of my time during the year. Attendance at conventions of farmers and dairymen—many of them of provincial nature and scope—in the several provinces of Canada, took me from home very frequently.

Upon the recommendation of the Honourable the Minister of Agriculture, the Government approved of the establishment of Experimental Dairy Stations, (1) for the purpose of investigating, by carefully conducted and repeated experiments, the methods and treatments in the manufacture of cheese during the summer, which yield the finest quality and the greatest quantity of cheese from the milk which is furnished by the patrons of factories, and (2) for the purpose of carrying on the manufacture of creamery butter at the same stations, during the other months of the year, in order to encourage farmers to obtain an income from their cows during every month, by supplying cream or milk to a creamery and by the raising of calves and pigs during the winter season. Parliament made provision for that undertaking in the appropriation for the work of the Dairy Commissioner. From March, 1891, preparatory arrangements in the different provinces were made. Supervision was given to the work of itinerant instructors in the provinces, where the dairy industry was not developed sufficiently to call for the establishment of Experimental Dairy Stations in 1891; and the management of two Experimental Dairy Stations in Ontario, and some experimental work in Quebec, were undertaken.

These tasks and duties, together with lectures at conventions of dairymen and farmers' institutes, required my absence from Ottawa for some part of every month, and for the greater part of all the months, except February and November. In all, 49 conventions or meetings, of from two to five sessions each, were attended during the year. They were distributed: Ontario, 19; Quebec, 8; New Brunswick, 2; Nova Scotia, 4; Prince Edward Island, 3; Manitoba, 3; North-West Territories, 1; British Columbia, 9. My assistants in the Dairy Commissioner's branch of the work attended and gave addresses at 242 meetings. The report of the Dairy Commissioner for 1891 (which can be obtained upon application by farmers and all others who are interested in agriculture), will present a brief yet fairly complete statement of progress.

The remainder of my time was available for the Central Experimental Farm, and was given to planning for and superintending experiments in (1) the feeding of steers for beef; (2) the economical feeding of milking cows; (3) the fattening of swine; (4) investigations in the experimental dairy; (5) the management of 40 acres of land, to determine how many cattle could be kept economically on that area; and (6) the growth of fodder corn and the making and feeding of ensilage.

Permit me to refer farmers, and others who may be seeking information on the other branches of the agricultural work—grain-growing, root-growing and general farm management—to your own report.

For the sake of clearness, and the convenience of those who may be seeking information and guidance from its pages, the matter to be presented has been grouped under the following heads:—

I. Cattle.—New purchases; general management; report on the feeding of steers; experimental tests in progress on the feeding and fattening of steers; investigations in the economical feeding of milking cows; short test to compare mangels with sugar-beets; and directions for the feeding of calves.

II. Swine.—New purchases; reports on the fattening of swine on steamed *vs.* cold, raw feed; on the feeding of pease ensilage to pigs; on the quantities of grain consumed per pound of gain in weight, at different stages of the feeding periods; and feeding tests in progress with skim-milk and frozen wheat.

III. Experimental Dairy.—Equipment of the building; tests in the separation of cream by different methods and treatments; experiments in the churning of cream at different stages of ripeness; experiments in the setting of milk and the making of butter from cows at different stages of lactation; the sterilizing of cream; and disposal of the dairy products.

IV. Forty-acre Lot.—Areas of different crops; yields of mixed crops and corn,

V. Fodder Corn and the Silos.—Varieties of corn; yields from different methods of planting; ensilage from corn; ensilage from mixed crops of cereals; ensilage from pease, rye and clover; the construction and filling of silos.

I have received indispensable assistance in carrying on the work and investigations, which are reported upon herein, from those who have attended to the details from day to day. Much of the thoroughness and reliability of experimental work, such as has been undertaken here, depends upon the faithfulness, watchfulness and care of those servants of the public whose names are seldom brought to its notice, to receive the due recognition and appreciation which the value of their services merits. For the work of so many hours per day, every man has received fair wages; but for that special quality of service and concern for the success of the work, which money cannot buy, I take this opportunity of making mention of Mr. John Fixter, Farm foreman; Mr. R. R. Elliott, Herdsman; and Mr. Chr. Marker, Butter-maker.

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

JAS. W. ROBERTSON,
Agriculturist.

PART I.—CATTLE.

To the herd of cattle, only a few thoroughbred animals were added by purchase during the year. They were almost immediately thereafter shipped to the branch experimental farm at Brandon, Man.

Shorthorn.

From Mr. W. S. Hawkshaw, Glanworth, Ont.:

One bull calf, General H.=14574=; red; calved 15th December, 1890; bred by W. S. Hawkshaw, Glanworth, Ont.; got by Aberdeen Hero (Imp.)= =;—dam, Countess of Hawkhurst=8752=; by 3rd Duke of Rutland=559=; Countess 2nd =784=; by Lord Ramsden=794=.

Holsteins.

From Messrs. A. C. Hallman & Co., New Dundee, Ont.:

One cow, Queen of Waterloo, No. 14666, H.F.H.B., No. 153, H.F.H.B.C.; calved 12th April, 1888; bred by A. C. Hallman & Co., New Dundee, Ont.; sire, African Prince, No. 1270, H.F.H.B.; dam, Mina Rooker 2nd, No. 3742, H.F.H.B.

One cow, Princess Leda 2nd, No. 18510, H.F.H.B., No. 141, H.F.H.B.C.; calved 6th January, 1889; bred by A. C. Hallman & Co., New Dundee, Ont.; sire, Netherland Monk, No. 4424, H.H.B.; dam, Princess Leda, No. 7130, H.F.H.B.

Ayrshires.

From Messrs. Kains Bros., Byron, Ont.

One bull, Middlesex—1216—; red and white; calved 10th September, 1890; bred by Kains Bros., Byron, Ont.; sire, Prince of Byron—583—; dam, Jeanie of Auchenbrain, (Imp.)—129—; by Duke 3rd—647—; Paisley, by Wallace of Drumlanrig —61—. From Messrs. David Morton & Sons, Hamilton, Ont.

One heifer, Dandy 2nd (imported in dam)—2004—; brown and white; calved 6th April, 1889; bred by Hugh Jack (Little Shewalton), Irvine, Scotland, imported by David Morton & Sons, Hamilton, Ont.; sire, Dandy Jim (1579); dam, Dandy 1st (5502), by Red Prince (1000).

One heifer, Jewel—2003—; white and brown; calved 14th June, 1889; bred by Hugh Jack (Little Shewalton), Irvine, Scotland; imported by David Morton & Sons, Hamilton, Ont.; Sire, Dandy Jim (1579); dam, Judy (Imp.) (5505); by Red Prince (1000).

Galloways.

We exchanged a bull calf which we had received in 1890 from Mr. Thomas McCrae, Guelph, Ont., for one bull, Chester (4472) 6760; calved March, 1887; bred by D. McCrae, Guelph, Ont.; sire, Stanley III of Drumlanrig (Imp.) (1793) 2833; dam, Chrissy (Imp.) (7099) 2587; by Chipperkyle (2332).

The four animals of the Galloway breed, which we had at the Central Experimental Farm, were sent to the Brandon farm, together with four Shorthorns and one young Holstein bull.

Grade Steers.

In October, 1891, sixteen grade steers were purchased for the carrying on of investigations into the effects of different rations for the feeding and fattening of cattle.

GENERAL MANAGEMENT.

SUMMER.—The hours of the stablemen were from 6 a.m. to 6 p.m., and four hands were employed. The assistant from the experimental dairy fed the calves. The bulls, part of the cows and the calves, were kept in the stables and fed on green fodders. The area of pasture land has been small for the number of cattle which have been kept. The animals not in the stables were inspected, and fed allowances of green fodder every day during the greater part of the season. The same hands looked after the experimental piggery and fed from 20 to 40 pigs.

WINTER.—The hours of the stablemen are from 6 a.m. to 5 p.m., and six hands are employed. Experiments in feeding are in progress, with 25 cows, 21 steers and 36 swine. Nine different rations are fed daily to cows, steers, bulls and calves. The quantity of feed consumed daily, by each animal, or group of animals, is weighed and recorded. The stalls and gutters in the main stable are cleaned out twice daily; the box stalls are cleaned out every second day. The cattle are curried daily, with a few exceptions; and the udders of the milking cows are brushed carefully before each milking. All the breeding and other animals—which are not weighed oftener in some special test—are weighed once every month.

Abortions.

During 1890 the disease of epidemic abortion was reported as prevailing in the herd. The method of treatment, which was then adopted, was described:—

I. The stables were thoroughly fumigated by the burning of sulphur, saturated with alcohol, with the doors and windows closed for three hours. Of course, all the cattle were out.

II. A wash was made up of 1 part of bichloride of mercury to 4,000 parts of water, into which solution were put 8 ounces of common salt; once a day the bare skin around the vulva, the anus and the root of the tail of the cows in calf, and also of those which had aborted, were sponged with the solution.

III. After several weeks of that treatment, the following was adopted as being preferable: $2\frac{1}{2}$ drachms of bichloride of mercury were dissolved in $3\frac{1}{4}$ ounces of glycerine and $3\frac{1}{4}$ ounces of alcohol; after these had united, $4\frac{1}{4}$ gallons of rain water were added. (The mixture should be kept in a wooden vessel, out of the reach of irresponsible persons, and animals). The bare skin under the tail and around that part was moistened once a day with the solution.

IV. The cows, which formerly had been turned out into a large yard every day for water, were watered from troughs in front of their stalls.

V. When a pregnant cow showed any sysmptoms of approaching abortion—and these are, slight relaxation of the muscles surrounding the vulva, restlessness and a continuous slight elevation of the tail—she was at once put into a box stall, where she was free from disturbance or causes of excitement. One-ounce doses of tincture of opium were given in the feed—even three times a day for one or two days until a quiet and slightly sluggish condition prevailed. Drenching with medicine was avoided.

The result is—and it is mentioned with hesitation and fear, lest the dread abortions should occur again—that since the system of treatment has been adopted 13 cows have given safe delivery to calves at the natural time, and only one case of abortion has occurred, and that could be accounted for satisfactorily. That covers a period of three and a half months. During the preceding ten months there were 13 births at the natural time, and 14 prematurely, at from four and a-half to eight months.

The preceding six paragraphs have been copied from my report of 1890. During 1891 the number of births at the natural time was 34. There were 3 cases of abortion; one of these was that of a cow which had a similar misfortune last season; another of the cases could be accounted for afterwards, in so far as it was discovered that the cow was affected with an incurable disease, which had a tendency to provoke uterine disorders; the third case was that of a grade heifer, and for it no satisfactory reason could be assigned. There were also two cases of still-born calves.

Lice on Cattle.

Government property has no greater immunity from the attacks of parasites than that of private individuals, and during the winter of 1890-91 some of the cattle became infested with lice. That fact is mentioned for the purpose of stating that a most effective, safe and simple treatment can be given by applying a kerosene emulsion. The method of preparation is described thus in Bulletin No. 11, prepared by Mr. Fletcher, Entomologist:—

Kerosene (coal oil)	2 gallons
Rain water	1 do
Soap	$\frac{1}{2}$ pound

"Boil the soap in the water till all is dissolved; then, while boiling hot, turn it into the kerosene, 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."

For use on the cattle it was diluted with 18 times its measure of water. Besides killing the lice, it seemed to have a beneficial action on the hair and skin. One-quarter of the quantity mentioned above is sufficient for a large herd.

Dehorning.

On 3rd December the operation of dehorning was performed on 4 three-year old steers, and on one Jersey bull five years old.

Through questions which have been asked at conventions and farmers' institutes, and by letters which have been received, an opinion has been asked repeatedly during the past two years upon the subject of dehorning cattle. Farmers who have sufficient open-shed or closed-in-shed convenience for the fattening of steers if they could be allowed to run loose with safety, have made frequent applications for information. The practice has become common in many of the States of the Union.

The references which have been made to it in the columns of the agricultural press provoked further curiosity and interest on the part of Canadian farmers, to learn from some authoritative source in Canada what effect the operation would have. The mode of procedure was to put each steer into the sling which we use for lifting the bulls when the hoofs are to be trimmed. The neck was fastened securely between two upright pieces of scantling, one of which was movable at the top, after the style of the common old-fashioned stable stanchion. The head was then tied to one side. The hair around the base of each horn was clipped off, to permit the cutting to be effected in such a way as to remove a narrow ring of skin with the horn. Leavitt's dehorning machine was used on two horns. It is constructed in such a way as to clip the horn off at one snap. In the case of three-year-old steers, the horns were too hard and tough for one man to use the machine with sufficient quickness of motion. For the other horns, a common fine-toothed carpenter's saw was used.

The operation on each horn lasted from one quarter to one half of a minute. In the case of two of the steers, the saw cut through an artery, from which a small jet of blood spurted. The wounds on the heads of two of the steers, appeared to be acutely painful for nearly a week; the other two animals did not appear to suffer any inconvenience after the operation was ended. It was not expected that blood would flow so freely from the wounds as it did in the two cases mentioned, and no particular preparation had been made to staunch the flow at once. A cloth covered with coal-tar, is probably one of the most accessible and suitable applications which can be made on the ordinary farm. The steers have been fed in box stalls, running loose in pairs, and they seem to be most healthy and gentle since the wounds healed.

In the case of the Jersey bull, he had become so vicious that the attendants went into his box-stall only at the jeopardy of their lives. Instructions had been given several months previously that no one was to go into his box-stall until after he had been securely tied. For the dehorning operation, the bull was tied in a similar manner to the steers. His horns were sawn off as close to the skull as possible. Not a thimbleful of blood altogether was shed; and when he was turned loose in his box-stall he acted as mildly as a sheep.

A full report on the feeding of the dehorned steers will appear after the completion of the experiment, which is expected to last until after April, 1892.

The Feeding of Six Steers.

Six steers were purchased for feeding purposes in November, 1890. They were a fairly even lot of two-year-olds, and apparently were grades of Shorthorns. On 1st December, 1890, the average weight was 1,135 lb. each. They were weighed every week, and all the feed which they consumed was weighed every day. They had free access to water in a trough in front of the stalls, and a supply of salt was provided at one side of each manger. The following Table shows the weight of each steer on 1st December, 1890, and every four weeks thereafter until 18th May, 1891.

—	Dec. 1.	Dec. 29.	Jan. 26.	Feb. 23.	Mar. 23.	April 20.	May 18.	Total Gain
Steer No. 1	1,220	1,305	1,355	1,390	1,420	1,486	1,493	273
" No. 2	1,120	1,195	1,200	1,256	1,255	1,350	1,374	254
" No. 3	1,037	1,096	1,102	1,188	1,199	1,235	1,317	280
" No. 4	1,170	1,230	1,263	1,310	1,336	1,385	1,442	272
" No. 5	1,225	1,302	1,308	1,361	1,386	1,396	1,430	205
" No. 6	1,040	1,081	1,108	1,175	1,207	1,257	1,263	223

The rate of increase in weight was not nearly so rapid as it might have been if all the animals had been fed in a stable, where they could feed and lie undisturbed. In our stable there is such a succession of visitors that the animals are disturbed, I suppose, a dozen times daily. The disturbances and consequent unfavourable conditions were alike for all the animals, and did not interfere with the fairness of the comparison, although they did hinder the rapidity of the fattening.

The six steers were fed on the same ration until 29th December. They were divided into three lots of nearly equal age and weight, and evidently of similar breeding. The main object of the test was to discover the value of corn ensilage as compared with common hay. One lot of steers were fed on a ration composed of hay, roots and meal; another lot of steers were fed on a ration of corn ensilage, with the same kind and quantity of meal; and the third lot of steers were fed on a ration consisting of corn ensilage, hay and roots, and an equal quantity of meal of the same quality as the other two rations contained.

The compositions of the rations were as follows:—

First Lot of Steers, Nos. 1 and 2:

	Lb.
Hay	20
Turnips	40
Straw	5
Chopped barley	2
do pease	2
Ground oil-cake	1
Cotton-seed meal	1
	71

For a period of five weeks, from 17th March to 20th April, one pound each of oil-cake and cotton-seed meal were added to the ration.

For the whole period of 20 weeks, from 29th December to 18th May, each steer consumed an average of 55·5 lb. per day.

Second Lot of Steers, Nos. 3 and 4:

	Lb.
Corn ensilage	50
Straw	5
Chopped barley	2
do pease	2
Ground oil-cake	1
Cotton-seed meal	1
	61

For a period of five weeks, from 17th March to 20th April, one pound each of oil-cake and cotton-seed meal were added to the ration.

For the whole period of 20 weeks, from 29th December to 18th May, each steer consumed an average of 60 lb. per day.

Third Lot of Steers, Nos. 5 and 6:

	Lb.
Corn ensilage	20
Turnips	20
Hay	10
Straw	5
Chopped barley	2
do pease	2
Ground oil-cake	1
Cotton-seed meal	1
	61

For a period of five weeks, from 17th March to 20th April, one pound each of oil-cake and cotton-seed meal were added to the ration.

For the whole period of 20 weeks, from 29th December to 18th May, each steer consumed an average of 52·8 lb. per day.

For the purpose of making a comparison between the actual cost of feeding steers on the three different rations, a market value was estimated for the component fodders in each. The hay was valued at $8 per ton; roots (turnips or mangels) at $4 per ton; straw at $4 per ton; pease and barley at $20 per ton; and cotton-seed meal and oil-cake at $30 per ton. The corn ensilage cost $1.40 per ton, as per statement in Bulletin No. 12, issued by Prof. Saunders in June, 1891. It will be observed that the corn ensilage was placed at cost, and the other fodders at an estimated market price; but it will not be considered by farmers, in many districts in Canada, that they can produce hay at a cost below $8 per ton, or roots below $4 per ton.

The following Table shows (1) the increase in weight of the steers in 20 weeks; (2) the quantity of feed consumed per day, and (3) the cost per head per day for feed:—

TABLE II.

—		Ration.	Increase in Weight.	Average feed consumed per day.	Average cost of feed per day.
			Lb.	Lb.	Cents.
First lot	No. 1	Hay, roots and meal	188	55·5	19·23
	No. 2	do do	179		
Second lot	No. 3	Corn ensilage and meal	221	60·	11·90
	No. 4	do do	212		
Third lot	No. 5	Hay, roots, corn ensilage and meal.	128	52·8	15·58
	No. 6	do do do	182		

All the steers were allowed as much feed as they could eat up clean; and the quantity was varied from time to time, as they would eat more or less.

It may be mentioned, in explanation of the small increase in weight of steer No. 5, that he did not thrive well, part of the time. That could not be accounted for satisfactorily. He seemed to be healthy, but, as everyone who has fed cattle knows, an animal "will go off his feed" occasionally and will not thrive.

It will be observed that the steers fed on the corn ensilage and meal ration gained an average of 33 lb. each more than those on the ration of hay, roots and meal, during the 20 weeks.

During the last month of the testing period steers No. 3 and 4, on corn ensilage and meal, gained in weight much faster than the others; and when the experiment was finished they were in more attractive condition for handling and selling.

Table III shows the quantities of the digestible constituents in the feed, consumed by the several lot of steers, as calculated from the following table, which is reproduced from the report of 1890:—

QUANTITIES of Digestible Protein, Carbo-hydrates and Fat, in each pound of certain Feeds, from tests with ruminants—(Oxen and Cows.)

—	Total Dry Organic Matter.	Digestible Protein.	Digestible Carbo-hydrates.	Digestible Fat.
	Lb.	Lb.	Lb.	Lb.
Wheat .... 1 lb.	·89	·095	·588	·014
Barley .... do	·89	·094	·600	·026
Oats .... do	·87	·080	·440	·044
Pease .... do	·87	·201	·534	·029
Oil-cake .... do	·92	·283	·368	·050
Cotton-seed meal .... do	·92	·336	·264	·070
Wheat bran .... do	·87	·117	·453	·027
Mixed straw (wheat, barley, oat) .... do	·85	·035	·330	·004
Mixed hay .... do	·86	·051	·430	·012
Corn ensilage .... do	·25	·016	·230	·006
Corn stover .... do	·48	·033	·480	·008
Turnips .... do	·085	·010	·075	·001
Mangels .... do	·120	.011	·100	·001
Carrots .... do	·141	.013	·115	·002
Sugar beets .... do	·185	.010	·167	·001

TABLE III, showing the average quantities consumed, per day, by the two Steers in each lot.

—	Rations.	Total Dry Organic Matter.	Digestible Protein.	Digestible Carbo-hydrates.	Digestible Fat.
		Lb.	Lb.	Lb.	Lb.
First lot, steer No. 1.. / do No. 2..	Hay, roots and meal ...	47·64	4·60	25·34	·87
Second lot, steer No. 3. / do No. 4.	Corn ensilage and meal....	44·04	4·55	31·65	1·13
Third lot, steer No. 5.. / do No. 6..	Hay, roots, corn ensilage and meal..........	43·62	4·41	25·98	·93

Experiments in Progress.

At the present time, experiments are in progress with twenty steers :

Three-year-olds.—Two steers which were dehorned are being fed in a loose box (where the temperature is almost as low as in a shed with single board sides) on a ration of—

	Lb.
Corn ensilage	50
Straw	5
	55

Two steers of the same age and similar quality, also dehorned, are being fed in a like manner, on a ration of—

	Lb.
Corn ensilage	50
Straw	5
Oil-cake	2
Ground pease	2
do barley	2
	61

Two-year-olds.—Two steers are being fed upon each of the following rations:

No. 1.	Lb.	No. 2.	Lb.	No. 3.	Lb.	No. 4.	Lb.
Corn ensilage	20			Corn ensilage	50	Corn ensilage	50
Hay	10	Hay	20				
Roots	20	Roots	40				
Straw	5	Straw	5	Straw	5	Straw	5
Oil-cake	2	Oil-cake	2	Oil-cake	2	Frozen wheat	6
Ground pease	2	Ground pease	2	Ground pease	2		
do barley	2	do barley	2	do barley	2		
	61		71		61		61

Yearlings.—Two yearling steers are being fed in a loose box, similar to those used for the three-year olds, on ration No. 3; and two other steers of equal age are being fed on the same ration in the ordinary stable.

Calves.—Two steer calves—one Shorthorn grade and one Quebec Jersey grade—are being fed on ration No. 2; and two steers of an equal age, and similar breeding, are being fed on ration No. 3.

These experiments will furnish data, also, upon the number of pounds gained in weight, and the quantity of feed consumed per pound of increase in live weight, by *three-year-old*, *two-year-old*, *yearling* and *calf* steers, respectively, when fed upon the same ration.

The Feeding of Milking Cows.

The object of this test was to discover the effect of substituting corn ensilage for hay and roots, and also the effect of substituting hay and roots for corn ensilage in the ration of milking cows. A study was also made of the economic effect of feeding different quantities of ground grain and meal in the rations. Eighteen milking cows were selected. For one week they were all fed upon a ration composed of—

	Lb.
Corn ensilage	25
Roots (carrots, mangels)	20
Straw (oat and barley)	10
Bran	3
Meal (pease, barley, oats)	2
Cotton-seed meal	2
	62

Each animal was allowed as much of the mixture as it would eat every day. Twelve of the cows (afterwards Lots 1, 2, 3 and 4) were fed twice a day; and six of the cows (afterwards Lots 5 and 6) were fed three times daily. The eighteen cows were divided into three groups of six cows each. The six cows of each group were again divided into two lots of three cows each. The cows in each lot were arranged in such a way that the cows in the one lot of each group, were of nearly equal weights, milking capacity and period of lactation, with the cows of the other lot in the same group. For the first four weeks of the experiment eight tests of the morning and eight tests of the evening milk of each cow, were made with the Babcock milk tester, to determine the percentage of fat. Only four tests of the morning milk and four tests of the evening milk of each cow, were made during the second feeding period, after which the testing apparatus was unexpectedly required for the work of the travelling dairy instructors. The tests, which had been made, twice of morning milk and twice of evening milk, of each cow, every week, had shown such wide variations and unaccountable fluctuations in the quality of the milk of the same cows that it was decided that the data on the percentage of fat in the milk could not be considered reliable unless the milk were tested every day.

A series of experiments to discover the effect of the quality of the feed upon the percentage of the solid constituents in the milk of 25 cows has been undertaken since, and will be reported upon when it is concluded. At the time of writing, enough information has been secured to warrant the statement that a progressive increase in the richness of the ration, by the addition of one pound of meal per cow per day, every fortnight, does not appear to have any appreciable effect towards increasing the percentage of solids in the milk, within three months.

The Cows of Group I., Lot 1 (Daisy, Pinkie, Blossom) were grade Shorthorns, and at the commencement of the test—23rd March, 1891—had been milking for an average period of 46 days. The average weight of the cows was 1,195 lb. each.

First Period.

From 23rd March to 19th April the three cows of Group 1, Lot 1, were fed on ration 1, which was composed as follows:—

	Lb.
Corn ensilage	60
Wheat bran	2
Chopped pease	2
Oil cake	2
Cotton-seed meal	2
	68

Of that mixture each cow consumed an average of 92·7 lb. per day. The 92·7 lb. of the mixture contained 10·9 lb. of the mixture of bran, chopped pease, oil-cake and cotton-seed meal. The cost per day was calculated on the same basis of valuation as was used in the tests in the feeding of steers, viz.:—hay at $8 per ton; roots at $4 per ton; wheat, bran, pease and barley at $20 per ton; and cotton-seed meal and oil-cake at $30 per ton. Corn ensilage cost $1.40 per ton, as per statement in Bulletin No. 12, issued by Prof. Saunders in June, 1891. Upon that scale of values, the cost per day was 19·37 cents per cow for feed.

The average quantity of milk, which had been yielded by the three cows during the weeks which preceded this test—1st March to 22nd March—was 28·3 lb. each per day. From 23rd March to 19th April the average quantity of milk was 28·94 lb. per cow per day.

The average quality of the milk, as determined by eight tests of morning milk and eight tests of evening milk of each cow, showed 3·52 per cent of fat.

The animals weighed an average of 1,195 lb. each at the commencement, and an average of 1,207 lb. each at the end of the four weeks.

Second Period.

After the feeding of the ration 1, for four weeks, the quantity of corn ensilage was increased to 90 lb., with the same quantity of meal as before. The ration as then arranged was:—

	Lb.
Corn ensilage	90
Wheat bran	2
Chopped pease	2
Oil-cake	2
Cotton-seed meal	2
	98

Of that mixture each cow consumed an average of 95 lb. per day, which contained 7·7 lb. of the meal mixture—bran, chopped pease, oil-cake and cotton-seed meal.

The cost per day was 15·77 cents per cow, or 3·6 cents per cow less than in the former case.

The average quantity of milk was 26 lb. per cow per day.

The animals weighed an average of 1,200 lb. each at the end of the four weeks.

Third Period.

During the third period of fo i weeks the ration was:—

	Lb.
Corn ensilage	40
Hay	20
Bran	2
Chopped pease	2
Oil-cake	2
Cotton-seed meal	2
	68

Of that mixture each cow consumed an average of 53·6 lb. per day, which contained 6·3 lb. of the meal mixture—bran, chopped pease, oil-cake and cotton-seed meal.

The cost per day was 16·4 cents per cow.

The average quantity of milk was 21·7 lb. per cow per day.

The animals weighed an average of 1,234 lb. each at the end of the four weeks

The extended explanations which have been given in presenting the facts of feeding the cows of Lot 1, for the three periods of four weeks each, apply to the other lots of cows.

The following Tables present the facts for convenient comparisons:—

TABLE I.—Group I, Lot 1, (Daisy, Pinkie, Blossom).—Three grade Shorthorn cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 46 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage.	Lb.	....	60	90	40
Hay	"	....	....	....	20
Root (mangels or carrots)	"	....	....	....	....
Meal (equal parts by weight of wheat bran, ground pease, oil-cake and cotton-seed meal)..	"	....	8	8	8
		....	68	98	68
(For composition of ration for preparatory period, see page 72).					
Quantity consumed per cow, per day	Lb.	57·	92·7	95·	53·6
do of meal, per cow, per day	"	....	10·9	7·7	6·3
Value of feed consumed, per cow, per day	Cents.	....	19·37	15·77	16·40
Average quantity of milk, per cow, per day	Lb.	28·3	28·94	26·06	21·74
do percentage of fat in milk	p.c.	....	3·52	....	....
do live weight per cow at beginning	Lb.	1,175	1,195	1,207	1,200
do do do end	"	1,195	1,207	1,200	1,234
Value of feed consumed per 100 lb. of milk produced	Cents.	....	66·93	60·51	75·43

TABLE II.—Group I, Lot 2 (Blue-Bell, Buttercup, Pansy).—Three grade Shorthorn cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 45 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage	Lb.	....	30	40	90
Hay	"	....	15	20	....
Roots (mangels or carrots)	"	....	....	....	....
Meal (equal parts by weight of wheat, bran, ground pease, oil-cake and cotton-seed meal.)	"	....	8	8	8
			53	68	98
(For composition of ration for preparatory period, see page 72.)					
Quantity consumed per cow, per day	"	57	68	53	90
do meal per cow, per day	"	....	10·2	6·2	7·3
Value of feed consumed per cow, per day	Cents.	....	23·19	16·22	14·94
Average quantity of milk per cow, per day	"	26·8	28·47	27·1	23·87
do percentage of fat in milk	p.c.	....	3·50	....	....
do live weight per cow at beginning	Lb.	1,211	1,214	1,247	1,250
do do end	"	1,214	1,247	1,250	1,249
Value of feed consumed per 100 lb. of milk produced	Cents.	....	81·45	59·85	62·58

TABLE III.—Group II, Lot 3 (Barberry, Clenna Rex, Countess).—Two Jersey and one Ayrshire cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 151 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage..................	Lb.	.. ..	60	90	90
Hay.................	"	....	....	....	....
Roots (mangels or carrots).........	"	....	... .	....	....
Meal (equal parts by weight of wheat bran, ground pease, oil-cake and cotton-seed meal)..	"	....	....	4	8
		....	60	94	98
(For composition of ration for preparatory period, see page 72.)					
Quantity consumed per cow, per day....	"	44·	60·	66·3	65·
do of meal per cow, per day.....	"	....	....	2·9	5·3
Value of feed consumed per cow, per day......	Cents.	....	4·2	7·95	10·79
Average quantity of milk per cow, per day.....	Lb.	13·9	10·75	11·32	12·58
do percentage of fat in milk.............	p.c.	....	4·65	.. . .	....
do live weight per cow at beginning......	Lb.	856	854	827	812
do do end.......	"	854	827	812	856
Value of feed consumed for 100 lb. of milk produced.............	Cents.	... .	39·06	70·22	85·77

TABLE IV.—Group II, Lot 4 (Maggie B., Clenna Rex II).—One Ayrshire and one Jersey cow. (The other Jersey cow was taken sick and was dropped out.) At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 172 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage	Lb.	....	60	90	90
Hay	"	....	....	....	....
Roots (mangels or carrots)	"	....	....	....	....
Meal (equal parts by weight of wheat bran, ground pease, oil-cake and cotton-seed meal)	"	....	8	8	4
		....	68	98	94
(For composition of ration for preparatory period, see page 72.)					
Quantity consumed per cow, per day	"	47	74·5	70·8	66·7
do of meal per cow, per day	"	....	8·7	5·7	2·8
Value of feed consumed per cow, per day	Cents.	....	15·57	11·75	8
Average quantity of milk per cow, per day	Lb.	17·6	18·18	18·49	14·12
do percentage of fat in milk	p.c.	....	4·58	....	....
do live weight per cow at beginning	Lb.	846	833	869	881
do do at end	"	833	869	881	898
Value of feed consumed per 100 lb. of milk produced	Cents.	....	85·64	63·54	56·62

TABLE V.—Group III, Lot 5 (Dorinda II, Dorinda III, Aaggie's Cornelia). Three Holstein cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period, was 150 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage....	Lb.	....	40	100	....
Hay....	"	....	....	....	40
Roots (mangels or carrots)....	"	....	30	30	30
Meal (equal parts by weight of wheat bran, ground pease, barley, oil-cake and cotton-seed meal)....	"	....	10	10	10
		....	80	140	80
(For composition of ration for preparatory period, see page 72.)					
Quantity consumed per cow, per day....	Lb.	54	134·6	122·3	48·3
Quantity of meal per cow, per day....	"	....	16·8	8·7	6·0
Value of feed consumed per cow, per day....	Cents.	....	34·99	21·89	20·53
Average quantity of milk per cow, per day....	Lb.	28·6	31·76	29·30	25·12
do percentage of fat in milk....	p.c.	....	3·56	....	....
do live weight per cow at beginning...	Lb.	1,175	1,094	1,255	1,220
do do at end....	"	1,094	1,255	1,220	1,204
Value of feed consumed per 100 lb. of milk produced....	Cents.	....	110·17	74·70	81·72

TABLE VI.—Group III., Lot 6 (Miss Elgins, Fashion Book, Cherry Constance). Three Shorthorn cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 121 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage	Lb.	....	....	....	100
Hay	"	....	20	40	....
Roots (mangels or carrots)	"	....	30	30	30
Meal (equal parts by weight of wheat bran, ground pease, barley, oil-cake and cotton-seed meal)	"	....	10	10	10
		....	60	80	140
(For composition of ration for preparatory period, see page 72.)					
Quantity consumed per cow, per day	"	57·	67·2	46·6	101·
Quantity of meal per cow, per day	"	....	11·2	5·8	7·2
Value of feed consumed per cow, per day	Cents.	....	29·1	19·8	18·
Average quantity of milk per cow, per day	Lb.	23 5	25·63	20·76	18·14
do percentage of fat in milk	p.c.	....	3·75	....	....
do live weight per cow at beginning	Lb.	1,300	1,295	1,342	1,342
do do at end	"	1,295	1,342	1,342	1,290
Value of feed consumed per 100 lb. of milk produced	Cents.	....	113·53	95·37	99·22

The teaching of the experiment points to the economy of:—

(1) Providing for milking cows a ration of succulent quality;

(2) Feeding as large a quantity of the feed as the animals will eat up clean; and

(3) Making the ration of such a gross and bulky composition that not more than from 6 to 8 pounds of meal—the concentrated and expensive part of the feed—will be consumed by the ordinary cow per day.

Corn ensilage of such quality as came from our silos was not in itself a complete or suitable feed for milking cows. During the period when it was fed alone the hair of the cows seemed dry, there was an absence of thrifty appearance, and the yield of milk fell off in the first period of four weeks by 22·6 per cent. There was an average gain in the yield of milk during the first period of four weeks, from the cows in each of the other five lots, of 6·5 per cent.

Feeding Mangels vs. Sugar-beets for a Short Period.

An experiment to last for three weeks was undertaken on 7th December, to discover if any immediate and perceptible influence on the quantity and quality of the milk resulted from feeding sugar-beets in a ration, in place of mangels.

Twenty-three milking cows were in three groups, according to their periods of lactation, for the experimental dairy tests reported upon in Tables V to X of the dairy experiments recorded in Part III of this report.

The ration fed from 7th to 13th December was composed of:—

	Lb.
Corn ensilage	40
Mangels	35
Straw	5
Meal (barley, pease, oats)	5
	85

The ration fed from 14th to 27th December was composed of:—

	Lb.
Corn ensilage	40
Sugar beets	35
Straw	5
Meal (barley, pease, oats)	5
	85

The milk was carefully weighed, the specific gravity was taken by the lacto-densimeter, and the percentage of fat was ascertained by the Babcock milk tester. The following Table shows the average results:—

TABLE VII.

—	From Mangels.		From Sugar Beets.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Average quantity of milk ..... Lb.	8·29	6·48	7·72	5·42
do specific gravity	1,033·08	1,032·91	1,033·27	1,033·54
do per cent of fat in milk ..... p.c.	4·13	4·76	4·16	4·75

This experiment does not indicate that there was any appreciable difference in the quantity or richness of the milk, due to the substitution of sugar-beets for mangels. An examination of the butter which was made revealed the fact that the butter made during the period when sugar-beets were fed had a firmer body and a finer flavour than that which was made during the period when mangels were being fed.

Feeding Calves.

Very many enquiries have come to the office by mail, asking for information and advice on the feeding and raising of calves for the dairy. At my suggestion one of my assistants in the Dairy Commissioner's branch, Mr. J. W. Hart, prepared the following short article on that subject. Mr. Hart has proven by his work that he has special aptitude and ability in the care of dairy stock; and I consider the matters of advice contained in his article to be so much to the point, and capable of so much service to the stock-raisers of Canada, that I introduce it here in his own bright language.

(Written by J. W. Hart).

A knowledge of the principles which underlie the science of feeding will materially aid any one who essays to raise dairy stock; and no class of stock upon the farm will more fully respond to judicious, intelligent and generous treatment than will the calves. No saving can be effected by stinting calves in their feed. The man who starves his young stock through greed of gain, and in accordance with his false notions of economy, is not a capable stock-raiser or feeder. Aside from a humanitarian standpoint, what shall it profit a man if he feed a calf twelve months to attain a weight that could have been laid on in one-half the time? A stunted, dejected-looking calf, and the loss of the food necessary to maintain its miserable existence for six months is the ordinary result. Nor is this all. If the calf be raised for the dairy it will seldom outlive the effects of its early treatment. The difference between what such a cow is, and what she might have been—extending over a period of years, and to her offspring—will keep hundreds of dollars out of the stock-raiser's pocket.

The feeding of a calf commences before the calf is dropped. Before calving, the cow should be fed liberally with suitable food, that the calf may be strong and vigourous, and the flow of milk large.

"Milk is the natural food of the young of all mammalia." But, except in a few instances (and they are rarer than many of our breeders of thoroughbred stock suppose), milk—the model and perfect food—is too expensive a diet for the calves. Therefore, some owners of cows knock the calves on the head; but others prefer to raise them. The object of this article is to show how this may be accomplished with profit. I would not advise any one to raise all the calves dropped in his herd. It matters not how excellent the herd may be, there will be some weakly calves, and calves from the poorest milkers, that cannot be raised with profit or advantage.

Milk being a perfect food, supplying all the elements necessary for the growth of bone, muscle, nerve and sinew, for repairing waste and maintaining the animal heat, "it must follow as the night the day," that the more closely we can get our substitutes to resemble milk, in character and composition, the more rational and correspondingly successful will our practice be. The following is an average of a number of analyses of milk:—

Water	87·25	per cent.
Fat	3·50	do
Albuminoids	3·90	do
Sugar	4·60	do
Ash	·75	do

In this article I shall not attempt a description of these constituents and their functions in the animal economy. If the fat be taken from the milk in the form of butter it should be replaced by a cheaper food, rich in fat. Flax-seed is such a food, and its mucilaginous character when cooked specially adapts it to the tender mucous coat of the alimentary tract of the young animal. If flax-seed be difficult to obtain, linseed-meal, oatmeal, pease-meal or cotton-seed meal may be used. If whey be used as the basis of a ration, it should be fed sweet. Owing to its watery character, more grain should be fed with it than with skim-milk. Whatever meal is fed in milk or whey should be cooked.

I think it best to let the calf get its fill two or three times from the dam in nature's own way. Then feed it twice a day on whole milk, warm from the cow, until it is a week old. A gallon at a feed will be as much as an ordinary calf can assimilate. To teach a calf to drink, back it into a corner, get astride of its neck, and set the pail containing the milk down in front of it; place the first two fingers of the right hand in its mouth, keeping the palm of the hand over its nose. As soon as the calf commences to suck, lower its nose into the pail of milk; the calf will continue to suck, drawing the milk through the canal formed by the fingers; gently remove the fingers, keeping the calf's nose—not its nostrils—below the surface. If it keeps on drinking, the victory is won; but if objecting to this—to it unnatural treatment—it ducks its head to the bottom of the pail and jerks it up again, spouting the milk all over you, don't swear and maul the innocent little stranger with a milking stool. Two or three lessons will usually be successful in teaching the most obstinate calf to drink. It becomes more difficult to teach calves to drink as they get older, but it can be done by persistence, patience and gentleness. After the first week, one-half of the new milk may be replaced by sweet skim-milk, with the addition of half a teacupful of flax-seed jelly. Instead of flax-seed, oil-cake, oil-meal, oat-meal, middlings or pease-meal may be fed—the last named sparingly, as it is constipating in tendency. The flax-seed may be gradually increased to half a pound a day for a calf of three months. Keep some clean, bright hay and chopped grain where the calf can reach it, and it will soon learn to eat. Don't be afraid that it will eat too much of these things.

In feeding calves there is a danger that the milk will be swallowed too rapidly, and thus produce indigestion and scouring. For young calves a nipple is often used, which obviates that difficulty. Half a teaspoonful of rennet-extract in the milk will correct the tendency to scours, and will prove an excellent promoter of digestion. If scouring be noticed, don't dose the calf with powerful astringents, but decrease the ration of milk, and to it add a teacupful of boiled flour.

Where two or more calves are fed together, keep them tied up while feeding, and for a short time afterwards, so that they cannot suck each other.

Feed regularly twice or three times a day, and have the milk at blood heat. Never feed cold milk to a young calf. It is better that the same person should attend the calves regularly.

Calves should be allowed access to pure water and salt. Don't miss the effects of good feeding, by allowing them to suffer for these prime necessaries.

After the calf is four months old, if milk be scarce, gradually lessen the quantity fed, until at the age of six or seven months it may be dispensed with entirely.

Exercise is beneficial, especially to calves intended for the dairy. The run of a grass plot should be given where convenient. The calf pen should be kept dry and clean.

Study the nature of the animal; respect its preferences; anticipate its wants; treat it kindly; be a watchful, intelligent feeder; and verily thou shalt not fail to raise good calves.

PART II.—SWINE.

Of thoroughbred swine there were purchased during the year:

Berkshire.

One boar, from Mr. Thomas Teasdale, Concord, Ont.

Tamworths.

One boar and one sow, from Messrs. J. L. Grant & Co., Ingersoll, Ont.

Poland Chinas.

Two sows (pure bred, but not now eligible for registration), from Messrs. W. M. & J. C. Smith, Fairfield Plains, Ont.

A number of grade pigs were purchased, with which to carry on experiments, of which some are still in progress.

Provision has been made for crossing some of the longer and leaner breeds, such as the Improved Large Yorkshires and Tamworths, on the shorter and more hardy breeds, such as the Essex, Berkshire, &c. The ultimate object will be to discover what cross or pure-bred swine will give the largest yield in weight, and the best quality of meat for every pound of feed consumed. A few feeding tests for a comparison of the cross-bred pigs are in progress at this writing.

Experiments in the Fattening of Swine.

In November, 1890, 24 grade pigs were purchased. Eight of them were white, and apparently grades of Chester whites; 16 of them were nearly all black, and were evidently grades of Berkshires. They were divided into six lots of four pigs in each.

The eight white pigs were put into pens Nos. 1 and 2, and the two lots of four each were, as nearly as possible, alike in weight and appearance. Both lots were fed on a mixture of grain, consisting of equal parts of ground pease, barley and rye. The object of this experiment was two-fold—(1) to discover the difference, if any, in the quantity of grain required to produce every pound of increase in the live weight of the swine, when *fed steamed and warmed* in the one case, and when *fed raw and cold* in the other case; (2) to obtain a record of the comparative quantities of grain required to produce every pound of increase in the live weight of the swine, during the different stages of the feeding period.

The mixture of grain was fed wet in both cases. Cold water was given to drink. A mixture of salt and wood ashes was kept in a box on the floor of each pen, where the pigs had access to it at will. The feed was weighed every day, and the swine once every week. In the following Table the feeding period has been arranged into five periods of four weeks each, and one period of three weeks. It shows the gain in weight and the quantities of grain consumed.

Table I.

——	9th December.	5th January.	2nd February.	2nd March.	30th March.	27th April.	18th May.	Totals.
Pen 1—Four Swine—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Fed on a mixture of ground pease, barley and rye, *fed steamed and warmed:*								
Live weight..........	302	407	614	808	917	974½	745*	.. ..*Three swine only.
Gain in weight....	....	105	207	194	109	57½	30	702½ gain in weight.
Feed consumed........................	....	348	637	736	545	406	256	2,928 grain consumed.
Feed consumed per lb. gain in live weight........................	....	....	....	....	....	....	.. ..	4·16 grain.
Pen 2—Four Swine—								
Fed on a mixture of ground pease, barley and rye, *fed raw and cold :*								
Live weight	308	413½	597	723	781½	830½	872	....
Gain in weight.........	....	105½	183½	126	58½	49	41½	564 gain in weight.
Feed consumed..................	....	348	563	558	413½	278½	237	2,398 grain consumed.
Feed consumed per lb. gain in live weight........................	....	....	....	...	....	....	....	4·25 grain.
Pens 1 and 2—								
Average feed consumed per lb. of gain in live weight..................	....	3·31	3·07	4·04	5·73	6·45	6·93	
Percentage of increase in feed consumed per lb. of gain in live weight.......	....	....	....	31%	86%	110%	125%	

(1). Results :—Taking in the whole period, extending from 9th December to 18th May, 4·16 pounds of the mixture of grain, ground pease, barley and rye, were consumed for every pound of increase in the live weight, when fed steamed and warm, against 4·25 pounds of the grain when fed raw and cold.

(2). The swine, on the steamed and warm feed, gained 702½ pounds in live weight, against 564 pounds of gain by the swine on the raw and cold feed; but the former consumed 2,928 pounds of grain, as against 2,398 pounds of grain consumed by the latter. That indicates that when feed was provided, steamed and warm, the swine consumed larger quantities of it than when fed raw and cold; they also gained faster in weight, but every pound of increase in weight cost practically as much in grain in the one case as in the other. There was nothing to compensate for the labour and expense of the steaming.

(3). There was a marked and gradual increase in the quantity of grain consumed per pound of gain in live weight, after the second month of the feeding. That will be presented again in another Table.

Eight of the black pigs were put into Pens Nos. 3 and 4. The pigs in Pen 3 were as nearly as possible similar in weight and appearance to those in Pen 4.

In this experiment, the object was to discover the value, if any, of clover ensilage for the feeding and fattening of swine of an average weight of 64 pounds each.

Records were also kept, to ascertain the comparative quantities of feed required to produce every pound of increase in the live weight of the swine, during the different stages of the feeding period.

The pease ensilage was prepared by harvesting the crop when the earliest pods were filled and before the pease became hard. The vines were green and succulent. The ensilage was well preserved. The pigs in Pen 3 were fed an allowance of grain, a mixture of equal parts of ground pease, barley and rye, but not as much as they would have eaten readily. They were fed also a quantity of pease ensilage. The pigs in Pen 4 were fed upon pease ensilage only. In both cases the pigs refused to eat more than a small portion of whatever quantity of pease ensilage was offered to them. The remainder was nosed over, pushed about and tramped on. When what was left uneaten was weighed out of the pens it was very wet.

Both lots of pigs were allowed cold water to drink, and a mixture of salt and ashes was accessible to the pigs in both pens. The pease ensilage did not seem to have any feeding value to the pigs which received an allowance of grain; and the pigs in Pen 4 steadily decreased in weight for nine weeks, when the feeding of ensilage was ended.

The following Table contains the details of the weights of pigs, feed consumed, and rate of gain in live weight:—

TABLE II.

—	29th December.	5th January.	2nd February.	2nd March.	30th March.	27th April.	18th May.	Totals.
Pen 3—Four Swine—								
Fed on a mixture of ground pease, barley and rye, *fed steamed and warmed,* and pease ensilage—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Live weight	254	267	414	*379	442	494	548	*Three swine only.
Gain in weight	....	13	147	74	63	52	54	403 gain in weight.
Feed consumed { Grain	....	63	474	335	287	260	243	1,662 grain consumed.
Feed consumed { Pease ensilage	....	112½	682	345				
Pease ensilage left uneaten (wet)	....	100	625	319				
Grain consumed per lb. of gain in live weight	....	....	....	....	....	....	....	4·12 grain.
Pen 4—Four Swine—								
Fed on pease ensilage only until 2nd March—								
Live weight	256	237	223	205				
Loss in weight	....	19	14	18	....	....	....	51 loss in weight.
Pease ensilage fed	....	235	1401	2127				
do left uneaten (wet)	....	150	938	1409				
After 2nd March, fed on a mixture of ground pease, barley and rye, *fed raw and cold*—								
Live weight	....	....	....	205	395½	512½	571	
Gain in weight	....	....	....	....	190½	117	58½	366 gain in weight.
Feed consumed	....	....	....	....	443	388	327	1,158 grain consumed.
do per lb. of gain in live weight	....	....	....	....	2·32	3·31	5·59	3·16 grain.
Pens 3 and 4—								
Average feed consumed per lb. of gain in live weight	....	4·84	3·22	4·52	2·88	3·83	5·06	

THE OTHER EIGHT BLACK PIGS—Berkshire grades—were put into Pens Nos. 5 and 6, and the two lots were as nearly similar in appearance and weight as possible. The objects of this experiment were the same as those in the experiment with the swine in Pens 1 and 2. The method of conducting it was similar, with the difference of sugar beets being fed to the swine in both pens, with the grain mixture.

Table III shows the weights of the swine, the gains in weight, and the quantities of feed consumed.

TABLE III.

—	9th December.	5th January.	2nd February.	2nd March.	30th March.	27th April.	18th May.	Totals.
Pen 5—Four Swine—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
Fed on a mixture of ground pease, barley and rye, *fed steamed and warmed*, and sugar beets—								
Live weight	187	258	425	581	669	744½	812	
Gain in weight	...	71	167	156	88	75½	67½	625 gain in weight.
Feed consumed { Grain	....	333	412	540	475	369	282	2,411 grain consumed.
Feed consumed { Sugar beets	....	44½	330	313	320	308	224	1,538 sugar beets consumed.
Feed consumed per lb. of gain in live weight	....	....	....	....	....	....	....	3·86 grain. 2·46 sugar beets.
Pen 6—Four Swine—								
Fed on a mixture of ground pease, barley and rye, *fed raw and cold*, and sugar beets—								
Live weight	201	272	415	547	692	731	772	
Gain in weight	....	71	143	132	145	39	41	571 gain in weight.
Feed consumed { Grain	....	225	396	503	458	371	270	2,223 grain consumed.
Feed consumed { Sugar beets	....	60	320	307	310	322	244	1,563 sugar beets consumed.
Feed consumed per lb. of gain in live weight	....	....	....	....	....	....	....	3·89 grain. 2·73 sugar beets.
Pens 5 and 6—								
Average feed consumed per lb. of gain in live weight { Grain	....	3·93	2·61	3·62	4·00	6·50	4·33	
Average feed consumed per lb. of gain in live weight { Sugar beets	....	0 72	2·10	2·15	2·73	5·52	5·11	
*Percentage of increase in feed consumed per lb. of gain in live weight	....	....		21 per ct.		90 per ct.		
*1 lb. grain equal to 5 lb. sugar beets	....	....		....		....		

The following Table shows the quantities of feed consumed per pound of gain in live weight, during each of the six feeding periods. The duration of each feeding period was four weeks, with the exception of the first period for Pens 4 and 5, and the last period for all the Pens, which was three weeks. The grain fed in each case was a mixture of equal parts of ground pease, barley and rye. No notice is taken in this Table of the pease ensilage fed to Pens 4 and 5, as it did not appear to have any appreciable feeding value in these cases.

TABLE IV.—Pounds of Feed consumed per pound of gain in the live weight of swine.

—	Pen 1, 4 Swine; Grain, Fed Steamed and Warm.	Pen 2, 4 Swine; Grain, Fed Raw and Cold.	Pen 3, 4 Swine; Grain, Fed Steamed and Warm.	Pen 4, 4 Swine; Grain, Fed Raw and Cold.	Pen 5, 4 Swine; Grain, Fed Steamed and Warm, and Sugar Beets.		Pen 6, 4 Swine; Grain, Fed Raw and Cold, and Sugar Beets.	
Feeding Periods.	Grain, Lb.	Grain, Lb.	Grain, Lb.	Grain. Lb.	Grain, Lb.	Sugar Beets, Lb.	Grain, Lb.	Sugar Beets, Lb.
First	3·31	3·30	4·84	....	4·69	0·61	3·17	0·84
Second	3·07	3·07	3·22	....	2·46	2·00	2·76	2·23
Third	3·79	4·43	4·52	....	3·46	2·00	3·81	2·32
Fourth	5·00	7·07	4·55	2·32	5·40	3·63	3·15	2·13
Fifth	7·06	5·68	5·00	3·31	4·88	4·08	9·51	8·25
Sixth	8·53	5·71	4·50	5·59	4·17	3·31	6·58	6·00
Average	4·16	4·25	4·12	3·16	3·86	2·46	3·89	2·73

CONCLUSIONS.—The teaching of these three sets of experiments is to the effect that :—

(1.) There is no appreciable difference in the number of pounds of grain required to produce every pound of increase in the live weight of swine, when fed steamed and warm, as against fed raw and cold;

(2.) On the average there is a gradual increase in the quantity of feed consumed, for every pound of gain in live weight of swine, after the second month of their feeding period and after the average live weight exceeds 100 lb.;

(3.) It is economical to market swine for slaughtering when they weigh from 180 to 200 lb. alive;

(4.) The *largest* consumption of feed per day by swine is at or near the period of their feeding, when the number of pounds of feed consumed, per pound of increase in weight, is *lowest*;

(5.) For the increase of weight by 3,231½ lb. in 24 swine, 4·14 lb. of a mixture of ground pease, barley and rye were required for every pound of increase in live weight.

Several series of feeding tests are in progress, mainly for the purpose of determining the relative values of (1) ground grain and whole grain; (2) of grain and skim milk; and (3) of frozen wheat from Manitoba and North-West Territories. At this writing, the quantity of ground frozen wheat consumed per pound of increase in live weight has been 5·30 lb., with swine weighing from 185 lb. to 275 lb. live weight each, and 3·93 lb. of ground frozen wheat per pound of increase in live weight with swine weighing from 70 lb. to 105 lb. each.

PART III.—EXPERIMENTAL DAIRY WORK.

The experimental dairy building on the farm, which was described in the annual report for 1890, was completed early in 1891. A cut of it appears underneath.

The machinery and apparatus are adequate for the present needs of the farm, and enable us to carry on investigations which are considered to be capable of rendering the most immediate and practicable service to the dairymen of the country.

An 8 h. p. boiler and 6 h. p. steam engine were purchased from Mr. Geo. Low, of Ottawa, who also fitted up the steam pipes and shafting throughout the building.

A hand-power centrifugal cream separator, manufactured by Burmeinster & Wain, of Copenhagen;

A No. 4 "Alexandra" centrifugal cream separator, and a No. 8 "Alexandra" centrifugal cream separator for operation by hand-power, manufactured by R. A. Lister & Co., Dursley, England ;

One No. 5 Daisy revolving barrel churn of fourteen gallons' capacity, and two No. 2 Daisy churns of four gallons capacity each ;

A Boyd cream ripening vat, and fermentation starter vat;

A lever butter worker for hand use;

Several Babcock milk-testers;

Two pairs of weighing scales; and the usual outfit of small dairy utensils, such as deep-setting milk pails, 20″ x 8½″ diam., shallow milk pans, strainer, skimmer, butter printer, thermometers, water pails, hot water and cold water tanks, washing sink, brushes, etc., furnish the dairy with conveniences for carrying on its work.

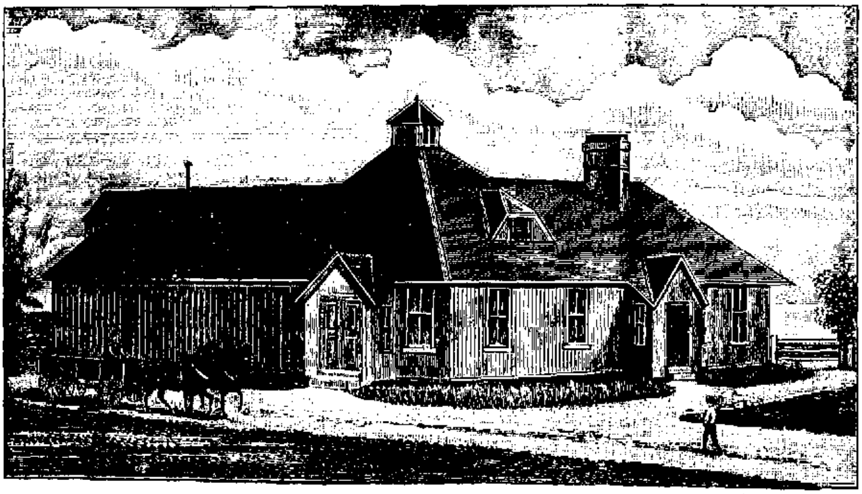

FIG. IV.—Dairy Building, Central Experimental Farm.

Besides these, there are several tables, and a milk-setting tank which merits particular description for the information of farmers. The tank is constructed of 2-inch pine lumber; its length is 7 ft. 6 in.; its width 2 feet, and its depth 2 feet. These are inside measurements. It is divided into four compartments, each 21 x 24 x 24 inches. That size gives sufficient space for the setting of four deep-setting milk pails in each. Cold water is led into each compartment by means of a pipe which runs down to within 1 inch from the bottom. The overflow of water—when it has been slightly warmed by contact with the milk-pails—is carried off by a pipe at its surface. Where the supply of cold water is limited, this method of leading the cold water to *near the bottom of the tank*, and conducting the water which has been warmed from the surface to the overflow pipe or drain, will enable the cooling power of the water to be used most economically. The overflow water may be in excellent condition for the watering of stock, where and when water for both purposes is scarce.

PARTICULARS OF EXPERIMENTS.

In the course of the experimental work of the year a great mass of valuable data has been accumulated in the records. As far as experiments have been completed, or even advanced sufficiently to furnish useful guidance for dairymen in their practice, they will be reported upon. The tests for comparison between the centrifugal cream separators and the setting methods are not ready to be reported on in full, as it is considered desirable to make a record of the results which are found during every month of the year before any definite conclusion is announced.

Instead of burdening the pages of the report with the details of single tests only, a statement of the average results of from 4 to 12 tests will be presented in most of the different experiments. Our herd of milking cows contains animals of seven different breeds, beside grade milch cows. When not otherwise specified, the milk used in the experiment was mixed herd milk.

Experiments in Deep-setting of Milk at different Temperatures.

The test was conducted for six days—28th May to 4th June—and included six settings of morning milk and six settings of evening milk in each case. The whole quantity of milk used was herd milk, and was thoroughly mixed in a large vessel before it was divided into three lots. The setting period was 22 hours. Table I shows the average results from the 12 tests:—

TABLE I.

Temperature of Milk when set.	98° Fahr.	88° Fahr.	78° Fahr.
Quantity of milk set.......... Lb.	35	35	35
Per cent of butter-fat in milk..........	3·48	3·48	3·48
Temperature of water.......... Fahr.	49°	49°	49°
Quantity of skim-milk.......... Lb.	29·6	29·8	30·25
Per cent of butter-fat in skim-milk..........	0·62	0·64	0·71
Quantity of fat in whole milk.......... Lb.	1·22	1·22	1·22
do left in skim-milk.......... "	0.183	0·190	0·214
Percentage unrecovered..........	15 04	15·63	17·60

This experiment shows that the loss of butter-fat—unrecovered from the skim-milk—was only ·59 of 1 per cent greater, when milk was set 88° Fahr., than when it was set 98° Fahr.; and that the loss of unrecovered butter-fat was 2·53 per cent greater when milk was set at 78° Fahr. than when it was set at 98° Fahr.

Experiment in Immediate vs. Delayed Setting of Milk.

This test was conducted for six days—from 27th July to 2nd August—and included six settings of morning milk and six settings of evening milk in each case. The milk was herd milk, and was mixed immediately after milking, before it was divided into two lots. One lot was set at once in a deep-setting pail, in ice water, of a temperature of 38° Fahr.; another lot was left in a pail in the dairy room for one hour, and was then set in ice water, under conditions precisely similar. The following Table shows the average results from the morning and evening tests:—

TABLE II.

—	Morning Milk.		Evening Milk.	
	Immediate setting.	Delayed one hour.	Immediate setting.	Delayed one hour.
Quantity of milk set .... Lb.	35	35	35	35
Per cent of butter-fat in milk..................	3·53	3·53	3.93	3·93
Temperature when set ....Fahr.	98°	88°	98°	88°
Per cent of butter-fat in skim-milk..................	·48	·96	·65	1·20
Highest per cent of butter-fat in skim-milk..........	·9	1·2	·9	1·8
Lowest do do do	·4	·75	·4	·7
Setting period in hours..................................	22	21	22	21
Quantity of fat in whole milk.............. Lb.	1·23	1·23	1·37	1·37
do left in skim-milk.............. "	0·139	0·278	0·183	0·348
Percentage unrecovered..................................	11·31	22·63	13·76	25·40

This experiment shows that the loss of unrecovered butter-fat—which was left in the skim-milk—was 11·48 per cent greater, when the setting of milk in deep-setting pails in ice water was delayed one hour, than it was when the milk was set immediately.

Experiment in Deep-setting of Milk for 11 *Hours vs.* 22 *Hours.*

This test was continued for six days—from 12th August to 18th August—and comprised six settings of morning milk and six settings of evening milk in each case. The milk was mixed herd milk, and was set immediately after it reached the dairy building in deep-setting pails, in ice water of a temperature of 38° to 40° Fahr.

Table III shows the average results from the 24 settings of milk.

TABLE III.

	Morning Milk.		Evening Milk.	
Setting Period...	11 Hours.	22 Hours.	11 Hours.	22 Hours.
Quantity of milk set.......................... Lb.	35	35	35	35
Per cent of butter-fat in milk	3·61	3·61	4·27	4·27
Temperature when set ....Fahr.	96°	96°	95°	94°
Per cent of butter-fat in skim-milk..	·98	·55	·97	·65
Highest per cent of butter-fat in skim-milk..........	1·4	·8	1·6	·8
Lowest do do do	·7	·3	·8	·4
Quantity of fat in whole milk................ Lb.	1·26	1·26	1·49	1·49
do left in skim-milk.............. "	0·284	0·159	0·281	0·188
Percentage unrecovered..................................	22·55	12·65	18·87	12·65

This experiment shows that the loss of unrecovered butter-fat was 9·9 per cent greater for the morning milk, and 6·22 per cent greater for the evening milk, when the milk was set in deep pails for 11 hours, than it was when the milk was set for 22 hours.

Experiment on the effect of adding Water to Milk in Deep-setting.

The test was carried on for six days—from 24th September to 1st October—and included six settings of morning milk and six settings of evening milk, or 36 settings in all. The milk used was herd milk, and was mixed in one vessel, before any difference of treatment was given. To one lot, 25 per cent of water at a temperature of 160° Fahr. was added; to another lot, 25 per cent of water at a temperature of 60° Fahr. was added; and the third lot was set under similar conditions with the others, and without the addition of any water.

The following Table shows the average results from 12 settings in each case; the setting period was 22 hours:—

TABLE IV.

—	25 per cent of Water at 160° Fahr. added.	25 per cent of Water at 60° Fahr. added.	No Water added.
Quantity of milk set .... Lb.	25	25	35
Percentage of butter-fat in milk	3·52	3·52	3·52
Temperature of milk when mixed .... Fahr.	92°	92°	92°
do milk when set	110°	82°	92°
do water in tank	38°	38°	38°
Percentage of fat left in skim-milk	·63	·60	0 58
Quantity of fat in whole milk .... Lb.	0·88	0 88	1·23
do left in skim-milk .... "	0·130	0·124	0·168
Percentage unrecovered	14·82	14·11	13·67

This experiment shows that there was practically no appreciable difference (1·15 per cent) between the percentages of unrecovered fat left in the skim-milk, when 25 per cent of water at 160° Fahr., 25 per cent of water at 60° Fahr., and no water added, were the differences of treatment in the setting of milk, in deep-setting pails in ice water.

Four Experiments in the Creaming of Milk from Cows at different stages of Lactation, by the Deep-setting method.

For these tests, which were conducted in November, the cows of the herd were divided into three groups, according to the length of time during which they had been milking since the last calving.

Group I contained the cows which had been milking for periods ranging from 8 to 11 months, and was made up of 1 Shorthorn, 1 Shorthorn grade, 2 Jerseys, 1 Holstein, 1 Devon and 1 Quebec Jersey.

Group II contained the cows which had been milking for periods ranging from 5 to 7 months, and was made up of 6 Quebec Jerseys, 2 Shorthorn grades and 1 Devon.

Group III contained the cows which had been milking for periods ranging from 1 to 3 months, and was made up of 3 Ayrshires, 3 Holsteins, 2 Shorthorns, 1 Shorthorn grade and 1 Polled Angus.

The setting period in all cases was 22 hours.

THE FIRST EXPERIMENT was conducted for five days. The milk was set in cold water, in which no ice was used, of a temperature of 47° Fahr.

Table V shows the average results from five tests of the setting of morning milk and five tests of the setting from evening milk of each group, or 30 settings in all :—

TABLE V.

—	GROUP I.		GROUP II.		GROUP III.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set. ....Lb.	33	31	34	30	35	35
Per cent of butter-fat in whole milk....	3·86	4·26	3·80	4·17	2·86	3·6
Temperature when set ....Fahr.	87°	88°	89°	87°	91°	91°
Per cent of butter-fat left in skim-milk..	1·14	1·55	1·84	1·5	·65	1·13
Quantity of fat in whole milk.......Lb.	1·27	1·32	1·29	1·25	1·00	1·26
do left in skim-milk.... "	0·311	0·398	0·518	0·372	0.188	0·327
Percentage unrecovered.......... ..	24·54	30·15	40·18	29·82	18·85	26·00

THE SECOND EXPERIMENT in this series was continued for four days. The milk was set immediately after it reached the dairy building from the stables, in ice water, which was maintained at a temperature of 38° Fahr.

Table VI shows the results from the four settings of morning milk and the four settings of evening milk, from each group, or 24 settings in all :—

TABLE VI.

—	GROUP I.		GROUP II.		GROUP III.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set............. .Lb.	35	27	35	31	35	34
Per cent of butter-fat in whole milk....	3·95	4·42	3·9	4·17	2·8	3·15
Temperature when set ....Fahr.	89°	92°	92°	94°	93°	95°
Per cent of fat left in skim-milk.......	1·2	1·7	1·05	1·05	·45	·55
Quantity of fat in whole milk ......Lb.	1·38	1·19	1·36	1·29	0·98	1·07
do left in skim-milk.. "	0·348	0·380	0·304	0·269	0·130	0·154
Percentage unrecovered.....	25·22	31·95	22·39	20·85	13·26	14·48

THE THIRD EXPERIMENT in the series lasted for four days. The milk was re-heated to 98° Fahr. after it reached the dairy building, and was set immediately thereafter in ice water, which was maintained at a temperature of 38° Fahr.

Table VII shows the results from the four settings of morning milk and the four settings of evening milk, from each group, or 24 settings in all :—

TABLE VII.

—	Group I.		Group II.		Group III.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set .... Lb.	32	26	34	31	35	34
Per cent of butter-fat in whole milk. ..	3·71	3·9	3·8	4·2	3·1	3·6
Temperature when set..... .....Fahr.	98°	98°	98°	98°	98°	98°
Per cent of fat left in skim-milk.......	1·5	1·65	1·15	1·02	·45	·52
Quantity of fat in whole milk. .... Lb.	1·19	1·01	1·29	1·30	1·08	1·22
do in skim-milk ..... "	0·397	0·356	0·324	0·308	0·130	0·146
Percentage unrecovered..............	33·40	35·19	25·11	23·70	12·08	12·00

THE FOURTH EXPERIMENT in the series extended over five days. To the milk from Groups I and II, 10 per cent of water was added before it was set; the milk from Group III was delayed in setting for half an hour, then reheated to 98° Fahr., and set immediately afterwards, without the addition of water.

Table VIII shows the results from the five settings of morning milk and the five settings of evening milk from each group, or 30 settings in all :—

TABLE VIII.

—	Group I.		Group II.		Group III.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set........ ......Lb.	33	25	34	31	35	35
Per cent of butter-fat in whole milk...	3·70	3·96	3·52	3·8	3·	3·24
do water added...............	10	10	10	10	0	0
Temperature when set...........Fahr.	98°	98°	98°	98°	98°	98°
Per cent of fat in skim-milk...........	1·75	1·40	1·25	1·26	·54	·62
Quantity of fat in whole milk ...... Lb.	1·22	0·99	1·20	1·18	1·05	1·13
do skim-milk .... "	0·478	0·290	0·352	0·324	0·156	0·180
Percentage unrecovered...............	39·22	29·29	29·34	27·43	14·91	15·91

The next Table has been arranged to show the relative efficiency of the creaming which resulted from the different treatments of the milk, in each of the four experiments of the series. The comparison between the different treatments requires this explanation: The different treatments were given to the milk of the same cows upon four consecutive weeks. That did not afford a basis, for a comparison of the effects of different setting conditions on milk, as sufficient or as reliable as when different portions of herd milk, from the same cows on the same day, are subjected to different setting conditions for creaming. This experiment provided for treating the milk from the different groups alike on the same days, as the comparison was between the milks of the different groups, and not between the different methods of setting.

Table IX shows the percentage of unrecovered fat, which was left in the skim milk in the case of each of the three groups of cows, during each of the four experiments:—

TABLE IX.

—	Group I.	Group II.	Group III.
FIRST EXPERIMENT.—Milk set in water of a temperature of 47° Fahr	27·34	35·00	22·42
SECOND EXPERIMENT.—Milk set in ice water of a temperature of 38° Fahr	28·58	21·62	13·87
THIRD EXPERIMENT.—Milk re-heated to 98° and set in ice water of a temperature of 38° Fahr	34·29	24·40	12·04
FOURTH EXPERIMENT.—10 per cent of water added to milk of Groups I and II; milk of Group III delayed half an hour, then re-heated to 98° Fahr	34·25	28·33	15·41
Average of four experiments	31·11	27·35	15·93

These four experiments in the setting of milk in deep-setting pails, with 36 setting tests for the milk of each of three groups of cows, show:—

(1.) That 31·11 per cent of the butter-fat was not recovered from the skim-milk, in the case of the group of cows which had been milking for periods of from 8 to 11 months each.

(2.) That 27·35 per cent of the butter-fat was not recovered from the skim-milk, in the case of the group of cows which had been milking for periods of from 5 to 7 months each.

(3.) That 15·93 per cent of the butter-fat was not recovered from the skim-milk, in the case of the group of cows which had been milking for periods of from 1 to 3 months each.

Experiment in Deep-setting, as compared with Shallow-pan Setting, with the Milk from Cows of Groups I and II.

The cows which composed Groups I and II were the same as those described for the series of experiments which have been recorded in Tables V to IX. A portion in each case was set in an ordinary shot-gun, deep-setting pail, of 8½ inches diameter, set in water without ice, of a temperature of 45° Fahr.; another portion of the mixed milk was set in shallow-pans to a depth of 2½ inches.

The milk was set in each case for a period of 22 hours.

The test was continued for five days—8th to 12th December, 1891.

The following Table shows the results:—

TABLE X.

Method of Setting...	Group I (Milking 9 to 12 months).				Group II (Milking 6 to 8 months).			
	Deep-setting.		Shallow-pan.		Deep-setting.		Shallow-pan.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set......... Lb.	19	....	8	8	24	24	8	8
Per cent of butter-fat in milk . . .	4·1	....	4·1	4·8	4·1	4·6	4·1	4·6
Temperature of milk when skimmed.. ....Fahr.	45°	....	55°	55°	45°	45°	55°	55°
Quantity of cream obtained...Lb.	3·5	....	1·5	1·5	4·	4·	1·5	1·5
do of skim-milk. ..... "	15·5	....	6·5	6·5	20	20	6·5	6·5
Per cent of fat left in skim-milk..	2·1	....	·27	·21	2·3	2·6	·25	·35
Quantity of fat in whole milk.. Lb.	·779	....	·328	·384	·984	1·104	·328	·368
do of fat left in skim-milk .. .. "	.325	....	·017	·014	·460	·520	·016	·022
Percentage unrecovered..	41·72	....	5·18	3·65	46·75	47 10	4·88	5·98

This experiment shows that the loss of unrecovered butter-fat left in the skim-milk, from the milk of cows at the milking periods of from 6 to 12 months since calving, was 40·27 per cent greater when the milk was set in deep-setting pails, in water at a temperature of 45° Fahr., than when it was set in shallow-pans to a depth of 2½ inches.

During the winter season, as well as during the summer, it seems necessary, in order to obtain efficient creaming by means of deep-setting pails, to use ice-water of a temperature at or below 40° Fahr. That appears to be particularly essential in the setting of milk from cows which have been milking for periods of more than 6 months. To prevent any one from inferring a misleading conclusion from Table X, the following Table has been prepared to show the results from the testing of the mixed milk from the whole herd, for a period of three months. The trials of the different methods of separating the cream, of which the average results appear in Table XI, lasted for one week in every month in each case. The full report of this experiment, which is not yet completed, will appear in the next annual report.

TABLE XI.

	Centrifugal Cream Separator.	Deep-setting in Ice-water at 38°.	Shallow-pan setting to depth of 2½ in.
Per cent of butter-fat in whole milk..........	3·82	3·81	3·82
Quantity of milk per lb. of butter.......... . ...Lb.	23·71	25·97	24·91
do butter obtained per lb. of butter-fat in whole milk "	1·104	1·005	1·051

The results of these experiments, and of the series of experiments recorded from Tables V to X, seem to indicate:—

(1.) That by the deep-setting of milk from cows which have been milking for periods of 5 to 12 months in cold water of a temperature of 45° or 48° Fahr., without the use of ice, about 37 per cent of the butter-fat was left in the skim-milk; and by setting in ice water of a temperature of 38° Fahr. about 28 per cent of the butter-fat was left in the skim-milk.

(2.) That during the fall and winter, particularly, the use of shallow-pans for the setting of milk from cows, which have been milking for periods of from 5 to 12 months, will permit the recovery in the cream of about 95 per cent of the butter-fat in the whole milk.

(3.) That the use of the centrifugal cream separator will enable the dairyman to recover practically the whole of the butter-fat into the cream, from the milk of cows at all stages of lactation, and during all seasons of the year.

Experiment in the Setting of Milk in a Cheese-factory Milk-can, 15 *inches in diameter, and in a Shot-gun Can,* 8½ *inches in diameter.*

Among the patrons of cheese factories, the practice of using the cheese-factory milk-cans for the setting of milk for cream, after the close of the cheese-factory season, is a common one. A comparison between setting milk in a milk-can 15 inches in diameter and an ordinary shot-gun can 8½ inches in diameter, was made by setting morning milk for three days, and evening milk for three days, between 9th and 14th November. A quantity of herd milk was mixed before it was divided into two portions. It was put into the two cans, to an equal depth—about 19 inches. Both lots were set in ice-water, at 38° Fahr., for 22 hours.

The following Table shows the result:—

TABLE XII.

—	Milk-can, 15 inches diameter.		Shot-gun Pail, 8½ inches diameter.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk in three settings.......... Lb.	315	315	105	105
Per cent of butter-fat in milk..................	3·36	3·46	3·36	3·46
do fat left in skim-milk..................	·71	·73	·45	·47
Quantity of fat in whole milk.............. Lb.	10·58	10·90	3·53	3·63
do left in skim-milk .... "	1.83	1·88	·39	·40
Percentage unrecovered..........................	17·32	17.27	11·05	11·13

This experiment shows that the loss of unrecovered fat—left in the skim-milk—was 6·2 per cent greater, by the use of a milk-can 15 inches in diameter, than by the use of a deep-setting pail 8½ inches in diameter.

Experiments in the Churning of Cream.

The first series of experiments was undertaken to discover what difference, if any, in the product of butter, resulted from the churning of cream obtained by the deep-setting method, from the milk of three groups of cows at different stages of lactation. The cows which composed the three groups were the same as those described in Tables V to IX, viz.:—

Group I contained cows which had been milking for periods ranging from 8 to 11 months.

Group II contained cows which had been milking for periods ranging from 5 to 7 months.

Group III contained cows which had been milking for periods ranging from 1 to 3 months.

THE FIRST TRIAL was made on 28th November. A portion of the milk of two days was used from the cows of each group.

The milk was set immediately after it reached the dairy building, at a temperature of 96° Fahr., in deep-setting pails, in ice-water of a temperature of 38° Fahr.

The setting period was 22 hours.

In each case 5 per cent of fermentation starter was added, and the cream of the three lots was ripened to as nearly the same stage of acidity as possible.

The ripening period in this trial was 12 hours.

Table XIII shows the result of the first trial of churning cream from the milk from each of the three groups.

TABLE XIII.

—	Milk from		
	Group I.	Group II.	Group III.
Quantity of milk set.......... Lb.	121	138	248
Per cent of butter-fat in milk..........	4·3	4·1	3·1
Creaming—			
Quantity of cream.......... Lb.	26	27	38
Per cent of fat left in skim-milk..........	1·20	1·00	·65
Churning—			
Churning temperature..........Fahr.	64°	64°	62°
Minutes churned..........	150	100	40
Revolutions of churn per minute..........	65	65	66
Quantity of butter obtained.......... Lb.	4·75	5·75	8·00
do buttermilk.......... "	21	21	30
Per cent of fat left in buttermilk..........	·20	·30	·20
Results—			
Quantity of fat in whole milk.......... Lb.	5·20	5·66	7·69
do do left in skim-milk and buttermilk.......... "	1·18	1·17	1·42
do of milk per lb. of butter.......... "	25·5	24·	31·
Percentage of fat unrecovered..........	22·69	20·67	18·46

THE SECOND TRIAL was made on 30th November. A portion of the milk of two days was used from the cows of each group. The milk was re-heated to a temperature of 98° after it reached the dairy building, and was set immediately thereafter in deep-setting pails, in ice-water of a temperature of 38° Fahr.

The setting period was 22 hours.

In each case 5 per cent of fermentation starter was added, and the cream of the three lots was ripened to as nearly the same stage of acidity as possible.

The ripening period in this trial was 15 hours.

Table XIV shows the result of the second trial of churning cream from the milk from each of the three groups.

TABLE XIV.

—	Milk from		
	Group I.	Group II.	Group III.
Quantity of milk set .... Lb.	114	137	279
Per cent of butter-fat in milk....................	4	4·1	3·1
Creaming—			
Quantity of cream.................... Lb.	22	27	51
Per cent of fat left in skim-milk	1·35	1·00	0·55
Churning—			
Churning temperature....................Fahr.	64°	64°	62°
Minutes churned....................	180	100	50
Revolutions of churn per minute	60	65	66
Quantity of butter obtained.................... Lb.	4·12	5·25	9·75
do buttermilk.................... "	17	21	41
Per cent of fat left in buttermilk....................	·45	·35	·30
Results—			
Quantity of fat in whole milk.................... Lb.	4·56	5·62	8·65
do left in skim-milk and buttermilk.................... "	1·31	1·17	1·37
Quantity of milk per pound of butter.................... "	27·6	26·1	28·6
Percentage of fat unrecovered....................	28·73	20·82	15·84

THE THIRD TRIAL was made on 4th December. A portion of the milk of two days was used from the cows of each group. The milk was re-heated to a temperature of 95° after it reached the dairy building. To the milk from Groups I and II, 10 per cent of water was added, before it was set; the milk from Group III was delayed in setting for half an hour; it was re-heated to 98° and set without the addition of water. The three lots were set in deep-setting pails, in ice-water of a temperature of 38° Fahr. The setting period was 22 hours. In each case 5 per cent of fermentation starter was added to the cream, and each lot was ripened to as nearly the same stage of acidity as possible. The ripening period in this trial was 16 hours.

Table XV shows the result of the third trial of churning the cream from the milk, from each of the three groups.

TABLE XV.

—	Milk from		
	Group I.	Group II.	Group III.
Quantity of milk set.......... Lb.	116	121	308
Per cent of butter-fat in milk..........	3·6	3·8	3.8
Creaming—			
Quantity of cream.......... Lb.	23	24	62
Per cent of fat left in skim-milk..........	1·60	1·30	·50
Churning—			
Churning temperature.......... Fahr.	70°	64°	62°
Minutes churned..........	49	85	49
Revolutions of churn per minute..........	65	65	66
Quantity of butter obtained.......... Lb.	3·25	4·75	12·00
Quantity of buttermilk.......... "	19	19	50
Per cent of fat left in buttermilk..........	·35	·15	·20
Results—			
Quantity of fat in whole milk.......... Lb.	4·18	4·60	11·70
Quantity of fat left in skim-milk and buttermilk.......... "	1.55	1.28	1·33
Quantity of milk per lb. of butter.......... "	31	25·5	25·6
Percentage of fat unrecovered..........	37·79	27·82	11·37

Table XVI shows the length of time required for churning, and the percentage of butter-fat left in the buttermilk, from the three trials in each case.

TABLE XVI.

	Group I.			Group II.			Group III.		
No. of Trial.....	First.	Second.	Third.	First.	Second.	Third.	First.	Second.	Third.
Churning temperature, Fahr...	64°	64°	70°	64°	64°	64°	62°	62°	62°
Minutes churned....	150	180	49	100	100	85	40	50	49
Revolutions of churn per minute	65	60	65	65	65	65	66	66	66
Percentage of fat left in buttermilk	·20	·45	·35	·30	·35	·15	·20	·30	·20

The conclusions which were indicated by these churning experiments were:—

(1) That the cream from the milk of cows, which have been milking for periods of from five to eleven months, should be churned at a temperature of from 66° to 70° Fahr., in order to obtain butter in from one hour to three-quarters of one hour.

(2) That the loss of fat unrecovered from the buttermilk, was practically the same, viz., ·33, ·26, ·23 of 1 per cent of fat, left in the buttermilk, from Groups I, II and III, respectively.

(3) An examination of the butter showed a decided absence of rosy and delicate flavour in the butter obtained from the milk of cows which had been milking for longer than five months.

The second series of experiments in the churning of cream was made to determine the effect on the quantity of butter which could be obtained by churning cream at different stages of ripeness or acidity.

THE FIRST TRIAL was conducted on the 29th August; 120 lb. of cream were taken from 676 lb. of milk. The whole quantity of cream was mixed thoroughly, and afterwards divided into two equal lots. One lot was ripened by the addition of fermentation starter, and by being kept at a temperature of 64°; the other lot was cooled to 40° and kept sweet until the following day. Both lots were then divided into equal portions of 30 lb. each; 30 lb. of the sour ripened cream was then mixed with 30 lb. of the sweet cream, leaving three lots for churning, as shown in the following :—

Lot 1, sour cream......... { 30 lb., sour, in churn No. 1.
{ 30 lb. } mixed, in churn No. 2.
Lot 2, sweet cream....... { 30 lb. }
{ 30 lb. sweet, in churn No. 3.

A SECOND TRIAL was made on the 10th September, when 120 lb. of cream were taken from 774 lb. of milk. The whole quantity of cream was treated in the manner which has been described in the first trial.

The following Table shows the results from the two trials of churning cream at different stages of ripeness.

TABLE XVII.

——	First Trial.			Second Trial.		
No. of churn	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
Daisy churn ... Size.	No. 2	No. 5	No. 2	No. 2	No. 5	No. 2
Quantity of milk ... Lb.	169	338	169	194	387	194
do. cream ... "	30	60	30	30	60	30
Stage of ripeness	Sour.	Mixed.	Sweet.	Sour.	Mixed.	Sweet.
Churning temperature ... Fahr.	59°	60°	60°	62°	62°	62°
Minutes churned	53	35	65	40	30	65
Revolutions of churn per minute	66	62	68	66	64	68
Quantity of butter obtained ... Lb.	6·5	12·7	6·	7·25	13·75	6·
do milk per lb. of butter "	26·	26·6	28·1	26·7	28·1	32·3
Per cent of fat left in buttermilk	·20	·50	1·30	·15	·90	2·00

These trials showed:—

(1.) A longer churning period for the sweet cream than the sour; (the mixed cream was churned in shortest time, because the revolving barrel churn, size No. 5, was a larger size than No. 2);

(2.) 14·6 per cent more milk or cream of equal quality, required to yield each pound of butter, when the cream was churned sweet, than when it was churned sour;

(3.) The buttermilk from sweet cream to contain 1·65 per cent of fat, as compared with ·17 of 1 per cent of fat in the buttermilk from sour cream.

Other experiments on this matter are in progress.

Experiments on the Heating of Milk to 150° *Fahr.*

The heating of milk and cream to the scalding point—150° Fahr.—has been undertaken in some places, to sterilize them for keeping qualities and for wholesomeness in table use. Cream has been sterilized also for the purpose of regulating the degree of acidity which would be developed in a given time by the addition of a percentage of fermentation starter of known strength or acidity. Before undertaking a series of trials in the sterilizing of milk and cream, for the purposes which have been mentioned, a few tests were made to discover the effect of scalding milk and cream to 150° Fahr., upon the quantity, odour and flavour of the butter.

THE FIRST TRIAL was made on 10th October. 350 lb. of milk were mixed, after which 190 lb. were heated to 150° Fahr. Both lots were then set in deep-setting pails, in ice-water of a temperature of 38° Fahr.

The setting period was 22 hours.

A SECOND TRIAL was made on 12th October, when 360 lb. of milk were used. The treatment was similar to that of the first trial.

Table XVIII shows the results of heating milk to 150° Fahr., before setting in deep-setting pails in ice-water, from both trials.

TABLE XVIII.

—	First trial.		Second trial.	
Quantity of milk set.......... .... Lb.	190	160	195	165
Per cent of butter-fat in milk...............	3·40	3·40	3·40	3·40
Temperature when set........ .... Fahr.	150°	96°	150°	96°
Creaming—				
Quantity of cream........ .... Lb.	31	30	31·5	30
Per cent of fat left in skim-milk............	1·00	·35	·90	·40
Ripening cream—				
Temperature............................ Fahr.	67°	67°	64°	64°
Per cent of fermentation starter added....	10	10	5	5
Ripening period........................... Hrs.	10	11	16	16
Churning—				
Churning temperature..................... Fahr.	64°	64°	64°	64°
Minutes churned..............................	60	100	60	90
Revolutions of churn per minute................	65	65	65	68
Quantity of butter obtained................ Lb.	5·75	5·50	5·80	5·75
Per cent of fat left in buttermilk................	·15	·15	·3	·3
Results—				
Quantity of fat in whole milk.............. Lb.	6·46	5·44	6·63	5·61
do do left in skim-milk and butter-milk...... .... "	1·64	·49	1·55	·61
do of milk per lb. of butter........... "	33·4	29·1	33·6	29·
Percentage of fat unrecovered............	25·38	9·01	23·38	10·87

These two trials point to the conclusions:—

(1.) When the milk was heated to 150° Fahr., before being set in deep-setting pails, 4½ lb. or 15·5 per cent more of milk was required to yield each pound of butter, than when the milk was set at a temperature of 96° Fahr.

(2.) When the milk was heated to 150° Fahr., 14·4 per cent more of the fat in the whole milk was not recovered from the skim-milk and butter milk, than when the milk was set at 96° Fahr.

(3.) In both trials the butter from the milk, which was not heated to 150°, was decidedly better in flavour and odour than the other lots.

Experiments in the heating of Cream to 150° Fahr.

The two trials in this experiment were conducted on 21st and 26th October. The main object was to discover the effect of scalding cream to a temperature of 150° Fahr., upon the odour and flavour, which are introduced into the milk and its products from the feeding of turnips to cows. The cows were fed lightly upon turnips at first; and at the time when the milk was obtained for the second trial they were consuming 90 lb. of turnips per head per day in their ration. That excessive quantity was fed to make the trial of a treatment for expelling the turnip odour and flavour more emphatic one way or the other.

FOR THE FIRST TRIAL the milk of two days, weighing 758 lb., was set each day at a temperature of 96° in deep-setting pails, in ice-water of a temperature of 38°. From the two days' milk 140 lb. of cream were obtained. That quantity was divided into two equal portions, one of which was heated to 150° Fahr.

FOR THE SECOND TRIAL the milk of one day, weighing 387 lb., was set at a temperature of 96°, in deep-setting pails, in ice-water of a temperature of 38°. From the milk, 70 lb. of cream were obtained. That quantity was divided into two portions, one of which was heated to 150° Fahr.

Table XIX shows the details of treatment afterwards, and also the results in the quantity of the butter and the percentage of loss of the fat.

TABLE XIX.

—	First trial.		Second trial.	
Quantity of milk set... Lb.	380	378	191	196
Percentage of butter-fat in milk	3·6	3·5	3·6	3·6
Temperature when set... Fahr.	96°	96°	96°	96°
Creaming—				
Quantity of cream... Lb.	70	70	35	35
Percentage of fat left in skim-milk	·45	·55	·51	·60
Cream heated to... Fahr.	150°	65°	150°	68°
Cream cooled to... "	50°	....	50°	....
Ripening Cream—				
Temperature... Fahr.	65°	65°	65°	68°
Percentage of fermentation starter added	6	6	6	6
Ripening period... Hours	14	14	14	16
Churning—				
Churning temperature... Fahr.	61°	64°	64°	64°
Minutes churned	35	40	45	50
Revolutions of churn per minute	65	66	66	66
Quantity of butter obtained... Lb.	14	1.35	7	7·2
Percentage of fat left in buttermilk	·4	·3	·1	·3
Results—				
Quantity of fat in whole milk... Lb.	13·68	13·23	6·88	7·06
Quantity of fat left in skim-milk and buttermilk... "	·78	·70	·86	·98
Quantity of milk per lb. of butter... "	27·1	28·	27·3	28·
Percentage of fat unrecovered	13·01	12·85	12·5	13·88

These two trials point to the conclusions:—

(1.) When the cream was heated to 150° Fahr., before being ripened for churning, $\frac{8}{10}$ of 1 lb. less milk was required to yield each pound of butter than when the cream was not heated above 68° Fahr.

(2.) The percentage of fat unrecovered from the buttermilk, was practically the same in both cases.

(3.) In both trials, the bntter obtained from the cream, which was heated to 150° Fahr., had no flavonr or odonr of turnips, and was decidedly better in every respect than the other two lots.

(4) In both trials, the bntter obtained from the cream, which was not heated above 68° Fahr., had a distinct odonr and flavour of tnrnips, the lot from the last trial on 26th October giving a particularly strong smell and taste of turnips.

(5.) In both trials, the bntter obtained from the cream, which was heated to 150° Fahr., was excellent in flavonr and grain. It was rated at 37 and 36 for flavonr out of a possible 40 (perfection); and at 30 (perfection) for grain.

(6.) In both trials, the bntter obtained from the cream, which was not heated above 68° Fahr., was rated lower than the other lots. The points awarded to it were:—flavonr, 35 and 25, out of a possible 40 (perfection);—and grain, 30 and 29, ont of a possible 30 (perfection).

NOTE.—The butter was re-examined in glass jars, on 8th March, 1892, when the previons jndgment was confirmed.

Disposal of Dairy Products.

The record of the qnantities of milk received at the experimental dairy building from May—when the work there commenced—nntil December, and the disposition which was made of the same, is submitted herewith.

Milk received at the dairy for experimental work:

	Lb.
May	12,795
June	11,522
July	10,428
August	7,502
September	7,352
October	11,322
November	8,936
December	6,501
	76,358

	Lb.
Butter in lb. prints, sold at 22c. and 25c. per lb	1,939½
Butter in tubs and experimental jars, sold	321
do do do on hand	210
	2,470½

	Quarts.
Cream sold to residents on the farm at 20c. per qnart	127½

	Quarts.
Buttermilk sold at 2c. per quart	404

The skim-milk and the remainder of the buttermilk were fed to calves and pigs.

	Quarts.
Milk sold to residents on the farm at 4c. and 5c. per quart.	6,634½

PART IV.—FORTY-ACRE LOT.

In the spring of the year it was arranged that abont 40 acres of land should be set apart for the particular object of growing feed for cattle, in order to ascertain and illnstrate how many cattle could be fed for the whole year npou the product of that area. In many parts of Canada an impression has prevailed that farmers cannot keep or feed at a profit large herds of cattle unless they have large farms. In most instances the estimate is that six full-grown cattle, and an equal number of young growing stock, are as many as can be fed conveniently on the fodder and coarse grain crop of a farm of representative size, of say 55 acres of cleared land. As a matter of fact, the average number of horned cattle kept per farm is about four head of full grown animals, and an equal number of growing young stock. It appears to me that the numbers of cattle might be doubled, with increasing profit to the farmers, and decided gain to the fertility of the fields. A further extension and improvement in mixed farming, which will cause more cattle to be fed on fewer acres, is capable of great service to the whole agricultural interest of the Dominion. This experiment has been in progress for only six months of the year. The full report can be made with satisfaction only at the close of each twelve months. The following report of progress will show the areas of land under different crops, and the yields of each which were obtained. In a general way, it may be said that the yield of crops did not reach my anticipations. The corn crop was the lightest per acre which has been gathered for three years, and a disastrous hail storm on 13th August beat down the grain crops and battered the leaves of the corn to a very serious extent. The recurrence of an injury from that cause is unlikely in coming years, as it has been infrequent in past years. Continued rains during the harvest season caused further losses in the grain crops. Notwithstanding these drawbacks, the experience of the year points to the probability that 25 milch cows will be fed, wholly or nearly so, on the product of the 40-acre lot for eleven months. On 2nd July 25 cows were put in one herd, to be fed from its crops. The milk from them furnishes a supply for experimental dairy work; and feeding experiments are being conducted with them, on different rations, as described in Parts I and III of this report:—

TOTAL YIELD OF CROPS FROM 40-ACRE LOT.

Ripened Crops.

		Lb. of Straw.	Lb. of Grain.
8 acres, mixed crop, as in Table I		26,454	13,245
3 acres	Golden Vine Pease		905
	Goose Wheat	1,003	437
	Beardless Barley	3,102	1,373
	Banner Oats	2,790	2,060
3 acres, in 5 plots of mixed crop, similar to plots 1 to 5 in Table I		10,442	4,345
14	Totals	43,791	22,365

Root Crops.

		Lb.
1 acre, Carrots		26,785
1 acre, Mangels and Turnips	Mangels	8,110
	Turnips	9,655
1 acre, Turnips		29,584
3	Total	74,134
½ acre, Cabbage and Kohl Rabi		15,296

Cured Fodder Crops.

2 acres, Spring Rye, wilted 12 hours and put in silo, 14,080 lb.
Mixed crop, cereals, second cutting, 1,825 lb.
11½ acres, Corn, wilted on an average two days, and put in silo, 130 tons 1,750 lb.
(That is equal to 183 tons 450 lb., green weight.)
1 acre, Corn, stooked in field to cure, 11,940 lb., as weighed February, 1892.

14½

1½ acres, Corn, fed green to the cattle (from 7th August), with mixed crop.
4⅓ acres, pastured.
3⅔ acres, mixed crop, as in plots 1 to 5, fed green; nearly 1½ acres of this was used in erecting paddocks for the bulls, and the crop on it was partially spoiled by the traffic incident to the work.

The following Table and explanatory notes present the details of the different crops:—

Ripened Crops.

Eight Acres Mixed Crops.—The land had no manure applied for at least five years; it was cropped every year; it was ploughed in the fall of 1890; it was disc-harrowed twice in spring of 1891; the smoothing harrows were used on it twice. It was divided into eight plots, each one acre in size.

A different mixture of grain was sown on each plot.

TABLE I.

—	Number of Plot.							
	1	2	3	4	5	6	7	8
Mixture sown—								
Goose Wheat............ Bush.	½	1	1	....	1	1½	....	....
Danish Chevalier Barley. "	¾	1	....	1	1	....	1½	....
Banner Oats............ "	1	....	1	1	1	....	....	1½
Golden Vine Pease...... "	¾	1	1	1	....	1½	1½	1½
Flax.................... Lb.	2	2	2	2	2	....	....	....
Total per acre....... Bush.	3	3	3	3	3	3	3	3
Date sown	April 30	April 30	April 30	April 30	April 30	April 30	April 30	April 30
Came up.....	May 12	May 12	May 12	May 12	May 12	May 12	May 12	May 12
Date when ripe.............. ..	Aug. 24	Aug. 17	Aug. 17	Aug. 17	Aug. 17	Aug. 22	Aug. 22	Aug. 22
do cut..........	do 26	do 18	do 17	do 18	do 17	do 25	do 25	do 25
Quantity of straw and grain.. Lb.	4,945	4,860	4,975	5,180	4,864	5,175	4,870	4,830
Grain from thresher .... "	1,728	1,595	1,518	1,795	1,808	1,871	1,435	1,495

Notes.—The mixtures were all sown on 30th April, and came up on 12th May. Two pounds of flaxseed were sown with the mixtures on plots 1 to 5. It ripened, and was ground with the grain for the feeding of cattle. I think at least 3 pounds per acre will give better returns.

The crop from plot 6—wheat and pease—gave the largest yield of grain per acre. That mixture of grain is also the most valuable for feeding in combination with corn ensilage. The second largest yield of grain was on plot 5, from a crop of wheat, barley and oats. I do not recommend this mixture, as I consider that every mixture should contain either pease or vetches. These latter grains do not require to obtain their supply of nitrogen from the nitrates in the soil as the other grains of the mixture do.

Owing to a severe hail storm on 13th August, and rains before and during harvest time, the crops on all the plots were very badly broken down and lodged. In consequence, a large percentage of grain was shelled on the field.

Plot 1.—Mixture of wheat, barley, oats and pease; all ripened together fairly well, excepting the wheat, which was in the doughy state when the other grains were ripe; cut with the mower, because too badly lodged to be cut with the reaping machine.

Plot 2.—Mixture of wheat, barley and pease; wheat in doughy state when other grains were ripe, 17th August; badly broken down and lodged; cut with mower.

Plot 3.—Mixture of wheat, oats and pease; wheat in doughy state when other grains were ripe; badly lodged; cut with mower, 18th August.

Plot 4.—Mixture of barley, oats and pease; badly lodged; cut with mower, 18th August.

Plot 5.—Mixture of wheat, barley and oats; wheat in doughy state when other grains were ripe; cut 17th August.

Plots 6, 7 and 8.—Mixture of wheat and pease, barley and pease, and oats and pease; all badly lodged, and cut with the mower, 25th August.

Three Acres of Grain.—The land, whereon were grown the pease, wheat and barley, was manured in the spring at the rate of from 18 to 20 tons to the acre; it was ploughed, and harrowed twice; part of the pease and wheat crops were taken in, and parts were injured by the enclosing of the bull paddocks which have been mentioned; part of the acre of barley was injured and part of the crop was killed by water standing on it; that was owing to unusually heavy rains and the failure of a drain to work efficiently; the land for the Banner oats adjoined plot 8, and received treatment similar to plots 1 to 8.

Three Acres of Mixed Crop.—The soil was of a peaty character; it received a coating of manure at the rate of from 18 to 20 tons per acre; it was ploughed in spring, and harrowed twice; the mixtures were the same as on plots 1 to 5; they were sown on 9th May and came up on 16th May; parts from the ends of each plot were cut and fed green, as mentioned in the summary of the yield of crops; three acres were left to ripen.

Root Crops.

Three acres were prepared for sowing, one acre each of carrots, mangels and turnips. The land received a coating of manure at the rate of from 18 to 20 tons to the acre. It was ploughed in the spring, harrowed twice, and set up in drills 2½ feet apart.

Carrots.—Five varieties were sown for comparison, but owing to the wet season, and water standing on part of the plot for several days, the crops were not grown under sufficiently uniform conditions to make any fair comparison of the yield per acre of the different varieties. "Steele's Improved Short White," "Giant Short White," or "White Vosges," "Green Top Orthe," "Improved Half-long White," and "Early Gem," or "Guerande," were the varieties which were sown.

Notes.—Sown 13th May; came up 26th May; pulled 30th October. Total weight of the five varieties, 26,785 lb. from one acre.

Mangels.—Five varieties were sown on 13th May and came up on 26th May. The names of the five varieties were "Pearce's Canadian Giant," "Golden Fleshed Tankard," Giant Yellow Intermediate," "Mammoth Yellow Intermediate," and "Giant Yellow Globe." From 10th June to 14th June cut-worms destroyed about two-thirds of the young plants. The spaces were sown with turnip seed on 15th June. The yield of mangels was 8,110 lb., and of turnips 9,655 lb. from one acre.

Turnips.—Five varieties of turnips were sown on 4th June. The names of the varieties were, "Improved Purple Top Mammoth," "Laidlaw's Improved," "Elephant Swede," "Hartley Bronze," and "Rennie's Prize Purple Top." They all came up 10th June. They were pulled 24th October. There was a large percentage of the turnips in one part of the plot diseased. The inside of the roots turned to a jelly-like mass, before there was any easily recognizable evidence on the outside that decay had set in. A similar disease prevailed in the turnips on other parts of the farm, and in the vicinity of Ottawa on other farms. The total yield of the five varieties was 29,584 lb. from one acre.

CABBAGE AND KOHL RABI.—Half an acre of the land, prepared in the same manner as for the roots, was sown with cabbages and kohl rabi. The cabbages were put in rows 3 feet apart, and the plants were left 2 feet apart in the rows. Four varieties were sown, viz.: "Early Drumhead," "Drumhead Savoy," "Giant Drumhead," and "Thousand Headed, or Kale." They were sown on 14th May and came up on 23rd May. Two-thirds of each variety were eaten by the turnip-flea beetle and cut-worms. The same varieties were sown in their place on 5th June and came up on 12th June. The kohl rabi suffered in a similar manner, and a re-sowing was made on 6th June. The second crop came up on 12th and 13th June. The total weight from the cabbage and kohl rabi was 15,296 lb. from half an acre.

Cured Fodder Crops.

TWO ACRES SPRING RYE.—The land received a dressing of manure, about 18 or 20 tons to the acre; it was ploughed in the spring and harrowed twice with smoothing harrow; sown 1st May; came up 11th May; cut 15th July. When the heads were filled with grain in the doughy or late milk state it was allowed to wilt in the field for twelve hours and then put into the silo; total weight, 7 tons 80 lb. (For remarks on rye ensilage, see report on silos.) The same land was ploughed 17th July, and sown with a mixture of Hungarian grass and millet; this second crop did not come to anything worth mentioning for feed.

FOURTEEN ACRES OF FODDER CORN.—Ten acres of the land were in one block; an oat crop had been taken off in 1890. In the spring of 1891 a dressing of manure, at the rate of about 18 tons to the acre, was given; it was ploughed under, and the land harrowed twice. The soil was very uneven in its character; a part of it was a mellow, sandy loam, with streaks and patches of clay soil of a whitish colour. These patches, in some cases, were 50 feet across; about two acres of it were of a peaty character, with interruptions of loam and patches of clay. Parts of the land had been a swamp four years ago, and portions of it had been burned during the clearing. For these reasons, the yields per acre in that portion of the block did not give results which could be relied upon as guiding to a knowledge of the best practice in planting or in selecting varieties.

FOUR AND ONE-HALF ACRES were devoted to the planting of the varieties of Red Cob, Pearce's Prolific, Longfellow and Thoroughbred White Flint, (1) at rates of 2, 4, 6 and 12 grains respectively to the lineal foot, in rows 3 feet apart, and (2) in rows 3, 4 and 5 feet apart, with about 3 grains to the foot, planted by a seed-drill.

The corn was planted on 23rd May, and was cut on 16th and 17th September. It was left to wilt in bunches on the field for an average of two days before being put into the silo. The total weight after wilting, from the 4½ acres, was 49 tons 1,740 lb. From a test made on another plot, corn was found to have lost 28·5 per cent in weight by wilting in small bunches in bright sunshiny weather for two days. At that rate of shrinkage, the green weight of corn on the 4½ acres would be calculated as 69¾ tons.

ONE ACRE of Red Cob and Longfellow was planted in rows 3 feet apart, two rows of each alternately, 18 lb. of seed per acre; cut 16th September; wilted two days; weight, 10 tons 785 lb.

ONE ACRE of Thoroughbred White Flint and Pearce's Prolific was planted in a similar way; cut 16th September; wilted two days; weighed 12 tons 350 lb.

ONE ACRE of Red Cob and Longfellow was planted in rows 3 feet apart, with the seed mixed before planting; 18 lb. of seed per acre; cut 14th September; wilted two days; weighed 11 tons 1,685 lb.

ONE ACRE of Thoroughbred White Flint and Pearce's Prolific was planted in a similar way; cut 14th September; wilted two days; weighed 11 tons 1,600 lb.

ONE ACRE of Thoroughbred White Flint and Longfellow was planted in a similar way; cut 14th September; wilted two days; weighed 10 tons 1,745 lb.

HALF AN ACRE Red Cob (corn, 5 lb. and pease 5 lb.) was planted in rows 3 feet apart. The mixture was not a success; the corn was a good crop, but the pease came up too soon and did not use the corn stalks as a trellis. The crop was fed to the cattle green.

TWENTY FEET by width of block, 562 feet, Red Cob corn and pease, were sown by ordinary seed drill with spouts 7 inches apart; corn and pease in alternate drill rows; the corn was of a variety too late in maturing to be mixed with pease; a heavy crop was obtained; fed green; this mixture of corn and pease, in same order of sowing, promises to be useful in obtaining a more complete ration for cattle than corn is in itself.

FOUR ACRES sandy loam; size of the plot, 562 x 310 feet; of it, 562 x 210 feet received a dressing of manure, at the rate of about 18 tons per acre; ploughed in spring; harrowed three times; planted in four lots, one each of Red Cob, Thoroughbred White Flint, Pearce's Prolific, Thorougbred White Flint and Longfellow; about one acre was fed green; the remainder was cut 18th September; wilted for two days and put into silo; the remainder was stooked in the field, to be used as dried and cured fodder corn.

The cutting of corn to be fed green to the cows commenced on 7th August.

Particulars and Tables, showing the comparative yields, stages of maturity, number of ears per 100 feet, and condition of the corn ensilage, will be found in Part V of this report.

Three and one-fifth acres of fall rye have been sown for feeding in the spring of 1892, and for use as ensilage during the early part of summer.

PART V.—FODDER CORN AND THE SILOS.

It is not too much to say that no single subject closely related to successful agriculture is receiving so much attention from the agricultural press of Canada, or is creating so much discussion at conventions and meetings of farmers, as that of the growing of fodder corn and the making of ensilage. The economical feeding of cattle in stables, and the increasing of the number of cattle which are kept per farm, are matters peculiarly important to the farmers of Ontario and the provinces that lie eastward of it. The economic possibilities of fodder corn and the silo have been mentioned in connection with the fattening of steers for beef and the feeding of cows for milk, in Part II of this report. This brief chapter is presented for the purpose of indicating how the farmers in every district may obtain the largest service from this crop. No specific rule or direction will be found applicable to all soils, districts or seasons; but in all districts, in nearly all soils, and in every season, the corn crop will yield the farmers in the provinces which I have mentioned feeding material for their cattle during the winter, with more profit and advantage than any other single crop which can be grown with as little labour and exhaustion to the fertility of the land, and which can be saved in a cured condition as conveniently.

On one plot on the farm, 68 varieties of corn were planted in rows 3 feet apart—two rows of each—to a length of 90 feet. They were planted on the 21st of May and came up from 1st June to 4th June. They were all cut on 12th September. The average yield, weighed green, was 17 tons and 47 lb. per acre. Particulars on the comparison of varieties for one season only are apt to be rather misleading. Some of the varieties, which gave excellent results on the farm during the two previous years, and did equally well on other parts of the farm in 1891, did not turn out so well on this experimental plot; but, taking the plots on the whole farm, the results as published in Bulletin No. 12, prepared by Prof. Saunders, can be taken as agreeing with the results for the season of 1891. The following short extract is taken from that bulletin:—

"From the results given, it would appear that the Thoroughbred White Flint, Long White Flint, Long Yellow Flint, Yellow Dutton, Large White Flint, Pearce's Prolific and Longfellow, are the most productive of the Flint varieties, ranging in yield in the order named, and all of them, excepting the Long White Flint, attained a sufficient degree of maturity to make excellent ensilage.

"Among the different sorts of Dent corn, none of which, however, mature as well as the Flint varieties, the following have been found to yield the greatest weight of crop:—Virginia Horse-tooth, Golden Beauty, Golden Dent, Blunt's Prolific, Mammoth Southern Sweet and Red Cob Ensilage.

"Many sorts of sweet corn have given a large yield, the most prolific being Mammoth Sugar, Crosby, Eight-rowed Sugar, Egyptian Sugar and Asylum Sweet. The earliest ripening among these is the Crosby."

On a plot adjoining the one where the 68 varieties were planted, Thoroughbred White Flint was planted in hills 3 feet apart. Two rows of it of an equal length, from the hill method of cultivation, gave at the rate of 4 tons 250 lb. per acre larger yield than two rows under the drill method of cultivation, grown close by. It would not be prudent to base a general conclusion on the result of this one comparison. The method of cultivation in hills seems to permit of the formation of a larger number of ears on the stalks, and a rather earlier maturing of the crop.

From the corn which was grown on the 40-acre plot, already reported upon, some information bearing upon the comparative value of the crop of corn at different stages of maturity has been obtained. The stage of maturity reached has been recorded at the "tasselling," "silking," "early milk," "late milk" and "glazing" stages of growth.

The following Table illustrates the number of ears and nubbins, obtained from planting in rows 3 ft., 4 ft. and 5 ft. apart, with from 3 to 4 grains per lineal foot in the rows:—

TABLE I.

Number of Ears and Nubbins, in rows 100 feet long, on 15th September.

Varieties.	Distance of Rows apart.					
	Three Feet.		Four Feet.		Five Feet.	
	Ears.	Nubbins.	Ears.	Nubbins.	Ears.	Nubbins.
Red Cob..........................	20	49	16	95	22	109
Pearce's Prolific..........................	102	22	91	20	143	39
Longfellow..........................	87	23	121	30	134	34
Thoroughbred White Flint..........	13	51	45	48	63	59
Average..................	59	36	68	48	90	60

While the rows 5 feet apart showed the largest number of ears and nubbins per lineal foot in the rows, the three different methods of planting gave nearly the same numbers each per acre.

Information on the comparative percentages of water, dry matter, yields per acre, dry matter per ton, and dry matter per acre, at the different stages of growth of the four varieties, "Longfellow," "Pearce's Prolific," "Thoroughbred White Flint," and "Red Cob," are found in the following Table:—

TABLE II.

Name of Variety.	Planted.	Tasselling.	Silking.	Early Milk.	Late Milk.	Glazing.
Longfellow........	May 23.....	Aug. 1 ...	Aug. 11....	Aug. 27....	Sept. 10....	Sept. 21....
Pearce's Prolific..........	do 23.....	do 3....	do 13...	do 29....	do 12....	do 22....
Thoroughbred White Flint	do 23.....	do 18....	do 25....	Sept. 22....	Oct. 3....	....
Red Cob................	do 23.....	do 22....	Sept. 2....	Oct. 3....	....	....
Per cent of water in green plants		85·73	83·8	80·0	77·8	73·8
do dry matter in green plants..		14·27	16·17	19·95	22·14	26·18
Yield per acre (green weight) ..... Lb.		45,329	48,052	45,806	42,759	43,154
Dry matter, per ton of green corn.. do		285	323	399	443	524
do per acre .. .. do		6,468	7,770	9,138	9,467	11,298

These figures point to a very large increase in the weight of dry matter per acre as the corn approaches the ripe condition.

The analyses of these varieties of corn and the calculations have been made by Mr. F. T. Shutt, Chief Chemist. A more extended analysis of the corns will doubtless appear in his Report for 1891 or 1892.

Corn of the same four varieties was also grown under a method of cultivation with from three to four grains to the lineal foot, in rows of 3 feet, 4 feet and 5 feet apart, respectively, in each case. The following Table shows the average yields per acre which were obtained from the different methods of planting:—

TABLE III.

Weights of four varieties of Indian Corn sown in rows 562 feet long. Four rows of each variety were sown at the distances of 3 feet, 4 feet and 5 feet apart, respectively.

The corn was wilted two days before weighing.

Varieties.	Distance of Rows apart.		
	3 feet.	4 feet.	5 feet.
	Lb.	Lb.	Lb.
Red Cob......	2,970	5,330	5,305
Pearce's Prolific..........	2,568	2,800	4,470
Longfellow................	2,464	3,430	4,110
Thoroughbred White Flint.....	3,058	4,270	5,190
Average per acre.......	17,857	19,154	18,479

Taking into account the convenience of cultivation, the keeping down of weeds, and the quality of the stalks, it appears that the best results are obtained from planting in rows 3 feet or 3½ feet apart, or, better still, in hills 3 feet apart each way.

The same four varieties of corn were also planted in rows 3 feet apart, at the rates of 2, 4, 6 and 12 grains per lineal foot in each row. The land on which they were grown was so irregular in character that no fair comparison of the yields that may be obtained per acre from these different methods of planting could be made. A brief report of the quality of the ensilage from these methods of planting the corn will be made.

These four varieties of corn were also planted in different combinations (1) two rows of each alternately, and (2) two of the varieties mixed in each row. The following Table shows the results obtained from these investigations:—

TABLE IV.

Method.	Varieties.	Stage of Growth.	Weight per Acre, wilted.	Green Weight per Acre. (Calculated)
			Lb.	Lb.
Two rows alternately	Red Cob Longfellow	Silking Late milk	20,785	29,099
Two rows alternately	Thoroughbred White Flint Pearce's Prolific	Early milk Late milk	24,350	34,090
Seed mixed before planting	Red Cob Longfellow	Silking Late milk	23,685	33,159
do do	Thoroughbred White Flint Pearce's Prolific	Early milk Late milk	23,600	33,040
do do	Thoroughbred White Flint Longfellow	Early milk Late milk	21,745	30,443

These five acres were all planted on 23rd May, cut on 12th September, and wilted for two days. The green weights per acre would be about 40 per cent more than the wilted weights.

There does not appear to be any advantage from the planting of different varieties in alternate rows, nor from the mixing of varieties in the same rows.

The heaviest yield on a single acre of corn was one acre of Thoroughbred White Flint, which weighed, after two and a-half days' wilting, 12 tons 900 lb.

Condition of Ensilage.

In silo No. 1 there were 116 tons and 1,259 lb. of mixed varieties, odd plots, and Thoroughbred White Flint. The silo was opened on 10th October. It had been covered with a layer of straw to a depth of about 18 inches. On the top it was spoiled to a depth of about 2 inches, and there was of spoiled and mouldy ensilage 3,333 pounds. The total weight of waste ensilage from this silo, besides that found on the top, was 100 pounds. The corn for this silo was cut in lengths fully 1 inch long. The cattle refused to eat portions of the larger stalks, and also portions of the cobs.

In silo No. 2 there were 95 tons 1,135 lb. It also was covered with a layer of straw. There was spoiled and mouldy ensilage on top for a depth of 2 inches, which weighed 2,694 pounds. The surface area in both silos was 18 feet x 16 feet. Different lots of corn, according to the method of planting under which they were grown, were put in separate layers. They were divided from each otherby a layer of uncut corn stalks.

The first layer was one of ensilage from Red Cob corn, grown in rows 3 feet, 4 feet and 5 feet apart It had barely reached the " early milk " stage when cut. The sample was in only medium condition as to preservation.

The next layer was that of the four varieties of corn planted in rows 3 feet apart, with 12 grains to the lineal foot in each row. It had been allowed to wilt in the field until it had become rather dry. When it was taken from the silo it was in fairly good condition, but so dry that the meal of the ration would not adhere to it.

The next layer of ensilage was from the four varieties of corn planted in rows 3 feet apart, with 6 grains to the lineal foot in each row. This layer was found to be in an excellent condition as to preservation, but was rather dry from too much wilting.

The fourth layer of corn in this silo was from four varieties of corn planted in rows 3 feet apart, with 4 grains to the lineal foot. The ensilage was in an excellent state of preservation, and was not quite so dry in condition as the two layers above it. This silo was then closed for several weeks. Before this writing (February) it has been reopened. On the top was found a layer of mouldy ensilage, which weighed 2,840 pounds.

The fifth layer of the silo was from the corn of four varieties, planted in rows 3 feet apart, with 2 grains to the lineal foot in each row. This sample was of better quality, and in better condition as to preservation, than the ensilage from the same varieties of corn, planted with 4, 6 and 12 grains to the lineal foot in each row, respectively. The contents of silo No. 2 are being fed at this writing.

Silo No. 3 was constructed on the barn floor. Like the other silos, it is lined inside with two plies of lumber with paper between. The ensilage in it also was covered with straw; and there was of spoiled ensilage on the top a weight of 2,130 pounds. Its area is 15 feet by 15 feet. In a comparison between the condition of the ensilage in this silo, from the three varieties of corn, each grown in rows 3 feet apart, 4 feet apart and 5 feet apart, that from the corn grown in rows 4 feet and 5 feet apart, respectively, was found to be in the best condition. That appeared to be attributable to the fact that the stalks were rather more matured, and, as shown in Table I, carried a larger number of ears each. This silo is located over the stable, on a stout, 3-inch plank floor. A considerable quantity of ensilage was spoiled in the bottom of the silo.

Ensilage from Mixed Crops.—Some ensilage was made from a crop of mixed grain (oats, barley and pease)—grown in the summer of 1890. It was put into the bottom of the silo, and about 100 tons of green corn were put on top of it. After the corn was fed, the mixed crop ensilage came out in most excellent condition, and was fed to the cattle and calves as late as May and June.

Pease Ensilage.—In the autumn of 1890 part of a crop of pease was cut, when the pods were filled but not ripe, and put into the silo, to determine the value of such ensilage for the feeding of young pigs. The results are recorded in Table 2, in Part II of this report. The pease ensilage was fairly well preserved; but it gave off a very strong smell of ammonia whenever the surface was disturbed.

Rye Ensilage.—A crop of rye from two acres, weighing 7 tons 80 pounds, was put into the silo on 16th July, 1891. Feeding was commenced immediately. It had been allowed to ripen and wilt rather too much; in consequence, a portion of it became quite dry, and was not relished by the cattle. For the making of rye ensilage, the crop should be cut decidedly on the green side, and put into the silo without very much wilting.

Clover Ensilage.—A quantity of second crop clover was cut and put into the silo. It was put into the silo without being run through a cutting-box; in consequence, it packed rather loosely and unevenly, with holes and spaces in places. These became slightly mouldy. The bulk of the clover, however, is well preserved and is relished by the cattle.

CONCLUSIONS.—In the making of ensilage from mixed crops, rye or clover, it is desirable to put the crops into the silo in a green and succulent condition. They should be run through a cutting-box, to provide for even distribution and close packing. They must be weighted heavily, either by the application of artificial pressure, or by being put into the bottom of a silo, which will be filled shortly afterwards with corn ensilage. The interstitial spaces between the fine stalks of such crops as oats, pease, rye, clover and grass, hold sufficient air to cause them to mould or decay, unless pressure be applied to expel it. The silo offers a convenient place for the saving of such crops, when the weather is unfavourable, but the lighter yield which can be obtained of them per acre hinders them from being as profitable to grow for ensilage as a crop of corn, wherever that can be grown to the "late milk" or "glazing" stage of maturity.

The experience of the season points to the following conclusions in regard to the growth of corn, the construction of silos, and the filling of the same:

SOIL.—If a field with a loose, warm, loamy soil be convenient to the silo, and can be used, it should be selected in preference to heavy clay, or cold soils. Sod may be ploughed under, shortly before the crop is planted, with the probability of good results from that method of preparation. In all cases, the land should receive a liberal dressing of barnyard manure, be ploughed in the spring, and be harrowed to a state of fine tilth before the corn is planted.

SEED.—The vitality and vigour of growth of the variety of corn which has been selected should be tested. The putting of a few grains in a flower pot in a warm place in the house will enable any farmer to verify for himself these qualities in his seed grain. Frequent disappointment results from neglect in testing the vitality of corn before planting it. As a general rule, the variety which will yield the largest weight per acre, and reach the "glazing" stage of maturity before the frosts come, is the one to select for any district. The "glazing" stage may be otherwise described as the stage when the corn is just past its best condition for boiling in the ear for table use. It is better to err on the side of selecting a variety of a habit of small growth, which certainly will reach the glazing stage, than a variety of large growing habits, which may not come to the desired stage of maturity.

The maximum quantity of seed per acre may be put at 25 pounds; excellent results have been obtained from the planting of 18 to 20 pounds per acre.

MANNER OF PLANTING.—Planting in hills, 3 feet apart, both ways, appears to afford the corn a better chance for maturing early, and for producing a large number of ears. A hand corn-planter may be used to dibble in the corn. From 4 to 6 grains per hill should be planted. Corn may also be planted by the use of a hoe, and covered to a depth of at least 2 inches. In that case the foot should be pressed on the soil over the corn. For small areas, furrows 3 inches deep may be ploughed 3 feet apart. A marker (which may be constructed by driving wooden pins or harrow-teeth through a plank at distances of 3 feet from each other), may be drawn across the furrows. From 4 to 6 grains may be dropped at the points of intersection. They can be covered quickly and well by the planter's foot. For large areas, a single or double horse corn-planter may be used with advantage. The planting of corn in hills affords an opportunity for the effective cleaning of land from weeds, without much hand labour, by permitting cultivation in both directions.

If planted in rows, the rows should be from 3 to 3½ feet apart, and the grains may be put in at rates of 3 to 4 grains per lineal foot. For small plots, a convenient method is to open a furrow with a plough; the seed may be dropped in at the rate already mentioned, when it may be covered. For large areas, a single or double corn-planter will be found a serviceable implement.

DEPTH.—Corn seed should be planted to a depth of from 2 to 3 inches.

CULTIVATION.—In cases where a crust forms on the land, before or immediately after the corn comes through, a light harrowing will prove very helpful to the vigour and growth of the crop. Harrowing of the corn until it is 6 inches high will increase the rapidity of growth and the yield per acre. The cultivation between the rows, when the plants are small, should be close to them, and deep. When the plants have grown to a height of more than 3 feet the cultivation should be more distant and shallow, in order to avoid injuring the side roots of the plants.

SILOS.—The main features that are required in a silo are strength to resist the outward pressure of its contents, exclusion of air by the construction of the sides, and a fair depth of holding capacity, in order to permit the ensilage to settle into a compact mass. Sufficient strength of sides can be obtained in most silos by the use of 2 x 10-inch or 2 x 12-inch studs, placed from 18 inches to 2 feet apart. A clay or earthen floor is most economical, and as good as any that can be put in. The inside of the walls of the silo may be finished by a single lining of lumber, nailed to the studs horizontally. The lumber should be tongued and grooved and dressed on the inside. If each alternate board be allowed to extend at the corners, so as to make a lock-joint, that will give additional strength to the structure. The corners of the silo, on the inside, should be filled by the use of a board or plank 10 inches wide, set on end. The triangular space behind it should be filled with sand or sawdust. I consider that studs 2 x 10-inch or 2 x 12-inch, with one ply of sound tongued and grooved lumber, nailed horizontally on the inside, are sufficient for an efficient preservation of the ensilage. Additions to that method of construction may be advantageous, in a few cases, for convenience. If a portion of the ensilage around the sides becomes frozen, that is more an inconvenience than a loss. It should be mixed with the warm ensilage, from the middle of the silo, before it is offered or fed to the cattle.

CUTTING THE CORN.—The cutting of fodder corn by hand has been found the most economical of the methods which we have tried. If the crop be allowed to wilt in the fields, until it loses from 15 to 20 per cent of its moisture, a pleasant aromatic odour will be developed, which leaves the ensilage with a more agreeable smell. From an examination which was conducted with two tons of corn, left to wilt in the fields, in small heaps of about twenty-five or thirty stalks each, it was found that, with two days' exposure during bright sunshiny weather, the corn lost 28·5 per cent of its weight; and with four days' exposure, 36·8 per cent. After twenty-eight days standing in "stooks" it had lost 52 per cent; and after five months it had lost 58·8 per cent of its original green weight.

FILLING THE SILO.—It is advantageous to cut into the silo those varieties of corn which have thick stalks, in lengths of from ½ to ¾ of an inch. Cut into such lengths there is no waste, and the stalks and cobs are all eaten up clean by the animals. Provision should be made for a fairly even distribution of the corn in the silo, while it is being filled, and for tramping the sides and corners most thoroughly. The weighting of the corn does not appear to be necessary or advantageous. 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. If a foot of cut straw be put on top of that a few days later, probably no loss at all from waste ensilage will be found on the opening of the silo for feeding. The feeding should be effected from the top of the ensilage, and a quantity of the exposed ensilage should be raked from the top daily.

ANNUAL REPORT OF THE HORTICULTURIST.

(JOHN CRAIG.)

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

SIR,—I have the honour to submit herewith a report of the work carried on in the horticultural department, for the year 1891.

The season while on the whole unfavourable to nursery work and transplanting operations, will long be remembered throughout the Dominion as a year marked by a fair crop of fruit of first quality, the dryness of early spring being unfavourable to the development of apple scab and other fungous diseases. The unusual heat of September had the effect of hastening the maturity of late summer and autumn varieties, which lead to a lowering of market prices, by the consequent haste on the part of growers to get rid of this class of fruit. To provide against such contingencies, more attention will need to be paid by growers to the production of a commodity of higher quality, placed upon the market in the neatest, most convenient and attractive way. This in part may be accomplished by closer attention being paid to cultivation and spraying of trees, thinning, grading and packing of fruit; and as our fruit interests develop, cold storage will undoubtedly play an important part in the profitable disposal of the different orchard products.

In drawing up this report, which has been done in as concise and brief a form as possible consistent with clearness, I have followed the plan adopted last year—that of dividing the work and placing it under different heads.

I. LARGE FRUITS.—Gives notes on orchard culture with special reference to the needs of northern planters, together with suggestions, preventive and remedial, for the treatment of trees injured by mice or rabbits during winter. Particular attention has been given during the year to collecting information in regard to the most valuable varieties of the Russian apples, so far as experience up to this point can guide. The varieties mentioned have been carefully selected, and are commended to the attenion of northern orchardists.

II. SMALL FRUITS.—Under this head will be found some conclusions reached in regard to methods of planting; facts concerning winter protection, and relative profitableness of varieties. Considerable space is given to grapes, covering tabular information, as to time of colouring and ripening; also descriptive notes of varieties.

III. VEGETABLES.—Giving the names and descriptions of varieties in the following classes, which succeeded best in the experimental plots: Beets, cabbage, cauliflower, celery, pease, peppers and tomatoes; also some results from the use of fertilizers upon the latter.

IV. FORESTRY.—A report upon the work of distributing young seedlings, and tree seeds to the prairie provinces.

V. FUNGICIDES.—Giving results of experiments in spraying to prevent "apple scab," "grape" and "gooseberry mildew."

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W. P. Rupert & Son, Seneca, N.Y.—Two trees of Vermont Beauty Pear.

Mr. W. H. Phillips, Staunton, Ind.—One dozen Phillips' No. 1 strawberry.

Mr. A. M. Smith, St. Catharines, Ont.—Smith's Giant Raspberry.

Mr. W. W. Hilborn, Leamington, Ont.—Greenfield Red Currant.

Rev. Robt. Hamilton, Grenville, Que.—Apple scions.

Fitz-james Pear Co., Himrods, N.Y.—Two Fitz-james pear trees.

Mr. R. B. White, Ottawa.—Seedling plums.

Mr. J. P. Cockburn, Gravenhurst, Ont.—Seeds and roots of Witch-hazel and Muskoka June berries.

Chase Bros. & Co., Rochester, N.Y.—Two trees of North Star apple.

Prof. J. L. Budd, Ames, Ia.—Scions of Russian apples and pears.

Linus Woolverton, Esq., M.A., Grimsby, Ont.—Small fruit plants, and much valuable assistance in various lines.

I have also to acknowledge with thanks valuable assistance from Mr. Wm. Craig, jun., and Mr. J. M. Fisk, of Abbotsford, Que., in conducting experiments for the treatment of "apple scab."

MEETINGS ATTENDED.

During the winter I had the opportunity of meeting farmers at institute work in various places throughout the Province of Ontario, and was pleased to note the growing interest in fruit culture, manifested by their efforts to gain all information possible in regard to newer varieties and improved methods of cultivation.

By courtesy of the Hon. Minister of Agriculture I had the privilege of attending the twenty-third biennial session of the American Pomological Society, held in Washington last December. The work of revising fruit lists for the whole union, and passing on the continuous stream of new varieties being pressed upon the public, are among the functions of this society.

Three days were spent very profitably in session with the Ontario Fruit Growers' Association, at their winter meeting in Hamilton in December. The important part this society is taking in furthering the fruit interests of the Dominion, as well as the Province of Ontario, is very meritorious, and should receive the hearty co-operation of all interested in fruit-growing, wherever located.

I have the honour to be, Sir,

Your obedient servant,

JOHN CRAIG,

Horticulturist.

I.—LARGE FRUITS.

APPLES.

The winter of 1890–91, though not remarkably severe on the whole, was yet unusually trying on trees and plants having terminal wood not well ripened, particularly young nursery stock. The sudden fall of temperature in the latter half of December, 1890, to 15° below zero, and this at a time when there was no protecting blanket of snow, caused root-killing to a considerable extent in the case of one and two-year-old nursery stock, especially in light soils. In many instances, with root grafts, the lower root section was entirely killed; the young tree when not killed, being supported by the upper and hardier roots emitted from the scion. This state of affairs was particularly noticeable with many of the Russian varieties in nursery here. As a consequence, quite a percentage of one-year-olds was killed. Nursery stock on heavier soil did not suffer to the same extent.

Planting Season.—With practically no rainfall during the month of May and up to the last half of June, the spring season, with its drought and cold winds, was extremely unfavourable to planting and transplanting of all kinds, as well as to the best returns from small fruit plantations. The heavy rains of July and August induced a later growth than usual in trees and shrubs, more especially affecting root grafts and young nursery stock not previously well rooted.

Cultivation.—The same system of cultivation in orchard management has been continued as that outlined in my report for 1890.

INJURIES FROM MICE.

Owing to the great amount of damage sustained by young orchards throughout the country during the past winter, many questions have come in relating to the best and cheapest means of repelling the attacks of field mice. As varying conditions often call for different treatment, the following preventives and remedies are suggested:—

Preventives.—1. Remove all rubbish that may lie about the orchard affording hiding places for mice.

2. Tramp the snow firmly about the trees after each snow storm.

3. In the autumn, before the ground freezes, bank each tree with earth to the height of from 12 to 15 inches. This was done the past season to the 1,700 trees in the orchard of the Central Experimental Farm, at a cost of ·53 cents per tree, or a little over a half of 1 cent.

4. Tarred paper, which has been allowed to dry for a few days after being cut into squares of the required size, is also very servieeable. It may be fastened round the stem of the tree with twine, or may be held in place by a single carpet tack, pressed through the over-lapping edges into the bark.

Washes.—5. Portland cement of the consistency of common paint, to which is added Paris green in the proportion of 3 or 4 oz. to 3 gallons of the former. Apply with a brush, as a paint.

6. Slake 1 peck of fresh lime and make to the consistency of paint, adding half a gallon of soft soap, half a gallon crude carbolic acid, and 3 or 4 pounds of sulphur.

Remedial.—1. In all cases with a sharp knife pare the wound smoothly. If the wound is 18 inches or more from the ground, cover completely with a thin coating of grafting wax, and wrap with a cloth to prevent wax melting, and to assist in excluding the air.

2. When the wound is near the base of the tree, cover with grafting wax or green cow-dung, held in place by rough sacking; or the tree may be banked with earth to a point above the wound, which is preferable.

The main idea is to prevent evaporation by excluding the air, and keeping the tissues in a normally moist condition. Under such circumstances, when taken in time, trees will frequently recover, though completely girdled.

I wish to again impress the importance of keeping the bark on the stems and branches of the young trees in a clean and healthy condition, by the application of alkaline washes. Apart from preventing injury from scale insects, such washes repel the inroads of borers to an extent not generally appreciated. In looking through an orchard of 100 acres, chiefly made up of Duchess, the property of Messrs. Bardwell and Haviland, of Fort Dodge, Iowa, I could not, after the most careful examination, find a single tree injured by borer, or affected with sun-scald This result Mr. Haviland attributes entirely to the systematic and regular application of such a wash as is recommended in my report of last year. The cost will vary from 30 to 50 cents per hundred trees for the season.

Low Heads.—Another point which I wish to emphasize in connection with orcharding at the north is the importance of heading the trees low and growing somewhat in bush form. The experience of Messrs. Bedford and Mackay, of Brandon and Indian Head, bears strong and unmistakable evidence on this point—a larger percentage in every case of standards of the same varieties failing than those planted as one-year-olds and allowed to branch low. In climates subject to sudden extremes, long unprotected stems are very liable to suffer injury from sun-scald and bark-bursting. Again, the low head, from its proximity to the ground, assists in collecting snow, which does valuable service to the object covered in protecting it from extremes of temperature. To intending planters in northern Ontario and Manitoba I would say, purchase one-year-old root-grafted trees, selecting varieties as hardy or hardier than Duchess, cut them back and set in nursery row, for two years, then set out in permanent orchard situation, and train in low bush form. More lasting benefit will be gained from this class of tree than from the much finer looking standards, which may have been forced in nursery.

NEW VARIETIES.

Among the many new varieties which are being constantly heralded from different points, it is often difficult to discriminate between the useful and useless. Of the many aspirants for public recognition I think none more worthy than that known as "McMahon's White." The fruit of this was exhibited at the last meeting of the American Pomological Society in Washington, grown both in Wisconsin and Minnesota. A large oblong waxy yellow apple, with a light blush on one side, flesh white, juicy and of fair quality. A dozen trees of this on the experimental farm are among the most vigorous and healthy in orchard. Mr. A. L. Hatch, of Ithaca, Wisconsin, writes me as follows: "A seedling from Alexander introduced here about 20 years ago, and is proving more valuable than any other. It will grow and bear apples 'next year' when other varieties are tired out. I had 80 barrels of it this year—sold higher in Chicago and St. Paul than any other of its season."

STANDARD VARIETIES ADDED, 1891.

Arkansas.	Kinnaird's Seedling.
do Black.	Lankford do
do Beauty.	Mason's Orange.
Crawford.	Nero.
Clayton.	Osceola.
Coffelt Beauty.	Rainbow.
Cullin's Keeper.	Rebel.
Dickinson.	Shackelford.
Dr. Walker.	Spencer.
Early Colton.	Stuart's Golden.
Family Favourite.	York Imperial.
Huntsman.	North Star.
Ivanhoe.	Gano.

As the majority of the varieties mentioned above are from points considerably to the south of Ottawa, it is not expected that they will in all cases prove hardy, but opportunities are not wanting whereby their usefulness for southern Ontario can be determined.

In the accompanying tabular statement a classification of varieties now in the standard orchard is made on the basis of relative immunity from injury, during the winter of 1890-91. Those in column 2 "slightly injured," lost in most cases only a few inches of the terminal growth. In column 3 the injury was more severe, and was often accompanied by sun-scald and stem injury. In column 4 will be found varieties which seem to have died from unadaptability to soil and climate—the latter particularly—and which in this and similiar localities should only be tried as top-grafts in a limited way, if at all.

TABLE showing effect of Winter of 1890-91 on Standard Apple Orchard.

1. Uninjured.	2. Slightly Injured.	3. Considerably Injured.	4. Killed.
Baxter	American Beauty	Baldwin (American)	Cooper's Market.
Ben Davis	Belle de Boskoop	Bottle Greening	King (3 out of 5).
Bombarger	Brewington	Cranberry Pippin	Lady Henniker.
Canada Baldwin	Benoni	Early Harvest	Nonpareil.
Duke of Connaught	Beauty of the World	Gravenstein	Perry Russet.
Duchess	Chenango Strawberry	Hurlbut	R. I. Greening.
Fameuse	Dominie	Missouri Pippin	Red Russet.
Fanny	Fallawater	Nodhead	Swayzie Pomme-grise.
Golden Russet	Lord Suffield	Rome Beauty	Winter Bough.
Gideon	Magog Red Streak	Shannon	
Giant Swaar	Northern Spy	Sweet Bough	
Haas	Primate	Sutton's Beauty	
Keswick Codlin	Ribston Pippin	Utter's Red	
Lawver	Rolfe	Vandevere	
McMahon White	Red Beitigheimer	Wagener	
McIntosh Red	Roxbury Russet	Wine Sap	
Mann	Stump	Winter Pippin	
Orange Winter	Seek-no-further		
Princess Louise	Sharpe's Russet		
Pomme Grise	Spitzenberg		
Peach	Sops of Wine		
Plumb's Cider	Wolf River		
Red Astrachan			
Richards' Graft			
St. Lawrence			
Snyder			
Shiawassie Beauty			
Saxton			
Scott's Winter			
Salome			
Talman's Sweet			
Wealthy			
Walbridge			
Winter Duchess			
Winter St. Lawrence			
McMahon's White			

RUSSIAN APPLES.

The work of testing the merits and studying the habits of this race of apples has been carried on during the year, as much as opportunity and time afforded. To more rapidly advance this line of investigation, a visit by the writer was made last autumn, to the western States, by instruction of the Honourable the Minister of Agriculture. Some of the information gained from this visit, as well as the combined experience of the most careful experimenters are here given, in such form as may serve as a guide to propagators.

Conclusions reached are (1) that the northern limits of apple culture can be materially extended by planting the hardiest of these varieties.

2. That all fruit-growing districts of Canada may be benefited by adding a judicious selection of the best kinds.

3. That among them are many valuable summer varieties.

4. That experience seems to indicate that among them are winter apples of fair quality and superior hardiness.

5. That in the milder portions of Ontario, these winter apples are not yet sufficiently tested to be recommended for more than trial, in a limited way.

6. That nursery men supplying the needs of northern planters should propagate varieties mentioned hereafter, taking special care to send them out true to name.

SUMMER.

ANISOVKA (*No.* 185 *Dept.*)—A large fine looking apple of the Duchess type, but about two weeks later. The tree is extremely hardy, and is recommended for trial where the Duchess fails. It is spoken of in Minnesota as an early fall apple of great promise.

YELLOW TRANSPARENT (*No.* 334 *Dept.*)—This has now become so widely and so favourably known, that it is almost superfluous to insert it in this list. It has been mentioned as one of the leading apples in almost every list received, from Minnesota to Vermont. Its weak point in the western States is its liability to suffer from blight. Of its hardiness, quality of fruit, and early heavy-bearing habits, there is no question; in fact, this latter characteristic has been the means of bringing it thus rapidly before the public. Experience teaches that this variety needs high cultivation and careful thinning of fruit, in order to maintain a product of first quality, and perfect vigour of tree.

BRESKOVKA (152 *M.*)—One of the Moscow importation by Prof. Budd. This fruited as a top graft last year in the Niagara district, but was past its season when I saw it early in September; and in speaking of it, I do so principally on the recommendation of others with whom it has fruited. The tree is hardy at Ottawa, as it is in Iowa and Minnesota. As a dessert fruit, a week or two later than Yellow Transparent, it is highly spoken of.

ENGLISH BOROVINKA (9 *M.*)—Imported by Prof. Budd. Fruited at Abbotsford the past two years. Medium to large; flat conical; yellow ground; nearly covered with splashes and red stripes. Calyx partly open; basin large, wrinkled; stem three-quarters to an inch long; cavity narrow, deep and russeted. Flesh white, with sometimes a purplish tinge, sub-acid, fair quality. Season, September; keeps till November. A handsome early fall apple. Hardy in Minnesota. This is quite different from Borovinka, No. 245 of the Dept., which is not included in this list, as its place seems to be filled by Anisovka (*No.* 185 *Dept.*)

CHARLAMOFF (262 *Dept.*)—A hardy tree, of which favourable reports came from Minnesota, Iowa and Wisconsin. It is also doing well in various parts of the Province of Quebec, and at Ottawa. Fruit large, rather handsome; of the Duchess type in appearance, quality and season.

WHITE NALIV (*No.* 157 *Dept.*)—This fruit answers the description of Dr. Regel, as translated by the late Chas. Gibb. He says: "It stands our severest winters at St. Petersburg, and bears every year; at any rate, *heavily* every second year." Mr. Tuttle says: "A most valuable tree in orchard, hardy and free from blight." Good reports come from various points in Iowa as well. Fruit about medium size, yellow ground, sometimes quite highly coloured; fair quality. Ripens here about the middle of August.

BLUSHED CALVILLE (22 *M*).—Hardy at Ottawa. Recommended from Minnesota and Iowa as a summer apple; a little later than Yellow Transparent, and a better tree. Mr. Peterson, of Minnesota, says: "Hardy, free from blight; better than Duchess."

LUBSK REINETTE (444 *Dep.*)—"Is a summer apple, having juicy white flesh; fair to good in quality; fine-grained and good size; round in shape; suffused with carmine red over a white waxy ground; far more beautiful than any other apple I ever saw of any kind. For two seasons I sent them in barrels to St. Paul, Minn., and they sold at a higher price than any other kind and more were asked for each time. The tree is as good a grower as Duchess, not very fine in nursery, but good in orchard, though in some instances it blights slightly, not more, however, than Fameuse; also has scabbed, but very little when compared to Fameuse. For an early, fancy, high-priced apple, for a gilt-edged market, it is sure to be satisfactory and liked; it can be well grown in your climate, where the summer heat is probably not so intense as here."—A. L. Hatch, Ithaca, Wis. This has not fruited in Canada that I am aware of, but the tree is doing well at Ottawa and Abbotsford, Que., and should be more generally tested.

THALER (*No.* 342 *Dep.*)—This is thought by a few growers to be identical with Yellow Transparent, Mr. Tuttle, of Wisconsin, claiming the fruit to be the same, but the tree less liable to blight. Mr. Speer, of Iowa, thinks the tree more productive, but we in Canada have no fault to find with the Yellow Transparent in that respect. In my opinion, for Canadian planters, one is as good as the other, the fruit being so nearly alike, and the trees being equally hardy.

LIVLAND RASPBERRY (*No.* 340 *Dep.*)—This bears an attractive-looking fruit of fair quality, ripening about 1st September. The tree ranks with Wealthy in hardiness, but is not as thrifty in growth. It has been recommended in Wisconsin, and succeeds well in the Province of Quebec.

FALL.

WHITE PIGEON (317 *Dep.*)—Tree undoubtedly hardy. The wood of this variety is among the brightest and clearest in a string of nearly two hundred specimens, made up of cross sections of the stems of three-year-old nursery trees, taken at the critical point—the terminal bud of the first year's growth—presented to the Iowa Horticultural Society, after a recent test winter, by Mr. W. C. Haviland, of Fort Dodge. Mr. Webster, of Vermont, briefly describes the fruit as "a good substitute for the banana." Emphatic statements come from Minnesota in regard to its hardiness, and Mr. R. W. Shepherd has the following to say in regard to quality:—"The quality is best. It is the best dessert Russian I have yet seen or tasted; flesh firm and juicy, with delicious pear-like flavour. I consider White Pigeon equal to Early Joe in quality—than which nothing can be better; being a hardy tree, whereas Early Joe is only half hardy, it is the best fall dessert apple for this province for home use."

JUICY NALIV (544 *Dep.*)—What I have seen of this tree and fruit, has impressed me with the belief that it will prove valuable, along northern limits of fruit-growing in Canada. Messrs. Perry, of Beaver Dam, Wis., and R. P. Speer, of Cedar Falls, Ia., both speak highly of this as a hardy fall variety. Mr. Speer classes it with those of the Hibernal type. Fruit, medium to large, handsomely coloured; fair quality. At Ottawa the tree is a vigorous upright grower, quite hardy.

WHITE PELIKANOFF (980 *Dep.*)—This has been favourably noticed by several growers in Minnesota, on account of hardiness and almost entire freedom from blight. The fruit, as I saw it, is about the size of Duchess and better in quality, keeping into early winter.

GOLDEN WHITE (978 *Dep.*)—This has already been somewhat widely disseminated in the Province of Quebec, and last year was among the fruits distributed by the Fruit Growers' Association of Ontario. Specimens of the fruit received from Mr. R. Brodie, of St. Henri de Montréal, were large to very large, oblong ribbed and slightly irregular; colour, a rich yellow ground, covered with carmine splashings towards the stem end; calyx open, basin small, in some specimens almost absent; flesh white, crisp, tender and juicy; sub-acid; very good. Season, September and October. At Abbotsford, Que., it has shown some tendency to scab and crack.

ZOLOTOREFF (275 *Dep.*)—This may be classed with Titovka, 2 Dept. 430, Ribbed Naliv, 285, and Basil the Great, 971, all large coarse fall apples which seem to be intermediate between the Duchess and Alexander families. The trees are all hardy, and were among the first to fruit at Abbotsford. The Zolotoreff tree has given greatest satisfaction and is recommended for the colder districts. Described in the report for 1890.

SWITZER (304 *Dep.*)—"Has made larger full-branched trees than any other Russian. Three trees about 18 years old yielded 40 bushels for me this last season, and were very good apples; somewhat inclined to scab, but is one of the best of all the Russians where quantity is an object, and if it can be grown free from scab, as I think it can be with you. Late summer here."—A. L. Hatch, Wis.

"A fall apple, which may possibly keep as long as Fameuse under favourable circumstances. Has fruited at Como for the last four or five seasons. It is of Fameuse type and quality. It must become a favorite dessert apple, as its appearance and excellent quality place it in the front rank. The aromatic odour of the Switzer when ripe is more powerful than any other apple I know of. The tree is a heavy bearer, but its weak point is a tendency to drop the fruit considerably some seasons. Taking it altogether, the Switzer is a great acquisition, and could no doubt be grown successfully in unfavourable localities where the Fameuse does not succeed."—R. W. Shepherd. I do not think we can rank this among the hardiest, as at Mr. Haviland's place, northern Iowa, the wood was badly coloured; also at points in Minnesota it did not exhibit the same power to resist extremes as did many others. Yet, where Wealthy succeeds, I think it can be safely planted. In regard to quality, it is not overrated by Messrs. Hatch and Shepherd.

WINTER.

Ostrekoff (4 *m.*)—One of Prof. Budd's importation from Moscow. A perfect tree at Ottawa, giving a few specimens of fruit last year—the second from planting. The tree is doing well in Minnesota and Iowa, where it is looked upon as a decided acquisition. The fruit is medium to large, round waxy yellow, with bright blush on sunny side, flesh white, sub-acid, juicy, melting, good. Mr. Peterson, of Minn., says "keeps till March." I was very much pleased with this as seen in barrels at the Iowa Agricultural College last summer, and was impressed with the idea that it would make an attractive and saleable market apple.

Ostrekoff (472 *Dep.*)—Is also a winter apple and a hardy tree. I have been unable to compare the fruit of these two, but Mr. Peterson, of Minnesota, can see no difference between this and Lieby, or Hibernal.

Antonovka (236 *Dep.* 26 *m.*)—Although received from several sources, all appear true to name. This has proved valuable in the west, only in locations more or less free from blight. The tree is unquestionably hardy, and I have every hope of it being very serviceable at the north. Fruit medium to large, nearly round, yellow, without much colour; flesh white, breaking, briskly acid, but pleasant. I should like to see it widely tested. This will prove fall and early winter in many sections.

Hibernal (378 *Dep.*)—This has been fruiting for a number of years over wide areas. Two points are thoroughly established: 1. That it is one of the hardiest of all the Russian apples. 2. That it has no value as a dessert fruit, but as winter cooking apple is very useful. In the many reports which I have received, in no case has this or Lieby, which is almost identical, been omitted from the autumn or winter list. Growers in Iowa, Minnesota, Dakota, Montana, Wisconsin, Vermont and the Province of Quebec, all testify to its value for the north. In districts where Wealthy, Pewaukee and Scott's Winter succeed, there is little room for apples of this quality, except as stocks for top grafting; but for points farther north its value has become generally recognized.

Longfield (161 *Dep.*)—Rather better known than the majority of the Russians, on account of its habit of bearing young and heavily. The tree is very distinctive in appearance, a poor grower in nursery, shaping itself in orchard into a conical form, with the lower branches quite drooping; leaves silvery on the lower side. The size of the fruit depends much on care and cultivation; being a tremendous annual bearer, if not well manured and thinned, the fruit soon deteriorates and becomes small. Quality is first-class. For home use this should be encouraged. Ordinarily its season is that of Fameuse, or a little later in the Province of Quebec.

Red Reinette (316 *Dep.*)—This tree is reported by Mr. Hatch, of Wisconsin, as not being very hardy, yet it is succeeding well with Mr. Somerville of Minnesota, and Mr. Havi and, of Iowa. Hardy, at Ottawa and at various points where tried in Quebec. Fruit medium to large, round, approaching conical in form; green ground, covered on one side with a dark red blush; texture of flesh very firm, very pleasant sub-acid, a good keeper.

Cross (413 *Dep.*)—This is a fruit of medium size, flat, sometimes ribbed; green, with light red splashes on the sunny side; calyx closed, basin irregular, wrinkled;

stem thick, set in a deep wide cavity; flesh white, mild, sub-acid; season, early winter. Tree a strong grower, perfectly hardy here and at Abbotsford. It is succeeding admirably in Minnesota and Northern Iowa.

GIPSEY (1,227 *Dep.*)—This was noted in the report of last year, and is repeated here to emphasize its value. About the season of Fameuse.

SILKEN LEAF (327 *Dep.*, 75 *m.*)—A very hardy tree, bearing large, coarse-fleshed apples, of value only for culinary purposes. As in the case of Hibernal, the planting of this should be confined exclusively to extreme northern situations. Valuable as a top-working stock.

ARABKA (257 *Dep.* Imported by Elwanger & Barry, Rochester, N.Y.)—This was also mentioned in my report for 1890, and should have a place with planters in northern Ontario. (No. 315 Dep. Herren, as fruited at Abbotsford, seems to be identical with the above.)

ROYAL TABLE (5 *m.*)—*See* report for 1890.

ZUSOFF (585 *Dep.*)—Prof. Budd reports this not quite hardy at Ames, but Messrs. Somerville and Harris, of Minnesota, pronounce it satisfactory, and Mr. Tuttle, of Wisconsin, gives it three stars, and says it is equal to Fameuse in quality. It is certainly one of the handsomest large winter apples I have seen. I cannot speak of its hardiness at Ottawa, as it was only added to the collection last year. I feel jutisfied in saying, however, that where the Fameuse is hardy it can be safely planted. Fruit large, round and symmetrical, almost entirely covered with a rich dark red colour; flesh coarse, but not as stringy as Alexander; a pleasant acid. Season, mid-winter.

PLUMS.

A number of varieties of the *Prunus Americana* type (the De Sota class) fruited the past season, although planted only the previous year. While these cannot compete with the finer varieties of *P. Domestica* as shipping and market fruits, yet they will, in the north, fill a very important place for home use, being excellent for canning and preserving. Some of them, for example, Forest Garden, Wyant and Yosemite Purple, need annual shortening-in to keep the branches from becoming too long and unmanageable. Another important point towards attaining the best results with this class is the mixing of varieties in the orchard, for the purpose of more complete fertilization. Some kinds, Speer and Miner, for example, are said to be imperfect self-fertilizers and need a supply of pollen from other varieties in order to perfect their fruit. Very few belonging to the class *P. Domestica* came through the winter without greater or less injury, the condition of varieties in a general way corresponding with statements made in the report for 1890.

PEARS.

The varieties of Russian pears noted in last year's report have grown very vigorously the past year, and their dark-green glossy foliage has attracted the attention of many visitors while looking over the farm.

The question of hardiness seems to be, in the case of a large number of varieties, quite assured, but I do not anticipate that the fruit in any case will approach in quality Bartlett, or even Flemish Beauty. *Bessemianka* and *Gakovka* gave again this year a few specimens of fruit; in size medium to small, below medium in quality, showing too much tendency to drop prematurely and also to decay at the core—even before falling—without being apparently ripe. This, especially, was the case with *Bessemianka.* Dr. Hoskins, of Vermont, however speaks very favourably of the quality of this variety as fruited on his grounds. As it has been imported from several points in Russia, it is quite probable that variations will be found to exist, and time is needed to bring out the best.

Cherries.

An abundant show of blossoms presaged a heavy crop of cherries, but a severe frost followed by cold winds prevented fertilization, so that many varieties new to this locality did not fruit at Ottawa as was expected. At Abbotsford, however, the crop was only partially destroyed and an opportunity of summing up and comparing the notes of previous years was enjoyed. These results and conclusions, together with cuts of promising varieties, are embodied in a bulletin now in course of preparation.

The varieties under trial in this division of large fruits seem destined to be of great service in extending the profitable cultivation of cherries considerably northward. In order to accomplish this object successfully one or two important points must be remembered: 1. They must be headed low and trained somewhat in bush form; 2. Plant deeply in well-drained soil, and throw a mound of earth about the base of the tree in the fall to protect the roots.

II.—SMALL FRUITS.

Grapes.

In the older grape-growing districts the crop of the past year was an abundant one. In the Ottawa valley, which has quite a local reputation for the excellence of this fruit, the season was not favourable. Unusually warm weather in early spring induced growers to uncover their vines earlier than usual; cold, frosty weather following resulted in the killing of the unfolding buds and destroying the possibility of the year's crop of fruit. Those who waited till warm weather was assured, were rewarded by a full crop, although the unusually cool weather during June, July and August retarded ripening very much, yet the abnormally hot September more than counterbalanced the low temperature of early summer, and a much larger proportion of the varieties fruiting, ripened this year than last, though nearly ten days late on the whole. On the night of 14th of August a hail storm, local in extent, but very severe while it lasted, passed over the farm, doing much damage to vines and tender plants. It was estimated that 25 per cent of the fruit was lost from this cause. The leaves, where exposed, were completely riddled and the berries split open. Varieties trained to trellises suffered more than those on single stakes. Mildew under the control of ammoniacal copper carbonate did not appear in the farm vineyard to any appreciable extent, but anthracnose "Bird's-eye rot" (*sphaceloma ampelinum*) attacked a few varieties very persistently, and did not yield to the above remedy. This disease attacks the wood as well as the fruit, giving the former a blotched and spotted appearance, not unlike raspberry cane anthracnose. Some experimenters have obtained best results from the use of a strong solution of copper sulphate and in some cases iron sulphate (1 lb. to 10 of water) with which the canes are washed before tying to the trellis in the spring, followed by the application of Bordeaux mixture. The danger of vines being killed in winter when planted in light soils in exposed positions, and without a heavy protecting mantle of snow, has been strongly impressed upon me the past season, when noting the numerous fatalities resulting from the planting of vines in such situations, without taking proper precautions. Where the winter cold is extreme, it is necessary not only to cover with earth, but also to provide for a liberal covering of snow by placing wind-breaks of boards at intervals, or ever-green boughs to collect and hold the snow. This care is most essential when the vine is young and not fully established.

The following tabular statement shows the dates of colouring, ripening and gathering of each variety, fruited the past season, given in order of maturity:

Black Grapes.

Name.	Date of Colouring.	Date of Ripening.	Date of Gathering.
Florence	September 4	September 9	September 18.
Champion	do 4	do 15	do 23.
Moore's Early	do 4	do 18	do 30.
Janesville	do 4	do 18	October 1.
Canada	do 8	do 18	do 5.
Early Victor	do 14	do 20	September 30.
Eumelan	do 14	do 21	October 7.
Telegraph	do 4	do 21	do 3.
Cottage	do 14	do 22	September 30.
Potter	do 6	do 24	October 1.
Rogers No. 17	do 12	do 25	September 30.
do 30	do 12	do 25	do 30.
Brant	do 14	do 25	October 5.
Worden		do 25	
Eaton	September 14	do 26	do 1.
Black Elvira	do 14	do 26	do 1.
Peabody	do 9	do 26	do 1.
Herbert	do 20	do 26	do 2.
Merrimac	do 8	do 26	do 5.
Barry	do 15	do 26	do 5.
Conqueror	do 14	do 26	do 2.
Montefiore	do 21	do 26	do 5.
Creveling	do 14	do 26	do 5.
Wilder	do 14	do 26	September 30.
Chase Bros. (New)	do 18	do 26	October 2.
Belvidere	do 12	do 28	do 2.
Ives	do 18	do 28	do 2.
Monroe	do 14	do 30	September 30.
Amber Queen	do 18	do 30	do 30.
Hartford	do 18	do 30	October 1.
Elsinburg	do 24	do 30	do 7.
Alma	do 20	October 1	do 7.
Burnet	do 20	do 1	do 2.
Secretary	do 20	do 1	do 3.
August Giant	do 20	do 2	do 2.
Bacchus	do 22	do 5	do 7.
Cambridge	do 16	do 5	do 5.
Concord	do 24	do 5	do 5.
Canada Arnold	do 14	do 5	do 10.
Norton's Virginia	do 22	do 5	do 6.
Alvey		do 7	
Pizzaro	September 21	do 7	do 7.
Clevener	do 21	do 7	do 7.
Marion	do 4	do 7	do 7.
Rogers No. 2	do 24	do 10	Oct. 7 partly ripe.
Naomi	do 24	do 10	do 10.
Cunningham	do 25		do 12 not ripe.
Ariadne	do 20		do 12 do
Isabella	do 26		do 12 do
Othello	October 1		do 12 do
Senasqua	September 26		do 12 partly ripe

Red Grapes.

Name.	Date of Colouring.	Date of Ripening.	Date of Gathering.
Delaware	September 5	September 16	October 1
Moyer	do 8	do 17	do 1
Dracut Amber	do 16	do 25	do 1
Mary	do 6	do 25	do 1
Northern Muscadine	do 14	do 25	do 3
Rogers No. 30	do 11	do 25	do 3
Gaertner	do 14	do 26	do 2
Poughkeepsie	do 12	do 26	do 2
Brighton	do 12	do 26	do 2
Rogers No. 13	do 12	do 28	do 3
Lindley	do 14	do 30	do 1
Rogers No. 24	do 20	do 30	do 1
Maxatawney	do 14	do 30	do 1
Owasso	do 16	do 30	do 1
Salem	do 9	October 1	do 3
Massasoit	do 16	do 1	do 1
Norwood	do 18	do 1	do 2
Victoria	do 21	do 1	do 2
Berckmans	do 24	do 3	do 7
Rogers No. 5	do 16	do 5	do 5
Woodruff	do 16	do 5	do 7
Agawam	do 16	do 5	do 5
Rogers No. 39	do 22	do 6	do 10
Jefferson	do 21	do 6	do 10
Requa, Rogers No. 28	do 26	do 6	do 6
Vergennes	do 20	do 6	do 6
Oriental	do 24	do 10	do 10
Highland	do 24		Oct. 7, not ripe
Diana	do 24		do 10, do
Ulster Prolific	do 24	October 10	do 10, partly ripe
Catawba	do 21	do 10	do 10, do
Beauty	do 25		do 12, not ripe
Rogers No. 32	do 20		do 10, do
Challenge	do 25		do 10, partly ripe
Iona	do 30		do 10, do

White Grapes.

Name.	Date of changing Colour.	Date of Ripening.	Date of Gathering.
Hayes	September 15	September 24	October 2
El Dorado	do 8	do 24	September 30
Lady	do 8	do 25	October 1
Jessica	do 4	do 25	do 3
Empire State	do 12	do 25	do 3
Roger's No. 34	do 20	do 25	September 30
Allen's Hybrid	do 18	do 26	October 3
Duchess	do 18	do 26	do 6
Moore's Diamond	do 19	do 27	do 2
Perkins	do 18	do 28	do 4
Kensington	do 20	do 28	do 4
Niagara	do 15	do 30	do 4
Grein's No. 7	do 18	do 30	do 1
Irving	do 20	October 1	do 4
Elvira	do 22	do 4	do 7
Martha	do 15	do 5	do 5
Wilding		do 5	
Lady Washington		do 7	
Prentiss	September 20	do 7	do 10
Grein's Golden	do 19	do 10	do 5
Pocklington	do 21	do 10	do 10
Amber	do 21	do 10	do 10
Taylor	do 21	do 10	do 10
Noah	do 20	do 10	do 5
Triumph	October 1		Oct. 10, not ripe
Transparent			do 10, do
Etta			do 10, do
Imperial	September 30		do 10, do
Eva			do 10, do
Pearl			do 10, do
Autuchon			do 12, do
Missouri Reisling	September 21		do 5, do

NOTES OF VARIETIES.

In considering the following opinions, it must be borne in mind thatof all edible fruited plants, grape vines are among the most variable as to constitution of vine, quality, and quantity of fruit. Slight differences in soil and exposure often cause great variability in the nature of the product. In the main, the information given is based on the behaviour of each variety on the grounds of the Central Experimental Farm, supplemented in some instances by outside observation and experience.

I am indebted to the excellent Grape Manual published by Messrs. Bush & Son & Meissner, of Bushberg, Mo., U.S., for the nomenclatnre and origin of many of the varieties mentioned. To elucidate future reference, it may be well to say that all our cultivated grape vines east of the Rocky Mountains are derived from a few wild species, by crossing or hybridization between our natives, or with representatives of the European species, *Vitis Vinifera*.

1. VITIS LABRUSCA or Northern Fox Grape, native of the south New England and middle States. The *Rogers'* varieties are largely derived from this source.

2. VITIS RIPARIA is what is known in northern sections as the Frost Grape; distributed throughout Canada and the north-western States. *Clinton, Brant* and *Bacchus* are prominent examples of this class.

3. VITIS AESTIVAEIS; the wine grape of the middle or southern States; very few varieties of this species ripen as far north as any portion of Canada.

4. VITIS VINIFERA; European or old-world species. Hybrids have been produced between this and a number of our natives, with many failures and some successes.

BLACK VARIETIES.

Amber Queen (*Labrusca ?*).—A hybrid introduced by Ellwauger & Barry, sometimes classed with red grapes. Bunch medium to large; berries large oval; amber at first, turning black when fully ripe; good quality; usually three or four days earlier than Concord; keeps well. This is not the Amber Queen grown by a number of amateurs, proprietors of city gardens in Ottawa. This is a pure amber-coloured grape.

Alma (*Riparia.*)—This was erroneously described as a white grape in the report of 1890. I should have said small black, of the Clinton type. May be of value in districts south of this as a wine grape.

August Giant (*Hybrid.*)—A cross between Black Hamburg and Marion, retaining the characteristics of bunch and berry of the former. Does not attain full perfection of maturity here, although it colours well. Vine a rampant grower, but subject to winter killing. As an amateur variety for points south of this it is to be commended.

Alvey (*Aestivalis.*)—Originated in Maryland. Vine a short-jointed slow grower. Bunch medium, berries small, not promising.

Ariadne (*Riparia.*)—Seedling of Clinton. Bunch and berry small, black, and with present experience, apparently worthless.

Brant (*Riparia hybr.*)—A seedling of the Riparia type, produced from Clinton seed. Bunch long narrow shouldered; berry small, with purple bloom. Flavour a sprightly vinous acid, much liked by some. Vine a rampant grower aud heavy bearer, but the foliage is frequently injured by powdery mildew. It makes wine of a high quality; ripening early, it is probably the most valuable of Mr. Arnold's seedlings for northern sections.

Barry (*Rogers No.* 43.)—Vine, like most of the Rogers varieties, a strong grower, but on these grounds has the defect of dropping its leaves before the fruit matures. Bunch medium to large, shouldered, compact; berry large round, covered with bloom. Mildewed slightly the past two years. Keeps till the middle of December, as ripened here.

Belvidere (*Labrusca.*)—Vine closely resembles Moore's Early. Bunch medium to small; berry small, fair quality. Further trial is needed before an opinion can be offered.

Burnet (*Hybrid.*)—A cross between Hartford Prolific and Black Hamburg produced by P. C. Dempsey, of Prince Edward Co., Ont. Vine a fair grower; bunch large; berry medium; size oval; reddish black in colour; fine quality, but does not ripen sufficiently early for our average seasons; a poor keeper; desirable for home use.

Bacchus (*Riparia.*)—Like its parent, the Clinton, in many respects very productive, but the vine is not so vigorous. Bunch and berry small, ripening unevenly; sharp acid. Too late and uncertain for this locality or points northward.

Champion (*Labrusca.*)—The hardiness, productiveness, and early ripening habits of this grape have given it popularity in sections where it should be replaced by varieties of better quality, as it is a question whether the cultivation of such varieties trends to develop grape-growing or not. In the colder sections it has much value.

Canada (*Riparia hybi.*)—A seedling of Clinton, crossed with one of the European grapes, produced by the late Charles Arnold, of Paris, Ont. Bunch medium, berry small, round, with a pleasant acid sprigthtliness of flavour. It ripens among the earliest; keeps only a short time. Recommended for gardens at the north.

Cottage (*Labrusca.*)—This was given to the public by Mr. W. E. Bull, of Massachusetts, who originated the Concord, of which the Cottage is a seedling, and to which its foliage bears a striking resemblance. Bunch medium to large, berries larger than Concord, perfectly round; not equal to Concord in quality. In this locality the berries separate from the bunch immediately it ripens; but in this condition kept last year into November.

Conquerer (*Labrusca ?*)—Parentage obscure. Vine a strong grower. Bunch long, loose; berry medium size; with the summer heat of Ottawa it does not become sweet enough to be palatable.

CREVELING (*Labrusca.*)—Does not attain perfection in this vicinity. Vine a fair grower; bunch loose; berries oval, good quality. Subject to mildew and anthracnose. A vine surrounded by Clintons has set better bunches and borne larger crops than others of the same variety in the vineyard, showing the advantage of foreign pollen towards attaining the best results.

CHASE BROS' Seedling.—Fruit and vine of the Concord type. No apparent improvement.

CAMBRIDGE (*Labrusca.*)—Closely resembling Concord. No improvement.

CLEVENER.—No record of the origin of this variety. A small black wine grape without special value.

CUNNINGHAM (*Aestivalis*).—Quite too late for this locality; in fact it is doubtful whether it will ripen in any part of Canada. Essentially a southern grape.

EARLY VICTOR (*Labrusca.*)—Originated with John Burr, of Leavenworth, Kans., nearly twenty years ago. It belongs to the Labrusca division; a strong grower and a heavy bearer. Bunch above medium size, very compact; berry medium, round, with purplish bloom. Like Florence as grown here, it is particularly perishable, the berries shrivelling and dropping within a few days of gathering. Ripened last year 16th September, this year 20th September. In other grape-growing districts it is often spoken of as a fair keeper and shipper.

EUMELAN (*Aestivalis.*)—Supposed to be a variation of the wild grape (*Vitis Aestivalis*) of Texas and Arkansas, and the earliest variety from this stock. Bunch medium size, well shouldered; berries medium; skin thin, pulp fairly tender; ripening with Early Victor; keeps with care up to 1st January. The vine is a short-jointed slow grower.

EATON (*Labrusca.*)—From Concord seed; fruited for the first time on these grounds this year. A very large bunch and berry. Berries larger than any of the Black Roger hybrids, rather pulpy. Ripens a few days earlier than Concord.

ELSINBURG, of *Vitis Aestivalis* extraction.—Vine a weak grower, with small deeply cut leaves. Fruited this year only: bunch and berry small, the latter quite seedy. Not promising.

FLORENCE (*Labrusca*) ?—Said to be of Labrusca parentage. Vine a short-jointed, slow grower; leaves small; very pubescent. Bunch and berry medium to small, ripening with or before Champion. This year it matured nearly a week ahead of any other variety in the vineyard. Quality only medium. The fruit is very perishable, shrivelling on the vine soon after maturing. As a grape for garden culture in the colder sections it is valuable. Not a market variety in any respect.

HERBERT (*Hybr.*) (*Rogers* 44.)—The product of a cross between Black Hamburg and *Vitis Labrusca.* Vine a strong grower, occasionally subject to mildew. Bunch and berry among the largest, very handsome and quality good. Keeps easily to the middle of January. Where this variety succeeds, it is one of the most profitable of the Roger hybrids.

HARTFORD PROLIFIC (*Labrusca*).—An old and well known variety, especially in the eastern States, where it originated about thirty years ago. In this vicinity it cannot be taken as a standard of earliness, as this year it barely ripened before frost. In quality better than Champion, but too poor to encourage where finer grapes ripen.

IVES (*Labrusca*).—Vine vigorous and healthy. Bunch medium to large; berry approaching oval in form. Although it colours well, it does not thoroughly mature here. Farther south it may have value as a wine grape, for which purpose it was first introduced.

ISABELLA (*Labrusca*).—One of the oldest representatives of the native American grape. Its place has been taken by more profitable varieties in most grape-growing districts. Does not mature here.

JANESVILLE (*Labrusca*).—Origin obscure. Of Labrusca parentage. Bunch and berry small; juicy, pleasant, but pulp is generally tough and objectionable. Ripening as it does with Champion, for home use I think it preferable, but as a market variety and in point of productiveness it does not compete with the former.

Moore's Early (*Labrusca*).—A seedling of Concord. Much resembles its parent, with a larger berry and smaller bunch. Quality equal to Concord. Vine rather a slow grower; needs careful cultivation and liberal manuring. For home use and market it should have a place in every collection.

Merrimac (*Rogers No.* 19).—Vine an exceptionally free grower, usually healthy and exempt from mildew; bunch medium size, roundish, and compact. In bunch and berry closely resembling Barry and Wilder. Slightly sweeter however, and ripening more evenly, it is on the whole preferable. Keeps well.

Montefiore (*Hybrid*).—Vine weakly, subject to mildew. Resembles Early Victor in size of bunch and berry. As a red wine grape, its merits have been strongly advocated farther south, and for such purpose it may be valuable in localities where it ripens to perfection.

Monroe (*Labrusca*).—A cross between Delaware and Concord by Ellwanger and Barry, of Rochester, N.Y. Medium sized bunch and berry; poor quality; not desirable.

Marion (*Riparia*).—A southern wine grape of considerable repute. Although it colours early, yet it is one of the last to ripen, and does not attain here the requisite sweetness to make wine of the best quality. Vine hardy, vigorous and productive; somewhat liable to mildew.

Norton or Norton's Virginia (*Vitis Aestivalis*).—One of the leading wine grapes of the South Central States. Bunch small; berry medium; very sour as fruited here, the summer heat being insufficient to bring it to perfection.

Naomi (*Riparia hybr.*)—Of Clinton parentage with a mixture of foreign blood. Vine vigorous, productive; bunch large, shouldered; berry small; quality very good, with a peculiar sugary suggestion. I am inclined to think favourably of this as an amateur variety where it will ripen. Uncertain in this vicinity.

Othello (Arnold's Hybrid, No. 1.) (*Riparia hybrid.*)—Vine vigorous, and productive. Does not ripen here. One of the most popular of our American grapes in France, for making wine.

Potter (*Labrusca?*)—Bunch compact, medium size, not shouldered; berry large; altogether resembling Cottage quite closely; skin thick, and pulp rather tough. Ripened last year with Champion, this year about one week later; much better quality.

Peabody (*Riparia*).—A seedling of Clinton, raised by Mr. Ricketts, of New York State. Bunch and berry medium size, the latter oval with blue bloom; seeds large; berry juicy, acid, with a peculiar breaking quality of flesh. Matures about a week later than Moore's Early; vine a fair grower.

Pizzaro (*Riparia hybrid*).—A cross between Clinton and a foreign variety. Bunch and berry small black; late; not desirable.

Rogers No. 17 (*Hybrid*).—Much resembling Herbert, No. 44, and apparently no improvement.

Rogers No. 36 (*Hybrid*).—Same season as last; not quite as large as Herbert. Vine a strong grower, free from mildew.

Rogers No. 2 (*Hybrid*).—Vine a strong grower; subject to leaf mildew. Bunch large; berry very large, oval; sharp acid. Too late for this and similar latitudes.

Secretary (*Riparia hybrid*).—A cross by Mr. Ricketts between Clinton and a foreign variety. It retains the Clinton foliage and style of bunch. Mildews badly; nothing to commend it for this locality.

Senasqua (*Labrusca hybrid*).—A hybrid between Concord and Black Prince; a foreign variety. Vine a fair grower but not hardy. Bunch of large size, very compact, shouldered; berries medium; too late to obtain an idea of quality as fruited here. Am inclined to think favourably of it for southern Ontario.

Telegraph.—Of the Labrusca or Southern Fox grape type, coming according to the Bushberg catalogue from Pennsylvania. Bunch medium, very compact; berry purplish black, oval; sweet, with slightly foxy flavour. I am inclined to think favourably of it.

WORDEN (*Labrusca*).—A seedling of Concord; for this climate much more desirable, on account of maturing a week or ten days earlier, and being of better quality. As a shipping grape it does not come up to the standard of Concord, being thinner in skin and more tender generally. Vine hardy and vigorous. Owing to the great demand for this variety when first given to the public, many vines not true to name were sold, resulting in great disappointment to purchasers as the reputed Wordens frequently developed into good old-fashioned Concords. This was our experience with four out of six vines of this variety planted in the experimental vineyard.

RED VARIETIES.

AGAWAM (*Rogers No.* 15).—Vine a strong free growth, inclined to mildew; bears profusely. Bunch and berry large; colour, dark crimson; very rich; juicy; of first quality. Skin thick; keeps well without losing its flavour. In this section it does not ripen to perfection every season.

AMINIA (*Rogers No.* 39).—Resembles the last so closely as to render a description unnecessary. In flavour and keeping qualities not equal. Vine fairly vigorous.

BRIGHTON (*Labr. hybrid*)—A cross between Concord and Diana Hamburg. A strong, free grower; very productive; fairly free from mildew. Bunch large; well shouldered; berry medium; colour, dark crimson; pulp melting; juice very sweet; equal to Delaware in quality. Unless perfectly ripened does not keep well, losing flavour in three or four weeks. Too tender for distant shipment; where it ripens, invaluable for home use. Matured comparatively earlier this year than last.

BERCKMAN'S (*Riparia hybrid*).—Resembles Clinton, one of its parents, in form of bunch, and Delaware, the other parent, in flavour—not quite so sweet however. Ripened last year a few days after Delaware, but was much later this season. I am inclined to think well of it.

BEAUTY (*Labrusca*).—Said to have originated in Minnesota from Delaware, which it resembles. Bunch, medium, compact; berry round, medium size; the colour of Salem, with a purplish tinge; pulpy; poor quality.

CATAWBA (*Labrusca*).—One of the oldest and most widely known grapes in cultivation, being a selection from the native *vitis Labrusca*, of North Carolina, introduced nearly seventy years ago. Valuable as a market grape where it ripens and is free from mildew; much too late for this vicinity.

CHALLENGE (*Labrusca hybrid*).—Said to have originated from Concord seed, fertilized with a foreign variety. Bunch large; berry medium fair quality; ripens very unevenly, and late.

DELAWARE (*Vinifera hybrid*).—The origin of this widely disseminated variety is unknown. Vine a slow grower, never attaining very large size; hence particularly valuable for garden culture. Bunch medium; berry small, very sweet and juicy; quality best. In the Mississippi valley, where this does not succeed on its own roots, it has been grown satisfactorily grafted on Concord roots. One of the most valuable for this latitude.

DRACUT AMBER (*Labrusca*).—Is simply a variation of the Southern Fox grape, maturing exceptionally early. Vine vigorous; bunch large; berries large, round and thick-skinned; a poor keeper, with such a strong foxy odour as to be very objectionable to most people; hardly worthy of propagation.

DIANA (*Labrusca*).—Vine succeeds well, but its fruit does not ripen here.

GAERTNER (*Rogers No.* 14).—A very strong grower, with healthy foliage. Bunch medium; berry large, light amber; attractive; good quality; when kept, developes a slight foxiness. Ripening as it does soon after Delaware, considering quality and productiveness, it will generally give satisfaction.

HIGHLAND (*Labrusca hybrid*).—Produced from Concord fertilized with a foreign variety, by Mr. Ricketts, of New York. Vine a weak grower; bunch long; berry medium size, and of bright, attractive colour; skin thick; very juicy; acid as grown here, where it does not thoroughly mature; a variety well worth testing south of this.

Iona (*Labrusca*).—A seedling of Catawba; a fair grower, bearing fruit of first quality; is subject to mildew; ripens with Catawba; too late for this locality.

Jefferson (*Labrusca*).—A cross between Concord and Iona, by Mr. Ricketts, of New York. Vine a strong grower, of the Concord type; affected with anthracnose the past season. Bunch large; berry medium size, bright red, thick skinned; in quality very rich and juicy. In keeping it shrivels, but retains its flavour; as a market grape, where there is a longer ripening season than at Ottawa, it should be more generally planted.

Lindley (*Rogers No.* 9).—Without doubt one of the most valuable and generally adaptable of Rogers' hybrids. Vine a healthy, free grower. Bunch long, loose, occasionally so, from imperfect fertilization; berry medium to large, juicy and rich; keeps without extra care till the first of January.

Moyer. ——— The proprietor of this grape, Mr. E. D. Smith, of Winona, says, that it originated with Mr. Allan Moyer in Lincoln County, Ontario, about ten years ago. As fruited here this year it seems almost an exact counterpart of Delaware; the berry slightly larger; bunch generally smaller; quality is good; worthy of trial.

Mary (*Labrusca*).—Introduced by Jacob Rommel, of Missouri. Vine a free, healthy grower, with Roger-like foliage; productive; bunch large, shouldered; berries medium to large; light amber; skin thick; juicy, sweet; quality, fair to good; keeps to 1st January; very promising.

Maxatawney (*Labrusca*).—Bunch small; berry medium size; amber coloured; quite foxy; poor quality; shrivels soon after picking; further trial is needed; not promising.

Massasoit (*Rogers No.* 3.)—A fair grower; ripening with Salem. Bunch larger, berry smaller; light red; good quality; much subject to mildew; preferred by many to Salem or Agawam; keeps well into December or January.

Northern Muscadine (*Labrusca.*)—Another very foxy kind, closely resembling in that respect Dracut Amber. Bunch and berry medium size; dull amber colour; fairly productive. For those who admire the decidedly foxy characteristics, it is worth planting.

Norwood (*Labrusca.*)—In growth and appearance resembles Lindley. Bunch large, shouldered; berry large; bright amber; thick skinned; very productive; keeps well; ripened 1890 with Delaware; this year, 1891, nearly two weeks later. Very desirable.

Owasso (*Labrusca.*)—Strong grower; productive foliage, and fruit apt to mildew. Bunch large, long and loose; imperfectly fertilized. Berry dark amber, mottled; poor keeper; hardly to be commended.

Poughkeepsie.—From Iona and Delaware seed; vine a weak grower, entirely lacking vigour on these grounds. Bunch and berry larger than Delaware; not equal in quality but fairly good. Does not keep well; should be tested in a limited way.

Rogers No. 30 (*Hybrid.*)—Vine vigorous, productive. Bunch large. Berry very large, rich and juicy; rather irregular as to date of ripening; last year it matured after Lindley; this year four or five days ahead; a valuable variety.

Rogers No. 13 (*Hybrid.*)—Vine a moderate grower. Bunch and berry large dark amber, good quality; resembles Vergennes quite closely, but is not preferable, as it is not a good keeper.

Rogers No. 24 (*Hybrid.*)—A fairly satisfactory vine, but resembling Agawam too closely to warrant propagation.

Rogers No. 5 (*Hybrid.*)—Vines have made a poor growth and borne lightly. In season, quality, and appearance resembling Lindley.

Requa (*Rogers No.* 28).—Vine weakly; bunch medium to large; berry large, oval, dark amber; highly flavoured; too late for this vicinity.

Rogers No. 32 (*Hybrid*).—Vine vigorous and productive but lacking in foliage, which retards and prevents perfect ripening. Bunch large; berry large, oval, amber-coloured, juicy; a fair estimate of quality could not be obtained.

Salem (*Rogers No.* 53).—Bunch medium. Berry large, dark chestnut ; skin thick; juicy, and pulp rich and of first quality. Subject to mildew of vine, which injures the keeping qualities of the fruit. One of the best of the Roger's hybrids where not affected by mildew.

Ulster Prolific (*Labrusca*).—Vine has not made a satisfactory growth. Of half a dozen planted in different situations all are feeble and making weak growth. Bunch short, shouldered; berry medium; bright amber ; flavour not rich, but very sweet and pleasant. Where the plant succeeds it may ripen its fruit earlier than as noted elsewhere in the table.

Victoria (*Labrusca*).—Vine lacking vigour and hardiness; bunch loose, medium size; berry oval; dark amber; skin thick, acid; not reliable for this locality.

Vergennes (*Labrusca*).—Originated in Vermont; vine exceedingly hardy and vigorous. Bunch and berry large; skin thick; flavour rich and sprightly, which characteristic is well retained even when the fruit is kept under ordinary circumstances. As a winter grape it probably heads the list.

Woodruff (*Labrusca*).—Said to be a cross between Concord and Catawba; vine vigorous, short-jointed, with thick leathery leaves; bunch medium; berry large, round, light red; foxiness distinctly noticeable; quality fair; cannot be considered good; does not keep well.

WHITE VARIETIES.

Allen's Hybrid (*Vinifera hybrid*).—Is of interest as being the first American hybrid grape, produced nearly forty years ago. Vine a weak grower; bunch medium. Berry small; golden yellow; fine quality; home use.

Amber (*Riparia*).—Originated in Missouri; of the same stock as Elvira; vine a good grower; bunch and berry medium size; the former rather long and loose. A correct estimate of quality can hardly be arrived at as ripened here.

Autuchon (*Riparia hybrid*).—Mr. Arnold, of Paris, Ont., produced this by crossing a seeding of Clinton with Golden Chasselas. A weakly vine, bearing a small white grape; ripening very late; of no value here.

Duchess (*Labrusca hybrid*).—Supposed to be of Concord and Delaware extraction. Vine exceedingly vigorous and productive; bunch medium; very compact. Berry medium size; greenish white; clings well to cluster; flesh tender, with a peculiar breaking quality, and brisk vinous flavour. Because of its firm texture it should prove a desirable market variety. This grape was shown in good condition by Ellwanger & Barry, of Rochester, at the meeting of the Western New York Horticultural Society, 28th January, 1892.

El Dorada (*Labrusca hybrid*).—Produced by Mr. Ricketts, by crossing Concord with Allen's hybrid. Vine vigorous, hardy, fairly productive, but does not always set its fruit well; bunch long, loose. Berry medium to large; when fully ripened, a beautiful golden yellow. The flavour and quality are richer and finer than anything in the vineyard. Too tender for shipment, but should have a place in the garden of every amateur.

Empire State (*Riparia*).—A cross between Hartford Prolific and Clinton, by Mr. Ricketts, of New York, who sold the vine and right of sale, to a Rochester nurseryman for $4,000. It has not fruited in sufficient quantity in this vineyard thus far to describe it accurately. Appears to be somewhat later than Delaware.

Elvira (*Riparia*).—Vine hardy and a strong grower; bunch of medium size; compact. Berry medium, round, green; when well ripened tender, with a fine rich flavour. Judge Mosgrove, the proprietor of a vineyard of considerable size on the Richmond road, finds this a profitable variety, and experiences no difficulty in ripening it. On these grounds it has not reached perfection during any season of its fruitage thus far.

Etta (*Riparia*).—Said to be a seedling of Elvira. Vine a strong grower; very productive. Bunch small; berry medium to large, round, good quality. About a week later than Elvira. Worthy of trial where the season is long enough to ripen it.

Eva (*Labrusca*).—A seedling of Concord, closely resembling Martha; a little later but not superior in any respect.

Irving (*Hybrid?*)—A single vine fruited this year for the first time in the Farm vineyard. Bunch medium; berry large, pinkish white; pulp tender.

Grein's Golden (*parentage?*)—Vine fairly vigorous; productive. Bunch large, loose, somewhat defective. Berry large, greenish white; thin skinned; pulp tender, juicy, pleasant, but not high flavoured subject to mildew. Valuable for home use where it succeeds.

Hayes (*Labrusca*).—A seedling of Concord, originating with Moore's Early. Vine; a weak grower; bunch and berry small, of a rich yellow colour; flesh tender, melting; very good; keeps with ordinary care about a month. For home use only. It should be planted particularly in localities where the summer heat is comparatively limited.

Imperial.—Said to be a seedling of the last, with an admixture of foreign blood, which is quite perceptible in the character of fruit. Bunch and berry medium to large; white, with a pinkish or lilac-coloured bloom; rich and juicy, with the aroma of hot-house grapes. Subject to mildew; it does not ripen to perfection here.

Jessica (*Vinifera*).—Introduced by D. W. Beadle, of St. Catharines, Ont. Vine fairly vigorous. Bunch and berry small; colour, golden yellow; thin skin; pulp tender; good quality; home use in northern sections.

Kensington (*Riparia hybrid*).—Produced at London, Ont., some years ago, by Mr. Wm. Saunders, who pollenized Clinton with Buckland's Sweetwater. This variety, in a remarkable way, combines in fruit and vine the characteristics of both parents. Vine fairly vigorous; wood short-jointed; leaves deeply cut; bunch medium. Berry medium size, oval; white skin, thin; pulp rich and juicy; a grape of first quality, ripening with or a little before Concord; home use. Thus far it has not been propagated to any extent, but its probable value for southern localities, should lead to giving it a more thorough trial by grape-growers.

Lady (*Labrusca*).—A seedling of Concord; vine is lacking in vigour; bunch small. Berry large, round; very agreeable flavour, with slight foxiness. For home use it is heartily recommended on account of earliness and quality.

Lady Washington (*Labrusca hybrid*).—Produced by pollenizing Concord with Allen's hybrid. Vine vigorous, partaking of the character of the female parent; bunch and berry large; pulp rather tough; fair quality. It may be serviceable in southern Ontario. Too late for this vicinity.

Moore's Diamond (*Labrusca*).—Said to be a cross between Iona and Concord. Vine a fair to medium, sometimes weak grower; bunch medium. Berry medium size, golden yellow; flesh tender and melting; good quality; does not keep well; probably too tender for distant shipment. Being earlier than Niagara, it has more value in the colder districts.

Martha (*Labrusca*).—A seedling of Concord; vine of the Concord type, but slower in growth; bunch medium. Berries small, green, pulpy, often uneven in size, foxy, medium quality; season of Concord; not a sure crop here.

Missouri Reisling (*Riparia*).—A seedling by Mr. Grein from Taylor; a white grape, quite too late for most points in Canada.

Niagara (*Labrusca*).—Said to be a cross between Concord and Cassady. Vine a vigorous and strong grower; hardy, productive. Bunch large, shouldered; berry large, round, pale yellow, as ripened in the Niagara and eastern districts. Good quality, with a well-marked foxy odour. It is subject to mildew here, and ripens only in favourable seasons.

Noah (*Riparia*).—A seedling of Taylor. Vine makes a strong annual growth. Like all seedlings of Taylor. in this vicinity it mildews badly and is too late.

Prentiss (*Labrusca*).—A seedling of Isabella. Vine a good grower; bunch compact and large. Berry medium size; flavour pleasant, though somewhat foxy; not of high quality. In some districts it is considered a good market variety. Too late in this vicinity for that purpose.

Pocklington (*Labrusca*).—A seedling of Concord. One of the most vigorous and hardy of vines. Bunch large; berry large; fair quality, with a distinct foxiness. As it carries well, it is a promising market sort where it ripens. Too late for northern Canada.

PERKINS (*Labrusca*).—Vine lacking in vigour; fruit drops badly. Bunch medium. Berry small to medium; colour greenish white, turning to pale lilac, tinged with red; flesh juicy, with considerable foxiness; has no merits as a keeper. Shrivels and losses flavour rapidly.

PEARL (*Riparia*).—A seedling of Taylor; very late, and utterly worthless on account of its liability to mildew.

ROGERS No. 34 (*Hybrid*).—Vine vigorous and productive; bunch long loose. Berry large, light yellow; skin thin; flesh tender, rich and melting; first quality. Like a number of the Rogers varieties, it is not a perfect self-fertilizer, and should not be planted in an isolated position. Valuable for home use.

TAYLOR (*Riparia*).—An old Kentuckian variety brought into notice many years ago. Vine makes satisfactory growth, but is badly affected with powdery mildew; bunch and berry small; poor quality; not adapted to our soil and climatic conditions.

TRIUMPH (*Labrusca hybrid*).—A cross between Concord and a foreign variety, by Campbell, of Ohio. Vine not hardy here. Fruit attractive, on account of size and appearance, but its value in Canada is quite doubtful.

TRANSPARENT (*Riparia*).—A seedling of Taylor. Vine vigorous; very productive; bunch small, very compact; berry very small, unattractive. As a wine grape it is worthy of a trial in sections to the south of this.

WILDING (*of Riparia and Labrusca extraction*).—Vine a fair grower, apparently hardy. Bunch rather small; berry medium, green, very thin skinned; pulp tender, of first quality; subject to mildew. Home use south of this point.

STRAWBERRIES.

The spring of 1891 was most unfavourable to fall-set plants, of which the new plantation is composed. Cold weather and high winds, coupled with the somewhat sandy nature of the soil, wrought much damage to a "stand" which the previous autumn was almost perfect. On this account reliable comparisons between varieties could not be made.

METHODS OF PLANTING.

In setting out the new plantation in the fall of 1890 two methods of planting were adopted. Half of each variety was planted in the ordinary way, by (1) making a hole deep enough to admit the roots without doubling them up, then spreading them carefully in all directions as much as possible, filling in the soil by hand, and taking care to compact it firmly; (2) The remaining half was planted by striking a spade across the line of the row. Into this cleft the fan-shaped roots were inserted and spread as much as the opening would admit, and the earth then packed well about them. This method requires a man and boy—the former to operate the spade, the latter to set the plants—and is much more rapid than the old style.

Results reached are:

1. A perfect stand of plants was obtained from both methods.
2. No difference in the health and vigour of the plants comprising the two sets was noticed.
3. The spade method being more rapid, cheaper, and equally satisfactory, is therefore recommended.

RENEWING OLD BEDS.

When old beds have become run out and lacking in vigour, it is occasionally found convenient to renew them without losing a crop. This may be accomplished by the following plan: As soon as the crop of berries has been picked, remove the mulch from between the rows, dress these interspaces with rotted manure, wood ashes, or some commercial fertilizer, which should be well worked in with a small plough or cultivator; then train the runners into these spaces. By the middle of September the young plants will have become firmly rooted, when a line is stretched on either side of the old rows, and the young plants separated rapidly from the old with an edging knife, or sharp spade. In small plantations it will be found more convenient to use a spade than a plough in turning under the old plants; where larger, a plough will be found to be more economical.

Raspberries.

(Propagated from Suckers.)

"With a view to test the advantage as well as cost of protecting during the winter by laying down and covering with sufficient earth to hold them in position, half of the plants of each variety were pruned and treated in this manner. The relative returns from the two sections will be carefully noted next year." (Report for 1890.)

RESULTS.

1. The first effect was to hasten the ripening of varieties so treated from five to eight days.
2. With such hardy varieties as Turner and Hansel, the increased product and earliness did not more than repay the cost of such protection.
3. With varieties of the grade of hardiness of Cuthbert, Marlboro', Herstine, Heebner and Golden Queen, productiveness was increased 16 to 22 per cent. This, with the advantage of increased earliness, much more than repaid the cost of protecting.
4. It is fair to conclude that in this and similar latitudes, suckering raspberries of nearly all varieties are left unprotected at an actual loss to the owner.

YIELD OF VARIETIES.

Standard Red sorts yielded in the following order: *Cuthbert, Hansel, Turner, Marlboro', Heebner, Reider, Clark, Hudson River Antwerp, Rancocas.*

Black Caps—*rooting from the tips—Shaffer, Hillborn, Gregg, Mammoth Cluster, Souhegan,* were productive in the order named and may be considered valuable in the same order.

*Yellow.—Golden Queen—*Is the best yellow berry for market and home use.

Brinckle's Orange, on account of its exceptionally fine quality, should be grown in a limited way for home consumption.

SEEDLINGS AND HYBRIDS.

With the experience of the past three years as a guide, a new trial plantation has been made by selecting the most promising, from the original large collection of seedling and hybrid raspberries, also the best of the named varieties of raspberries and blackberries.

The transplanting was done in October, after which a furrow was thrown up on each side of the rows, and the whole surface of the ground liberally manured. In this plot there are now 105 varieties of selected seedlings and hybrids; 35 named varieties of Black and Red Caps, and 20 kinds of blackberries. As a rule, there are 100 plants of all named sorts, and a quarter that number of the seedlings and hybrids.

Blackberries.

Paying results were obtained by laying down all varieties of blackberries in the fall of 1890. In order to accomplish this successfully the canes should not be pinched, before they have attained a height of from 3 to 3½ feet. Care must be taken in bending the canes down to loosen the soil at the side of tho root to which the plant is inclined, thus preventing the cane from snapping off at the base. As noted last year, *Agawam, Snyder, Stone's Hardy* and *Western Triumph,* with the addition of *Nevada,* which did exceptionally well the past season, can be recommended with confidence.

Currants.

Red and white currants gave satisfactory returns the past season. In point of productiveness the principal red varieties ranked in the following order: *Victoria, Raby Castle, Cherry, Fay's Prolific, Red Dutch, Red Grape, London Red, Prince Albert.* White: *White Grape, White Dutch.*

Black currants in low situations were a total failure on account of late frosts. A large number of seedlings of this class on higher ground fruited very freely.

Gooseberries.

Were unusually free from mildew during the early part of the season, but the disease developed considerably on unsprayed plants later in the summer.

Downing yielded twice the number of boxes per plant of any other variety. *Houghton,* though healthy and fairly productive, is small. *Pearl* gives increasing satisfaction, and without doubt will take a leading place among native gooseberries.

III.—VEGETABLES.

A large amount of data has been collected bearing upon various phases of successful vegetable growing, as well as facts regarding varieties, but for the present it is thought best to confine a report to the enumeration, with brief descriptive notes, of the most reliable and satisfactory varieties in each class, based upon our experience during the year. The soil upon which tests were conducted is a sandy loam in good condition, having been previously used for growing strawberries.

Cut-worms were kept in check by the use of poisoned traps, made by soaking clover hay or freshly-cut weeds in a strong mixture of Paris green in water. This method of destroying cut-worms has been advocated at length by Mr. James Fletcher, the Entomologist of the experimental farms, and is well worthy the careful attention of amateurs and market gardeners. Hellebore was also used with a fair degree of success in checking the injury caused by the cabbage root maggot, as was pyrethrum when applied as a specific for the cabbage worm.

Beets.

A comparative test of thirty-one varieties was made the past season, including a number of the best French and English sorts.

The following list covers the most valuable of those tested, given in order of maturity.

Blood Turnips.—Round, smooth, dark red, maturing early; strain well selected; inclined to become hollow late in the season.

Eclipse.—Turnip-shaped, dark red, reaching edible maturity shortly after the preceding. Tops large; may be used for greens.

Lentz.—Round, medium in size and season, very even and regular. Foliage green with red veins; a desirable medium early sort.

Covent Garden Red.—Half long, light red, fair size; very even and desirable.

A few varieties usually grown for greens deserve special mention as ornamental plants. In bedding they might be used with good effect. Among these may be mentioned Dells Black Leaved, Reines des Noires, and Swiss Chard.

Cabbage.

Out of 60 varieties included in the experimental plots, the following will, for home use or market, probably prove most satisfactory:—

EARLY.

Early York.—An old and well-known variety; generally a sure header; oval in shape; very solid, varying in weight from 2 to 9 pounds.

Express.—Same season as last; type not quite as well fixed; heads round and solid; weight, 2 to 6 pounds.

Premier.—Roundish oval, vigorous thick leaf; a good early market sort, which averaged 5½ pounds per head this season.

Wakefield.—This is a sort of generic name, with which are associated Selected Early Jersey Wakefield, Early Jersey Wakefield, Jersey Wakefield, Long Island Wakefield, and Charlston Wakefield. There was practically no difference in the time of maturing of any of these. Seedsmen are too fond of prefixing adjectives to old sorts, or to fancied improvements, thus unnecessarily multiplying varieties.

Long Island Wakefield (Henderson) gave the greatest number of solid heads for the number of plants set out. Heads averaged 6 pounds.

Aroostook.—Heads round; very solid; strain is not completely fixed, but a very promising early sort, averaging 6 pounds per head.

MEDIUM EARLY.

Montreal Market (Evans).—Medium to large; round flat-topped; heads well and solidly; heaviest head, 15 lbs.; lightest, 5½ lbs.

Succession.—Last year as well as the past season, this has proved itself one of the most valuable midsummer varieties; average weight this year, 11 lbs.

Schweinfurt (Simmers).—Large, flat, solid; a sure header; averaging 10 lbs. per head.

LATE VARIETIES.

Fottler's Brunswick.—Large, round, leafy; one of the best medium early or late market sorts. Average weight, 11 lbs.

Brunswick Short Stem (Pearce).—Much like last, but later; heads of the largest size, round, flat, weighing on an average 12 lbs.

Hyde Park (Hallock).—One of the largest and best in the list for late market; head round solid; average weight, 13½ lbs.

Mammoth Rock Bed (Henderson).—Probably the best of the large late-pickling sorts.

Drumhead Savoy (Pearce).—Medium size; very firm and a sure header; average weight, 5 pounds; one of the best varieties for winter storing.

CAULIFLOWER.

Owing to the extreme drought already referred to, very few of the thirty varieties of this vegetable gave satisfactory and reliable results; many failed to head, while others, especially early varieties, headed prematurely, consequently fell below the characteristic size. *Early London* and *Autumn Giant* headed best and gave the most satisfactory returns. The latter is exceptionally large, and a sure header.

CELERY.

A varietal test, in which thirty kinds of this vegetable were included, was made. Seed sown on 31st March appeared in fifteen to twenty days. The lowest per cent found to germinate was 17 and the highest 74 per cent. After transplanting twice and cutting back once, it was set out in well-manured trenches on 22nd June. All varieties were twice handled before earthing the 1st September. Treated in this way, there was not more than five days difference in the time of edible maturity of any variety. But this early earthing up had a very deleterious effect upon the keeping quality of the late sorts; nearly all of this class were affected with heart or stalk rot—a disease said to be of bacterial origin—which, in a few cases, entirely destroyed some varieties, and in all cases prevented their being kept for more than a few weeks. The spread of this disease may have been peculiarly favoured, and aggravated by the unusually hot weather during September. Varieties earthed two weeks latter did not suffer to the same extent.

Last year the following varieties were recommended, and there does not seem to be any good reason for changing the list this year:—

Paris Golden Yellow (Steele Bros.)
White Walnut (Henderson).
Half Dwarf (Henderson).
White Plume (Ewing).
Sandringham.
Giant Golden Heart (Vaughan).
Red Giant Solid.

Golden Heart (Pearce)—A small growing, rather early variety; good quality; very satisfactory this year.

Giant Pascal.—One of the best tall-growing late sorts; generally crisp, with fine nutty flavour.

PEASE.

The following selection, out of sixty varieties on trial, proved most satisfactory, season, yield and freedom from mildew considered:—

Early.

Dan'l O'Rourke, R. N. Yorker, Vick's Early and *Lightning*, tall-growing sorts, needing stakes or trellis. These were in edible condition 55 days after sowing, though much retarded by late spring frosts and cold.

First and Best, First of All, and *Philadelphia* are half-dwarf sorts, reaching edible maturity about the same time.

Second Early.

Little Gem, Small French and *Blue Peter* reached edible condition in 70 days after sowing. *American Wonder*, a dwarf variety, is a few days earlier, and might be classed with the early sorts; on most soils it is not sufficiently productive for market. *Bliss' Abundance* and *Yorkshire Hero*, very productive varieties of medium height, are ten days later than the first mentioned of this group.

Late.

Sanders Marrow, Black-eyed Marrow-fat, and *White Marrow* complete the season; fit for table use 90 days after sowing.

Edible Podded.—A number of so-called edible podded varieties are now on the market. Some of them are extremely palatable, and valuable additions to our list of vegetables.

Dwarf Sugar, which is an evident misnomer, as it grows to a height of 4½ feet, reaches edible maturity in 70 days. One of the best.

Tall Sugar, about 15 days later than the last, and somewhat taller; is very desirable on account of the size and succulence of the pods.

PEPPERS.

Good treatment of tomatoes will, when applied to peppers, give fair results, though the number of varieties suited to this latitude is proportionately less than in the case of tomatoes. A germination test showed that the seed of many varieties were lacking vitality, six out of thirty giving a return of less than 7 per cent—practically worthless.

The following are among the earliest to ripen and most productive, therefore best adapted to the conditions of this and similar localities:—

Cardinal.—Ripe, August 10; fruit pendant, scarlet, 4 to 6 inches long, pointed; very prolific; one of the best market sorts.

Ruby King (Pearce).—A vigorous grower; fruit very large, pendant, handsome and attractive. Beginning to ripen August 27.

Squash (Henderson).—A very distinct variety, the fruit much resembling, in form and colour, a tomato. Plant a fair grower and fairly productive; medium to late, ripening with the last.

Golden Dawn (Henderson).—Vigorous grower; fruit large, bright yellow. Prolific and medium early.

Coral Gem (Northrup and Braslau).—A dwarf variety; fruit small oval, bright scarlet; held upright in such a manner as to make it a very desirable pot-grown plant for house decoration. Useful, also, for pickling.

Tomatoes.

The work of testing the old, and the many new varieties constantly being introduced, was carried on again this year. The experimental plots contained fifty-seven varieties of eight plants each. The seed was sown in boxes in the green-house on 16th March, pricked into other boxes 2 inches apart on 10th April, and potted about three weeks later, using 3-inch pots. Setting out was delayed considerably by the cold weather of May, and did not take place until 4th June.

In testing the seed of each variety much variation was found. The highest per cent found to germinate in any case was 92 and the lowest 20 per cent. The average vitality of the entire collection was found to be 63·1 per cent. In view of this wide variation, it is essential, for market gardeners especially, to carefully test samples of seed in advance of the sowing period, in order to gain an intelligent idea of the probable return, and quantity of seed required. Where considerable quantities are used, it will be economical to purchase at an early date, small samples for testing purposes before ordering the main supply.

With a view of testing the effect of mulching as a rot preventive, a strip running across the plots, including several varieties, was heavily mulched with coarse strawy manure, containing, however, a very small proportion of fertilizing material. The fruit was carefully examined, at various times during the ripening season, but no appreciable difference in quality or quantity could be detected, although the crop of fruit on the mulched strip was somewhat later in ripening than on those unmulched. In this and similar climates it is of prime importance to select early-ripening varieties, start them early, transplant or re-pot frequently, and set out strong plants after danger of spring frosts is past.

The following list includes the twelve earliest varieties, all set out on 4th June: *Electric* or earliest (Northrup, Braslan, Goodwin & Co.) gave the first ripe fruit on 26th July, followed by *King Humbert*, *Atlantic*, *Early Ruby*, *Early Advance*, *Conqueror*, *Acme*, *Canada Victor*, *Mikado*, *Hathaway*, *Cumberland Red*, *Thorburn's Long Keeper*.

The following twelve varieties gave the largest yield of ripe fruit up to 15th September:—

Hubbard's Early,	General Grant,
King Humbert,	Henderson's 400 (Ponderosa),
Horsford's Prelude,	Conqueror,
Mikado,	Canada Victor,
Early Ruby,	Cumberland Red,
Thorburn's Long Keeper,	Hathaway.

The following twelve varieties gave the largest yield of fruit ripening before frost:—

Horsford's Prelude,	Canada Victor,
Thorburn's Long Keeper,	Cumberland Red,
Essex Hybrid,	Climax,
Hubbard's Early,	Volunteer,
Mikado,	Mitchell's No. 1,
Golden Queen,	Conqueror.

EFFECT OF DIFFERENT FERTILIZERS.

The accompanying table gives the results from the use of various fertilizers as affecting productiveness. The soil upon which the plants were grown was in a fair state of fertility, and ordinarily would not be considered as needing manure of any kind; yet it will be seen that the application of the different fertilizers was in each case helpful.

TOMATOES.

EFFECT of Fertilizers—Comparative Yields from One Plant of each Variety.

Fertilizers.	Paragon.		Queen.		Trophy.		Electric.		Table Queen.		Early Ruby.		Sunrise.		Total amount of fruit ripened.	Total amount of fruit unripened.	Average yield per plant ripe fruit.
	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.			
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Nitrate of soda	11	2	7	3	16	4	6	......	19	4	22	......	13	5	94	18	13·2
Muriate of potash	13	4	14	4	15	4	12	6	13	1	16	4	16	4	99	27	14·1
Superphosphate No. 1	15	5	9	5	19	7	10	......	19	4	23	5	18	7	112	33	16·0
Wood ashes	15	6	20	5	12	3	21	......	18	1	16	1	14	6	116	22	16·1
Barnyard manure	19	7	15	3	20	5	16	....	18	1	24	3	15	8	127	27	18·1
Unfertilized	9	3	10	5	8	3	12	5	16	1	21	6	13	5	89	28	12·7

Nitrate of soda, muriate of potash and superphosphate No. 1, were used in two applications at the rate of 300 lbs. to the acre. The first application was made at time of transplanting; the second three weeks later; wood ashes applied in the same way at the rate of 50 bushels per acre; barnyard manure at the rate of 6 tons per acre.

IV.—FORESTRY.

Distribution of Seedling Forest Trees.

This line of experimental work, inaugurated in 1890, has met with such hearty approval and co-operation at the hands of the settlers of the North-West Provinces and Territories, that it was decided by the Honourable the Minister of Agriculture to double the number of seedling trees sent out the first year. Accordingly, about 200,000 trees were distributed, each package being prepared for mailing in the same manner as that described in the report for 1890.

The records show that 260 post offices in Manitoba received 1,022 packages, while 130 post offices in the North-West Territories received 883 packages. Ninety-five bundles were distributed throughout the Dominion to specialists who are particularly interested in forest extension and preservation.

With a few exceptions, each package contained the following selection:—

10	Green ash.	Fraxinus viridis.
10	White ash.	Fraxinus Americana.
2	Soft maple.	Acer dasycarpum.
2	Sycamore.	Platanus occidentalis.
2	Linden.	Tilia Americana.
20	American elm.	Ulmus Americana.
6	Manitoba elm.	Ulmus Americana var?
2	Black cherry.	Prunus serotina.
2	Black walnut.	Juglans nigra.
2	Honey locust.	Gleditschia triacanthos.
5	White birch.	Betula Alba.
3	Canoe birch.	Betula papyracea.
2	American mountain ash.	Pyrus Americana.
4	Yellow cottonwood.	Populus monolifera var?
4	Riga pine.	Pinus rigænsis.
4	Norway spruce.	Picea excelsa.
1	Arbor vitæ.	Thuja occidentalis.

About 500 Dwarf Mountain pines (*Pinus Montana*) were also sent out, being occasionally substituted for varieties which were exhausted before the total number of packages was completed. More than 300 reports have been received, going to show that the trees, with few exceptions, arrived in good condition and made fair progress during the first season.

It has, however, been uniformly noted that *Honey Locust, Black Locust, Black Walnut* and *Russian Mulberry* did not ripen their wood sufficiently to escape injury by the first autumn frost. It is not expected that these varieties will succeed at any point in the noth-western country. Settlers are specially cautioned in regard to the Russian Mulberry, which is often unwarrantably lauded on account of alleged hardiness, and are advised to be content for the present with the best varieties of native trees; when with these a certain amount of shelter has been obtained, other less reliable varieties may in a limited way be tested.

A collection of forest trees of larger size was also sent by express to the superintendents of Indian agencies, to officers commanding the various posts of mounted police, and to each of the trial gardens of the Canadian Pacific Railway.

Distribution of Tree and Vegetable Seed.

In addition to the seeds sent out in December, 1890, small bags containing from three to five thousand seeds each have been distributed as follows:—

Variety.	No. of Bags.	
	Manitoba.	North-West Territories.
Box elder (Negundo aceroides)	1,377	1,188
Green ash (Fraxinus viridis)	613	604
VEGETABLE SEED.		
Asparagus	731	780
Rhubarb	842	780

The samples of asparagus and rhubarb seed were put up in suitable-sized envelopes, with printed instructions for planting and cultivation, and enclosed with the tree seeds.

Of Asparagus, *Conover's Colossal* and *Pulmetto*, and of Rhubarb, *Carleton Club*, *Paragon* and *Stott's Mammoth*, were the varieties distributed.

Miscellaneous Distribution.

One hundred and fifty packages, including 12,500 plants, were sent out to various parts of the Dominion, more or less remote from nursery men. The following varieties were used in making this collection:—

SMALL FRUITS.

Raspberries.—Cuthbert, Turner, Hansel.
Strawberries.—Crescent, Bubach, Capt. Jack.
Apple Trees.—Sacharine, Bode, Silken Leaf, Little Hat, Blushed Calville.
Shrubs.—Rosa rugosa.

FOREST TREES.

Riga pine, Norway spruce, green ash, white ash, box elder, American elm, white birch and soft maple. Appropriate instructions accompanied each package. *See* report for 1890, page 94.

V.—FUNGICIDES.

Apple Scab.

Some experiments were conducted last summer with the co-operation of Messrs. Wm. Craig, jun., and J. M. Fisk, of Abbotsford, Que., which were designed to throw light upon the following points in the treatment of apple scab:—

1. The relative efficacy of copper carbonate in suspension and solution.
2. The relative efficacy of copper carbonate unwashed (a modified eau–celeste) in solution and in suspension.
3. The possibility and effect of using Paris green with these mixtures.

The results are given in detail in the accompanying table, and may be briefly summarized as follows:—

1. Paying results were obtained from the application of all of the mixtures.
2. In no case was the foliage injured.
3. The unwashed solution (a modification of eau–celeste) gave the best results, and the same preparation in suspension the lowest returns.
4. The addition of Paris green to the fungicides at the time of the second application had no injurious effect upon the foliage, and increased the quantity of sound fruit 8·2 per cent.

TABLE showing per cent of Fruit of First, Second and Third Quality, also per cent of Sound and Wormy Fruit.

Copper Carbonate.	Per Cent First Quality.	Per Cent Second Quality.	Per Cent Third Quality.	Per Cent of Wormy Fruit with Paris Green.	Per Cent of Wormy Fruit without Paris Green.	Per Cent in favour of Paris Green.
1. Solution..........	38·8	46·6	14·5	21·6	26·6	5·
2. Suspension	33·5	52·	14·5	16·9	25·9	9·
3. Unwashed Suspension	33·	50·	17·	10·5	22·3	11·8
4. Unwashed Solution.....	42·5	46·5	11·	8·5	15·	6·5
5. Unsprayed	18·	51·	31·	18·	27·	9·

COMPARATIVE RESULTS.

Copper Carbonate.	Percentage Scale. 10 20 30 40 50 60 70 80 90 100		
(4.) Unwashed Solution..........	First Quality.	Second Quality.	Third Quality.
(1.) Solution..............	First Quality.	Second Quality.	Third Quality.
(3.) Suspension......................	First Quality.	Second Quality.	Third Quality.
(4.) Unwashed Suspension...........	First Quality.	Second Quality.	Third Quality.
(5.) Unsprayed	First Quality.	Second Quality.	Third Quality.
With Paris Green	Sound Fruit.	Wormy.	
Without Paris Green........	Sound Fruit.	Wormy.	

DETAILS OF THE EXPERIMENT.

The trees selected were of the Fameuse variety planted fifteen years ago, and having made good growth are now of fair size. Six trees were set apart for each test. Three applications were made in each case, the first one on the 22nd of May, when the leaves were about half-formed and the blossoms just beginning to open. At the time of the second application, 8th June, Paris green at the rate of 1 lb. to 200 gallons of water was added to each mixture when *fully diluted.* This was applied to three trees in each lot, while the remaining trees were left as checks. On the 20th of June they received the third treatment, and in the same manner as that on 22nd May. The apples were carefully hand-picked and graded, the per cent of wormy fruit in a representative bushel of each class being ascertained by actual count, and the total percentages deduced therefrom.

FORMULÆ.

The following are the formulæ used in the experiment detailed above, of which the individual results are shown in the tables.

1. Solution.

Carbonate of Copper	1½ oz.
Ammonia	1½ pts.
Water	25 galls.
Paris Green (added in second application)	1¾ oz.

2. Suspension.

Carbonate of Copper	1½ oz.
Water	25 galls.
Paris Green (added in second application)	1¾ oz.

A slightly increased quantity of Paris green was used in this instance, as without the ammonia solvent there is less danger of injuring the foliage.

3. Unwashed Solution.

Has the constituents of No. 1 present in the same quantities.

In Bulletin No. 10 the following directions were given, which it is thought well to repeat here:—

HOME MANUFACTURE OF COPPER CARBONATE.

As the precipitated form of carbonate of copper is not always obtainable from druggists, directions are herewith appended for the easy preparation of this material at a cost much less than the usual wholesale price.

In a vessel capable of holding two or three gallons, dissolve 1½ pounds of copper sulphate (blue vitrol) in 2 quarts of hot water, using the crystalline form. This will be entirely dissolved in fifteen or twenty minutes. In another vessel dissolve 1¾ pounds of sal soda (washing soda), also in 2 quarts of hot water. When completely dissolved pour the second solution into the first, stirring briskly. When effervescence has ceased fill the vessel with water and stir thoroughly; then allow it to stand five or six hours, when the sediment will have settled to the bottom. Pour off the clear liquid without disturbing the precipitate, fill with water again and stir as before; then allow it to stand until the sediment has settled again, which will take place in a few hours. Pour the clear liquid off carefully as before, and the residue is *carbonate of copper.* Using the above quantities of copper sulphate and sal soda, there will be formed 12 ounces of copper carbonate.

Instead of drying this, which is a tedious operation, add four quarts of strong ammonia, stirring in well; then add sufficient water to bring the whole quantity up to 6 quarts. This can be kept in an ordinary two-gallon stone jar, which should be closely corked.

FORMULA.

Each quart will contain 2 ounces of the carbonate of copper, which, when added to 25 gallons of water, will furnish a solution for spraying, of the same strength and character as that obtained by the use of the dried carbonate, and one which can be prepared with little labour, and kept ready for use throughout the season.

CARBONATE OF COPPER IN SUSPENSION.

When the carbonate is to be used in suspension, instead of adding the ammonia to the sediment, add water until the whole quantity is made up to 6 quarts. Stir this thoroughly until the sediment is completely suspended (entirely mixed throughout) and pour the thick liquid into a suitable jar, when it will be ready for use.

Before using shake the contents thoroughly, so that all the sediment may be evenly distributed in the water. Pour out a quart of the thick fluid and mix in the 25 gallons of water. The *unwashed solution* is prepared by simply pouring the two solutions together (copper sulphate and sal soda), and when the effervescence has ceased, pouring off the top or supernatent liquid; add four quarts of strong ammonia, stirring in well, then add sufficient water to bring the whole quantity up to 6 quarts. The formula is the same as that already given above.

The *unwashed suspension* is prepared in the same way, water taking the place of ammonia in making the quantity up to 6 quarts.

GRAPE MILDEW.

As stated elsewhere, grape mildew (*Peronospora viticola*) was effectually kept in check in the farm vineyard by three applications of ammoniacal copper carbonate, as recommended in Bulletin No. 10.

With the co-operation of his Honour Judge Mosgrove, an extensive grape-grower on the Richmond road, a series of experiments were planned and designed: (1) To show the relative effectiveness of different strengths of copper carbonate in solution and in suspension; (2) To show the benefit of spraying the vines, immediately on being uncovered, with copper sulphate.

The results, owing to the appearance of an unlooked for and unexpected disease (*Sphaceloma ampelinum*), have not been conclusive, and the work will be continued another season, when it is hoped the objects of the experiment will be attained.

Little if any mildew appeared in any case upon the fruit of those treated, though in a few instances the foliage was affected.

The first application was made on 22nd May, using a solution of copper sulphate, 1 lb. to 25 gallons of water. This was followed by four applications of the ammoniacal copper carbonate, made on the following dates: 2nd, 13th and 30th June and 31st July.

While this treatment was generally satisfactory in the case of the downy mildew, it was not so with "bird's-eye rot" (*Sphaceloma ampelinum*). In order to rid the vineyard of this pest, treatment was commenced this fall by carefully burning all rubbish and trimmings, and spraying one-half of the vines with a strong solution of copper sulphate, the other half with iron sulphate. Next spring, on the vines being uncovered, they will be again treated with the copper and iron solution, followed by dilute Bordeaux mixture and ammoniacal copper carbonate, used in a comparative way. It is hoped that by this treatment both the bird's-eye rot and downy mildew will be controlled.

GOOSEBERRY MILDEW.

Comparisons were made as to the effectiveness of copper carbonate, in solution and suspension in different proportions, and potassium sulphide used also in varying quantities. While the disease (*Sphaerotheca mors-uvæ*) was not as prevalent as usual this year, yet on the European varieties and seedlings it was sufficiently active to make the results quite conclusive. These are summarized as follows:—

Five applications were made in each case:

1. Potassium sulphide, 1 oz. dissolved in three gallons of water, gave the best results, keeping the foliage practically healthy and free from disease during the whole season.

2. Potassium sulphide, 1 oz. to four gallons; stood second in order of effectiveness.

3. Ammoniacal copper carbonate, 3 oz. to twenty-five gallons; stood third; fairly effective.

4. Suspension mixtures of copper carbonate did not give a sufficient degree of immunity to pay for cost of materials and time of application.

REPORT OF THE CHEMIST.

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

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

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

The analytical data contained in the following pages and obtained in the laboratories of the experimental farms embrace the results of work of a very varied character. Assistance both by experiment and analysis has been rendered during the past year to the numerous branches of agriculture, and it is confidently hoped that the information here found will prove of much practical benefit to the dairymen, the horticulturists and the general farmers throughout the Dominion.

The increasing interest taken by farmers in this department of the Experimental Farm system has resulted in an increased demand upon our time, both in the matter of analysis of samples sent for examination, as well as in answering enquiries from those seeking advice and information. With regard to the latter, it will suffice to say that over 1,200 letters have passed, in 1891, between myself and correspondents on matters pertaining to the science and practice of agriculture. Respecting the accumulation of samples of substances forwarded for analysis by farmers, I can but repeat what I have said in a former report. Although a large number of these have been examined and reported upon, as the present report testifies, many still await analysis for lack of time. In addition, there are the experiments and analyses planned and carried out by this department. The results of this original research I deem of great value to the Dominion as a whole. It is a branch of the work I am anxious to develop more and more as time and assistance permits. All this points to the fact, that in order to cope successfully with the work of the chemical department in the future, further skilled help will be required in the laboratories.

During the year addresses have been delivered at several conventions and meetings of farmers' institutes on agricultural topics. The large attendance at these meetings, and the keen interest taken by those present, as evinced by the lively discussions which usually follow the addresses, clearly show that the farmers are not only eager to learn, but also ready to avail themselves of these opportunities for increasing their knowledge in agriculture.

For the convenience of readers and for ready reference, I have classified the matter in the present report, according to the plan adopted last year. The following brief epitome outlines the subjects treated in the following pages:—

PART I, SOILS.—Twenty-four soils have been analysed during the past year. Many of these were virgin soils and included samples taken from the surface and subsoil. These represent the character of the soil over comparatively large areas. Among those examined were several specimens of so-called alkali soil from Manitoba and the North-West Territories. Sufficient data have not as yet been obtained to enable a complete diagnosis of the cause of the apparent barrenness or poisonous nature of these soils, nor can we as yet advise with confidence any treatment for their amelioration. The remarks on the work done in this connection, however, will, it is hoped, assist in some measure, by outlining probable methods for their improvement. The investigation into the character of these soils will be continued during the coming year

With regard to the virgin soils of Manitoba and the North-West Territories in general, I may state that the chemical data emphatically point to their excellence and great fertility.

Some soils from the district of Muskoka, as well as others from Ontario, Quebec and Nova Scotia, have also received attention.

It would be well to emphasize that more analytical results are required before inferences as to the relative fertility of districts in Canada can be drawn. In the meantime the analyses here given, together with the deductions made, will serve to indicate the general character of many classes of our soils, and assist in suggesting the most economical and profitable means for their improvement.

PART II. NATURAL FERTILIZERS.—There is here included the analyses of twenty-seven samples of swamp muck, mud and peat from different parts of Canada. Their composition is tabulated and their use and value as fertilizers explained. Analyses of eel grass and of spent tan-bark, made at the request of correspondents, are here given. The results of an examination of a sample of gas liquor are also stated.

PART III. FODDERS, PLANT AND ANIMAL PRODUCTS.—*Roots.*—The chemical examination of roots has formed a part of this work during the past season, and this chapter comprises the analyses of several varieties of carrots, turnips, mangels and sugar beets grown on the experimental farm at Ottawa. Their composition is given in tabular form, which allows of an easy comparison of their food values. The useful and important functions of roots as part of cattle rations are also considered.

Fodder Corn.—The results of experiments with fodder corn carried out at the experimental farm, Ottawa, in conjunction with the Dairy Commissioner, are given. These corroborate and supplement those obtained in 1890, which were published last year in Bulletin 12 of the Farm series. The attention of farmers and dairymen may be specially directed to this work. Further experiments with analyses of fodder corn and ensilage are in progress.

Sugar-beets.—The investigation that has continued for the past three years with a view of ascertaining the value of this crop for sugar manufacture has received further attention. Sixty-four samples of this season's roots are reported on. The average of 21 samples of the same variety grown at Ottawa was 14 per cent of sugar. In another table will be found figures showing the effect of earthing up the roots while growing. This practice resulted in an increased sugar content of 2·2 per cent over that in the same varieties which had only received ordinary field culture. In a third table are the analyses of beets grown at the branch experimental farms and roots sent in from various parts of Ontario.

Sorghum.—A short chapter on sorghum grown at Ottawa is added.

Babcock Method.—In June last a bulletin was issued on the Babcock method for ascertaining the amount of fat in milk. It contained analyatical data obtained in our laboratories proving the accuracy and reliability of this process. As the value of milk depends chiefly on the amount of butter-fat it contains, it becomes at once apparent that any method by which this could be easily and cheaply determined would prove itself most valuable in placing the purchase and sale of milk on a good business foundation. The importance of this subject I consider warrants the insertion of the principal facts and deductions already published. Further experimental work is in progress, with a view to lessening the time employed in making the test by the analysis of composite samples once or twice a week.

Condensed Milk.—In view of the possible development of the condensed milk industry in Canada, several brands of this article were carefully and thoroughly examined.

PART IV. MISCELLANEOUS EXPERIMENTS AND ANALYSES.—*Well Waters.*—In previous publications we have impressed upon farmers and dairymen the necessity of pure water for their stock. During 1891, 29 samples of well-water were sent for examination. The reports on these are here presented.

Prevention of Smut.—Further results of experiments inaugurated two years ago for the treatment of wheat for the prevention of hard smut by certain solutions are here reported. The effect on the vitality of the wheat germ by iron and copper salts, stated in last year's report, have been corroborated, while, in addition, the experiments made this year go to show that copper sulphate and "agricultural bluestone" are far more efficacious for the prevention of the development of smut than sulphate of iron.

Fertility of Soil not injured by Spraying.—An impression was going abroad that the copper solntions used in spraying for fungus diseases was affecting disastrously the fertility of our soils, and an article to this effect lately appeared in one of our leading papers. I have, therefore, written a short chapter, discussing the nature of the application and the chemical changes involved. These all go to show that the assertion that the soils are "poisoned" by this useful operation is fallacious.

Insecticides with Soap Solution.—There are many cases in which it is desirable to apply the insecticide Paris green in soap solution. The question then arose: Is the effect of Paris green weakened by the soap? As I was requested to give an opinion on this matter, I undertook a number of experiments, the results of which are enumerated in this report. They show that the efficacy of this insecticide is not materially affected by being applied in soap solution.

Sprayed Apples are not poisonous.—The last chapter of this report contains the results of an experiment undertaken to afford scientific proof for the refutation of the statement that "apples sprayed for codling moth are dangerous to health, if not positively poisonous, owing to the presence of arsenic of the Paris green used in the operation of spraying."

Some few months ago a statement to this effect appeared in an English horticultural paper. This report received wide circulation in the press generally, and was calculated to do much harm to the Canadian export apple trade. I therefore made a very careful analysis of apples that had been twice sprayed (Paris green 1 lb., water 200 gallons), and though the process employed was one of extreme delicacy, not a trace of arsenic could be detected. This result gives additional support to the statement that the suspicion that Canadian apples are poisonous is entirely without foundation. The publication of this positive proof of the absence of arsenic in these sprayed apples should serve to assure those in England, as well as Canadian horticulturists and apple exporters, that this practice, so useful in prevening the ravages of the codling moth, does not result in poisoned apples.

I again with very much pleasure record my thanks and indebtedness to Mr. Adolph Lehmann, B.S.A., the assistant chemist, for the valuable aid he has rendered me. Mr. Lehmann has devoted himself most assiduously to the work of the department since his appointment, and many of the analytical data contained in this report are the result of his ability and industry.

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

FRANK T. SHUTT,
Chemist, Dominion Experimental Farms.

CHEMICAL LABORATORIES,
CENTRAL EXPERIMENTAL FARM,
OTTAWA.

PART I.

SOILS.

The factors upon which the fertility of a 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 rain-fall, &c.) are the chief. It is very evident, therefore, that chemical analysis alone cannot give all the information necessary to a full knowledge of a soil's productiveness, but that it is exceedingly useful to that end will be apparent to those who have given this important subject careful thought. A good mechanical condition and a favourable climate would prevail nothing for the growth of crops unless those elements necessary for plant sustenance were present. Chemical analysis gives the composition of a soil or the amount of these fertilizing elements; unfortunately, in the present state of the science, it can give us but little exact information as to the degree of solubility or assimilation of such.

The amounts of nitrogen, potash and phosphoric acid, together with other elements of plant food of minor importance, as obtained by means of analysis, I propose to call the "total fertility" of a soil. The value of the knowledge of this "total fertility" in arriving at a soil's relative productive power and its more especial needs, will be apparent upon reflection. For, if on the one hand it proves a soil to be barren of any of those substances necessary for plant development, we know that certain manures must be added before profitable crops can be expected; if, on the other hand, a soil is shown to contain these materials in abundance, we may be sure that with proper working and favourable climatic condition, this food will be converted into assimilable forms. The matter of soil analysis is one of great importance. Unfortunately, it is one involving a very large amount of skilled labour, as the operation is not only lengthy, but must be performed with the greatest care, from the fact that the most fertile soils contain plant food only in comparatively small quantities, and that the differences in these quantities between rich and poor soils are represented by fractions of a per cent. We are, therefore, unable to undertake the analysis of all the samples that may be sent for examination, and are obliged to restrict this work to those specimens of virgin (unmanured and uncropped) soils that are representative of large districts in the Dominion. Several samples, however, of "alkali" and other soils, which demanded special attention, have, in addition to these virgin soils, been examined. In all, twenty-four samples have been analysed during the past year, the composition of which is fully set forth in the following table. Several enquiries have been received by me from Great Britain regarding the composition of our soils, and it is, therefore, probable that this work done in the laboratories of the Farm may be found useful for those in the old country who are considering the various provinces of the Dominion as fields for emigration. It must be distinctly understood that the data here given are altogether too meagre to form the basis of any broad conclusion as to the relative fertility of the lands of any district, yet they may serve in the meantime, and until further work of this character is done, to indicate the nature of some of our soils.

Alkali Soils.

Three specimens of so-called "alkali" soils from the North-West Territories, have been carefully analysed. In each instance the sender stated that such occurred in patches—sometimes only a few feet square, sometimes larger—surrounded by land of excellent fertility. The earth of these spots or patches though black when moist and first turned up, dries out more or less white. In these places the seeds of roots and cereals will germinate, but the plants soon dwindle away, the former attaining only the size of a gooseberry, and the latter turning yellow and dying at the height of a few inches. Mr. Bedford, Superintendent of the Manitoba experimental farm, writes that these patches generally occur in low lands with clay subsoil, which possess very inadequate drainage. My examination of this class of soils is not yet complete, and experiments are now in progress that may result in throwing some light as to their proper treatment. But as far as the work has progressed it would seem—at all events in those analysed—that a large excess of alkali (salts of soda) is not present. There can be no doubt that the amount of soluble inorganic matter, including alkali if present, varies in the upper strata of soil according to the temperature and extent of rainfall, but it is at least worthy of note that those examined, and which have been held to possess alkali, should contain such small quantities of these salts of soda. Whether this may in part be due to the season at which the samples were collected, I am unable to say. In two of those examined, Nos. 4 and 7, there are notable percentages of sulphate of magnesium (epsom salts), and I am now experimenting to ascertain if this salt in quanties such as have been found, is deleterious to vegetation.

The amelioration of such soils is a subject of great importance to the farmers in many parts of the North-West Territories and Manitoba, and rightly forms an object for our investigation. 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 barn-yard 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, though I have not received any strong evidence of its efficacy. Where the alkali is carbonate of soda, gypsum is, however, beneficial in converting this caustic salt into one less deleterious to vegetation. Further work and experience it is hoped will enable us to give more definite information regarding the improvement of these soils, which in other respects would be termed very fertile.

Constituents of Soils.

In Part I of my last report (1890) is to be found a short history of soils in general, as well as an account of the changes which are continually taking place in them due to fermentation processes and atmospheric agencies. I therefore now append only a very brief statement of the amount and functions of the more important elements of plant food in soils, reserving a notice of the special characteristics of the specimens analysed when considering the soils individually.

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 feldspathic 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 calcarious 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 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.

The following notes regarding the source and character of the soils examined, will be found useful when studying the analytical data in the annexed table:—

No. 1. A greyish-black soil of fine texture from the valley of the Fraser River, sent by Wm. Tasker, of Ladner's Landing, B.C. It has resulted from the deposition of the silt brought down by this river. An area of over 30 square miles is said to be covered by soil of this origin and character.

Both from chemical analysis and physical appearance, this soil should be an extremely fertile one, provided other conditions are favourable. It possesses potash, phosphoric acid and nitrogen in quantities considerably above those in rich, fertile soils.

No. 2. A surface soil, from Yorkton, N.-W.T., forwarded by Mr. R. Mitchell, of Carlow, Ireland, who had visited the larger portion of the North-West Territories, with the view of ascertaining the relative advantages offered there to settlers. It is a black, sandy loam, containing a large amount of organic matter and nitrogen. In potash and phosphoric acid it also ranks with the most productive soils.

No. 3. Subsoil to the preceding sample.

A knowledge of the composition of a subsoil is valuable as an aid to good practice. It is often beneficial to mix by deep ploughing the subsoil with that of the surface, and again there are many instances in which such would do more harm than good. The soil under discussion appears to be one fairly rich in the organic and inorganic elements of plant food. The surface soil, derived from the subsoil plus the remains of decayed plants, is richer, as might be expected, in organic matter and nitrogen; yet we find here these present in quantities equalling those possessed by many surface soils held to be fertile. It contains more lime, but less phosphoric acid and potash, than the soil resting upon it. These in the latter are probably more readily available for plant nutrition.

No. 4. A so-called alkali soil, forwarded by John C. Kinghorn, of Saltcoats, N.-W.T. A greyish-black soil, containing all the constituents necessary for plant growth, in good quantities. As before remarked alkali (*i.e.*, salts of soda) are not present in excess, and the cause of the trouble is not very evident.

No. 5. Also an alkali soil, from Geo. W. Stewart, Moosomin. A little darker, but otherwise very similar in appearance to No. 4. The absence of sulphuric acid and chlorine—save in traces—in a soil of this character, is worthy of remark. In lime and magnesia it is considerably lower than the preceding specimen, while in soda it possesses a like amount. In fertilizing constituents it is almost equal to the above subsoil.

No. 6. Sent by Wm. Walsh, Sharp Hill Creek, Calgary, N.-W.T. I consider that this should be a very fertile soil, provided that climatic influences are favourable The analytical data show it contains more than average quantities of the requisite elements of plant food.

No. 7. An alkali soil from 3 miles north of Brandon, Manitoba. Somewhat lighter in colour than Nos. 4 and 5. It is very low in potash and phosphoric acid, but of medium quality as regards nitrogen. It possesses sulphuric acid, chlorine, magnesia and soda in more marked quantities than the soils of this character already considered. The lime, if combined with the carbonic acid, would be equivalent to 13·39 per cent of carbonate of lime, leaving the sulphuric acid and magnesia to form 3 per cent sulphate of magnesium or epsom salts.

It is gratifying to note that chemical analysis bears out very emphatically the impression that the soils of Manitoba and the North-West Territories generally are most fertile, and possess in abundance all those elements necessary to large crop yields.

No. 8. This sample and the four following were sent by Mr. G. S. Wilgress, B.A., barrister of Huntsville, Muskoka, a gentleman who is interesting himself in the agricultural welfare of that district. This soil is from the farm of Mr. Andrew Hart, lots 5 and 6, concession 6, township Sinclair. It is a loose, sandy loam and has never been cropped. The subsoil of hard pan is found at a depth of from 6 to 12 inches. The land was cleared about ten years ago. This is a very dry soil, containing little lime, and less than the average in potash. Phosphoric acid is present in fair quantities. It is only moderately rich in organic matter and nitrogen.

A heavy application of wood ashes, to supply potash, lime and phosphoric acid, would greatly benefit this soil. In the absence of barn yard manure, the turning in of some green crop—preferably clover, or if this will not grow, rye—would improve the absorptive and retentive qualities of this soil, and at the time supply available nitrogen.

Nos. 9 and 10. From lot 17, concession 4, township of Chaffey, the farm of Mr. James Down. Sandy loam, about 15 inches in depth, underlaid by hard pan. No. 10 is taken 12 inches below the surface. Soil was originally timbered with pine and other soft woods, together with maple and birch. It was burnt over five years ago, after which hazel, cherry and other small trees grew. The ground was cleared in 1890, and has never been manured. These soils were taken during a season of drought, and to this fact the low percentage of water may be largely attributed. While in no sense a calcareous soil it cannot be considered deficient in lime. The subsoil contains very much less than the surface soil. The potash, alike in quantities in both soils, is low. In phosphoric acid also they are below the average. The organic matter and nitrogen in No. 9 are lower than in the preceding sample. In the subsoil they are present to about one half the amount of those in the surface soil.

Nos. 11 and 12. From lot 23, concession 14, township of Franklin, the farm of Rev. R. N. Hill. Ground, originally timbered with mixed hardwoods and hemlock, has never been ploughed, but scuffled between the stumps. One crop of wheat, one of oats and two of hay have been taken off, but no manure applied.

The surface soil is a light-grey loam, somewhat clayey in texture. It is exceptionally high in potash* and fair in phosphoric acid, but very low in nitrogen. The sub-soil is very much poorer in the elements, nitrogen practically being absent. In both soils the lime is comparatively high for Muskoka soils.

The analytical work in this series is not yet quite completed, but from the data so far obtained the general character of the Muskoka soil appears to be light and sandy.

The addition of muck would greatly improve their tilth and at the same time add much nitrogenous plant food. As suggested when remarking upon No. 8, wood ashes plentifully supplied and the turning in of some green crop would materially enhance their fertility.

Nos. 13, 14 and 15 are from lot 11, concession 2, township of Russell, county Russell, the farm of Norman E. Otto.

No. 13, a virgin soil (uncultivated and unmanured) is a grey sandy loam with a fair proportion of nitrogen and phosphoric acid. The potash is low.

No. 14. Is a light yellowish sandy subsoil, containing little more than traces of organic matter and nitrogen.

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* The exceptional amount of potash (·58 per cent) in this specimen may possibly be due to the accidental presence of ashes produced in clearing the land.

No. 15. Cultivated surface soil, very similar in colour and texture to No. 13. The nitrogen and organic matter are somewhat lower than those of the virgin soil. In phosphoric acid it is deficient.

No. 16. A loam from Mr. Hiram Walker, Walkervile. A fair soil in composition, with the exception of phosphoric acid, which is low, and of lime in which it is particularly deficient.

No. 17. From J. N. Poirier, Victoriaville, Arthabaska County, P.Q. A sandy loam of fair quality, but rather low in mineral constituents.

No. 18. Subsoil to the above and very similar to it is the proportion of potash and phosphoric acid. For a subsoil it may be considered high in nitrogen.

No. 19. Also sent by Mr. Poirier. It is a black muck of average quality. As a soil it contains an abundance of nitrogen, though this is only slowly rendered assimilable, and a fair amount of phosphoric acid. In potash it is remarkably deficient. The best fertilizer to improve the composition of this soil is wood ashes, which contain from 4 per cent to 9 per cent of potash and about 2 per cent of phosphoric acid; leached ashes are very much poorer in potash. An application of from 60 bushels to 150 bushels to the acre of fresh ashes, according to the nature of the crop about to be grown, would give good results. The texture of this soil would be benefited by a heavy dressing of clay, sand or other inert matter.

No. 20. Subsoil, underlying the above. A greyish sandy soil, containing little potash, but fairly rich in nitrogen. Though not contributing much plant food, its admixture with the surface soil (No. 19) would very materially improve the latter by rendering it heavier.

No. 21. A pinkish red sand, containing very little organic matter and only traces of nitrogen. The amounts of the mineral constituents, including potash and phosphoric acid, are very small.

No. 22. A brownish red, sandy soil, considerably richer in organic matter and nitrogen than the preceding sample. It is rich in potash, though phosphoric acid is present only in small quantities.

Nos. 21 and 22 were from St. Adelaide de Pabos, P.Q., and were forwarded by the Rev. Joseph Dechamplain.

No. 23. A surface soil from the farm of A. S. Ross, Hansford, Cumberland County, N.S. A brown, sandy soil, very poor in nitrogen and phosphoric acid.

No. 24. Sent by John Gillis, South-west Mabou, N.S. A brown, sandy soil, having a fair amount of organic matter and nitrogen. It is comparatively high in potash and low in phosphoric acid. Lime is practically absent.

Analyses of Soils (Air-dried), 1891.

Number.	Soil.	Lacality.	Water.	Organic and Volatile Matter.	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Soda.	Phosphoric Acid.	Soluble Silica.	Sulphuric Acid.	Chlorine.	Carbonic Acid (undetermined.)	Total.	Nitrogen.	Clay.	Sand.
1	Surface.....	Ladner's Landing, B.C.	6·66	16·39	67·32	7·70	·47	·12	·49	....	·27	·02	......	....	·54	100·00	·576	21·55	45·77
2	do	Yorkton, N.W.T.	5·32	13·27	71·80	7·69	·06	·19	·46	...	·20	·09	......	....	·92	100·00	·477	11·56	60·24
3	Sub-soil	do	5·90	7·70	74·07	9·04	·71	1·45	·40	....	·09	·12	......	...	·52	100·00	·123	9·62	64·45
4	Surface.....	Saltcoats, N.W.T.	5·91	12·74	64·68	7·52	2·72	2·63	·32	·08	·20	·11	·17	·02	2·90	100·00	·538	14·03	50·65
5	do	Moosomin, N.W.T.	5·23	11·18	75·16	5·12	·90	·87	·29	·08	·11	·11	traces	....	·95	100·00	·454	15·13	60·03
6	do	Sharp Hill Creek, Calgary, N.W.T.	4·90	11·63	74·09	6·84	·88	·63	·42	....	·16	·17	......	....	·28	100·00	·425	9·69	64·40
7	do	3 miles north of Brandon, Man	4·07	8·55	61·63	6·00	7·48	2·77	·04	·32	·05	·09	2·08	·15	6·77	100·00	·281	4·91	56·72
8	do	Lots 5 and 6, Con. 6, Tp. of Sinclair, Muskoka, Ont	2·42	8·53	82·13	6·30	·10	·26	·11	....	·26	·07	......	....	......	100·18	·181	9·97	72·16
9	do	Lot 17, Con. 4, Tp. of Chaffey, Muskoka	1·53	6·69	85·60	4·98	·39	·31	·07	....	·10	·06	......	....	·27	100·00	·137	15·84	69·76
10	Sub-soil	do do	1·80	3·44	88·63	5·34	·19	·14	·08	....	·17	·22	......	....	.....	100·01	·073	11·90	76·73
11	Surface.....	Lot 23, Con, 14, Tp. of Franklin, Muskoka	5·79	5·95	72·62	13·22	·72	·08	·58	....	·17	15	......	....	·72	100·00	·097	13·70	58·92
12	Sub-soil	do do	7·26	3·44	74·64	12·88	·62	·23	·02	....	·08	·22	......	....	·61	100·00	traces	13·18	64·46
13	Surface.....	Lot 11, Con. 2, Tp. of Russell, Ont.	3·58	6·06	85·65	3·62	·39	·37	·06	....	·21	·09	......	....	.....	100·03	·159	25·86	59·79
14	Sub-soil	do do	1·13	1·38	90·22	5·71	·58	·69	·14	....	·10	·04	......	....	·01	100·00	·012	22·09	68·13
15	Surface.....	do do	4·89	4·88	84·03	4·86	·57	·49	·10	....	·09	·12	......	....	.....	100·03	·136	30·96	53·07
16	do	Walkerville, Ont.	1·55	6·39	83·35	8·10	·02	·66	·33	....	·12	·09	......	....	.....	100·61	·233	11·16	72·19
17	do	Victoriaville, Arthabaska, Que.	7·85	8·00	77·20	5·87	·35	·02	·15	....	·16	·32	......	....	·08	100·00	·273	16·63	60·57
18	Sub-soil	do do	4·98	5·19	81·27	7·35	·28	·47	·16	...	·17	·16	......	....	.....	100·03	·175	13·27	68·00
19	Surface.....	do do	16·65	71·64	3·14	1·78	4·22	·20	·04	...	·22	·29	......	....	1·82	100·00	1·355	......	...
20	Sub-soil	do do	4·09	5·95	82·18	6·13	·67	·03	·03	....	·31	·26	......	....	·35	100·00	·178	15·34	66·84
21	Surface.....	Ste. Adélaïde de Pabos, Que.	·11	1·63	93·66	4·32	·06	·01	·06	....	·04	·05	......	....	·06	100·00	traces	12·28	81·38
22	do	do	2·32	7·67	83·17	5·99	·15	·14	·43	....	·07	·04	.	....	......	100·08	·210	1·87	81·30
23	do	Hansford, Cumberland, N.S.	1·36	3·32	90·87	3·97	·05	·17	·16	....	·06	·02	.....	...	·02	100·00	·089	15·13	75·74
24	do	South-West Mabou, N.S.	2·32	6·81	83·68	6·54	traces	·20	·36	....	·09	....	......	....	.. .	100·00	·207	35·86	47·82

PART II.

MUCKS, MUDS AND PEATS.

In previous reports I have taken occasion to point out and emphasize the value of this class of natural fertilizers; but on account of the importance of the subject, and in order to make the analytical data here given intelligible and easy of comprehension, I propose to again briefly discuss the origin, the uses or application, and the value of these substances.

Muck.—Every true muck consists largely of semi-decayed vegetable matter or humus—the accumulated remains of plants, chiefly aquatic, of many generations. These well-known deposits of swamp muck are the result, principally of the continuous action of water on the fresh and green vegetable matter, converting it into a uniform black or brown mass. The lack of structure in the matter deposited increases with decay. In the upper layers are to be found the roots of plants still growing on the surface, together with much undecomposed woody tissue. The lower portions of the muck deposits show, as a rule, but few roots, the process of decomposition having proceeded farther, destroying all structure. A black or brown material results, light as to weight and powdering easily when dry.

In some degree a measure of the value of a muck may be obtained from its colour, its structure, and the amount of ashes left when a small sample is burnt. A good muck should be dark brown or black, structureless (that is not full of undecayed woods and roots), light and easily powdered when dry, and should yield only a small quantity of light ashes when burnt.

As a supplier of plant food, muck is chiefly valuable for its nitrogen, contained in the organic matter or semi-decomposed plant remains. Under favourable circumstances it yields this nitrogen as food for farm crops.

But in addition to being a nitrogenous fertilizer, its application to many soils improves their tilth or mechanical texture. If a soil be too light or too heavy, the best results cannot be obtained, though all the elements of plant food be present. Muck has the effect of making heavy soils porous, allowing air and water to freely permeate and the roots to find an easy passage. For light and sandy soils and those poor in organic matter muck is most beneficial, improving their retentive powers for moisture and fertilizing elements. For rich soils that require lightening it forms a valuable and cheap substitute for barn-yard manure, on account of its bulk and lasting qualities.

By its further decomposition in the soil, carbonic acid gas is developed. This when dissolved in the soil-water assists in setting free mineral plant food hitherto in a condition unavailable and is probably of service in other ways. The germs of nitrification which render soluble and assimilable the nitrogen of muck, likewise convert and make soluble that in the nitrogen-holding substances in the soil, so that both the mineral and organic plant food of a soil are made more readily available for crops by the application of muck.

As might be supposed, all mucks are not equally valuable. Those which contain large amounts of clay and sand will be poor in organic matter and consequently in nitrogen. Again, as an inspection of the following table will show, the proportion of nitrogen in the organic matter of mucks is very variable. This is partly due to the nature of the vegetation from which the muck has been formed, partly to the degree of decay or fermentation that has taken place, and partly no doubt, in some instances, to a leaching action of the water on the soluble nitrogen-holding compounds. The colour of muck is not an invariable criterion as to its quality; many of a brown colour contain a larger percentage of nitrogen than black samples, which appears contrary to the generally accepted opinion.

Peat.—The difference between muck and peat is perhaps one more of degree than of kind. The vegetable matter of peat, usually present without admixture with clay and sand, has not decayed to the extent that it has in muck, and consequently its nitrogen is not so available for plant food. Peat is composed largely of woody fibre, still undecomposed and still retaining its structure. Its derivation is not largely from aquatic plants, as in the case of muck, and its formation does not appear to have taken place with the presence of that large excess of water conducive to the development of swamp deposits. While not so valuable for immediate use, or as a compost, as muck, peat, by reason of its texture and absorbent qualities generally, offers itself as being particularly valuable for soaking up and retaining liquid manure.

MUDS.—River and lake muds are formed by the gradual deposition of silt. They consist largely of inert matter—very fine clay and sand—with variable amounts of animal and vegetable *débris*. As a rule their percentage of nitrogen is not large. Their fine mechanical condition, however, often enhances their value.

Mucks, peats and muds, without further fermentation or decay, do not readily give up their nitrogen to growing plants. If applied to a soil without this previous fermentation, the immediate result, except what may be due to improved tilth, will not be a large one. The process there is a slow one, the rapidity, however, depending on the nature of the soil, the amount of moisture, and the temperature. Favourable conditions are a fairly light soil, and damp, hot weather.

It is as a compost that the full benefit of mucks may be obtained. Such may be made by mixing it with barn-yard manure, wood ashes, dissolved bone or garden and house refuse, and allowing them to heat together. By this means the nitrogen becomes more and more soluble, and, therefore, of greater use for the plants.

As already stated, peat and muck are excellent absorbents for liquid manure in stables, cow houses, pig pens, &c. After being used for this purpose, and mixed with some of the more solid manure, the mass should be allowed to ferment in a heap, being from time to time turned over. In this way much fertilizing material that might go to waste is preserved, and by the addition of the nitrogen of the muck to that of the manure, a most valuable and rich fertilizer is obtained.

During the past year twenty-seven specimens of these fertilizers have been examined. They were obtained in the provinces of Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island.

They were accompanied by particulars as to source and amount of supply and a request for information as to their fertilizing qualities.

The following table gives the composition in full of the first five samples analysed. The results are calculated on the air-dried material.

ANALYSES of Muds and Mucks (Air-dried), 1891.

—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Water	4·24	23·69	18·19	7·79	2·43
Organic and volatile matter	17·78	36·44	64·86	57·37	9·39
Insoluble residue (clay and sand)	63·51	30·70	2·46	32·29	70·91
Oxide of iron and alumina	9·78	3·48	4·35	1·40	8·23
Lime	·30	2·63	4·99	·44	3·84
Magnesia	1·37	·38	·36	·24	·17
Potash	·12	·08	·23	·13	·58
Soda	....	....	....	....	·49
Phosphoric acid	·16	·30	·31	·22	·10
Soluble silica	·01	·30	·17	·11	·06
Sulphuric acid	2·66	....	....	....	....
Carbonic acid, &c. (undetermined)	·07	2·00	4·08	1·01	3·80
	100·00	100·00	100·00	100·00	100·00
Nitrogen (in organic matter)	·504	1·135	1·820	2·045	·332
Pounds of nitrogen in one ton of air-dried material	10·	22·	36·	40·	6·

The following brief explanatory notes with regard to the above are added:

No. 1. Marsh mud, forwarded by the Pioneer Publishing Co., Summerside, P. E. I. This is not a rich fertilizer, but represents an average sample of marsh or river mud. In potash and phosphoric acid it is somewhat low. The percentage of nitrogen is a little higher than that usually found in marsh lands.

No. 2. Is a black muck from the east riding of Peterborough, Asphodel township, and sent by Mr. F. Birdsall. The 30 per cent of insoluble matter is chiefly sand, which gives to the whole a fine loamy texture. The air-dried substance contains over 1 percent nitrogen, or 22¾ lbs. to the ton, making a valuable nitrogenous fertilizer. It also contains over 4 per cent of carbonate of lime, a very useful material for many soils. Mr. Birdsall reports very good results from its use, and thinks it equal to barnyard manure sometimes found.

No. 3. A black muck from a cedar swamp, South Orillia. Depth of deposit, 3 feet to 6 feet, with a subsoil of quicksand. The swamp, partially burnt over, contains about 150 acres. The sample analysed is from the deposit on the farm of Mr. R. Lehmann, South Orillia. This may be considered a first-class muck. It possesses nearly 2 per cent of nitrogen (40 lbs. to the ton) and 9 per cent of carbonate of lime. The small quantity of inert, insoluble matter, is noticeable. In potash and phosphoric acid, it is a good average sample.

No. 4. Forwarded by Mr. Bayard Williams, of Long Reach, King's county, N.B.; obtained from the bottom of a lake. It partakes very much of the nature of a swamp muck, possessing over 40 lbs. of nitrogen to the ton. It should prove, both from its composition and texture, a valuable nitrogenous manure.

No. 5. A river mud from Lower Montague, P.E.I., sent by Mr. H. P. Robertson. The analysis shows it to be rather of the nature of a good soil than a manure.

It was found that time would not permit to make a complete analysis of all the samples that were sent in for examination. It was therefore determined to estimate only their most important constituents. Their relative values as suppliers of nitrogen is brought out in the subjoined table, which also affords further information regarding their constitution.

ANALYSES of Mucks, Muds and Peats (Air-dried), 1891.

No.	Nature of Material.	Locality.	Sender.	Nitrogen per cent.	Organic and Volatile Matter.	Sand and Clay.	Mineral Matter Soluble in Acid.	Water.	Pounds of Nitrogen in One Ton of the Air-dried Material.
6	Swamp or black muck...	Lot 21, Con. 3, Tp. Edwardsburg, Grenville Co., Ont.	J. Newman............	2·605	74·99	5·35	8·94	10 72	52·
7	do do	Musselburg, Perth Co., Ont.............	David Gascho..........	1·960	59·97	17·19	11·10	11·74	39·
8	do do	Kinmount, Victoria Co., Ont.	Henry Coben., ...	1·620	67·28	1·69	10·81	20·22	33·
9	do do	do do	do	1·812	61·47	1·97	13·52	23·04	36·
10	do do	Almonte, Lanark Co., Ont	W. B. Munro..........	1·630	50·57	28·06	9·84	11·53	32·
11	do do ...	St. Adelaide de Pabos, Gaspé, P.Q..	Rev. Jos. Dechamplain..	2·300	68·68	8·13	13·16	10·03	46·
12	do do	do do	do ..	1·615	66·33	9·57	5·85	18·25	32·
13	do do	Hatley, Stanstead, P.Q....	G. H. Burrage.........	2·315	72·54	3·73	9·64	14·09	46·
14	do do	do do	do	1·425	68·69	1·27	9·97	20·00	28·
15	do do	Chatham, Northumberland, N.B	Hon. J. B. Snowball....	1·170	53·38	1·40	5·24	39·98	23·
16	do do	Long Reach, King's Co., N.B..........	Bayard Williams..... ..	1·525	88·16	·38	2·98	8·48	30·
17	do do	South-West Mabou, N.S.....	John Gillis	1·830	53·44	4·51	11·84	30·21	36·
18	do do	Bayfield, N.S...........................	Percy Randall	2·650	72·12	6·94	8·46	12·48	53·
19	do do	Lower Freetown, P.E.I..................	Joseph Taylor..........	·985	85·26	2·89	·90	10·95	20·
20	do do	Roseneath, Cardigan, P.E.I.............	Thos. J. Donahoe, ...	1·665	86·20	1·78	1·34	10·68	33·
21	do do	do do	do	·615	88·32	1·65	·95	9·08	12·
22	do do	Georgetown, P.E.I.....	F. G. Bovyer..........	·879	86·57	·80	1·08	11·55	17·
23	Mud (?)	Pownal, P.E.I..	A. M. McRae.........	1·520	49·30	15·64	8·40	16·66	30·
24	Mussel mud..	Lot 14, Grand River, P.E.I	Geo. Monkley..........	·161	6·35	49·67	42·44	1·54	3·
25	Lake mud.....	Hansford, Cumberland Co., N.S.........	A. S. Ross............	·803	23·79	55·24	12·57	8·40	16·
26	Salt mud..	Five Islands, N.S..................	C. A. McBurnier...... .	·079	5·23	76·73	15·19	2·85	1·
27	Peat.	Tp. Asphodel, Peterboro' Co., Ont.......	F. Birdsall.	1·295	76·32	1·51	7·45	14·72	26·

A brief description of each sample is here appended :

No. 6. A muck rich in organic matter and nitrogen, with little inert matter, clay and sand. As this was intended for use as a litter, the value of the resulting manure would be materially increased, owing to the additional nitrogen supplied by the muck.

No. 7. Very similar in appearance to the preceding sample, but contains only three-quarters the amount of nitrogen. Nevertheless, it is above the average in this important element.

Nos. 8 and 9. These specimens of swamp muck were taken from the surface (No. 8) and from 2 feet below (No. 9). They differ much in appearance. No. 8 shows a considerable amount of undecomposed woody tissue and is less granular than No. 9. Their analysis proves them to be very similar in composition.

No. 10. A powdery, loamy muck of brown colour, containing nearly 30 per cent of sand. It possesses about the average quantity of nitrogen found in fair samples.

Nos. 11 and 12. These are similar in the percentages of organic matter and insoluble residue they contain. The organic matter of No. 11 is not as rich in nitrogen and not as well decomposed as that of No. 12.

Nos. 13 and 14. These are from extensive deposits lying near each other. No. 13 is much darker and somewhat less woody and more granular than No. 14. Its value is considerably the higher of the two.

No. 15. As this was analysed when it contained nearly 40 per cent of water, it appeared to possess less nitrogen than many others which are really of less value. Calculated on the basis of 10 per cent of water, this sample would yield 35 lbs. of nitrogen to the ton. It may be considered a very fair average sample of black muck.

No. 16. Light brown in colour. Considering its small percentage of water, it must be regarded as low in nitrogen.

No. 17. Apparently well decomposed, black, and of good texture. If dried to 10 per cent of water it would contain 47 lbs. of nitrogen to the ton, which is considerably above the average.

No. 18. From a very large deposit. This muck contains the largest amount of nitrogen received during the past year. Evidently a very valuable nitrogenous fertilizer.

No. 19. A reddish brown sample. Although containing 85 per cent of organic matter, it yields only 20 lbs. of nitrogen to the ton.

No 20. Although very fibrous, it possesses an average amount of nitrogen. It would do good service as an absorbent in stables.

No. 21. Taken from 4 feet below the surface, fairly dark and granular, but notwithstanding is very poor in nitrogen.

No. 22. A dark brown muck, considerably below the average in nitrogen.

No. 23. Sent as a sample of "mud," but evidently more of the nature of a swamp muck. Of a dark gray colour and somewhat sandy. A fair sample, slightly below the average quality.

No. 24. "Mussel mud." Consisted principally of the unbroken and undecomposed shells of mussels embedded in clay. It cannot be considered a nitrogenous fertilizer, but is of value to soils deficient in lime. The use and value of these mussel muds have been treated of at some length in former reports.

No. 25. "Lake mud." Not a rich fertilizer compared with swamp muck. Insoluble matter is over 50 per cent, and organic matter less than 25 per cent.

No. 26. "Salt mud." Exceedingly poor in nitrogen, consisting largely of insoluble residue. Is a reddish, compact, very earthy substance.

No. 27. A peat. A valuable material for bedding, owing to its texture and richness in nitrogen.

A considerable variation in the composition, and hence in the value of these specimens, is to be noticed. The twenty-four samples of black muck give an average of 33 lb. of nitrogen to the ton. Nitrogen is the most costly of the three important fertilizing elements generally found necessary to return to the soil. Its value may be said to vary from 18 cents per pound in salts of ammonia and nitrates to 5 cents per pound in wool waste, hair, &c. Although these may be considered trade values, yet in a great measure they represent their relative worth to the farmer. The nitrogen in the first-named articles is immediately available, whereas in hair, wool and the like, a fermentation process must ensue, continuing over a considerable length of time, before the nitrogen is converted into such a soluble condition that plants can make use of it. Mucks rank with the latter rather than with the former class, as fermentation is necessary to obtain its full benefit. If the nitrogen in muck be assigned an average value of 7 cents per pound (the degree of fermentation or decay that has taken place will affect its worth for present results), one ton of the material containing 33 lbs. of nitrogen would be worth $2.31, and a sample possessing 50 lbs. to the ton, $3.50. It is plain, therefore, that a valuable nitrogenous fertilizer is to be found in the deposit of many of our swamps.

EEL GRASS (*Zostera marina*).

A sample of this material has been received from Mr. William Mackay, of Haliburton Bridge, Pictou, Nova Scotia, who writes that it grows in immense quantities in all the harbours and shallow bays on the north shore of Nova Scotia and New Brunswick. He further says that it is generally supposed to be useless as a manure and allowed to go to waste, excepting small quantities used for banking houses in the autumn. If the dry substance contained 1 per cent of nitrogen, Mr. Mackay thought it would be worth hauling.

The material as received had been dried with a gentle heat. Its analysis furnished the following figures :—

	Per cent.
Total ash, or mineral matter	21·90
Phosphoric acid (in ash, 1·80 per cent)	0·41
Potash (in ash, 13·28 per cent)	2·90
Nitrogen, in organic matter	1·24

If without great expense this substance can be procured—preferably of course in the dry condition—I consider it would prove a valuable fertilizer. It contains notable quantities of the three chief constituents of plant food—potash, phosphoric acid and nitrogen. Before application to the soil it should be fermented. In its dry, hard condition it might lie in the soil undecomposed for a very long time. If suitable for bedding, this manner of use would be most profitable; but in any case it should be first mixed with some material that would cause its decay. In this process of composting the elements of plant food are set free in an easily assimilable form.

SPENT TAN BARK.

This was also forwarded by Mr. Mackay, who stated that a tannery in the neighbourhood ran 4,000 to 5,000 tons of the substance annually into a cove, as worthless. It is hemlock bark after the "tan" has been extracted, and is essentially woody fibre. On analysis it was found to possess ·167 per cent of nitrogen. As a fertilizer, I am of the opinion that this material is almost valueless. It contains very little plant food, and is of a nature that would enable it for a long time to resist decay.

AMMONIACAL GAS LIQUOR.

In the destructive distillation of coal for the manufacture of illuminating gas a number of bye-products are formed, prominent among which is the so-called ammoniacal liquor. It contains varying amounts of ammonia (according to the nature of coal used and the process of condensation and purification in vogue), and also of certain other tarry and volatile substances.

Viewing it as a fertilizer, we may consider it as a dilute solution of ammonia containing certain impurities more or less harmful to vegetation—notably sulphur compounds.

For the purpose of concentrating and fixing the valuable constituent, ammonia, and in order to get rid of the poisonous products, it is submitted to distillation, the ammonia being collected in sulphuric acid. In this way ammonium sulphate is formed, a salt largely used in artificial fertilizers.

The direct application of the ammoniacal liquor to the soil can only be used with safety after careful experiment and previous dilution. It is impossible to give definite instruction with regard to the extent of the dilution that should be practised, owing to the fact that the liquor varies in strength and amount of impurities in different samples. Some persons have found injurious effects from it when diluted to twelve times its volume, while others have used it with safety and profit upon the addition of three times its bulk of water only.

When not distilled, this gas liquor is usually allowed to run to waste. Containing as a rule somewhat under 1 per cent of ammonia, it scarcely pays to transport it any great distance. The question, however, has arisen, whether the liquor could not be used with advantage by the agriculturists in the neighbourhood of its production. Large watering carts have been suggested for distributing it on the land, and also the plan of adding sufficient sulphuric acid to the liquor to fix the volatile ammonia—present chiefly as the volatile carbonate—before application. It may be possible by suitable treatment to produce a valuable fertilizer without the expense of distillation. The details and cost, however, have yet to be worked out to arrive at an economical process. It may be found that upon neutralizing of the liquor with sulphuric acid and allowing it to stand for three or four days the volatile poisonous compounds are largely evolved, the tarry matter deposited and the ammonia retained. If such a simple method worked satisfactorily, the resulting liquor might be diluted in the fields to the proper degree, and at once applied to the soil. Again, ground gypsum added to the crude liquor would have the effect of retaining the ammonia in the liquid, the tarry matter being deposited with the carbonate of lime formed.

At the request of the Hon. J. B. Snowball, Chatham, N.B., a sample of ammoniacal liquor has been examined. The analysis showed that 14 gallons contained 1 lb. ammonia (NH_3). Every gallon of this liquor would produce 4 ozs. of ammonium sulphate. It contained therefore a little less than 1 per cent of ammonia. Nitrogen in artificial fertilizer costs about 17 cents per pound. This liquor therefore contains one cent's worth of nitrogen per gallon. If an opportunity presents itself, it is proposed to make some experiments with the material during the coming year at the Farm laboratories.

Sulphate of ammonia, while not a complete manure for plants, is an exceedingly valuable one for supplying nitrogen. It acts rapidly in the soil on account of its extreme solubility. In conjunction with other elements of plant food it usually gives most gratifying results—especially upon worn-out soils.

PART III.

FODDERS.

The desirability of our farmers having information regarding the relative value of cattle foods, as derived from chemical analysis, has led to a continuation of the work commenced and reported upon last year.

The laboratory investigations of the past season in this connection have been confined almost exclusively to the examination of roots and fodder corn.

Roots.

Roots form an important ingredient in cattle rations, and are largely grown to supply during the winter months succulent and palatable food.

In no sense can they be considered concentrated food, for they contain a very large percentage of water, and the "dry matter" is not rich in albuminoids; but owing to their easy and entire digestibility, their succulent nature, and what we may term medicinal properties, they have been found exceedingly valuable for keeping up the milk flow and in preserving a healthy tone to the digestive organs of the cow. The dry matter (or real cattle food) of roots is essentially non-nitrogenous. Their "nutritive ratio," or proportion of digestible albuminoids to digestible non-nitrogenous portion, is wide, and varies from 1 : 8 to 1 : 13. For this reason, together with the fact that the dry matter is only from 170 lbs. to 190 lbs. per ton, roots cannot be fed exclusively. Their use should be supplemented with a coarse or bulky fodder—for the proper distention of the ruminating apparatus—and also with a judicious quantity of a concentrated food, such as bran, oil cake or other meal to supply albuminoids. In this way a properly balanced and economical ration may be prepared.

The samples analysed were as follows:—Carrots, 3 varieties; turnips, 2 varieties; mangels, 3 varieties, and of sugar-beets 4 varieties. They were grown on the Central Experimental Farm during 1891. The roots examined were typical examples of fine specimens of each variety. They had been preserved as such, and not selected for analytical purposes. It is generally admitted, and confirmed by analysis, that the increased development in large roots is accompanied by a decrease in the percentage of dry matter—that is, the larger roots are the more watery, as a rule. On this account the percentage of water found in those examined is probably somewhat higher than it is in the average-size root. Three or more roots of each variety served to furnish the material from which the samples for analysis was taken.

In my report for 1890 I gave a brief account of the composition, value and function of fodder constituents, to which I would refer the reader for an explanation of the terms used in the following tables:

Carrots.—Three leading varieties were analysed, and their comparative value is brought out by the figures that denote the amount of digestible matter per ton in the above table. Though very close, the Ox-heart gave results which show it to be slightly richer in food constituents than the Short White or the Belgian carrots.

Turnips.—The Purple-top Swede, according to our analyses, is more valuable than the Greystone turnip.

Mangels.—The Golden Flesh, Golden Tankard and Mammoth Long Red mangels form the next group examined. No great amount of difference in composition is noticeable between these varieties. They are second to carrots in feeding value, weight for weight.

Sugar-beets.—The interest that has been awakened throughout Ontario and Quebec lately in the growing of sugar-beets for the purpose of manufacturing sugar has made it advisable to ascertain the value of this crop as fodder, compared with that of other roots. Analyses of four principal varieties have been made and the results tabulated. They show that sugar-beets are the most nutritious of all roots, containing about one-half more dry matter than carrots, mangels and turnips. Much of this dry matter consists of sugar, easily digested and assimilated, and of considerable value as a food. The culture of sugar-beets when grown for fodder purposes differs from that of those raised for the sugar factory. As a fodder crop the plants should not be so close together in the row, nor is there any necessity to earth them up, as in the case of factory beets. The yield per acre, in this way, will be considerably increased.

Sugar-beet Pulp.—This is a bye-product in the manufacture of sugar from beets, and consists of the residue after the extraction of the sugar by diffusion. The very large percentage of water (95·72 per cent) causes the fresh material to be of very little value. If pressed, however, until it contained 20 per cent of solid matter and then converted into ensilage, a useful fodder results.

Fodder Corn.—For the sake of comparison I have inserted the average composition of 7 varieties of Indian corn fodder at different stages of development—particulars of which appeared in Bulletin No. 12, issued in June last. The analyses of two samples of ensilage are also added. These latter show that there may exist a wide variation in the value of ensilage, depending chiefly on the degree of maturity of the fodder ensiled and the care with which it is preserved. If the corn possess a large percentage of water when put in the silo and the air not thoroughly excluded, the ensilage will be poor in quality. Further remarks on this important fodder crop will be found in a special chapter devoted to the results of our experiments of the past three years.

Screenings.—These samples consist of small wheat, weed seeds, chaff, broken straw, &c., winnowed out in the cleaning of the wheat before grinding.

Mr. Fletcher, Dominion Botanist, to whom was submitted a sample, makes the following report as to its botanical composition:—

	Per cent.
Small and broken wheat, chaff, straw, &c..	30·0
Seed of the wild buckwheat (*Polygonum convolvulus*)	29·2
Seed of the lamb's quarter (*Chenopodium album*)	33·3
Stinking smut	6·0
Seeds of wild sunflower	1·5

It is impossible to arrive at the actual feeding value of the screenings from analyses alone, as the digestibility must be taken into account, concerning which I have no data. However, an approximation to its relative value may be ascertained by comparing its composition with that of other fodder articles. I therefore subjoin the following:—

Fodder.	Albuminoids.	Fat.	Carbo-hydrates.
	Per cent.	Per cent.	Per cent.
Linseed meal	32 to 38	5 to 7	40 to 45
Wheat bran	17 to 20	2 to 6	55 to 62
Good hay	8 to 15	1·5 to 2	50 to 55
Corn meal	10 to 15	3 to 5·5	73 to 83
Pea do	20	1·5	55
Screenings Nos. 1 and 2	13·5 to 14·5	2·75 to 3	56 to 65

The screenings are finely ground, so that the material sold is in the form of meal. I have no information regarding any effect on the cow's digestion or general health by the substitution of this for other meals in the ration.

The following instructive table, besides giving the amounts of water and dry matter in the fodders already discussed, shows the percentages of food constituents in the solid matter, thereby allowing a comparison to be made of the value of the fodders after deducting the amount of water they contain. It also states the quantity of dry matter (practically all digestible in the case of roots) in one ton of the fodders.

Analyses of Fodders, 1891.

Fodder.	Manufacturer, Grower or Sender.	Water.	Albuminoids.	Fat.	Carbo-hydrates.	Fibre.	Ash.	Pounds of Digestible Matter in a ton (2,000 lbs.) Albuminoids.	Fat.	Carbo-hydrates.	Fibre.	Total.	Nutritive Ratio.
Carrot, Ox-heart, Short Red (Steele)	C. E. Farm	90·17	·66	·01	7·36	·97	·83	13.2	·2	147·2	19·4	180·0	1:12·6
do Short White (Steele)	do	90·79	·77	·03	6·66	·86	·89	15·4	·6	133·2	17·2	166·4	1:9·8
do Giant White Belgian (Sutton)	do	90·51	·77	·02	6·78	·97	·95	15·4	·4	135·6	19·4	170·8	1:10·1
Turnip, Greystone	do	90·95	·66	·06	6·41	1·19	·73	13·2	1·2	128·2	23·8	166·4	1:11·7
do Purple-top Swede	do	89·74	1·40	·04	6·75	1·40	·67	28·0	·8	135·0	28·0	191·8	1:6·0
Mangel, Golden	do	90·56	1·10	03	6·42	·84	1·05	22·0	·6	128·4	16·8	167·8	1:6·7
do Golden Tankard	Hon. Chas. Peloquin	91 90	·78	·03	5·62	·63	·84	15·6	·6	112·4	12·7	141·3	1:8·1
do Mammoth Long Red	C. E. Farm	91·41	·96	·02	5·73	·81	1·07	19·2	·4	114·6	16·2	150·4	1:6·8
Sugar-beet, Vilmorin Improved	do	84·89	1·35	·06	11·84	·99	·87	27·0	1·2	236·8	19·8	284·8	1:9·6
do Klein Wanzleben	do	83·09	1·42	·06	13·27	1·19	·97	28·4	1·2	265·4	23·8	318·8	1:10·3
do Musy "C.H."	do	85·09	1·52	·04	11·25	1·12	·98	30·4	·8	225·0	22·4	278·6	1:8·1
do Krüger	do	83·88	1·70	·04	12·21	1·19	·98	34·0	·8	244·2	23·8	302·8	1:8·0
Sugar-beet "pulp"	Factory, Farnham, Que	95·72	·51	·01	2·36	1·26	·14	10·2	·2	47·2	25·2	82·8	1:7·1
Indian corn, average of 7 varieties, "silking and early milk stage"	C. E. Farm	80·76	1·76	·21	10·70	5·19	1·38	25·6	3·1	143·9	77·2	249·8	1:9·0
do average of 7 varieties, "late milk stage"	do	77·25	1·81	·34	13·10	6·22	1·21	27·4	5·0	175·8	89·7	297·7	1:10·4
do ensilage	do	78·00	2·07	·96	11·41	6·25	1·31	30·3	14·4	152·8	89·9	287·4	1:9·2
do do "Crosby Early"	J. Drummond, Petite Côte, P.Q	80·63	1·84	·83	9·94	4·30	2·45	26·9	12·4	133·2	61·9	234·4	1:8·4
Screenings, No. 1	Lake of the Woods Milling Co., Keewatin	7·17	14·56	3·09	56·47	14·71	4·00	.....	.....	.....	.....	.....	.....
do No. 2	do do do	7·35	13·44	2·72	65·39	8·55	2·55	.....	.....	.....	.....	.....	.....

FODDERS: Composition and Amount of Dry Matter per Ton.

Fodder.	Manufacturer, Grower or Sender.	Water.	Dry Matter.	Composition of Dry Matter.					Dry Matter per ton, in Pounds.
				Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash	
		Per cent.	Per cent.	Per cent.	Per cent	Per cent.	Per cent.	Per cent.	
Carrots, Ox-heart	Central Experimental Farm	90·17	9·83	6·72	·10	74·87	9·87	8·44	196·6
do Short White	do do	90·79	9·21	8·36	·33	72·31	9·34	9·66	184·2
do Giant White Belgian	do do	90·51	9·49	8·12	·21	71·44	10·22	10·01	189·8
do average, 3 varieties	do do	90·49	9·51	7·73	·21	72·88	9·81	9.37	190·2
Turnips, Greystone	do do	90·95	9·05	7·29	.66	70·83	13·15	8·07	181·0
do Purple-top Swede	do do	89·74	10·26	13·64	·39	65·79	13·65	6·53	205·2
do average, 2 varieties	do do	90·34	9·66	10·47	·52	68·31	13·40	7·30	193·2
Mangels, Golden	do do	90·56	9·44	11·65	·32	68·01	8·90	11·12	188·8
do Golden Tankard	St. Hyacinthe	91·90	8·10	9·66	·26	71·89	7·83	10·42	162·0
do Mammoth Long Red	Central Experimental Farm	91·41	8·59	11·17	·23	66·71	9·43	12·46	171·8
do average, 3 varieties	do do	91·29	8·71	10·83	·28	68·06	8·72	11·33	174·2
Sugar-beet, Vilmorin's Improved	do do	84·89	15·19	8·94	·40	78·35	6·55	5·76	303·8
do Klein Wanzleben	do do	83·09	16·91	8·40	·34	78·48	7·04	5·74	338·2
do Musy "C. H"	do do	85·09	14·91	10·20	·27	75·45	7·51	6·57	298·2
do Krügers	do do	83·88	16·12	10·55	·25	75·74	7·38	6·08	322·4
Average 4 varieties	do do	84·24	15·76	9·52	·31	77·01	7·12	6·04	315·2
Sugar-beet, pulp	Factory, Farnham, Que.	95·72	4·28	11·91	·23	55·14	29·44	3·27	85·6
Fodder corn, glazing, average	Central Experimental Farm	73·82	26·18	....	....	....	....	....	523·6

Fodder Corn.

The results of the field experiments and analyses with this important crop made during 1889 and 1890 were issued in June last in bulletin form. From the analytical data then given I was enabled to draw the following conclusions:—

1. That the corn plant increases in value, by the storing up of digestible dry matter, until the kernel begins to glaze. If left uncut after this period the fibre becomes more indigestible and the percentage of albuminoids is somewhat lessened, and consequently the food value is lowered.

2. That the dry matter in different varieties of fodder corn, taken at the same stage of growth, is very similar in composition.

3. That it is during the early part of the season that the corn plant takes from the soil the larger portion of the mineral or ash constituents it requires; and also that the albuminoids (whose chief constituent is nitrogen) are principally formed in the tissues while the plant is yet young.

EXPERIMENTS OF THE PAST SEASON.

Further work, both in the field and laboratory, has been done during the past season towards obtaining fuller information regarding the growth of the corn plant.

The varieties experimented with were Longfellow, Pearce's Prolific, Thoroughbred White Flint and Red Cob Ensilage. These were sown in drills 3 feet apart, in fairly rich, loose soil. The latter had been well tilled, and it received a thorough cultivation during the growth of the crop.

Samples of each variety, consisting of 200 feet of one row, were cut at the following stages of growth: Tasselling, silking, early milk, late milk and glazing. The fodder was carefully weighed and a representative portion analysed. By these means the yield per acre and the nutritive value of the fodder at the different periods of development were obtained.

The following are the percentages of water and dry matter in the fodder corn:—

Amount of Water and Dry Matter in certain varieties of Fodder Corn at different stages of Growth, 1891.

Variety.	Stage of Growth.	Date.	Percentage of Water.	Percentage of Dry Matter.
Longfellow	Tasselling	Aug. 1	86·87	13·13
	Silking	do 11	86·02	13·98
	Early milk	do 27	82·84	17·16
	Late milk	Sept. 10	77·51	22·49
	Glazing	do 21	75·28	24·72
Pearce's Prolific	Tasselling	Aug. 3	84·52	15·48
	Silking	do 13	84·91	15·09
	Early milk	do 29	81·90	18·10
	Late milk	Sept. 12	79·00	21·00
	Glazing	do 22	72·36	27·64
Thoroughbred White Flint	Tasselling	Aug. 18	85·84	14·16
	Silking	do 25	85·27	14·73
	Early milk	Sept. 22	81·42	18·58
	Late milk	Oct. 3	77·07	22·93
Red Cob Ensilage	Tasselling	Aug. 22	85·68	14·32
	Silking	Sept. 2	79·14	20·86
	Early milk	Oct. 3	76·06	23·94

Averaging these results we obtain the figures in the subjoined table, where also are to be found the yield per acre, and the amount of dry matter in one ton of the fodder and the weight produced per acre at different periods in the life of the corn plant.

COMPOSITION, Yield per acre and Dry Matter per ton and per acre, 1891.

(Average of four varieties of Fodder Corn.)

Stage of Growth.	Percentage of Water.	Percentage of Dry Matter.	Yield per Acre.		Dry Matter. Per Ton.	Dry Matter. Per Acre.	
			Tons.	lbs.	Lbs.	Tons.	lbs.
Tasselling	85·73	14·27	22	1,329	285	3	468
Silking	83·83	16·17	24	52	323	3	1,770
Early milk	80·05	19·95	22	1,806	399	4	1,138
Late milk	77·86	22·14	21	759	443	4	1,467
Glazing	73·82	26·18	21	1,154	524	5	1,298

An examination of these figures shows most clearly the great gain to be obtained in nutritive value by allowing the corn plant to grow till the kernel glazes before cutting, whether it be intended for the silo or for preservation in the dry condition. In these experiments the increase of food material in the corn between tasselling and glazing amounted to about 75 per cent.

The value of this crop for producing cheaply a large quantity of palatable food has now become widely recognized. Sweet ensilage is now acknowledged as a valuable ingredient in the ration of cattle, both for milk and flesh production. The convenience in having a large supply of coarse fodder in a small compass renders the silo exceedingly useful to the farmer, stock-raiser and dairyman. By its means, food may be preserved in a succulent condition for use during the winter months.

The following suggestions, based on the results of the experiments of the last three seasons, are offered to those growing this valuable fodder crop:—

1. The tillage of the soil should be as thorough as possible, in order to allow the roots to freely penetrate the soil. The ploughing should be well done. The corn plant is one that readily responds to a rich soil. It will, therefore, be good practice to have it in a good mechanical condition and to give it a liberal application of manure.

2. Plant in drills or in hills. Sowing broadcast should be abandoned, as a great loss of cattle food per acre ensues from this course. The drills should never be less than three feet apart, and with most varieties as large a yield will be obtained if the distance be three and a-half feet. This plant requires plenty of room to properly develop and mature. It is mistaken economy to sow too thickly; 18 lbs. to 20 lbs. of seed per acre will give the best results. Essentials for rapid and generous growth are sunlight and air. When the rows are too close or too thickly seeded the plants are stunted and undeveloped, and the crop is not as suitable for preservation. It should be remembered that it is by the agency of sunlight that the leaves are able to appropriate the carbonic acid of the air—the source of all the carbonaceous food material formed in the plant.

3. Only varieties should be sown that yield a heavy crop and come to the glazing condition of growth before there is danger of damage by frost. Pearce's

Prolific, Longfellow and Thoroughbred White Flint are excellent for many localities. There are, however, other sorts which yield good results. Care should be taken to ascertain before purchasing seed if the variety is a heavy cropper and will come to maturity in the climate of the grower.

4. Begin cultivating early and keep the crop free from weeds. As the plants grow, restrict the cultivating more and more to the centre of the rows, otherwise there is a danger of cutting the principal roots which feed the plant.

5. Harvesting should be commenced when the kernel begins to glaze. The stalks at this time are beginning to turn yellow near the ground. If allowed to remain standing after this period the digestibility of the fodder may be impaired. If intended for the silo, and the weather permits, it should be left to wilt for two or three days after cutting. Sweeter ensilage results as a rule by this method than by at once drawing in and filling the silo.

SUGAR BEETS.

Sixty-four samples of sugar beets have been examined and are now reported on. Forty-five of these were grown on the Central Experimental Farm and nineteen were received for analysis from various localities in the Dominion.

The analyses of twenty-one samples grown on the Experimental Farm, Ottawa, from seed supplied by Wilfrid Skaife, Esq., of Montreal, afford the following averages:—

Percentage of sugar in juice............................	14·0 per cent.
Coefficient of purity..	83·3 do
Average weight of one root...............................	14 oz.

The seed is a cross between the varieties Klein Wanzleben and Vilmorin's Improved, and is known as "Krüger's" seed.

The ground had been well prepared and the roots were kept earthed up. The season was not a very good one for this crop, being too dry during the early part of the summer and too wet when the beets were ripening. Taking this into consideration, the average of 14 per cent of sugar is not low, and compares well with that obtained in the western States, where the crop is grown for manufacturing purposes. The coefficient of purity (or percentage of sugar in the solid matter) stands sufficiently high to make extraction of the sugar easy. The variation between the samples in sugar content is on the whole very slight.

Experiments with "Earthing."—The second series of experiments with sugar beets consisted in the analysis of 24 samples, including 12 well-known varieties. As explained in the following table, twelve samples (one of each variety) were kept thoroughly earthed while growing, while the remaining twelve were allowed to protrude above the surface of the ground. The averages of these show that the earthed samples were in every way superior to those unearthed, containing over two per cent more sugar, a higher coefficient of purity and a smaller weight. These results point to the value of the suggestions made last year for the culture of this crop. In eleven instances out of the twelve, the earthed roots gave a greater percentage of sugar than the unearthed. The analysis in each case was made from at least six roots. The maximum percentage of sugar was 16·3 and the minimum 5·5, and the average of the 24 samples was 12 per cent. Other data are given in detail in tabular form.

ANALYSES OF

Earthed and

No.	Grower.	Locality.	Variety.	Date of Sowing.
22	Central Experimental Farm......	Ottawa.......	"Krüger's Seed"......................	May 11...
23	do do	do	do	do 11...
24	do do	do	"Vilmorin's No. 1"..................	do 11...
25	do do	do	do	do 11...
26	do do	do	"Vilmorin's No. 2"..................	do 11...
27	do do	do	do	do 11...
28	do do	do	"Vilmorin's Green-top Brabant".......	do 11...
29	do do	do	do do	do 11...
30	do do	do	"Vilmorin's Improved"..............	do 11...
31	do do	do	do	do 11...
32	do do	do	"Vilmorin's Yellow Giant"...........	do 11...
33	do do	do	do do	do 11...
34	do do	do	"Original Klein-Wanzleben"........	do 11...
35	do do	do	do do	do 11...
36	do do	do	Musy "C. H"......................	do 11...
37	do do	do	do	do 11...
38	do do	do	Musy "B. D".......................	do 11...
39	do do	do	do	do 11...
40	do do	do	Musy "I. B"........................	do 11...
41	do do	do	do	do 11...
42	do do	do	Bulteau Desprez, U.S. Dept. Agriculture	do 11...
43	do do	do	do do ..	do 11...
44	do do	do	Dippe's Klein Wanzleben	do 11...
45	do do	do	do do	do 11...

Average of 12 varieties, earthed..................	....
do 12 do unearthed..................	....

SUGAR BEETS, 1891.

UNEARTHED PLOTS.

Date of Pulling.	Percentage of Sugar in Juice.	Coefficient of Purity.	Average Weight of one Root. Lbs.	ozs.	Nature of Soil and Fertilizer.	Remarks on Culture.
Oct. 7......	14·0	81·4	1	9	Manured in autumn, 1890	Earthed.
do 7.....	12·7	82·7	1	1	do do	Unearthed.
do 7......	10·8	77·5	1	1	do do	Earthed.
do 7.	8·5	70·0	2	3	do do	Unearthed.
do 7	12·0	78·8	......	12	do do	Earthed.
do 7.....	10·3	76·7	1	12	do do	Unearthed.
do 7.	16·3	83·4	......	14	do do	Earthed.
do 7.	10·1	77·5	2	6	do do	Unearthed.
do 7......	14·4	84·5	.....	11	do do	Earthed.
do 7	13·2	82·4	1	2	do do	Unearthed.
do 7	8·6	73·5	.. ..	11	do do	Earthed.
do 7.. ...	5·5	61·9	1	0	do do	Unearthed.
do 7	14·9	85·4	......	15	do do	Earthed.
do 7	11·9	82·3	1	10	do do	Unearthed
do 7......	12·1	81·0	1	5	do do	Earthed.
do 7	11·7	81·2	1	1	do do	Unearthed.
do 7......	12·5	83·2	1	7	do do	Earthed.
do 7.....	13·5	82·6	1	13	do do	Unearthed.
do 7......	15·3	86·5	......	12	do do	Earthed.
do 7......	12·5	80·8	1	2	do do	Unearthed.
do 7	14·2	83·7	1	6	do do	Earthed.
do 7... ..	10·3	76·6	1	12	do do	Unearthed.
do 7......	13·2	82·0	1	1	do do	Earthed.
do 7......	11·8	86·0	1	5	do do	Unearthed.
....	13·2	81·8	1	0		
....	11·0	79·2	1	8		

The second table of data gives the analyses and particulars regarding the growth, etc., of beets sent in for examination. Those grown on the experimental farm at Nappan, N.S. (Nos. 46 and 47) proved to be good roots as to sugar content, coefficient of purity and weight. As they received no special culture, it would appear that both the soil and season were conducive to the production of a rich beet.

ANALYSES OF

No.	Grower.	Locality.	Variety.	Date of Sowing.
46	Experimental Farm.....	Nappan, N.S..................	Dipper's Klein-Wanzleben ..	June 26..
47	do	do	Bulteau Desprez	do 26..
48	do	Agassiz, B.C..............	do	....
49	do	do	Dippe's Klein-Wanzleben....	....
50	do	Indian Head, N.W.T..	Bulteau Desprez	May 9..
51	do	do	Klein-Wanzleben...........	do 9..
52	John Galbraith.....	Camden East, Ont....	White Silesian........	April 28..
53	William Link...........	Harwich Township............	....	....
54	do	do	....	....
55	William Weaver........	Chatham Tp., Lot 5, Con. 4.....	From Schreiber & Sohn, Nordhausen, Germany.	June 10..
56	J. J. Payne	Raleigh Tp., Lot 22, Con. 3.... .	do do ..	....
57	John Langmoore........	do Lot 14, Con. 7......	do do ..	....
58	Andrew Neill.....	Harwich Tp., Lot 25, Con. 1....	do do ..	....
59	Frank Suitar	Raleigh Tp., Lot 13, Con. 7......	do do ..	do 12..
60	Wm. Irwin.............	do Lot 13, Con. 6......	do do ..	....
61	M. S. Jackson.........	Chatham Tp., Lot 1, Con. 2......	do do ..	July 8..
62	Thos. Montgomery......	Raleigh Tp., Lot 17, Con. 6......	Skaife's Seed....	June 20..
63	F. Arnold	Camden Township	Schreiber's Seed	do 20..
64	J. Gall......	Masonville, Ont.....	Ferry's Seed................	....

Those grown at Agassiz, B.C., were not quite equal to the above, and those from the experimental farm at Indian Head, N.W.T., gave still lower results. Sufficient analyses have not yet been made, nor has the culture of the beets in these provinces been sufficiently thorough to allow of any conclusions being drawn at present as to the suitability of these districts for the production of a rich sugar beet.

SUGAR BEETS, 1891.

Date of Pulling.	Percentage of Sugar in Juice.	Co-efficient of Purity.	Average Weight of One Root.	Nature of Soil.	Remarks on Culture.
			Lbs. oz.		
Oct. 22..	15·4	84·3	1 0	Light clay loam; well drained.	Rows 26 in. apart; plants thinned to 6 in. Not earthed up, but well cultivated.
do 22..	11·0	82·4	1 2	do do ..	
....	13·1	80·0	2 0	....	
....	13·3	82·6	1 14	....	
Sept. 28..	11·2	75·0	1 3	Fallowed previous autumn.	Rows 30 in. apart; plants thinned to 10-12 in. Well cultivated, but not earthed up.
do 28..	11·7	75·5	1 4	do do ..	
Oct. 26..	14·5	79·4	2 1	Sandly loam..............	Kept clean, rows 24 in. apart; plants thinned to 6-12 in.; partly hilled.
....	6·0	71·3	17 1	Clay do	Particulars not given.
....	10·6	75·2	2 14	do do	do
Oct. 24..	8·8	68·9	4 3	Rich clay loam.............	Not earthed; kept clean.
....	12·4	80·0	1 14	Sandy loam................	Rows 14 in. apart; thinned to 6-10 in.; not earthed.
....	13·2	80·5	2 2	Rich loam..............	Rows 20 in. apart; thinned to 10 in.
....	11·0	75·5	3 6	do clay.................	Rows 24 in. apart; thinned to 8 in.
Oct. 28..	7·6	65·1	7 2	do black loam.........	Not well earthed; little cultivation.
....	8·3	66·5	3 1	do sandy do	Rows 22 in. apart; thinned to 8-10 in.; not covered.
....	12·3	74·4	1 14	Sandy loam...............	Rows 30 in. apart; thinned to 6-8 in.
....	12·4	79·4	3 7	do	Not covered; rows 20 in., plants 6-8 in. apart.
....	12·3	77·0	2 6	do	Not well covered; rows 18 in., plants, 10 in. apart.
....	13·2	83·3	1 6	....	Manured in winter with barn-yard manure.

In No. 53 we have an excellent example illustrating the statement that large roots are usually very poor in sugar. No. 54 is the same variety of beet, grown on the same soil and in the same way, and though still too large, contains 4·6 per cent more sugar.

The roots throughout were too heavy to give high sugar percentages, and neglect to keep them earthed had assisted in most instances in causing low coefficients of purity.

SORGHUM.

Seed of three varieties of sorghum was furnished by Mr. Corbeil, of Hull, P.Q., with the request that they should be sown and the percentage of sugar in the product estimated.

This plant, known as the Chinese Sugar Cane (*Sorghum vulgare*) has been extensively introduced into the United States. Its cultivation there, both as a fodder crop and for the production of molasses and sugar, has been a matter of much experiment for some years past by the experimental stations, and the manufacture of sugar from the cane has received Government and State aid, with the view of establishing, if possible, an economical process for its extraction.

It therefore became a matter of interest to ascertain what amount of sugar the plant would develop when grown here, and, in accordance with the wishes of Mr. Corbeil, the work already alluded to has been carried out at the Central Farm, Ottawa. The following analyses give the results:—

Sorghum.

	Percentage of Sugar in Juice.
No. 1	5·15
No. 2	6·29
No. 3	9·50

The minimum percentage of sugar in the cane, as grown in the United States, is about 2 per cent, and the maximum 18 per cent, according to the variety of the sorghum, the season, &c.

Our present figures show a cane altogether too poor for profitable extraction. Sorghum requires a long and somewhat dry season, and although the exact and most favourable conditions for a rich cane are, perhaps, as yet unknown, it seems probably certain that the frosts of autumn, common to the climate of Ottawa and vicinity, would be detrimental to the quality of the sorghum for manufacturing purposes

MILK: THE BABCOCK TEST.

The value of milk depends principally upon the percentage of fat it contains, and this is true whether it be purchased by the city consumer, the creamery or the cheese factory. Fat is the most important and most valuable of all the constituents of milk, though of course the solids-other-than-fat have a food value.

A great variability exists in samples of genuine milk as to the amount of fat they possess. This is owing to breed, food, environment, period of lactation and individual characteristics. Again, the composition of the milk of the same cow is by no means constant—the total solid matter, including fat, being subject to large fluctuation within comparatively short periods of time.

Within certain limits, water may be added or cream extracted from pure milk, without liability of detection.

For these reasons, it becomes apparent that the adoption of any ready and cheap method for accurately determining the amount of fat would result in the valuation of milk according to its *quality*, and the selling and buying of milk would be placed upon a more equitable basis than it now enjoys. Quality as well as quantity should be taken into account, for in this way the producer would be paid for his labour and skill and the purchaser receive his money's worth.

The method devised by Dr. Babcock, of Wisconsin, was examined in our laboratories during the past year, and the results compared with those obtained from the same samples by an accurate method of chemical analysis. The work was published, somewhat in detail, in Bulletin 12, of the Dairy series; I therefore here only insert conclusions.

Of the thirty-two samples tested in duplicate by the Babcock method, only two gave a difference between their duplicates, amounting to three-tenths (·3) of one per cent.; two varied in their duplicates two-tenths (·2) of one per cent.; fourteen differed to the extent of one-tenth (·1) of one per cent., and thirteen gave results identically the same.

The greatest difference between fat determinations by the Babcock test and gravimetric analysis on the same milk was (·25) a quarter of one per cent. This occurs in three instances only. Where the results are not identical, the variation is usually between one-tenth and two-tenths of one per cent.

From these data, therefore, we may safely conclude that when the Babcock test is made according to instructions given with the machine, *strictly reliable results are obtained*, and that the percentage of fat so found, allowing for the greatest error possible under such circumstances, will be well within one-quarter of one per cent. (·25) of the amount of fat actually contained in the milk.

CONDENSED MILKS.

The brands analysed were "Reindeer Brand," manufactured by the Condensed Milk and Canning Company, Truro, N. S., the "Shamrock Brand," of the Condensed Milk Company of Ireland, Limerick, and the "Fruit Brand," Gleeve Bros., London and Liverpool.

On opening the tins a preliminary examination of the physical characters of the milk afforded me the following data:

"Reindeer Brand" is of a slightly yellowish tint; in an excellent state of preservation; evidently a well-made milk and perfectly homogeneous throughout; readily soluble in water, yielding a milky fluid, very sweet, with a slightly "boiled" taste.

"Shamrock Brand," of a bluish-white tint. In a good state of preservation; easily soluble in water—the resulting fluid having a marked flavour of boiled milk. One tin of this brand was found on opening to be somewhat fermented, evidently owing to imperfect soldering.

"The Fruit Brand," somewhat darker in colour than the milk of the "Reindeer Brand." Well made and in a good state of preservation; easily soluble in water, with a sweetish "boiled" flavour.

The composition of the milks, as elicited by a careful and thorough analysis, is depicted in the subjoined table:

COMPOSITION OF CONDENSED MILKS.

——	Reindeer Brand.	Shamrock Brand.	The Fruit Brand.
Water	25·67	30·22	27·70
Total solids	74·33	69·78	72·30
Fat	7·29	·35	5·13
Curd (casein and albumen)	8·44	10·44	9·31
Milk sugar	13·49	10·80	14·30
Cane sugar	43·16	46·06	41·50
Ash (mineral matter)	1·95	2·13	2·06

The foregoing data were obtained from duplicate estimations of each constituent. It is possible that a part of the cane sugar appears as milk sugar ; in the process of manufacture some of the cane sugar may be converted into a form that by analysis would be determined with the milk sugar.

The following table may be useful in showing that when condensed milk is diluted until it contains a percentage of solids about equal to the percentage of solids in whole, pure milk, it is not a complete or well-balanced food. This is owing to the large proportion of cane sugar in the total solids, the sugar being added for the purpose of preservation.

If to one measure of these milks five measures of water be added, the composition of the resulting fluids will be as given below. The analysis of an average sample of pure milk is here added for the sake of comparison.

—	Reindeer Brand.	Shamrock Brand.	The Fruit Brand.	Pure, average Milk.
Water	87·50	88·34	87·95	87·25
Total solids	12·50	11·66	12·05	12·75
Fat	1·21	·06	·85	3·50
Curd	1·41	1·74	1·55	3·90
Milk sugar	2·25	1·80	2·38	4·60
Cane sugar	7·20	7·68	6·92	
Ash	·33	·38	·35	·75

It will be seen that these are all "sweetened" condensed milks, cane sugar being largely added as a preservative during evaporation. It has been held until quite lately, that the addition of cane sugar is necessary for keeping the milk in good condition. By an improved process, however, unsweetened condensed milk is now manufactured in Switzerland. This is said to be of excellent quality. I do not think it is to be found in the Canadian markets.

In the manufacture of condensed milk, when whole milk is concentrated, unless the greatest care be exercised, oily globules separate, and the flavour becomes more or less rancid. It is, however, apparent, from the condition and analysis of the "Reindeer" and "Fruit" brands, that excessive skimming, such as has been practised in the case of the "Shamrock" milk, is not required in order to preserve a good flavour. The unsweetened condensed milk before alluded to is whole milk, concentrated to one-third of its bulk. It is, however, not free from the "boiled" flavour, apparently an inevitable result of concentration.

Although condensed milk is an extremely valuable preparation, it cannot be considered as a perfect substitute for new milk, on account of its poorness in fat, its peculiar flavour and diminished palatability and its excess of cane sugar.

Great care and skill are requisite in the concentration of milk, and it should be the object of the manufacturer to avoid, as far as possible, the development of the boiled flavour, retaining, at the same time, the butter-fat of whole milk and avoiding the excessive use of cane sugar.

Flavour is perhaps of as much importance as any other factor in determining the value of a condensed milk, and in this respect the "Reindeer" brand, made at Truro, N. S., takes the first place among those examined. Its condition betokens care in its manufacture, and the tins have been soldered air-tight. In composition it is somewhat richer than the "Fruit" brand.

The "Shamrock" condensed milk is the poorest of the three, both in composition and flavour. It is practically fat-free, and has a marked taste.

The "Fruit" brand is a good milk, and in most respects may be considered equal to the "Reindeer" milk. Its condition, flavour and composition testify to its excellence as a sweetened condensed milk.

PART IV.

WELL WATERS.

In former reports I have dwelt at some length on the necessity of good water for man and beast if health is to be maintained, endeavouring to impress upon farmers and dairymen that without pure, fresh water cows cannot produce wholesome milk, and that a great deal of the sickness on the farm might be traced to impure, polluted water. It is only too true that in many instances the wells are so situated that they act as cesspools for the drainage from the stable or privy. A glance at the last column of the subjoined table will corroborate this statement. It is, therefore, gratifying to notice that increased interest is being evinced by our agriculturists with regard to the purity of their water supply.

During the past year twenty-nine samples of drinking water have been examined and reported upon. The analytical data will be found in tabular form, together with a brief report upon the quality of the waters as deduced from these figures. Particulars, in outline, regarding the source of supply and the proximity of contamination, follow:

Analyses of Well Waters, 1891.

Results stated in Parts per Million.

No.	Name.	Locality.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.	Solids after Ignition.	Loss on Ignition.	Oxygen Absorbed at 80° F. In 15 Mins.	In 4 Hours	Phosphates.	Report.
1	Singleton, A. C...	Brighton, Ont..	Dec. 22..	·075	·110	......	1·00	235·0	185·0	50·0	·370	·805	....	A fair drinking water, though not first-class.
2	Lehmann, A......	Orillia, Ont....	Jan. 6..	·015	·065	......	45·00	524·0	324·0	200·0	·336	·724	....	A very good water.
3	Wright, Chas.....	Holland, Man..	do 27..	·040	·315	......	5·00	642·0	406·0	236·0	2·160	7·040	Traces.........	Too much vegetable organic matter; probably no sewage contamination.
4	Stoddart, W. E...	Bradford, Ont..	Feb. 19..	traces	·180	9·405	750·00	2878·0	2064·0	814·0	·576	1·456	Heavy traces...	Polluted by sewage; a very dangerous water to use.
5	Wenman, Wm....	Souris, Man....	June 1..	·09	·140	......	6·5	2148·0	1856·0	292·0	1·04	2·36	Very heavy traces.	Highly suspicious.
6	do	do	do 1..	·875	·140	......	9·0	2960·0	2486·0	474·0	1·48	2·96	do ..	A very bad water; totally condemned.
7	Pollock, W. C....	Almonte, Ont...	do 12..	·020	·050	......	46·0	542·0	226·0	316·0	·1512	·4320	....	A very good water.
8	Foster, W. A.....	Hintonburgh, O..	July 2..	·015	·130	12·254	66·0	704·0	402·0	302·0	·752	1·352	Very heavy traces.	Evidently contaminated; use attended with danger.
9	Hill, Robt........	do ..	do 2..	·010	·075	4·530	56·0	642·0	464·0	178·0	·328	·632	Traces.........	Perhaps a reasonably safe water, though not first-class.
10	do	do ..	do 2..	·005	·073	5·75	64·0	656·0	502·0	154·0	·532	·976	Very heavy traces.	Suspicious; use attended with danger.

Analyses of Well Waters, 1891—*Concluded.*

Results stated in Parts per Million.

No.	Name.	Locality.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.	Solids after Ignition.	Loss on Ignition.	Oxygen Absorbed at 80° F.		Phosphates.	Report.
											In 15 Mins.	In 4 Hours		
11	Gillespie, Thos....	Hintonburgh, O.	July 2..	·035	·175	9·68	26·0	474·0	370·0	104·0	·872	1·744	Traces.........	Not safe for drinking purposes.
12	Feely, Wm.......	Hull, Que	do 20..	·06	·08	1·08	12·50	342·0	280·0	62·0	·568	1·104	Heavy traces ...	A second-class water.
13	Learned, H. B....	Learned Plain, Q	do 25..	·14	·09	.....	5·50	......	......	......	......	......	....	Dangerously contaminated.
14	Mitchell, R.......	Yorkton, N.W.T	do 29 .	·12	·17	.....	7·00	570·0	440·0	130·0	......	......	....	A bad water.
15	Ross, A. S........	Hansford, N.S..	Aug. 4..	·15	·07	3·83	20·50	228·0	128·0	100·0	·3276	·7020	Traces.........	Polluted by sewage matter.
16	Jamieson, John..	Kars, Ont	do 19..	·13	·118	.....	3·50	230·0	184·0	46·0	1·096	2·180	Traces.........	Contaminated; not safe for drinking purposes.
17	Dean, Jas	Calgary, N.W.T.	Sept. 29..	·04	·10	.....	6·00	......	......	......	......	......	....	Insufficient quantity for complete analysis.
18	Harris, Wm	do ..	do 29..	·06	·08	.....	11·0	......	......	......	......	......	....	Not first-class waters, but probably not dangerously contaminated.
19	Town Hall........	do ..	do 29..	·06	·068	.....	6·0	......	......	......	......	......	....	
20	Grand Central Htl	do ..	do 29..	·08	·064	.....	5·0	......	......	......	......	......	....	Highly suspicious.
21	Scott, W. L	City View, Ont.	Oct. 13..	9·28	6·28	.....	100·0	2345·0	1208·0	1137·0	......	......	Heavy ppte....	An exceedingly bad water.
22	do	do ..	do 13..	160·60	......	....	......	11930·0	5770·0	6160·0	......	......	Very heavy ppte.	Really liquid manure.
23	Grand Central Htl	Calgary, N.W.T.	do 28..	·08	·05	·428	1·50	164·0	142·0	22·0	·04	·40	Traces.........	Indicates previous contamination.
24	Moore, D.........	do ..	do 28..	·02	·021	1·120	1·50	212·0	178·0	34·0	·276	·678	do	do do ..
25	Water works......	do ..	do 28..	·028	·06	·174	·50	170·0	148·0	22·0	·080	·372	None..........	An excellent water.
26	Robson, Hodder ..	do ..	do 28..	·00	·02	4·80	4·50	236·0	158 0	78·0	·216	·448	Traces.........	Indicates previous contamination.
27	Galbraith, John...	Camden East, O.	Nov. 10..	·057	·136	·573	13·0	417·2	354·0	63·2	·1856	·5036	do	Highly suspicious; use attended with danger.
28	Brodie, R.........	St. Henri, Que..	do 24..	·170	·190	13·625	105·0	1130·0	1014.0	116·0	·448	·844	Very heavy traces.	Very bad; condemned for drinking purposes.
29	Fortier, Victor....	Ste. Adèle, Que.	do 26 .	·024	·27	·786	2·0	152·0	72.0	80	1·064	3·504	Heavy traces...	Too much vegetable matter, otherwise a good water. Would be improved by filtering.

No. 1. Spring in pasture; formation of calcareous tufa around mouth of spring considerable amount of vegetable, suspended matter, which should be filtered out.

No. 2. Well, 18 feet deep, dug in heavy clay with quicksand bottom; 100 feet from Lake Couchiching. The well is lined with stones laid in cement, to keep out surface water, resting on an oak crib.

No. 3. Well, 17 feet; surface soil 1½ feet black mould, over clay and gravelly sand; about 4½ feet water; cribbed with pine boards; evidently largely soakage water; considerable quantity of vegetable *débris;* solids blackened on heating, giving off disagreeable odour, indicating presence of organic matter. This water should be passed through an efficient filter before using.

No. 4. Depth of well, 40 feet; distance from privy, 80 feet; from barn, 300 feet; soil, heavy clay loam; water in well, 15 to 20 feet; water has distinct "salty" taste. Well dug 23 years ago and not lately cleaned out.

No. 5. Well, 35 feet deep; surface soil. 20 inches vegetable mould; subsoil, sandy loam (9 feet), resting on heavy clay; 72 feet from privy; water has offensive taste and smell.

No. 6. Well, 53 feet deep; cribbed with spruce; soil similar to that of No. 5, except that bottom is quicksand; 70 yards from stable; well evidently acts as cesspool.

No. 7. Well, 55 feet deep; clay 12 feet; bored in rock 43 feet; 50 feet from stable; property well drained.

No. 8. Depth of well, 14 feet; clay loam, 4 feet; bored in rock 10 feet; 35 feet from privy and stable; not cleaned for three years.

No. 9. Bored well, in rock, 45 feet; privy 100 feet from well. Well not used for some years, but lately cleaned.

No. 10. Depth of well, 13 feet; clay loam, 5 feet; gravel, 1 foot; hard pan, 1 foot; rock (blasted), 6 feet; 70 feet from stable, 50 feet from privy, about 18 in of water.

No. 11. Depth of well, 18 feet; light loam, 2 feet; rock, 16 feet; 60 feet from privy.

No. 12. Well, 16 feet deep to rock; soil, loam, 3 feet; gravel, 13 feet; 40 feet from stable and privy; height of water, 10 feet.

No. 13. Well in low ground, 12 feet deep; black muck, 2 feet; hard pan, 8 feet; limestone, 2 feet; depth of water, usually 8 feet; barn, 60 feet away; privy about 180 feet, on higher ground.

No. 14. Said to be a spring; water contained a quantity of flocculent matter; sample collected one month before analysis.

No. 15. Well, 20 feet deep; water therein from 5 inches to 15 inches; distance from barn, stable and privy, 170 feet; from sink, 22 feet; soil very hard and full of fissures, through which water percolates.

No. 16. Depth of well, 12 feet; sandy loam, 2 feet; clay and sand, 10 feet; height of water, 4 to 5 feet; situated at edge of bush in pasture.

No. 17. Well, 14 feet deep, recently dug; gravelly soil; water rises and falls with that of the Bow River.

No. 18. Well, 25 feet deep, dug two years ago; privy within 50 feet; gravelly soil.

No. 19. Well, 20 feet deep; privy distant 75 feet; not cleaned since dug two years ago; gravelly soil.

No. 20. Well, 30 feet deep, within 20 feet of a cesspool and 40 feet of a privy; quite close to stable; gravelly soil.

No. 21. Depth of well, 56 feet, bored; usually about 25 feet water; 7 yards from house, 70 yards from stable, 100 yards from silo; rock in which well is bored is full of cracks and fissures, through which evidently the soakage from silo or barn, or both, find its way into the well.

No. 22. Well about 7 feet deep, in clay, 50 yards from stable, 150 yards from silo; water filthy, very bad, and sickening.

Nos. 23, 24 and 26 are from wells of from 14 to 25 feet in depth, dug in a light, gravelly soil, and all more or less contiguous to contaminating sources, as stables and privies. Their analyses, standing by themselves, would not absolutely condemn them for use, though they would not be considered "first class." These wells, however, are evidently fed from the Bow River by infiltration, and a comparison of the analytical data of the latter water (No. 25) clearly shows that these waters receive pollution to some extent.

No. 25. Drawn from the Bow River, near Calgary; clear; no *debris;* a good water.

No. 27. Depth of well, 12 feet 6 inches, in gravelly clay with limestone bottom. Distance from house, 30 feet; from hog yard, 130 feet; from barn, 300 feet. Most probably receives soakage from hog yard through crevices of the rock.

No. 28. Well, 42 feet deep, in sandy and gravelly soil. Distance from barn, 120 feet; average depth of water, 8 feet; 60 feet from closet. A clear, bright water, with no deposit, but very badly polluted, making it unfit for use.

No. 29. Creek water; no sewage contamination; contains suspended vegetable matter, which should be removed by filtration.

General Remarks on Waters and Water Supplies.

The chief impurities found in drinking waters, as detected by chemical analysis, are of an organic nature, and arise from the presence of decomposing animal or vegetable matter, or both. The former is to be regarded as the more deleterious of the two, and comprises the solid and fluid excreta of animals, and decaying animal matter; vegetable pollution consists of peaty matter—the more or less decomposed remains of plants. Although vegetable matter is not as injurious as that of animal origin, an excessive quantity is very apt to cause diarrhœa and kindred complaints.

Whether the organic matter itself always acts in the water as a poison or not is yet a question open for discussion, though there seems to be ample evidence that in many instances active organic poisons are developed by the decomposing matter.

It has, however, been well established that it is the organic matter of a water that forms the food for the growth of bacteria—microscopic plants, among which are the disease germs—and cases of typhoid (a germ disease) have been repeatedly traced to drinking water surcharged with organic matter.

For these reasons we may safely conclude that a water containing much organic matter must be more dangerous to health than water comparatively organically pure.

It is of the first importance, therefore, to discover the degree to which any water may be contaminated by organic matter and to endeavour to establish whether such be vegetable or animal.

The amounts of free and albuminoid ammonia, of the oxygen absorbed in fifteen minutes and four hours, and of chlorine, are a measure of the organic impurities of a water.

Large quantities of free ammonia associated with a considerable amount of chlorine prove contamination with sewage.

Small quantities of free ammonia and chlorine and high amounts of albuminoid ammonia and "oxygen absorbed" indicate vegetable pollution.

The presence in considerable quantities of nitrogen in nitrates and nitrites—especially in shallow wells—indicates previous sewage contamination.

When the ratio of oxygen absorbed in 15 minutes to that absorbed in 4 hours is as 1:2, dissolved vegetable matter is indicated; when this ratio approaches 1:1·5, the presence of animal organic matter is shown. A water contaminated with vegetable matter will absorb or use up more oxygen than one polluted with animal matter.

The bright and clear appearance of a water is no guarantee of its wholesomeness. Many badly polluted waters are sparkling and cold.

As every water must be judged according to its source and surroundings, it is impossible to lay down rules that could be applied rigidly in every case, though it has been abundantly shown that a good water, wholesome for use, should not contain more than ·08 parts per million of free ammonia, nor more than ·10 parts per million of albuminoid ammonia, and the amounts of chlorine and total solids should not exceed 70 and 570 parts respectively.

Those who are about to dig wells are cautioned against locating them in barnyards and stables or near any source of pollution—and this is especially urged where the soil is sandy or gravelly. It has been proved beyond dispute that the soakage from such contaminating sources will travel comparatively long distances in light soil, and it is in such that the well will act as a cesspool.

The surroundings of the well should at all times be kept clean, and the well itself examined from time to time as to its freedom from refuse material. Vegetable *debris* and dead animals are often the cause of impure water. The latter has frequently been found on an examination of the well, subsequent to a report that the water is polluted.

As far as time permits analyses of water are made for farmers free of expense, provided that the express charges are prepaid. As the right collection of the water is a matter of great importance, those desiring an analysis are requested to write for the necessary instructions before taking the sample.

EXPERIMENTS ON THE PREVENTION OF HARD SMUT OR BUNT BY TREATMENT WITH SOLUTIONS OF COPPER SULPHATE (BLUE VITRIOL), IRON SULPHATE (GREEN VITRIOL) AND "AGRICULTURAL BLUE STONE."

In the report of this department for last year, I gave the results of a series of experiments conducted to ascertain the effect of the above solutions on the vitality of the wheat germ. The conclusions drawn from this work were briefly as follows:—

1. That the vitality of the wheat seed after being soaked for 36 hours in a solution of blue vitriol (copper sulphate), of the strength of 1 lb. to 8 gallons of water, was seriously impaired.

2. That when wheat was treated in a similar manner with a solution of green vitriol (iron sulphate)—strength 1 lb. to 8 gallons—the germ was but little affected, though the growth of the plants was at first retarded.

3. That when the seed was merely sprinkled with the solution of copper sulphate the loss of vitality was very much lessened.

4. That if wheat be soaked for 36 hours in a solution of "agricultural blue stone" (1 lb. to 8 gallons), a deleterious effect is to be noticed—evidently owing to this salt containing 30 per cent. of copper sulphate. But if the seed be sprinkled only with this solution the per cent of loss of vitality is much less.

Experiments had also been tried to find out what effect these solutions severally had in preventing the development of hard smut or bunt. These latter failed, owing to the fact that the hard smut did not appear on any of the trial plots here. Though extremely damaging to the wheat crop in Manitoba and the North-West Territories, hard smut seldom develops in this locality. For this reason it was proposed to grow the wheat, after treatment with the different solutions, on the experimental farms at Brandon and Indian Head, and note the results.

The Work of 1891.

A further supply of "agricultural bluestone" was procured, and on analysis yielded the following figures:—

Sulphate of iron (green vitriol)	69·39
do copper (blue vitriol)	30·61
	100·00

These show it to be identical in composition with that used last year.

EFFECT on the Vitality of Wheat by Smut Preventives, 1891.

Variety of Wheat, 200 grains.	Treatment.	Sown 1891.	23rd March.	25th March.	28th March.	30th March.	1st April.	4th April.	6th April.	Total.	Percentage of Vitality.	Percentage of Strong Plants.	Percentage of Weak Plants.
White Connell	Untreated	March 17	160	174	178	179	...	...	...	179	89·5	84	16
do	Copper sulphate	do	67	130	158	165	...	...	...	165	82·5	70	30
do	"Agricultural bluestone"	do	82	158	180	183	...	...	...	183	91·5	83	17
do	Iron sulphate	do	101	172	178	180	...	...	...	180	90·0	87	13
Red Fife	Untreated	do	180	188	190	...	...	...	...	190	95·0	97	3
do	Copper sulphate	do	70	111	143	150	157	164	...	164	82·0	84	16
do	"Agricultural bluestone"	do	104	174	193	196	...	...	...	196	98·0	92	8
do	Iron sulphate	do	153	188	192	...	...	...	...	192	96·0	96	4
White Fife	Untreated	do	167	185	185	187	...	...	...	187	93·5	70	30
do	Copper sulphate	do	50	99	130	130	139	140	43	143	72·5	70	30
do	"Agricultural bluestone"	do	93	156	178	185	186	...	...	186	93·0	69	31
do	Iron sulphate	do	129	177	183	...	...	...	...	183	92·5	80	20
Judket	Untreated	do	164	177	179	...	...	...	...	179	89·5	92	8
do	Copper sulphate	do	19	53	110	127	129	132	...	132	66·0	76	24
do	"Agricultural bluestone"	do	83	156	168	170	...	...	...	170	85·0	95	5
do	Iron sulphate	do	128	152	155	156	...	...	...	156	78·0	95	5
Ladoga	Untreated	do	112	137	...	...	...	...	...	137	68·5	82	18
do	Copper sulphate	do	37	79	114	116	...	...	...	116	58·0	84	16
do	"Agricultural bluestone"	do	112	112	141	144	...	...	...	144	77·0	89	11
do	Iron sulphate	do	138	149	151	...	...	...	...	151	75·5	94	6

The solutions experimented with were copper sulphate, "agricultural bluestone" and iron sulphate, each of the strength of 1 pound to 8 gallons of water.

The wheats used were White Connell, Red Fife, White Fife, Judket and Ladoga.

The treatment was merely sprinkling the grain with the solution under trial, and allowing it to dry spontaneously.

The vitality of the wheat so treated was determined in the seed-testing house, and samples of each forwarded to the experimental farms at Brandon, Manitoba, and Indian Head, North-West Territories. Mr. Bedford, superintendent at Brandon, reports that unfortunately owing to high winds that prevailed in the spring the seed was blown out of the ground, though considerable care had been taken to select a suitable plot for the experiment. Mr. Mackay, superintendent at Indian Head, met with better fortune, and his results, obtained with great carefulness, are now reported upon.

The percentage of vitality and of strong and weak plants will be found here, as also the number of growing plants upon the dates which head the columns.

On the whole, these results corroborate those obtained last year, though the differences in the percentages of vitality, in some instances, are not so marked. This is probably due to the fact that the treatment this year was not so severe as in some of the experiments of last season, in which the seed was allowed to dry 13 days before sowing. In these experiments the seed was planted immediately on becoming dry. It would seem, both from the work of 1890 and 1891, that the deterioration of vitality was to a certain degree measured by the length of time the seed was allowed to dry after sprinkling with the copper solutions.

The table makes clear that the ultimate effect upon the seed by solutions of agricultural bluestone and iron sulphate, when used as explained and of the strength given, is so small that it may be disregarded; or, in other words, that owing to the injury to the vitality being so slight, no objection could be raised to such treatment, granting that it were efficacious in preventing smut.

The loss of vitality due to copper sulphate solution, averaging the above experiments, is equal to 15 per cent.

The retarding effect on the germination and growth of the young plant by treatment with these solutions is again well brought out. This is most marked in the case of copper sulphate and least in that of iron sulphate. That of the agricultural bluestone is between the two, a position evidently the result of the copper contained in this article. As remarked in my last report on this subject, the plants from treated seeds become vigorous and robust after the roots had assumed their functional activity.

Effect on the Prevention of Smut.

Three ounces of each sample of grain, treated and untreated, were sent, in March last, to Mr. Angus Mackay, Superintendent, experimental farm, Indian Head, N.W.T., with a request that they be sown on 100 square feet of soil (at the rate of 1¼ to 1½ bushels to the acre), and the good and smutty heads thereon counted before harvesting. Mr. Mackay has very carefully conducted this work, and I now give his results:

RESULTS obtained at the Experimental Farm, Indian Head, 1891, showing the value of certain Smut Preventives.

Variety of Wheat.	Treatment.	No. of Smutty Heads.	No. of Good Heads.
White Connell	Untreated	6	3,479
do	Copper sulphate	7	3,422
do	"Agricultural bluestone"	3	3,942
do	Iron sulphate	6	3,575
Red Fife	Untreated	164	3,189
do	Copper sulphate	1	4,420
do	"Agricultural bluestone"	7	3,983
do	Iron sulphate	168	3,722
White Fife	Untreated	10	3,690
do	Copper sulphate	0	3,840
do	"Agricultural bluestone"	0	3,810
do	Iron sulphate	2	3,595
Judket	Untreated	49	3,905
do	Copper sulphate	1	3,760
do	"Agricultural bluestone"	0	3,850
do	Iron sulphate	38	3,960

To discuss briefly these results:

In the case of the "White Connell," the number of smutty heads is very small, and no great difference is to be noted between the treated and untreated grain in this particular. This experiment gives no data from which any inference may be drawn as to the relative efficacy of the solutions.

The Red Fife, however, shows a fairly large number of smutty heads in the untreated sample and affords an excellent example for the study of this question. The number of smutty heads is practically the same in the untreated and iron sulphate experiments. By the action of copper sulphate, this number was reduced from 164 to 1 and by agricultural bluestone from 164 to 7. The value of copper sulphate (blue vitriol) and agricultural blue stone and the inefficiency of iron sulphate for destroying smut seems to be here well emphasized.

With White Fife, although the numbers throughout are small, like results are obtained, and the inferences with regard to the relative smut-destroying powers of the solutions are the same as with the Red Fife.

The experiments with Judket give similar results, with slight reduction in the number of smutty heads when treated with iron sulphate. Practically there is no appearance of smut after copper sulphate and agricultural bluestone.

Therefore these experiments, while serving to prove the efficacy and almost equal worth of copper sulphate and agricultural bluestone, go to show that for destroying smut spores, iron sulphate is almost valueless.

These experiments will be continued during the season of 1892.

A strong solution of bluestone if in contact with wheat for a long time will undoubtedly affect the vitality of the latter, but as the experiments just cited show, a treatment such as I have described results only in benefit. The small amount of loss due to this treatment in some instances is not to be compared with the advantage accruing from having wheat free from smut, which follows the use of bluestone.

EFFECT OF COPPER SOLUTIONS UPON THE FERTILITY OF THE SOIL.

An article lately appeared in a leading horticultural paper on what was held to be the deleterious action to the fertility of the soil from the copper in the solutions used as fungicides. It was there shown that, in the spraying of large orchards, a considerable quantity of copper sulphate was used annually, and it was maintained that this would accumulate in the soil—as it all eventually finds its way there—and finally there was very great danger that this would sterilize or render barren the soil.

At the request of several correspondents, who were anxious to know how far these statements were correct, I made a report thereon, the substance of which I now insert as affording some information to orchardists on this important subject.

Properly applied, *i.e.*, at the right time and in the correct proportions, the copper fungicides have proved and are proving themselves to be of inestimable benefit in the orchard and in the vineyard. The increased value of the fruit has more than repaid, by a large margin, the outlay for spraying apparatus and materials and cost of application, and I believe the time has come when no fruit-grower can afford to ignore this useful means of preventing fungus diseases. Not the least important element in successful fruit-growing, now-a-days, is keeping in check fungus growths and destructive insects, and, for this purpose, our present hope lies in the application of arsenical and copper solutions. By the more extended use of them the hope is confidently entertained that the loss occasioned by injurious insects and fungi will be greatly lessened year by year throughout the Dominion.

The danger to the fertility of the soil by the use of fungicides has, by some, been unduly magnified. In the first place, the large quantity of fungicides as recommended heretofore for each acre of trees per annum (400 gallons containing 108 lbs. of copper sulphate)* is considered by many of the best authorities as unnecessary. Three or four sprayings are equally efficacious with a larger number, provided the operation is begun early enough in the spring. Granting that each application requires, per acre, about 30 gallons, the total quantity of Bordeaux mixture per acre for the season would be between 90 and 120 gallons, containing from 24½ lbs. to 32½ lbs. of copper sulphate.

Secondly, Bordeaux mixture has to a very large extent been replaced by copper carbonate, either dissolved in ammonia—known then as ammoniacal copper carbonate—or applied simply in suspension. When applied in suspension or dissolved, the amount of copper carbonate per 25 gallons of water is two ounces—a quantity containing the same amount of copper as four ounces of copper sulphate. (Directions for preparing these solutions are to be found in Bulletin 10 of the Experimental Farm series.) Spraying with the fungicides, each acre of vines would receive during the season the equivalent of 1 lb. to 1¼ lbs. of copper sulphate. It is thus made manifest that by this treatment—one highly recommended by those who have had experience with it—no such quantity as 108 lbs. of copper sulphate is required per acre.

By far the greater amount of copper that reaches the ground is in a condition that is insoluble in water, or becomes so after a short time. In the case of Bordeaux mixture, I would point out that copper sulphate, as such, ceases to exist immediately after the addition of the lime, sulphate of lime (land plaster) and an insoluble compound of copper resulting. The argument, therefore, that the sulphuric acid of the copper sulphate immediately combines with the potash of the soil, which is subsequently lost, does not hold good. The sulphate of lime does, to a limited extent, set free potash in the soil, in a condition assimilable by plants, and on account of this beneficial function land plaster is often used as a fertilizer. The presence of minute quantities of an insoluble copper compound cannot, in my opinion, affect disastrously the fertility of a soil, nor act as a poison to plants. The acid fluids secreted by rootlets may have the power of rendering such soluble and thus capable of absorption, but unless the soil were heavily charged with copper compounds no evil effects from this cause need be anticipated. Plants can only absorb into their tissues fluids and gases, and although they have the power to a limited extent of rendering soluble certain substances, insoluble compounds, such as oxide and carbonate of copper, are for the most part harmless and inert.

* Bordeaux mixture contains 6 lbs. copper sulphate and 4 lbs. of lime in 22 gallons of water. The lime neutralizes the caustic effect of the copper sulphate, rendering the mixture innoxious to foliage.

For many years the application of Paris green (arsenite of copper, insoluble) has been in use for the destruction of the Colorado potato beetle. If the copper of such became and remained easily soluble, thousands of acres would long ere this have been rendered barren.

To sum up, my contention is that the copper which reaches the ground from properly conducted spraying is so minute in quantity and so insoluble in nature that no fear need be entertained of injury to growing vegetation. It certainly seems to me that it would be very foolish to relinquish so patent a means of preserving our orchards and vineyards and their fruit, before science and practice proclaimed the true nature of such to be a curse rather than a blessing.

THE APPLICATION OF PARIS GREEN IN SOAP SOLUTION AS AN INSECTICIDE.

The question has arisen whether the toxic action of Paris green as an insecticide is to any extent weakened or destroyed when this poison is applied with soap solution. For the purpose of answering this problem, I have carried out a number of laboratory experiments, the results of which form the basis of the present report.

Paris green (aceto-arsenite of copper) is an emerald green salt which is practically insoluble in water. The first experiment consisted in shaking up Paris green with water constantly for more than a week. The Paris green was then filtered off. Not a trace of arsenic could be detected in the filtrate, though the most delicate chemical process was employed.

Strong ammonia readily and completely dissolves Paris green, forming a deep blue solution and capable of being diluted with water, without decomposition or precipitation.

The fixed alkalies—potash and soda—in strong aqueous solution decompose this poison, the blue hydrate of copper separating. This on heating first becomes changed into the black oxide, and finally the red cuprous oxide, the arsenic going into the solution as potassium arsenite.

A number of experiments were then tried as to the solvent action of different soap solutions on this insecticide. The soaps used were (1) whale oil soap, (2) common brown soap, (3) "English" soft soap.

The whale oil soap, strength 1 lb. to 8 gallons, was not alkaline to test paper. The Paris green was shaken up with this solution repeatedly for five days and the mixture then filtered. Not a trace of arsenic could be detected in the filtrate, showing that no decomposition of the Paris green had taken place. The latter retained its bright green appearance throughout the experiment.

The solutions of the "common brown soap" and the "English" soft soap were not of any stated strength, but were made as strong as it was possible to make them. By this means a severe and extreme test was made in each case.

The common brown soap was strongly alkaline. This solution after acting upon it for five days was found to slightly decompose the Paris green, arsenic being detected in the filtrate. The residual Paris green was, however, bright green, which together with the fact that but traces of arsenic passed into solution, shows that only to a very slight degree had the poison been acted upon.

With the "English" soft soap solution, which was much more strongly alkaline than the preceding, there was more decomposition, *i.e.* more arsenic passed into solution and more copper precipitated than in the experiment just cited. The treatment was similar as in the previous trials, and the result showed that heavy traces of arsenic had passed into solution, while at the same time a slight brown deposit of oxide of copper was to be noticed on the residual Paris green.

If it were necessary for the efficacy of the poison that the Paris green be applied in such liquids as would have no decomposing or solvent action upon it, the results of these experiments show that no practical harm or deterioration would result from using it with soap solution. When it is remembered, however, that Paris green, although insoluble in water, passes more or less rapidly into solution by the action of the digestive fluids before its toxic effects can be conveyed throughout the insects' body by the circulatory system, there seems to be no good ground for condemning an application in which traces of arsenic are already soluble. The chief reason against the use of white arsenic is on account of its injurious effect on foliage —it being soluble in water and acid in its character. The arsenic set free in the soap solution is neutralized by the free alkali of the soap, so that where soap solution can be used *per se* without harm, no injurious results need be apprehended when to it is added the Paris green in the right proportion.

In all the above experiments the soap solution was at the ordinary temperature of the atmosphere when added to the Paris green. If heat had been used undoubtedly a larger portion of arsenic would have gone into solution.

THE RESULTS OF AN EXPERIMENT TO PROVE THAT APPLES ARE NOT POISONED BY SPRAYING WITH PARIS GREEN FOR CODLING MOTH.

A statement appeared a short time ago in a horticultural paper published in Great Britain to the effect that Canadian apples contained a small quantity of arsenic and were consequently poisonous. This, it was said, was due to our practice of spraying with Paris green after the petals have dropped, in order to preserve the fruit from the ravages of the codling moth. This assertion received wide circulation in the British press and was calculated to do a great deal of harm to the Canadian export apple trade. It is not the first time that a rumour to this effect has been set afloat, either by interested or ignorant people. That the suspicion is entirely without a foundation has been asserted by scientists and practical men in Canada and the United States on several occasions. Hitherto, however, no chemical work has been done in Canada to place before our horticulturists and shippers, as well as the British people, scientific proof for refuting the statement.

Mr. James Fletcher, Dominion Entomologist, therefore procured a sample of apples that undoubtedly had been sprayed, and I submitted them to a careful chemical analysis. The apples examined (Rhode Island Greenings) were kindly furnished by Mr. Woolverton, editor of the *Canadian Horticulturist*, who personally vouches for the fact that they were twice sprayed last June with Paris green of the strength of 1 lb. of the material to 200 gallons of water. The apples when received were just as they had come from the trees, *i.e.*, had not been rubbed, so that any arsenic left from the spraying would still be on the skin.

The quantity tested for arsenic was 9 lbs. 7 ozs., measuring about one peck. The process to which they were submitted is one that affords extremely accurate results, and is considered the most delicate of all for the detection of arsenic. It is capable of revealing the presence of one fifty-thousandth part of a grain of arsenic. If 23,000 bushels of apples contained 2½ grains of arsenic (As_2O_3), the minimum fatal dose for an adult, the poison could have been detected by this method.

Though all care was exercised not a trace of arsenic could be detected, thus showing the complete absence of this poison in these apples that had been twice sprayed with Paris green.

I am of the opinion that further experiments of this nature would only serve to corroborate this negative result and to prove that there are no grounds on which to base a suspicion that our sprayed apples are poisonous.

The insoluble character of this poison, precluding its assimilation by the apple if such were possible, the infinitesimal part of Paris green that can remain on the apple, the frequent rains subsequent to the spraying, and the fact that apples are pared before using, all go to substantiate the argument that there is not the slightest danger of poisoning in using sprayed apples.

REPORT OF THE ENTOMOLOGIST AND BOTANIST.

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

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

Sir,—I have the honour to hand you herewith a report upon some of the work carried on in my department during the past year. Owing to want of assistance and facilities for work, many things which might have been attended to have been held over for the present. I have treated at some length certaiu of the more important subjects which have been brought officially under my notice.

DIVISION OF ENTOMOLOGY.

There has not been, during the past season, any attack upon crops of special severity. Fruit pests have probably demanded more attention than any other class, owing to the exceptional abundance of such apple-tree pests as a new species of case-bearing caterpillars, the Eye-spotted Bud-moth, the Oblique-banded Leaf-roller, and in certain districts of the Autumn Canker-worm. A new attack of some interest by the last-named insect was upon the ash-leaved maples used as shade trees in the city of Winnipeg. This, however, could of course be easily prevented by a timely spraying with a weak mixture of Paris Green. The Vancouver Island Oak-looper, which has now for some years stripped the oak trees around the city of Victoria, was during the past autumn much reduced in numbers by the attacks of a fungous disease which has been kindly identified by Professor Roland Thaxter as *Sporotrichum globuliferum*, Spegazzini, a fungus which has done good service in reducing the Chinch bug in Illinois and other States. It also attacks many other insects, and has been used by Professor Forbes in his late experiments upon Chiuch bugs, Cecropia moths, the Grain Aphis and other plant-lice and some saw-fly larvæ. (Ill. Rep. XVII, p. 82.) Bark of oak trees sent from Victoria early in 1891, by Mr. W. H. Danby, who has given me much assistance in working out the life history of this pest, contained thousands of good eggs of the moth from which these caterpillars were hatched. A similar packet of bark received this winter contained a great number of dead caterpillars and chrysalids, all attacked by the fungus, and so few eggs that I could not find one. Later in the winter, however, seven specimens of caterpillars were secured. There must, therefore, have been some cause for the great diminution in the number of eggs laid, which cause I judge to be this fungus. Field crops all over the Dominion have as usual suffered to a certain extent from the various kinds of Cut-worms. *Agrotis ochreogaster* (=*A. turris*), a large and voracious caterpillar, when full grown 1½ inches in length and of the usual dull colours, but bearing on its back a broad reddish stripe, has been very injurious in many places, extending from Ottawa as far west as Calgary. In the Ottawa district *Noctua fennica*, the "Black Army-worm," was again this year very abundant and destructive, particularly to clover, pease and asparagus. Spreading from a clover field on the Experimental Farm they over-ran, about the third week in May, nearly three acres of a pea field, which they swept almost bare. This attack was stopped promptly by spraying a strip 50 feet wide, ahead of the caterpillars, with Paris green, 1 lb. in 100 gallons of water, by means of Knapsack sprayers.

The Grain Plant-louse (*Siphonophora avenæ*), occurred in small numbers as usual. Sensational accounts in the newspapers proved upon enquiry all to be gross exaggerations. The Tomato Stalk-borer (*Gortyna cataphracta*) was slightly more abundant than usual, and a new attack upon tomatoes was observed by Mr. W. J. Baylay, of New Edinburgh, in which the plants were cut off by being girdled by the punctures of the Buffalo Tree-hopper (*Ceresa bubalus.*)

Some injuries reported to have been done to potatoes by the Colorado Potato-bug in the west proved to be due to two of the Blister-beetles (*Epicauta Pennsylvanica*, De G.), in Manitoba and *Epicauta maculata* (Say), in British Columbia. This latter is a very serious pest. Mr. C. F. Cornwall writes from Ashcroft, B.C.: "I send you specimens of what we call the grey beetle. It is a most destructive insect pest in this neighbourhood, generally putting in an appearance by the middle of May and lasting till the middle of August. It arrives in enormous numbers very suddenly. In cool weather it is sluggish, and can be brushed from the vegetation into an old coal-oil tin or other receptacle. It is only in this way that it can be prevented from regularly eating up such things as beet-root, spinach, windsor beans, potatoes, &c. I have seen many acres of field potatoes with the haulms actually stripped of every green leaf by this beetle."

Hops in Prince Edward county were attacked by a species of *Gortyna*, the eggs of which are laid on the young shoots, and the young caterpillars after a while drop to the ground and attack the plant at the collar, just beneath the surface of the soil. I am now at work on this pest with the valuable assistance of Mr. S. J. Cotter, of Northport. The Hop Aphis occurred in small numbers in Ontario and up the Fraser River in British Columbia.

A new pest of turnips and radishes in the North-West Territories and Manitoba I have reported on at length in another page of this report.

Some false reports with regard to the supposed danger of spraying with Paris Green I have thought it well to notice, and Mr. Shutt has kindly analysed with great care some apples procured for the purpose, which prove conclusively that there is no danger in this practice; but, on the contrary, great advantage to both the grower and the consumer of fruits. Many of the pests of the orchard and garden can be kept in check only by this useful, cheap and well-known material. With proper care there need be very little danger in any way from its use; and from its possible absorbtion by any plant there certainly is none whatever. It has been found useful during the past year, not only in fighting the innumerable orchard pests, but has been used on a most extended scale in the State of Massachusetts, where a moth introduced twenty years ago as a producer of silk, and known as the Gypsy moth, has gradually increased until it has now spread over about 50 square miles as a perfect scourge. The Government of the State has appointed a commission to try and exterminate this pest, and in 1890 appropriated $50,000. In 1891 the work was put under the direction of a competent entomologist, Prof. Fernald, and further large appropriations of money were made. Prof. Fernald writes to me that the work is going on very satisfactorily, and that the State is making a magnificent fight with this moth, and that they have the advice of the ablest and wisest entomologists in the country. Up to the present the appropriations voted by the State of Massachusetts since 1890 amount to $175,000.

The value of Paris Green as an insecticide is now recognized all the world over, and it is largely used in England, Germany, France, Australia and India.

DIVISION OF BOTANY.

Some work has been done during the year in augmenting the number of shrubs and trees in the arboretum and in growing native plants from seed. A magnificent collection of seeds of wild plants from the North-West Territories has been received from Mr. T. N. Willing, of Calgary, N.W.T.; and Dr. J. E. White, of Toronto, has also sent seeds of many rare plants found in Ontario. Mr. J. R. Anderson, statistician of the Department of Agriculture in British Columbia, has sent a collection of living roots of ferns from his province, and has also rendered much assistance in sending me specimens and information concerning injurious insects. Prof. Macoun has again sent some seeds of rare plants for cultivation. Some of the above were sown last autumn and the rest will be planted this spring.

Fungous diseases have received such attention as I could find time for. The ammoniacal solution of Copper Carbonate was found perfectly satisfactory for the

Brown Rot of the grape (*Peronospora viticola*), in the vineyard of Mr. J. Lowe; and where, in the year 1890, hundreds of pounds of grapes were destroyed, this year, when treated three times, there were not 10 lbs. of diseased grapes. The use of the Bordeaux mixture in the treatment of the Potato Rot has proved also satisfactory, and I hope during the present season to have facilities for proving to farmers the good effects of this simple remedy.

I have the honour to be, Sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist to Dominion Experimental Farms.

DIVISION OF ENTOMOLOGY.

SPRAYING WITH THE ARSENITES.

The great improvement in the quality of American and Canadian fruit, consequent on the adoption of spraying with the arsenites, is very remarkable. Two years ago, through the efforts of Miss E. A. Ormerod, largely helped by the sudden appearance of vast numbers of caterpillars in the orchards of the south of England, the English fruit-growers learnt and quickly adopted this method of fighting leaf-eating insects. Anything so successful as this at once proved to be was naturally taken up readily, and now Miss Ormerod informs me there are numberless spraying machines and patent remedies in the market, all of which owe their existence to the introduction of Paris Green. Mr. C. D. Wise, the manager of the large fruit farm at Toddington, Winchcomb, Gloucestershire, England, writes me under date 19th May, 1890: "We have tried many experiments this season with various insecticides, including Paris Green and London Purple, and we have found that Paris Green is undoubtedly the best. London Purple is inclined to scorch the foliage. Our prospects for fruit this season are on the whole very good, and I think we have fairly overcome the caterpillar, thanks to greasing the trees in the autumn and the use of Paris Green for the past three or four weeks."

Quite recently a London, England, paper, which styles itself a "high-class weekly review," has gained for itself an unenviable notoriety by publishing some untrue and very absurb sensational articles under the heading "Arsenic in American Apples." The first of these was widely copied in the English press and commented upon by the press of this country. It is possible that these articles, having been so widely copied, may have affected temporarily the sale of American apples in the English market; but the English are not as a rule a very gullible race, and particularly is this the case when by such credulity they would be deprived of the very best quality of a commodity which they wish for, and which their common sense will assure them may be safely indulged in, until such time as the safety is proved to them positively by chemical analysis. In a later issue this paper makes it very clear that its whole object in issuing these articles was to get cheap advertisement from its contemporaries. The following headings in this very article speak for themselves: "Our allegations as to the poisonous nature of American apples arrest the attention of dusky fruit-growers in the banana groves of India."—"Our articles appear and are commented upon by the press of every country under the sun."—"We have no doubt we shall be able not only to claim but to prove that our articles have *encircled the earth.*"—"We claim that we have a world-wide circulation."

There are several misstatements made, such as the following: "The use of poisonous insecticides by American fruit-growers is upon the increase. They apply them to all kinds of fruits grown, and to such an extent that the authorities have again and again protested"—(N.B.—We are not told where)—"against the danger of the nature of the compounds used. Why, only recently, the New York City

Board of Health condemned grapes in the market that showed signs of poison on the stems and had tons of them destroyed."

"The officials not only had some tons of fruit that has been treated with arsenic in the manner we described seized, but destroyed."

"It is admitted that the American apple-growers are compelled to depend upon the use of arsenic in solution as an insecticide in their orchards; that this insecticide is used upon the fruit itself until it is completely saturated."

This last extract is so utterly ridiculous and false that it will be hardly necessary to say so to intelligent people. It is false that arsenic in solution is used by apple-growers; it cannot therefore be admitted to be the case by any one competent to express an opinion, Paris Green, the arsenite commonly used, being practically insoluble in water. It is also quite impossible for fruit to become saturated with any poison, however soluble, sprayed on it, while it is growing. In his yearning for notoriety the editor becomes reckless, and prints as a proof of how large his circulation is, a perfect refutation of his statements in an excellent article from the *Michigan Farmer*, where it is shown that the grapes seized and destroyed by the New York Board of Trade not only had not been sprayed with an arsenical insecticide at all, but with a carbonate of copper fungicide, quite a different thing; and, moreover, it goes on to say, the editor "does not seem to be aware that the United States Department of Agriculture promptly investigated that grape business, that the fruit was analysed by the most eminent chemists of the country, and the conclusion arrived at, that if a man managed to eat a ton of sprayed grapes he could not get enough poison to ensure a funeral, and that under the showing made, the city of New York had to pay for the fruit destroyed in the mistaken zeal of the Board."

The question of the possibility of poisoning the consumers of fruit or plants has so often come up that entomologists have fortified their position from time to time by getting analyses made, and these all have failed to show a trace of arsenic in the plants treated. On discussing the matter with Mr. Shutt, the Chemist to the Dominion Experimental Farms, we decided that it would be serviceable and reassuring to Canadian fruit-growers if a new analysis were made of Canadian apples, concerning which undoubtedly true data as to their having been actually sprayed could be obtained. As a result, the following letter was written to the *Canadian Horticulturist* for April, 1892.

"Is Spraying Fruit Trees with Arsenical Poisons a Dangerous Practice?

"Sir,—I have received several enquiries from correspondents concerning the foolish and inaccurate statements made upon the above subject, which you refer to on page 83 of your last issue. I therefore beg a little space to submit a few facts which, although well known to many of your readers, may be reassuring to others. In the first place, spraying with the arsenites, through the energy and perseverance of Miss Eleanor Ormerod, the Entomologist of the Royal Agricultural Society of England, is now almost as much practised in Great Britain as it is in this country. It is true that it was introduced as a practical method only two years ago, but through the skill of the introducer, and following the publication and distribution of the report of a special committee, composed of leading fruit-growers, and known as the "Experimental Committee of the Evesham Fruit Growers," spraying with Paris Green is now largely adopted in many parts of the British Isles as the best means of keeping down the ravaging hordes of caterpillars which were rendering futile the labours of the fruit-growers throughout many of the most fertile counties in England. The value of spraying with Paris Green is now fully recognized in England, and will never be given up again for the old methods. As to the possibility of any danger resulting from the practice by the consumption of sprayed fruit, I can only say that entomologists have, with the scientific aid of their colleagues, the chemists, shown over and over again that no danger whatever exists, if only the directions of experienced advisers are carried out. At the meeting of the Dairymen's Association of Western Ontario, held at Brantford on 15th January last, this subject came up, and the absurdity was pointed out of such ideas as you have referred to as published by your English contemporary. As soon as I returned to Ottawa I endeavoured to obtain apples which had been undoubtedly sprayed in accordance with the instructions given by entomologists, and at last, through your own kindness, succeeded. These, upon receipt, were kindly taken in hand at once by Mr. F. T. Shutt, Chemist to the Dominion Experimental Farms, and analysed with the greatest care. I send you herewith for publication his report. Coming from so high an authority, I feel sure it will be of interest to all fruit-growers."

Here followed Mr. Shutt's results, which are given in full on page 189 of this report. This analysis showed that some Rhode Island Greenings, which were obtained from the editor of the *Canadian Horticulturist*, and which he had twice sprayed in the month of June with Paris Green, in the proportion of 1 lb. to 200 gallons of water, when analysed by a most delicate method, capable of showing one fifty-thousandth part of a grain of arsenic, had it been present, revealed not the slightest trace of that poison. Further, in addition to the above, I may perhaps be allowed to give an extract from my own report to the Hon. Minister of Agriculture, for 1887, page 21:

"Frequent enquiries are made, and occasionally mistatements appear, as to the possible danger of poisoning the consumers of fruit and crops, protected with these arsenical poisons, which it is urged may be absorbed by the plants. These statements, however, are quite inaccurate, as a very elementary knowledge of vegetable physiology will show. Fear is expressed that when apples are treated for the Codling-moth the poison may be absorbed through the stigma and laid up in the seeds. With regard to this statement, it should be remembered that the stigma of a flower is without any epidermis, and is exceedingly delicate, so that any corrosive poison, like arsenic, in even a very weak solution, would be much more likely to injure the stigma than to be absorbed, and further than this, even in the natural operation of fertilization, the stigma is a passive member, and absorbs nothing. The activity is on the part of the pollen, which pushes out its fovilla-bearing pollen-tubes and protrudes them through the tissues of the stigma, down the style into the ovary." In corresponding on this matter, Prof. Forbes says: "Of course, you will have no trouble in proving by the highest authority that there is no possibility of the poisons being absorbed by the plants," which statement, with the following letter from Prof. A. J. Cook, should, I think, set this contention at rest:—

"I experimented twice extensively to find out the truth—first in 1880, when I had fifty apples analysed, which were very thoroughly sprayed; poison was carefully thrown on each fruit—with one pound of pure Paris Green to 50 gallons of water—four times as strong as necessary—in May. Chemical analysis in August found not a trace of poison. Another lot of fifty was analysed with the same result."

In short, all analyses have shown that practically there is no danger whatever in spraying fruit trees if ordinary common sense precautions are taken. In conclusion, let me add the following extract taken from the Boston *Transcript* of 1st January, 1892, which is a report of a lecture delivered by Prof. C. V. Riley, the United States Entomologist, undoubtedly the most eminent economic entomologist living:—

"The conclusion of the lecture was particularly appropriate and reassuring, as it dealt with the possibility of danger in the use of arsenical poisons, and the lecturer showed how perfectly safe and incapable of harm they are, if used intelligently and in accordance with the recommendations of those who had large experience in their use. He referred to the scare of last autumn in reference to grapes that were supposed to have been poisoned by spraying, and exposed for sale in New York city, and stated that the alarm, as the Department of Agriculture had showed, was entirely unjustified. 'In no instance,' said Professor Riley, 'is there an authentic case of poisoning through the use of plants or fruits that have been treated, and I wish to emphasize this fact, because almost every year there are statements in the press that are well calculated to alarm and engender the belief that we are in danger of wholesale poisoning by the increasing use of these arsenites.' The latest sensational report of this kind was the rumour, emanating from London, within the last week, that American apples were being rejected for fear that their use was unsafe.

If we consider for a moment how minute is the quantity of arsenic that can, under the most favourable circumstances, remain in the calyx of an apple, we shall see at once how absurd this fear is; for even if the poison that originally killed the worm remained intact one would have to eat many barrels of apples at a meal to get a sufficient quantity to poison a human being. Moreover, much of the poison is washed off by rain and some of it thrown off by natural growth of the apple, so that there is as a rule nothing left of the poison in the garnered fruit. Add to this the further fact that few people eat apples raw, without casting away the calyx and stem-ends, the only parts where any could, under the most favourable circumstances, remain, and that these parts are always cut away in cooking, and we see how utterly groundless are any fears of injury, and how useless any prohibitive measure against American apples on this score."

THE EYE-SPOTTED BUD-MOTH.

(*Tmetocera ocellana*, Schiff.)

Attack.—Early in the spring, a small, dark brown, caterpillar, about ½ inch in length, with head and collar black, and having the body dotted with small protuberances, each of which bears a slender short hair, is found destroying the fruit buds of apple, pear, plum, and some other trees belonging to the large Rose family. Frequently, having destroyed the flower buds, these little caterpillars do much harm by boring down the centre of the twig.

In 1885 I found in Nova Scotia some small larvæ, enclosed in silken cells, which they had spun in the roughnesses of the bark of fruit spurs upon apple trees. Upon one or two occasions last year the method of passing the winter of this insect was discussed at scientific meetings, but there seemed to be doubt about the matter. This winter I have made careful search upon apple trees and upon some twigs, which were sent to me by Dr. Young, bearing the larvæ of a small Coleophora. In every case I have been able to find the larvæ of this moth enclosed in small silken cells, covered over with, apparently, the excrement of the caterpillar, so that I am convinced that for this part of Canada and Nova Scotia, this is the usual mode of passing the winter. In early spring these small caterpillars leave their cells and crawl to the nearest opening buds and begin their aggravating work of destruction. Later they attack the leaves, two or three of which they attach together. During the past season the Eye-spotted Bud-moth has been very abundant, so much so that it has probably been the most notable injurious insect of the season. During May and June many letters were received:

"May 6.—I send you to-day apple-blossoms. You will find in them a small, black worm, which is cutting them before they open. These blossoms were picked off my place in the township of Grantham, county Lincoln."—F. G. Stewart, *Homer, Ont.*

"May 25.—Enclosed find specimens of leaves containing little, brownish-coloured grubs. They are found near the points of twigs of both plum and apple trees. They are sometimes found in a little whitish covering, surrounded by a curled leaf. They are quite numerous, as many as half-a-dozen being taken from a two-year-old tree."—F. Mulholland, *Yorkville, Ont.*

"May 25.—I send you a few peach buds, which have been destroyed by a small, brown worm, from ⅛ to ⅜ of an inch in length. They seem to be more destructive on the smaller and younger trees than large ones. We also find the same worm in both plum and pear trees. My neighbours are also noticing them in their trees." —Geo. Lentz, *Bartonville, Ont.*

"May 28.—The bud-moth, of which I spoke to you in a former letter, has been exceedingly abundant in this section this spring, every tree being disfigured by its attacks. I think we must be careful to take steps to destroy it another spring, or it will materially lessen our crop of apples, pears, quinces and peaches."— L. Woolverton, *Grimsby, Ont.*

"June 19.—The apple bud-worm, which I find plentifully destroying the blossoms on my trees, is not confined to any one kind. It is even on the quinces."—Rev. F. J. H. Axford, *Port Williams, N.S.*

"June 17.—By this mail I send you samples of a worm that is not generally known here; in fact, I have not observed it before. These were taken from a garden at Port Williams, and I hear of it in several other localities. The owner of the garden where I got these, says he has picked and burned about a peck of these leaves containing worms. They seem to roll and seal themselves up in the leaf, which becomes dead and dry. In some cases they eat the young wood. I shall be glad if you can give us any information about this pest, which may prove troublesome. I have advised Paris Green. Your Bulletin 11 is to hand, and is what was wanted by everyone."—C. R. H. Starr, *Wolfville, N.S.*

"June 31.—I send you enclosed in a box some caterpillars taken from my cherry trees, to which they are doing much harm by destroying the blossoms and buds; they are also in the apple buds, and are much more plentiful than last year. Some Gravenstein trees show quite a brown appearance, and they have killed a large percentage of the blossoms, so that the trees will have but a small crop of fruit."—E. E. Dickie, *Cornwallis, N.S.*

From the fact that the larvæ pass the winter half-grown, on twigs, they are able to do a great deal of harm by attacking the buds and boring into them early, before the leaves unfold. The only remedy that can be recommended is to spray the trees directly the buds open, and again after the flowers have fallen. Kerosene emulsion sprayed three times over trees, upon the twigs of which they were in winter quarters inside their silken tubes, had no effect upon the larvæ, having failed apparently to penetrate through the silken covering. Although like the Leaf-rollers they enclose themselves in cases made of leaves drawn together, they have to continually draw in fresh material, and I found last season that where an orchard was severely attacked at the same time by this insect, the Canker-worm (*Anisopteryx pometaria*, Harris), the Lesser Apple-leaf Roller (*Teras malivorana*, Le B.), and the Oblique-banded Leaf-roller (*Cacœcia rosaceana*, Harris), all were much reduced in numbers by a single spraying with Paris Green.

The moth is of an ashy grey colour, with a milky-white blotch on each wing. The eggs, which are remarkably flat, are laid in July, and the young caterpillars grow very slowly, and pass the winter half-grown on the twigs, and, according to Prof. Fernald, also on the ground amongst the fallen leaves.

Note.—Upon applying to Prof. J. H. Comstock for his experience, as to the hibernation of this insest, he kindly requested his assistant, Mr. Slingerland, who has made a special study of the Eye-spotted Bud-moth, to write to me on the subject. Since the above was sent to the printer, Mr. Slingerland has very kindly sent me a complete record of his observations, which I trust will soon be published. I am permitted to say that his experience entirely confirms my own, the larvæ leaving the leaves in September when half-grown, and spinning upon the twigs winter shelters, whence they emerge the following spring and attack the opening buds.

THE CIGAR CASE-BEARER OF THE APPLE.

(*Coleophora*, New Species.)

Attack.—Small orange-coloured caterpillars with black heads and dark feet, encased in brown leathery cigar-shaped cases, which they carry about with them. They attack the leaves of apple, pear and plum trees, by eating a small hole through the epidermis and then feeding on the *parenchyma* or soft substance of the leaf, which lies between the upper and lower surfaces, protruding their bodies a long way out of the cases, and eating for some distance around the central hole. When they have consumed all they can reach they move to a fresh place and make another hole. The brown cases are very tough and have some of the hairs from beneath the leaves attached to them exteriorly; at the upper end the case is contracted abruptly into a 3-limbed-star-shaped orifice, the lips of which fit closely together—through this hole the excrement is ejected and ultimately the moth makes its exit. The larvæ and the slender dark brown chrysalides are about four millimetres in length, the case six millimetres. There is only one brood in the season. The small shining, steel-grey moths appear at the end of July and the beginning of August, and lay eggs which hatch the same season and make about ¼ their growth before winter sets in. After feeding for a time, they fasten themselves to the bark of the tree and remain dormant till spring, when they revive and attack the new foliage.

This insect was first brought to my notice in 1889, when the late Mr. Wm. Brown, of Charlottetown, P.E.I., amongst others, sent me some larvæ from his plum trees, upon which they were abundant. Mr. Brown had also found them upon one "Brockworth Park" pear tree and upon some apple trees. In June last, Dr. D. Young, of Adolphustown, sent me specimens and wrote ;—

"June 14.—I send you to-day some small caterpillars in their cases; one end of the case is open, and the caterpillar seems to fasten to the apple leaf and then feasts away upon it. Most of the leaves of the Duchess, Golden Russet, Northern Spy, Talman Sweet, &c., have them upon them, and often half a dozen on a leaf. They are here by millions and are destroying the leaves rapidly. We have been spraying them this week with Paris Green (1 lb. to 200 gallons), and think that a portion of them are gone from the leaves of trees sprayed a couple of days ago."

"June 24.—Having examined the worm and its work under the microscope I found that it fed chiefly on the inside of the leaf; but that, to reach that part, it ate a little of the epidermis first, every time it attacked a fresh part of the leaf, which seems to be frequent; we therefore from this fact determined to use Paris Green, and we gave the trees a most thorough spraying. After the spraying, I thought, more than before it, they seemed in almost every case to move and attack a new part of the leaf, and wherever they did so they seemed to have just commenced operations and died, for they scarcely made a mark on the leaf. They are mostly gone, yet there are thousands fast to the leaves, but they are dead. They attacked about 1,000 Duchess of Oldenburgh trees, and had they continued a few days longer I believe they would have destroyed the foliage and crop. They are most voracious feeders."

Dr. Young sent me frequent consignments of these larvæ, and although many were dead in the cases, at the same time there were a great many that had formed the chrysalis, and from most of these the moths emerged later. Dr. Young also very kindly took much pains to advise me regularly how the insects were developing. He writes October 3: "I find the young worms are, as you anticipated, on the underside of the leaves. There is one or more on almost every leaf, sometimes only on every 5th or 10th leaf, but pretty plentiful. They are also in the forks of the branches as well as on the leaves."

This last mentioned habit must, I think, be the usual method of passing the winter; none could be found on the fallen leaves 18th November. Upon several lots of twigs sent me at different times during the winter I find the young larvæ in thousands. Being anxious to find out whether they might not be treated during the winter in a wholesale manner, I asked Dr. Young to spray some trees with Kerosene Emulsion. This he kindly did in a thorough manner, and then sent me the twigs about a fortnight afterwards. On 14th December he writes: "I now send you a package of the young caterpillars. The trees off which they were taken were sprayed 25th November; a light shower came that night, so I sprayed again 2nd December with Kerosene Emulsion. If you still wish to have the emulsion used warm, I shall be pleased to try it. In every alternate row of trees (among the Duchess) I have Golden Russets of the same age (17 years). The Russets had very few apples on them, so we did not spray them with Paris Green last season, and I am now satisfied that the caterpillars are many times more numerous on the Russets than on the Duchess of Oldenburghs. I think the Paris Green spraying last summer killed the greater proportion of those on the Duchess and that the dead ones must have fallen from the leaves, for they seemed so much less in numbers afterwards."

They were again sprayed later, as here recorded: "8th February, 1892.—I again send you some of the case-bearers in one package containing two small boxes. The flat box contains those sprayed with very warm Kerosene Emulsion. Those in the top of the round box, above the division, are sprayed with cool emulsion, and those in the bottom of the round box were not sprayed. The reason that I enclose the last is that we have had some very cold weather, 30° below zero, and I hoped it had injured the worms. The trees that were sprayed were done 19 days ago, but there was ice on the trees and I could not very well collect them before."

The cold had in no way, however, inconvenienced these hardy little enemies of the orchard. Upon receipt of the sprayed twigs they were found to be covered with the small case-bearers. The odour of the emulsion was quite strong, but most of the larvæ were still alive. My thanks are particularly due to Dr. Young for the very careful manner in which he has tried every experiment I have suggested and has at great trouble written the full accounts of the progress of the work. Upon enquiring from him when these caterpillars first appeared, he says: "We did not notice the case-bearers last spring till they had done great injury to the leaves. The apples on the Duchess trees were then about the size of pease, and the trees heavily loaded; my brother then came and told me that the leaves were badly eaten. We examined and found the case-bearers. My brother, whose time is occupied in the orchard, says that he has seen them for six or seven years, but not so many of them. Speaking safely, I think they caused a loss of one-half of the crop, for this was the best bearing year, and we had only 458 barrels, whereas we have had from 800 to over 1,000 barrels off the same trees. Besides this, the apples were not at all as good as formerly."

I received also specimens of this same insect in July from Rev. F. J. H. Axford, of Port Williams, Nova Scotia, where it had occurred in small numbers. It has however, as far as I can learn, nowhere else occurred in the devestating numbers recorded by Dr. Young.

From the above experience, spraying with Paris Green, 1 lb. to 200 gallons of water, directly the leaves begin to unfold, and again after the flowers have fallen, would probably be the best remedy. I bred a few chalcid parasites from the cases; but unfortunately they have been mislaid.

THE PEAR-LEAF BLISTER.

(*Phytoptus pyri.*=*Typhlodromus pyri*, of Sheuten.,

Fig. 5.—Cluster of infested leaves: *a*, upper surface of leaf; *b*, lower surface; *c*, two galls enlarged. (Figure kindly lent by Prof J. H. Comstock.)

Attack.—Reddish spots, irregular in shape, about $\frac{1}{8}$ inch in diameter and frequently confluent. These appear on young pear trees early in spring, and as the summer progresses they turn to corky blister-like galls, with a hole in the centre, through which large numbers of minute mites issue and attack fresh parts of the leaf.

I am not aware that this injury to pear trees has ever as yet been recorded in Canada; but I find that it is very widespread and serious. Four years ago I received specimens from River John, Nova Scotia, and during the past summer it has come in from several different localities. It is a European insect, and has doubtless been imported with pear trees.

"May 28, 1889.—The enclosed pear leaves were gathered off a pear tree in the garden. I noticed the young pear trees had their leaves flagging, and upon enquiry was told that it was a blight, and no one knows it nor how to cure it. Is this the case?"

"October 15, 1891.—I send you some more of the pear leaves. They are not nearly so much diseased this year as usual."—Mrs. W. G. Schreiber, *Springfield-on-Credit, Ont.*

"June 22.—I mail to your address some infested pear leaves. The disease is different to our common enemy *Fusicladium.* This trouble has been quite common in our pear orchards and spreads rapidly under favourable circumstances."

"July 13.—Enclosed I send some more diseased pear leaves, as requested. This trouble on the pear leaves, not directly injuring the fruit, we have given it but a casual passing notice. But every year it is growing worse, and on many of the trees this year the foliage is so impaired that the vigour and health of the trees are very much injured."—J. K. MacMichael, *Waterford, Ont.*

"July 14.—I send pear leaves attacked, I suppose, by insect or fungous disease."—Rev. F. J. H. Axford, *Cornwallis, N. S.*

"August 24.—Some kind of blight has been affecting the pear trees in my orchard for the past two or three years. I enclose some leaves, and should be much obliged if you could inform me of the cause of the appearance of these leaves, and also if there is any remedy. A good many of the trees are dying off, and I cannot attribute this to any other cause than the blight."—Chas. A. Holmes, *Richmond Hill, Ont.*

"September 8.—I enclose you some diseased pear leaves sent to me from near London. Would you be kind enough to tell me what the trouble is with them. I have seen the same before, and understand the insect to be a very small mite." L. Woolverton, *Grimsby, Ont.*

This injurious disease, which has spread unnoticed over the Dominion and much of the United States, has not been treated of by many of our North American entomologists, although the mite was figured by Glover (U. S. Agric. Rep. 1872) and mentioned by Riley (Am. Ent. III, p. 26), and Osborn (Ag. Col. Iowa, Bul. 2, 1884). Prof. J. H. Comstock, in Cornell University Bulletin XXIII, December, 1890, gives a full and well illustrated account of this pest, and in the Handbook of Destructive Insects of Victoria (Australia), by C. French, F.L.S., F.R.H.S., the Government entomologist, is also another good account, illustrated by a coloured plate, giving its history in the Australian colonies.

Fig. 6.—Adult mite.
(Kindly lent by Prof. J. H. Comstock.)

The cause of this disease, which, until it is examined, is as a rule attributed to the attacks of some fungous parasite, is a very minute insect belonging to the gall mites, *Phytoptidæ*. It is a very small insect indeed, with an elongated body, shown very much enlarged at Fig. 6; it is so exceedingly small, .12 mm., that it requires to be examined under a microscope. The life history as sketched by Prof. Comstock is as follows:—

"*Life history of the Species.*—The eggs are laid by the females within the galls that they have formed and here the young are hatched. How long the young remain within the gall of their parent has not been ascertained; but sooner or later they escape through the opening in it, and seeking a healthy part of the leaf work their way into the tissue, thus starting a new gall. By this spreading of the young from the galls in which they have hatched and starting new ones, the number of galls on a tree may become rapidly multiplied. The mites live within the galls till the drying of the leaves in the autumn; then they migrate to the leaf buds at the ends of the twigs, where, after working their way beneath the leafy scales, they remain throughout the winter."

No satisfactory remedy has as yet been hit upon for this pest. Prof. Comstock's experiments showed that Kerosene Emulsion sprayed on the leaves was not satisfactory, and all that can at present be suggested is spraying freely with Kerosene Emulsion at the time the buds burst in spring. It is difficult to mix any powder with Kerosene Emulsion, but this can be done with care, and Flowers of Sulphur would certainly be a valuable addition on account of its special efficacy in destroying mites.

THE CLOVER ROOT-BORER.

(*Hylesinus trifolii*, Müller).

Attack.—Small, brown beetles, shown magnified in the figure, which bore into the roots of clover and deposit eggs there; these eventually turn to white grubs and destroy the root of the clover plant.

Fig. 7.

This troublesome insect is now well known in some of the States of the Union; but has never, to my knowledge, been before this year found in Canada. In August last I received from the editor of the *Farmers' Advocate* the following letter, to which I replied as below:—

"SIR,—I send you by parcel-post specimens of red clover roots infected by insects, and black knot taken from cherry trees, with the worms still in them. There are two broods of the clover insect in a season, the first becoming a beetle and leaving the clover roots about the first of July, and the other about the time the red blossoms should develop for the second crop; but if the insects are numerous, there are no red blossoms, and I think they may have been the cause of the almost total failure of the crop of clover seed in this section for a number of years.* As to black knot, I am satisfied that it is caused by insects, and that the fungus exists only in the cranium of those so-called professors who argue otherwise. If they examine the knots the fore part of July they will find from one to ten maggots in each, without any openings to get in. There are openings now, as they are about to leave the knots, which dry up and make no further growth, and the insects do no more harm. If the knots are not destroyed before the insect escapes, it is useless to do so after."—(S. A. ARNOLD, *Harwich Township, Ont.*)

"SIR,—I now send you a short article on the beetle which was destroying Mr. S. A. Arnold's clover. Mr. Arnold's opinion concerning the nature and origin of black knot of the plum and cherry is entirely wrong. The nature and mode of growth of this parasitic fungus are now just as well known as that of the plum tree upon which it grows, and it has been ably treated in your pages by Prof. Panton. It is a rather new kind of argument that because an insect is found inside an object that, therefore, it made it. In the same line would be trying to prove that because maggots are found inside the ordinary mushroom that, therefore, they made the mushroom. There are no holes showing on the outside, because, when the insects hatched from the eggs laid by the mother insect, they were so very small that the hole necessary to allow them to enter the substance of the fungus could hardly be seen, and also because its increase of growth would soon obliterate the holes. (The eggs might also have been inserted in the substance of the gall by the female insect.)

*NOTE.—It is very evident that the gentleman is here confounding two insects—the Clover-seed Midge and the Clover Root-borer.

"The Clover-root Borer (*Hylesinus trifolii*, Müller).—The clover roots sent by Mr. Arnold were found to be badly infested by the Clover-root Borer, which was present in the grub, chrysalis and perfect states. The perfect beetle is a very small dark brown beetle, only $\frac{1}{12}$ of an inch in length. It belongs to the family known as Bark-borers or *Scolytidæ*, all of which are rather slow-moving and small insects: most of the species in this family live in and beneath the bark of trees, where they do much damage. The insect under consideration is a new pest in Canada, originally imported from Europe; it has only been complained of in North America since 1878, when specimens were sent to the United States Entomologist, Prof. Riley, from the State of New York. It has, however, already spread over a considerable area, and is now a formidable enemy of the clover grower. In order that the insect may be recognized by farmers, I give herewith an illustration of the insect in all its stages, which has been drawn with great care by Prof. Riley. All the figures of the insect are much enlarged, the actual size being only about that of the letter "a" by the side of the stem. (Fig. 7.) The life-history is as follows: Early in the spring the mature beetles emerge from the ground, where they have passed the winter in the roots of the clover plants, which they had destroyed the previous season. After pairing the female bores a cavity in the crown of the root and deposits there about half a dozen small white eggs. These hatch in about a week and eat their way down into the root, hollowing it out, as shown in the figure. The burrows are filled up with the excrement of the small white grubs (Fig. b.), which, when full grown, are only about $\frac{1}{10}$ inch in length. These change to chrysalides, and in September the perfect beetles may be found in the roots. In the specimen sent by Mr. Arnold I found full grown grubs, chrysalides, and the perfect beetles.

"These would all have attained the perfect form before winter, and remained in the root until spring, feeding upon its substance. Although the perfect beetle feeds on the roots, it is in the grub state that the chief injury is done. When the larger roots are particularly attacked, Prof. Riley found that in many cases the plants were entirely cut off at the surface of the ground, and the flower stalks were in many cases eaten into.

"*Remedy.*—No better remedy has been suggested than the ploughing under of clover when it is found to be infested. As a rule, this is not detected until the second crop is found to fail. In infested districts the fields should be examined frequently, and if indications of the pest are found, the clover should be ploughed under as soon after the first cutting as there is a pretty good growth on the ground. The value of the clover plant as a fertilizer is well known, so that the loss to a farmer is materially reduced on that account, when this treatment is found necessary. When Gas-lime can be had cheaply and conveniently it will render the treatment much more thorough if a heavy application of from two to four tons to the acre be made previous to the ploughing."

AN OAT WEEVIL.

(*Macrops porcellus*, Say.)

Attack.—A white, legless maggot, burrowing in the bases of the stems of oats, leaving the plant when full grown and penetrating into the ground a short distance to pupate, emerging three weeks later as a small brown weevil with mottled wing covers.

In walking through an oat field on 10th July I noticed that several of the stems had a faded and yellow central leaf, an attack similar to that of *Meromyza Americana* upon many grasses. This latter insect is reported by Prof. Cook as injuring oats severely in the State of Michigan, so I was very curious to see if I had at last found it here, where, although it is a very active enemy of grasses, barley, wheat and rye, I had never found it in oats. Upon taking up some of these stems I was much interested in finding an attack quite unknown to me. The base of the stem had been entirely eaten out by a footless, yellowish-white grub, $\frac{1}{4}$ inch in length, with a chestnut-brown head and the posterior end of the body becoming rapidly smaller at the last two rings. On taking the grub from the oat stem it progressed quickly across a table, working itself along by moving the rings of its body like a dipterous larva and at the same time making use of its slightly extensile tail to push itself along. The next day the same larvæ were found in the stems of *Panicum Crus-galli*, a very succulent grass. When full grown the larvæ left their food plants, and burying themselves in the soil formed oval chambers and changed to small beetles, which were afterwards identified for me by Mr. A. E. Schwarz, of Washington, and also by Dr. John Hamilton, of Allegheny, Pa.

This, I should judge, is not likely ever to develop into a serious pest of oats. It decidedly showed greater preference for the wild grass, *P. Crus-galli*.

RED TURNIP-BEETLE.

(*Entomoscelis adonidis*, Fab.)

Attack.—A showy scarlet beetle, with three black stripes down its back, a black patch on the collar and black legs. Two-thirds the size of the Colorado Potato Beetle, but narrower in outline. Eating the leaves of turnips, radishes and cabbages.

In August, 1885, I found upon the farm of Messrs. Cowdry Bros., at Regina, North-West Territories, sufficient specimens of this beetle to convince me that at any time it might develop into a troublesome pest. As then noted, this beetle also occurs in Europe, and I can see no difference between our specimens and some in my collection from Austria. It has every appearance of being a native insect. Since 1885 I have received no complaints of this beetle; but the following extracts will show that it can develop into a serious crop pest. From corresponding with the settlers through the district I judge that the injury is done by the adult beetle only. I have been unable to learn as yet its life history.

"July 20.—I enclose you some beetles and wish to ask if they are of a harmful kind. At present I only find them on turnips and cabbages, but they may spread further."—G. D. FITZGERALD, *Grenfell, N.-W.T.*

"August 8.—I send you by mail specimens of a beetle that has for about three weeks been feeding on the leaves of radishes; they are so numerous as to have half stripped the leaves from all the radishes and have cleared some to the stalk; we have noticed some feeding on the turnip-tops, but not to do any noticeable harm. Are they likely to give much trouble, and if so, how shall we destroy them?"—J. A. SMITH, *Saskatoon, N.-W.T.*

"August 10.—Please inform me what the enclosed insects are. I picked them off my turnips, which they have eaten the leaves off bare, only leaving the large ribs. I have noticed that such turnips as have been stripped have ceased growing."—ISAAC JONES, *Pheasant Forks, N.-W.T.*

"August 11.—I am sending you some beetles somewhat like lady-bugs, found on our turnips. They are doing considerable damage to the Sweet German turnips and a little to the other white turnips, but do not touch Swedes. I propose trying Paris Green in water."—S. A. BEDFORD, *Brandon, Man.*

"August 12.—I send you herewith some red insects, of which we have thousands on our turnips. Kindly give me some account of them."—Rev. F. R. HOLE, *Halse, Minnedosa, Man.*

Upon enquiring later whether the beetle had bred upon the turnip leaves, Mr. Hole wrote:—"The beetles appeared in July in full force on our turnips; they ate through the leaves a good deal, but the roots did not seem to suffer much. I did not notice any soft-bodied grubs such as you describe."

"Yours received; would say the beetle you speak of did not breed or lay eggs on the leaves, as far as I could see; saw only the beetles."—WM. H. WESTON, *Lorlie, Man.*

"Although hundreds of the beetles were working on the radishes and a few on turnips near by, I believe none of them bred. I have also enquired of a neighbour who had them in the garden, and find that they did not breed there either."—JOSEPH A. SMITH, *Saskatoon, N.-W.T.*

"The Red and Black Beetle in all its habits, except as to food, seemed to me so like the Colorado beetle that I had mentally been calling it *Doryphora rubra-trilineata.* The prevailing colour is red; there are three heavy black lines along the wing covers, the middle lines being made up one-half from each wing cover. It feeds on leaves of turnips and radishes, and where it can get a choice it prefers the latter, sometimes covering a radish plot in swarms. I have picked over 500 from a space five yards long, off a single row of radishes, and in two days they were almost as plentiful as ever. They also prefer the rough-leaved to the smooth-leaved turnips. Ruta-bagas or Swedes are very little meddled with if white turnips or others with rough leaves are growing alongside. I discovered no natural enemies. I watched carefully, as far as time would allow, for the eggs or larvæ of the beetle on the leaves of the radishes and turnips which were its favourite food, but in no instance found either. Some of the radishes if neglected for a day or two would be completely stripped. Some of the female beetles were very big, so big that I expected eggs, and not finding any I thought they must have been deposited in the ground. I know the beetles burrow; but cannot say where the eggs are deposited."—THOS. COPLAND, *Saskatoon, N.-W.T.*

This insect should be watched carefully by north-western farmers, and on their appearance in July the infested crops should be at once sprinkled with Paris Green, in the proportion of 1 pound to 100 gallons of water. I shall be obliged if some of my correspondents will next July send me specimens alive, so that the life-history may be worked out. They may be easily sent by putting one or two pairs into a small tin box with some turnip leaves. These latter should be allowed to fade a little before putting in the box or they will rapidly decay. The boxes for sending insects by mail must not have any holes punched in them, or the food plants and insects will soon dry up and perish.

THE PEA WEEVIL.

(*Bruchus pisi*, L.)

A small, brownish-grey, very active beetle, $\frac{1}{5}$ inch long, with two conspicuous black spots on the end of the body, which emerges from seed pease in autumn or in spring, leaving a small round hole. The egg is laid on the young pod and the grub eats its way into the pea, where it passes all its stages, emerging the same autumn or the following spring.

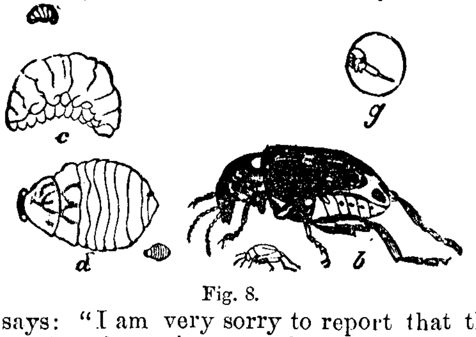

Fig. 8.

Reports from the pea-growing districts early in the season were to the effect that there was far less of the Pea Weevil than last year. Lately, however, I find this to have been a mistake, and a report from Prince Edward county, one of the best pea-seed growing districts in Canada, says: "I am very sorry to report that they are greatly on the increase. Lots coming from the central parts of the county are usually worse than those from the outskirts or from near the water. In some lots grown near the lake there is scarcely a weevil to be found. Certain varieties of peas are more infested than others, as the White-eyed Marrowfats, Forty-folds, and Golden-vines. The Early Kents had some, but the Runner peas have scarcely any. In the line of Runners, Black-eyes, and Golden-vines, farmers raise and keep most of their own seed."—T. G. RAYNOR, *Rose Hall, Ont.*

There was considerable excitement caused in Renfrew county, Ont., last spring, by the introduction of a large quantity of seed-pease, amongst which there were found to be some living weevils. A correspondent, who does not wish his name mentioned, wrote as follows:—"I herewith enclose you samples of pease containing some kind of a bug or grub, and would like to have you identify it. About 3,000 bushels of these pease have been imported from the United States, to be grown here, and a great many are afraid to sow them on account of this bug. In a great many cases the bug is dead, but in others it is not. What would you advise us to do? Is the bug a dangerous one? Would it be better for no one to sow the pease for fear of introducing the insect into the country. I send you by mail a sample of the pease just as they are in the bag, also a sample of those destroyed by the weevil. This seed has been imported by one of our leading seedsmen, and it would be a benefit to every one if the experiment could succeed. The owner supplies the seed and the growers return it to him in the fall, and he gives them 75c., $1, or $1.25 a bushel for the rest, according to the variety. They are to be hand-picked, and it is said it will keep between forty or fifty women busy all the winter. So you see, if they do well it will be a good thing all round, for the farmers, the village, the seed-dealer who introduced the seed, and the United States owner of the seed. I would suggest your writing a letter for the local paper regarding this pest. Possibly it may not live in this climate, as a great many of them are dead. I found a few alive, which I sent you, and one of my neighbours says he saw them as soon as they got to the heat come right out and fly away."

In response to this suggestion I prepared the following letter, and sent it off to the Renfrew *Mercury*, and it was printed on 8th May last:—

"WEEVILLY PEASE.

"*To the Editor of the Renfrew Mercury:*

"DEAR SIR,—I have received two letters from your district enclosing samples of seed pease infested by the Pea Weevil, and asking if it would be safe to sow these for seed. I am also informed that a considerable quantity of similar seed has been sent to your district to be grown for seed during the coming season. I write at once to warn farmers that unless seed is treated before sowing, it will be a very dangerous experiment to introduce this insect into your district. Although it is possible that the weevil may not survive your severe winters in Renfrew county, it must be remembered that this is the worst enemy known of the pea crop, and if the weevils are introduced into your fields with seed sown this spring, the crop grown this year will almost certainly be badly attacked.

"The following is a brief sketch of the life-history of this pest: The egg is laid by the female beetle on the young green pod. As soon as the grub from this hatches, it eats its way in through the pod into the nearest pea, where it remains until full-grown, consuming the interior of the pea and passing through all its stages, from a white fleshy grub to the chrysalis, and then to the perfect insect. Some of the beetles escape from the pease in the autumn and pass the winter hidden away under rubbish or about barns or sheds. The greater number, however, emerge from the pease the following spring, and as soon as the pease are in flower fly to the fields and lay their eggs on the forming pods.

"I have been asked if anything can be done to kill the weevils before the seed is sown. Under the circumstances, I would advise the following remedy: Half fill a barrel or large wash-tub with hot water, not actually boiling, but hotter that can be borne by the bare hand. Pour the pease directly into the hot water, which will instantly kill all the weevils that may have emerged from the pease. Then fill up at once with cold water, which should be standing ready close at hand. The seed should be left in soak, entirely covered with water, for 12 hours, when all the beetles in the pease will be killed. If the seed is to be sown by hand this may be done at once, after pouring off the water, and its growth will be much hastened by the soaking; but if it is to be drilled, it must be dried again or the drill set to allow the swollen pease to pass through freely. To dry the seed after soaking, spread it out thinly on a barn floor or on a large canvas or cloth out of doors, so that it dries up quickly."

The publication of this letter very soon brought in other letters and several samples of pease. From these latter I found that very nearly all the weevils were dead, and upon enquiry from the seed-dealer and shipper I found that the whole stock had been treated in the usual way with bi-sulphide of carbon before shipping.

This being the case, I felt justified in writing again to the Renfrew *Mercury* stating that this was the case.

That there were living weevils even only in small numbers, however, made care on the part of the farmers, as advised above, very necessary.

There are some fallacies current about weevilly pease which it may be well to refute:

1. *Weevilly Pease Floating.*—It is frequently stated that weevilled pease can be detected by throwing the seed into water, when they will float on the top. This is not the case, as everyone can prove for themselves.

2. *Warm Storage Remedy.*—It is also often advised that seed-pease should be stored in a warm room all the winter, so that the weevils may emerge during the winter and die. During the past season I have proved that this remedy is useless. I placed samples of about a quart each in glass jars in my office in January, 1891. They were kept in the heated office and examined frequently. Weevils continued emerging until well into June, long after the seed would have been sown in the field. This, then, makes the remedy of holding over seed until the next year the only reliable, simple remedy. I have found that seed pease may be safely held over for this length of time without losing their vitality. Two-year-old Black-eyed Marrowfats gave in two samples, respectively, 100 and 97 per cent of strong plants. Goldenvines of same age gave 97 per cent, Multipliers gave 99 per cent.

3. *Weevilly Pease as Seed.*—The statement is often made that pease which have been infested by Pea Weevil are almost as good for seed as sound grain. To test this (i.) One hundred injured pease were picked out indiscriminately and sown in the open ground in June. Of these 17 grew and appeared above ground, 2 made strong-looking plants and produced seed; all the others were stunted and weak. (ii.) One hundred were selected which had the radicle injured by the weevil in boring its way out of the grain. None of these grew. (iii.) One hundred were selected which had the hole away from the radicle. Sixty-two of these grew, but the plants were plainly weaker than others grown from sound seed alongside of them.

Two measured pints of a sample of pease grown in 1891 were carefully tested with the following result:—No. 1 gave 717 uninjured seed, 413 injured (none of which grew), and 64 injured seed which germinated. No. 2, 613 uninjured, 479 injured (none of which grew), and 49 injured, which germinated.

Two samples of two-year-old Golden-vine pease which had been injured by weevils, on being tested in the conservatory gave 9 per cent of sprouted grain in the seed tester and 8 per cent in the soil.

These tests then show plainly that weevilly pease do not answer for seed.

I have as yet never succeeded in breeding any parasite from the pea-weevil.

DIVISION OF BOTANY.

SMUT IN SMALL GRAIN.

The great damage by Smut to the immense wheat crop of the Dominion during the year 1891 has caused much enquiry from farmers. The Department of Agriculture for Manitoba has just issued a timely bulletin upon the subject. In a letter from Mr. A. Mackay, Superintendent of the Experimental Farm at Indian Head, he says: "I think too much cannot be known regarding Smut, and anything you could put in our papers cannot but be of value to the farmers. I think every bushel of seed will this spring be treated for Smut, and it is important that the best way should be known how to treat it effectually." In compliance with the above suggestion, I immediately wrote the following letter to the *Farmer's Advocate*, which has a large circulation in the North-West Territories and Manitoba.

Fig. 9.

There are two kinds of Smut which attack wheat. These are shown at Fig. 9, which is the Loose Smut of wheat, and Fig. 10, which shows a smutted grain of wheat attacked by the Hard Smut of wheat, also known as "Bunt" or "Stinking Smut."

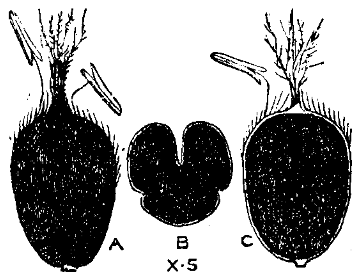

Fig. 10.

"CENTRAL EXPERIMENTAL FARM,
"OTTAWA, 19th March, 1892.

"To the Editor, *Farmer's Advocate*.

"DEAR SIR,—The constant enquiries which come to me from farmers as to the best way to treat grain for Smut make it advisable to draw attention, through your columns, so widely read, to a well-known but effectual remedy. By the time your next issue appears farmers will be preparing to sow their seed-grain. During the past season wheat, barley and oats in many parts of Canada were seriously attacked by the fungous diseases known under the general head of 'Smut.' These diseases are all due to the attacks of parasitic plants, and are propagated by means of the minute grains of black powder of which the Smut consists. These small grains, which are the fructification of the Smut plant, are called spores, and are bodies analogous to the seeds of more highly-organized plants. The diseases are transmitted by means of these spores or 'seeds,' which adhere to the grain and are sown with it. They then begin to grow, penetrate the tissues of the growing plant and in time destroy the seed. The above being the case, and the crop grown in 1891 having been badly infested by these enemies, there is every probability that the crop of 1892 will also be largely destroyed unless means are adopted to prevent it.

"There are several kinds of Smuts, and botanists recognize those which attack the various small grains as different species. For practical purposes, however, they may be considered by farmers as identical, because they all can be overcome by the same remedy. There are many remedies recommended, and for this reason many farmers do not try any. I advise the following, which I believe from all considerations to be the best:

"(1.) Dissolve 1 lb. of Blue-stone (copper sulphate) in 20 gallons of water; soak and stir the grain well in it and leave to soak for 12 hours; then soak in lime water (lime slaked in ten times its weight of water) for 10 minutes.

"(2.) Dissolve Blue-stone (copper sulphate) at the rate of 1 lb. to 2 gallons of water; place this in some large receptacle and pour in grain until it almost reaches to the surface of the liquid; stir well and skim all 'smut-balls' and rubbish from the top. Leave the grain to soak for a quarter of an hour; then pour off the liquid and spread the grain out thinly to dry, and sift dry lime over it.

Should the above be inconvenient, the following may be used:—

"(3.) One pound of Sulphate of Copper is dissolved in a pailful of hot water, which is then sprinkled by one person over 10 bushels of wheat placed in a waggon-box, whilst someone else keeps the grain well stirred. Should a large amount of Smut be detected in grain required for seed, the solution is made stronger, double the quantity of Blue-stone being used." (C. E. F. Bulletin 3, 1888, p. 14.)

"To your own readers I would recommend them to refer to your number for January, 1891, where the subject is treated fully by Prof. Panton. It was also exhaustively treated in Central Experimental Farm Bulletin No. 3, 1888, Bulletin 56, Ontario Department of Agriculture, and Bulletin 32, Manitoba Department of Agriculture.

"There is no question as to the efficacy of the Copper sulphate treatment, and the small percentage of injury to the vitality of the grain is not worth considering when compared with the crop of good, clean grain reaped.

"Wheat, oats and barley may be treated in the same way, but oats should be submerged, not sprinkled only.

"Prof. Kellerman, one of the highest authorities on this continent, says (Bulletin 12, 1890, Kansas Agricultural College, p. 30): 'Since the early part of this century, the almost universal method of preventing Smut has been to soak the seed before planting in a solution of blue vitriol (sulphate of copper). Of the many forms of the treatment in use, perhaps the best is to immerse the seed twelve to fifteen hours in a one-half per cent solution of sulphate of copper (that is 1 lb. in 20 gallons of water), and then put the seed for five or ten minutes in lime water made by slaking lime in ten times its weight of water. This, if properly carried out, will prevent the smut, with but little injury to the crop.'

"Cooke & Berkley, the highest English authorities, say: 'Since dressing the seed-wheat has been so widely adopted in this country, this has been of comparatively little trouble.'

"The above remedies have been tried, and have certainly given good results.

"Messrs. Kellerman & Swingle, who have been investigating this matter of Smuts for several years, and whose conclusions are, therefore, of much weight, have found that, on the whole, and particularly with oats and barley, the 'Jensen hot-water treatment' is the best. This consists of submerging the grain for from five to fifteen minutes in water kept at a temperature of 132½ degrees. I have not yet tried this remedy, so cannot speak of it; but I should judge that there would be difficulties, for farmers without special apparatus, in the way of maintaining the water at the proper temperature. Mr. A. Mackay expresses the opinion that there would be 'no use in recommending this treatment for the North-West Territories; water is scarce and farmers would not take the trouble.'"

GRASSES.

The experiments in grasses have been continued, and the grass plots have attracted a great deal of attention from visiting farmers.

The trial plots of one square rod each have been extended, and a larger number of species have been cultivated than was the case last year. Donations of grass seeds have been received from the following:—

Prof. Macoun, Government Botanist, Ottawa.

Prof. S. M. Tracy, Agricultural College, Mississippi.

Prof. Waldron, Agricultural College, North Dakota.
Mysore Government Botanical Garden, Bangalore, India.
H. L. de Vilmorin, Paris, France.
K. McIver, Roselea Farm, Virden, Man.
A. H. Craven, Duck's Station, B.C.

Herbarium specimens and valuable assistance in the identification of species have been received from Dr. George Vasey, United States Botanist, Washington; Prof. J. Lamson-Scribner, Director Agricultural Experimental Station, Knoxville, Tenn.

Last spring 2,519 packets of grass seeds, made up into 135 collections, were distributed for testing in the different parts of the Dominion. The varieties sent included the best European and native agricultural grasses. Very few reports have been received up to the present; but it is probable that, owing to the fact that it was rather late in the season when the seed was sent out, many of the varieties which did not germinate last season will come up this spring, and others which made some growth will do far better during the coming season.

Some of the statements made in my report for 1890 I find from the results obtained last season require modification or some further notes.

NATIVE GRASSES.

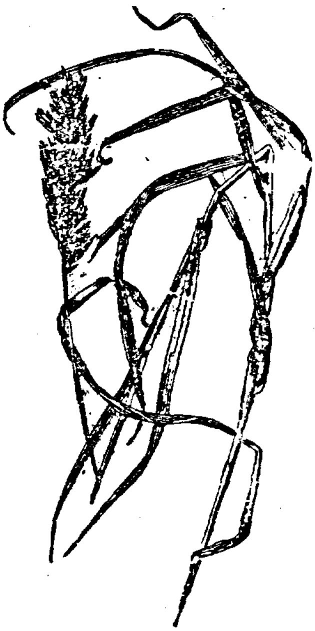

Fig. 11.

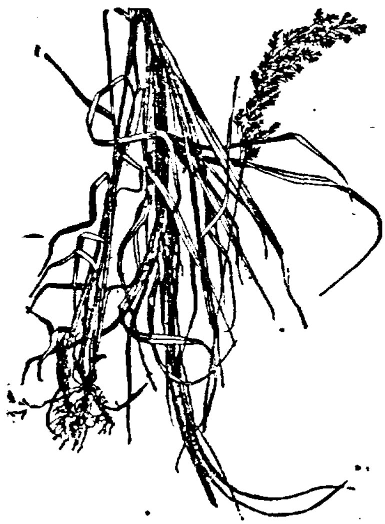

Fig. 12.

Bromus Pumpellianus, Scrib. (Western Brome Grass), Fig. 11. This is a good grass, very much resembling Austrian Brome Grass (*B. inermis*). On 1st May it was 1 foot high and of good appearance; speared 30th May; flowered 15th June; seed ripe, and 3 feet high, 16th July; much earlier than last year.

Deyeuxia Langsdorffii, Kunth. (Northern Blue-Joint). The second year of the plot. The whole bed divided and filled up 21st May; speared 30th May; flowered 15th June, 27 inches high; aftermath 10 to 15 inches high on 5th September. A fine soft grass, which makes excellent hay.

Deyeuxia Canadensis, Beauv. (Blue-Joint), Fig. 12. This is a fine grass of high quality and free growth. It grows in very wet land, sometimes to a height of 6 feet, and makes excellent hay.

Fig. 13. Fig. 14. Fig. 15.

Hierochloa borealis, R. & S. (Holy Grass, Indian Hay), Fig. 13. Mr. Bedford points out, what is undoubtedly quite true, that in land required for farm crops this grass in Manitoba will probably be more trouble to eradicate than will justify farmers in sowing it, except in land that can be left indefinitely in grass.

Muehlenbergia glomerata, Trin. (Wild Timothy). This grass is still a great favourite with all who have grown it. Mr. S. A. Bedford speaks of it in the highest terms of praise. Seed sown in the spring will yield a crop of good hay by August. At Fig. 14 is shown a flowering spike, and at Fig. 15 is a cut showing the whole plant.

Muehlenbergia sylvatica, T. & G. (Bearded Satin Grass). Seed from single plant collected at Ottawa. Sown 28th October, 1890; came up 21st May, 1891; transplanted 6th July; speared 13th August. On 5th September 20 to 24 inches high. This has the appearance of being a valuable grass. It kept green right up to hard frost. The bed is not yet filled, so that no weight could be taken.

Phalaris arundinacea, L. (Reed Canary Grass), Fig. 16. The plot was cut three times in 1890—4th June, 5th August and 16th October. Last season it did not make a good growth; this, however, may have been due to the drought early in the season.

A new bed of the variegated form made a most luxuriant growth; but is not so tall as the type.

Fig. 16.

Fig. 17.

Poa compressa, L. (Canada Blue Grass), Fig. 17. This grass is also known as "Wire Grass." Half of this bed was planted from roots collected wild; the other half from seeds sold wrongly named by one of our seedsmen as *Poa nemoralis*. Both made a vigorous and rich growth. Planted in 1890. A fine succulent growth of young shoots by 30th May; speared 8th June; flowered 24th June; height 18 inches. 7th July height 24 inches, and very even. Half of this bed, cut 5th August, gave 66 lbs. of grass to the square rod. Seed collected from the other half ripe 26th August. The new growth had begun again 5th September. This is rather a small species, somewhat resembling June Grass; but it is easily distinguished by its flat and more numerous stems and their green colour, even when the seed is ripe and has fallen off. It is very hardy, and will thrive in almost any soil, and as it will withstand the effects of drought it is particularly suited for rocky pastures. It flowers about 1st July; the stems remain green a long time, and it makes good hay even when the seeds are ripe; when fed green, our cattle picked it out in preference to all other kinds.

True, June Grass (*Poa pratensis*), which is the same thing exactly as Kentucky Blue Grass, is well shown at Fig. 18. It is not as a rule so highly valued by farmers as it deserves. This, perhaps, may be due to the fact that its chief value is in its leaves, which, although freely produced from early spring till late in the autumn, are not always recognized as belonging to the weak flowering stems recognized by all farmers as June Grass. There are also various forms, some much better agriculturally than others. On the whole, this is the most valuable pasture grass in the country. All stock relish it. It produces more continuously if kept fed off than any grass I know, and the chemical analysis shows it to be a specially rich food.

Fig 18.

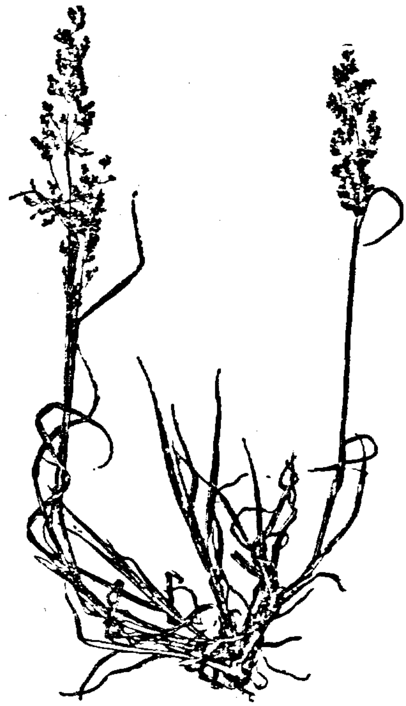

Fig. 19.

Agrostis vulgaris, With. (Red Top), Fig. 20. It might be supposed that all farmers would know what Red Top is; but this is not the case, and I have had more specimens of this grass sent in for name than any one other kind. Anyone who once knows it will not easily forget it again. The name "Red Top" is also given to many grasses to which it does not belong, as Fowl-Meadow Grass (*Poa serotina*), which is never red; when touched with frost it turns purple. Blue-Joint (*Deyeuxia Canadensis*), a tall water or low-land grass, sometimes 6 feet high, and others. True Red Top is an *Agrostis*, a family in which the florets are single at the end of the slender little stalklets in the panicle. In the Meadow Grasses of the genus *Poa*, the flowers are made up of five or six florets as shown in Fig. 17 and 18. Red Top is a very valuable grass for low land, and produces a heavy crop of rich, soft hay.

Agropyrum divergens, Nees. (Awned Blue-stem). In my last report I say: "Spoken highly of in the west, but made a poor showing at Ottawa." In discussing this grass with Professor Lamson-Scribner, he writes me as follows: "When in Montana I noted this grass particularly, and can assure you that it stood till fall upon the open ranges. The culms were hard and rigid, and cattle would not eat them so long as there was any other vegetation to be had. In the winter season, when stock is starvation hungry, of course it may serve to keep the animals alive."

Agropyrum tenerum (Western Rye Grass). This valuable hay and fodder grass has been specially tried during the past season, at the request of Mr. K. McIver, of Roselea farm, Virden, Man., who kindly sent me a good supply of seed in April last, with the following letter: "Will you kindly sow a small plot of native Rye-grass I send you herewith, and have it tested along with other varieties you may be growing. I may state that I have been growing it since 1885, and find it does remarkably well here. I had 3 acres of it last season, which I cut with binder, and which yielded about 50 bushels of seed. I intend to sow 15 acres more of it this spring. If it will compare favourably with other varieties in feeding qualities it must be a boon to this country, as stock are very fond of it, both as pasture and hay. This grass has very fine roots, similar to Perennial Rye-grass, only stronger and a little coarser. In fact, it was its likeness to it that made me gather the seed to test it. This is about the only variety that has given me satisfaction here. Timothy is no use, except for one season, and is hard to germinate. Cocksfoot can hardly stand the winter, and what lives is late in starting. The native Rye-grass (as I call it) is very early, affording a nice bite for stock before there is anything green on the prairie."

"January 16, 1892.—I collected this grass in 1885 while putting up hay in the Assiniboine valley. I noticed some tufts a few feet above the water's edge and observed that it resembled our Scotch Perennial Rye-grass very much, except the head. I felt sure that in a few years we should get no wild hay to cut, so concluded to give this grass a fair trial under cultivation. I gathered as much as half filled a flour bag, cutting half down the stem. From this I had enough to sow a plot of ground 400 yards square, which I sowed in the spring of 1886, on a dry sandy soil. It grew over 1 foot long and seeded, but did not fully mature. 1886 was a very dry summer here, so I felt more than satisfied with my success. In 1887 I got it destroyed by a hail storm. In 1888 I had 3 bushels of roughly-dressed seed, which I sowed in 1889 on 3 acres of wheat stubble-ploughed, mixed soil, sand in one part, clay in another, with a large spot of alkali soil. On this plot I had a magnificent crop in 1890, especially on the clay. The plot yielded about 20 bushels of seed to the acre. This last season I had over 4 tons of hay off same plot, which I did not thresh, having no use for seed. This last spring I sowed 45 acres under it, along with wheat, which did so well that I gave some of it to a party collecting for the Toronto Industrial Exhibition, which was fully 4 feet long. In conclusion, I would say that with the few experiments already made in Manitoba I have no fear of its future, as far as hay and pasture are concerned."

The seed sent by Mr. McIver was sown broadcast on 20th May. On account of the dry spring it did not come up until 23rd June. Copious rains fell on the 10th June. By 30th June the grass was 4 inches high. By 10th July 6 to 8 inches, but uneven. It speared 15th August, flowered 20th August, and the seed was ripe 12th September. The following analysis made by Mr. F. T. Shutt would show that this grass has a good nutritive value. Sample taken 8th July, when the seed was in the milk.

Albuminoids	14·06
Fibre	40·15
Ash	5·71
Fat	·98
	60·90
Carbo-hydrates	39·10
	100·00

Foreign Grasses.

The following grasses will not repay cultivation in the Ottawa district:—

Sweet Vernal Grass (*Anthoxanthum odoratum*). Part of a bed was planted in May, 1890, and had become well established by the winter. Two-thirds of this part winter-killed and the remaining one-third recovered very late. Flowered 30th May. This grass is apparently useless for this climate. Such plants as are not winter-killed recover so late that their character for earliness is entirely lost. The other half of the bed was planted out during the summer of 1890, and had made nice vigorous plants by autumn; but every plant was killed by the winter. This was also the experience we had with this grass in 1887 and 1888.

Wood False-Brome Grass (*Brachypodium sylvaticum*). This variety went into the winter of 1890 with a magnificent appearance. Every plant winter-killed.

Crested Dog's-tail (*Cynosurus cristatus*). The same particulars as the last.

Perennial Rye-grass (*Lolium perenne*). do

Italian Rye-grass (*Lolium Italicum*). do

The following have proved themselves perfectly hardy at Ottawa, and they are probably hardy in all the agricultural districts of the Dominion :—

Tall Fescue (*Festuca elatior*).

The Meadow Fescue (*Festuca pratensis*).

Hard Fescue (*Festuca duriuscula*).

Austrian Brome Grass (*Bromus inermis*). Fig. 21. Of all the grasses not in general cultivation which we have tried, this is by far the most promising. The seed germinates readily and the young plants soon become established. It is conspicuous for its free leafy growth and tall stems which bear an abundance of seed. It flowers here in the last week of June and has produced nearly 4 tons of hay to the acre. It is very hardy, early, and a heavy cropper, and produces a heavy aftermath of succulent leafy shoots, one of which is shown with a panicle of seed at Fig. 20. This grass has also been call "Awnless Brome Grass," "Smooth Brome Grass" and "Hungarian Fodder Plant." The use of the last of these, however, should not be encouraged, as already confusion has arisen on account of the similarity of the name with "Hungarian Grass" a kind of millet.

Fig. 20.

Mr. T. Routledge, writing from Virden, Man., says, 7th September: "I am convinced that this grass is the very best we can get for Manitoba, and the growing of it here is going to be, in my opinion, of very great importance in the future to stock-raisers in this province. What was sown here last spring is now as green as it was a month ago and would still cut for hay, although the prairie grass is dried yellow. I do not think as much of the Western Brome (*Bromus Pumpellianus*, Scrib.), although it is looking very well."

Note.—The drought of the spring of 1891 affected very seriously the grasses grown upon the experimental plots, as far as comparative records with other years are concerned—so much so, that any fuller details than I have given above would only confuse and give a wrong impression concerning many of the species.

The figures used in illustration of this section of my report Nos. 11—20 have been very kindly lent by the William Weld Co. (Limited), of London, Ont., and are the same as were used in the number of the *Farmer's Advocate* for March, 1892.

WEEDS OF THE FARM.

There has been considerable enquiry for information concerning weeds of the farm, and farmers generally seem to be alive to the necessity of stamping out a new pest as soon as it appears. There are certain principles which must be borne constantly in mind by those who wish to clear their land of noxious weeds. In the present age of great and easy communication with all parts of the globe, there are frequent opportunities for seeds of weeds being introduced into previously uninfested districts. This is, as a rule, with other seeds or in hay and straw used as packing. Perhaps the most fertile source of weeds upon a previously clean farm is bought manure. Notwithstanding all efforts to the contrary, weeds will, however, be constantly introduced from outside sources either with seed, manure, or carried by the elements, and it is well that farmers should understand a simple classification of all weeds by their modes of growth.

Plants may be divided into the following classes: annuals, biennials and perennials. In eradicating weeds it is all-important to know under which of these heads they come.

Annuals—Are those plants which complete their whole growth in a year. As a rule, they have small fibrous roots and produce a large quantity of seed. Examples of this class are found in Wild Mustard, Penny Cress (called in Manitoba Stink-weed or French-weed), Lamb's quarters, Wild Buckwheat, Purslane, Ragweed. There are also some annuals which are biennial in habit, that is, of which seeds ripened in the summer produce a certain growth before winter sets in and then complete their development the following spring. Of these may be mentioned Shepherd's Purse, Penny Cress, mentioned above, and Chess.

Biennials—Are those plants which require two seasons to complete their growth, the first being spent in collecting and storing up a supply of nourishment, which is used the second season in producing flowers and seeds. Examples of these are Burdock, Wild Parsnip, Mullein, Evening Primrose and Viper's Bugloss or Blue-weed.

Perennials—Are those plants which continue growing for several years. Perennial weeds are propagated by various methods. The most troublesome are those which extend long shoots beneath the surface of the ground as Sheep's Sorrel, Canada Thistle, Perennial Sow-thistle, Chicory and Couch Grass. Some perennials extend but slowly from the root by means of short stems or offsets; but produce a large quantity of seed. Of these, Ox-eye Daisy, Dandelion, Golden-rod and Perennial Groundsel are examples.

In adopting a method of extermination the nature of the plant to be eradicated must first of all be taken into consideration. Any method by which the germination of the seed in the soil is hastened and then the young plants are destroyed before they produce fresh seed, will clean land infested by annual weeds. The seeds of some annuals have very great vitality, and will continue appearing for several years as fresh seeds are brought to the surface. Wild Mustard and Wild Oats have been known to germinate after lying deep in the ground for twenty years. Biennials must be either ploughed up or cut off previous to flowering. Where ploughing is impracticable they should be cut off below the crown of the root. For this purpose a large chisel in the end of a long handle (to obviate the necessity of stooping) is as convenient a tool as can be used. Perennials are by far the most troublesome of all weeds and require very thorough treatment, and in some instances the cultivation of special crops, to ensure their eradication. Imperfect treatment, such as a single ploughing, frequently does more harm than good, by breaking up the underground stems and stimulating growth.

There is no weed known which cannot be eradicated by constant attention, if only the nature of its growth be understood. Farmers should be constantly on the alert to prevent new weeds from becoming established on their farms. There are some general rules which all should remember:—1. Weeds do great harm by robbing the soil of the plant-food intended for the crop. 2. They crowd out and take the place of more useful plants. 3. They cause great loss of time to eradicate, and frequently compel the farmer to change the best rotation of his crops, and perhaps grow crops which are not the most advantageous for his farm. 4. *Weeds of all kinds can be eradicated* by constant attention along the following lines: (i.) Never allow them to seed; (ii.) Cultivate frequently early in the season, so as to destroy seedlings while of weak growth; (iii.) For perennial weeds, the only means of destroying them is to prevent them from forming leaves and storing up nourishment in their roots. This can be done by constant cultivation. The importance of leaves to plants can be seen by the serious injuries frequently inflicted even upon large forest trees by the destruction of their leaves by insects. The American larches over thousands of acres in Canada have been destroyed during the last four or five years simply by having most of their leaves eaten by the Imported Larch Saw-fly (*Nematus Erichsonii*). Gooseberry and currant bushes stripped of their leaves during one season by the Currant Worm (*Nematus ribesii*) seldom mature a good crop of fruit the next.

The following are amongst the more important pests of the farmer which have been enquired about during the past season:—

Pepper Grass (*Lepidium intermedium*, Gray.)

Specimens of this plant were sent down by Mr. Bedford from Brandon, where it was not known by farmers, and was causing much alarm from its unusual development and luxuriance. This latter character must, however, have been due to the season, as it is indigenous and very common from the Red River west to the Pacific: It is a slender annual herb, about 12 to 18 inches in height, belonging to the Cress family. It produces an enormous quantity of very small reddish seeds, by far the greater part of the plant consisting of the flowering branches thickly beset with the small, round, flat pods. It grows in the shape of a miniature tree with a central stem and a large spreading head. There are two species of these pepper grasses *L. Virginicum* and the present species *L. intermedium*. They are much alike, but can be at once separated by an examination of the seed. In *L. Virginicum* the seed-leaves of the undeveloped plant, inside the seed, are accumbent—that is, have their edges lying against the radicle, while in *L. intermedium* the seed-leaves are incumbent, or have the radicle lying against the back of one of them.

In July the same weed was sent in by the editor of the *North-West Farmer*, who had received it from Mr. H. Byers, of Portage la Prairie, who had come across it in several places, and in one place "had found about half an acre of a wheat field, where the weed had completely crowded out the wheat." About the same time there appeared in the newspapers several references to the great abundance of the same plant in Minnesota and North and South Dakota, where, owing to unusually wet weather, it had developed more quickly than the wheat crop and crowded it out. In the *Lake County Leader*, published at Madison, South Dakota, 25th June, 1891, the following appears: "Valley city, North Dakota.—Extended observations and well-authenticated reports from all parts of the country show the alarming condition of the wheat on account of the growth of Pepper Grass, the new weed of the Mustard family, which has appeared this year for the first time. Many fields are already entirely ruined, and thousands of acres of wheat that was most promising, being chiefly on summer fallow, will not be worth harvesting. The damage to date is estimated at from 15 to 25 per cent." It is probable that this state of things improved as the season progressed; but the above shows the advisability of farmers making every effort to clean this weed out of their land. It is an annual, and produces no running roots; it is easily seen, and can be easily pulled by hand, which will probably be found the best means of eradicating it.

Penny Cress, "Stink-weed," "French-weed" (*Thlaspi arvense*).

This is considered one of the worst weeds in Manitoba. It belongs to the Cress family, and has great vitality. There are two large successive crops of seed ripened in the summer, and frequently many plants will be found late in the autumn, which pass through the frosts of winter unharmed and ripen their seeds early the next spring. It is an exhaustive weed of a rank, unpleasant odour. It is an annual, and wherever seen should be destroyed. It is very abundant in Manitoba, and is now also found in many other parts of Canada. It can at once be recognized by its small white flowers its large flat pods, frequently over half an inch across, and its pungent odour. Thorough cultivation and hand-pulling will destroy it.

Purslane, "Pusley" (*Portulaca oleracea.*)

The red fleshy leaves and stems of this persistent weed are well known to every gardener. The tiny yellow flowers which appear in July, and are of the same form as those of the lovely garden Portulaca, are followed by pods filled with minute black seeds. This is a very difficult plant to kill, owing to its succulent nature. It must be hoed up very lightly and constantly when it first appears. If hoed heavily some of the plants will be covered by the earth, and will soon take root again.

Common Rag-wort, "Stinking Willie" (*Senecio Jacobæa.*)

I have had considerable and very interesting correspondence with the Rev. Father Burke, of Alberton, Prince Edward Island, concerning this plant, which is a perennial groundsel. It has been introduced from Europe into the Maritime Provinces and has been credited with causing a mysterious disease amongst cattle. It is a perennial, but does not seem to spread much from the root. It matures however, many downy seeds, by which it is becoming rapidly disseminated. The following interesting account of this plant appears in the *Prince Edward Island Agriculturist:*—

"For years aback a dirty, yellow weed of rapid growth and extensive fibrous root has been spreading with wonderful rapidity in the western part of the county. As far as can be ascertained, it was accidentally brought to this country from Ireland by an old settler in a bed tick, who took up land near Tignish. From May, till the frost kills out all vegetation, its rank leaves and ugly yellow head, meet the eye everywhere from the place whence it started as far east as Conway station. Every year it makes a stage of many miles, and at this rate before long will waive its unsightly head from one end of our little province to the other. Up to this time it has been known in the west by the name *Baughlan*, which its importer gave it, and which it no doubt was known by in that part of the Emerald Isle whence it came. But now it turns out to be no less a pest then the European Rag-wort, one of the most troublesome weeds the farmers of the other continent have to deal with." Not knowing its name and alarmed at its rapid spread up west, the Rev. Father Burke enclosed a plant (root, leaves, flowers and seeds), to Mr. Fletcher, of the Central Experimental Farm, and has had the following reply:

"Rev. A. E. Burke, P.P.,
"Alberton, P. E. I.

"My Dear Sir,—I am in receipt of your two favours. The yellow weed concerning which you previously wrote is *Senecio Jacobæa*, the 'Common Rag-wort' of Europe, whence it was imported into the Maritime Provinces. It is a common and troublesome weed in many places throughout Nova Scotia and New Brunswick. Principal Mackay, now of Halifax, says that it is supposed to be injurious to cattle, and I know this was a common belief in England years ago; but as a matter of fact I never saw cattle touch it."

In a late issue of the same paper a correspondent, "Farmer John," writes that this plant is well known in Pictou county, and it is stated that the majority of the farmers there believe that to it and it alone are they indebted for what is known as "the Pictou cattle disease." "An investigation, however, was made by some of the leading veterinaries of America, and they concluded that the weed had nothing to do with the disease, and to prove this, cattle were kept on it for some time."

"Nevertheless, I for one—backed up by the opinion of hundreds of others who are interested—cannot help the conviction that it has to do with causing trouble amongst our cows. One thing sure, where there is none of the weed there is no disease, and after the weed has made itself noticeable in a section the cattle disease follows. So if "Billy" should happen by any chance to be innocent he certainly keeps very bad company, and every effort should be made to stamp him out completely, or it will only be a question of time when it will overrun the whole island.

This is no easy task to do, unless every farmer works to keep it down, for one farm can supply seed enough to seed a whole district.

"Sheep eat it and appear to suffer no ill effect from doing so, and it is claimed hereabouts that sheep are the best motor yet discovered to kill out the weed. I have often wondered why our County Council have not taken the matter up; for, as I have said, the weed will overrun the whole county, as it does any section where it gets a hold, unless prompt measures are taken to stamp it out. But my word for it, its destruction is worth a mighty effort."

Father Burke writes: "I notice nothing will eat it here. I have time and again put it in to pigs, which, closed up in pens, usually rush for anything green; but they would not touch the Baughlan."

It is well that all who see this weed should make an effort to destroy it. In old meadows and pastures digging out each plant will be necessary, as it has such a firm hold on the soil that it is almost impossible to pull it up. Rotation of crops and frequent cultivation will of course destroy it in farm lands; but it flourishes by road sides and in waste places. The only way to eradicate it entirely would be for the members of agricultural societies and farmers' institutes to wage a systematic war against it. This should surely be possible.

Perennial Sow-Thistle. (*Sonchus arvensis*).

This is another troublesome plant which is complained of by farmers every year. Specimens were sent in by the editor of the Stouffville *Tribune*, of Stouffville, Ont., who stated that the plant was beginning to seriously affect crops in that vicinity and that farmers had applied to him for information concerning it and the best method of extermination. It is a perennial, with strong underground stems which spread out a long distance from the centre. The leaves cover the ground closely and choke out the crop amongst which it grows. The flowering stems have no leaves towards the top, where there are three or four large yellow flowers which are conspicuously glandular hairy outside and on the foot-stalks. When this plant is established in a piece of land it can be eradicated only by constant cultivation or hoeing.

Burdock (*Lappa officinalis*).

The large rhubarb-like leaves of this plant, and the burrs with their hooked tips which surround the flowers and seeds, are well known to everyone. The Burdock is a biennial, and is easily eradicated by cutting it off below the collar, or by continuous mowing to prevent the plant going to seed.

Wild Chicory, Succory (*Cichorium Intybus*).

The lovely blue flowers of this perennial plant are very conspicuous along roadsides in many parts of Canada. It also is occasionally found in fence corners and around stone heaps. It has strong spreading root-stocks, but is not a difficult plant to overcome by constant hoeing. The large flat, pure blue flowers are borne on stiff leafless stems and open only early in the morning.

Orange Daisy (*Rudbeckia hirta*).

This is one of our most beautiful wild plants. It has now been introduced into most parts of Canada, where it may frequently be seen in clover fields. The flowers are bright orange with a purple centre, and are about the same size as those of the Ox-eye Daisy. The whole plant is very rough and bristly hairy. During the past summer I received specimens from several places, one of which was from Prince Edward Island, where it was described as "not common, but had attracted attention by its great beauty."

Such a conspicuous plant as this is, catches the eye at once, and it should always be pulled up when seen, as it developes a large number of seeds and spreads rapidly.

Ox-eye Daisy (*Chrysanthemum Leucanthemum*, L.)

Few pests of the farm are better known than this. It is a pernicious weed which has become well established in many parts of the country. This is chiefly in hay-fields and pastures.

To clean these the sod must be turned under and the land put into alternate husbandry. A great deal of good may also be done by digging up all plants found along the sides of farm-roads, etc.

Upon the farm of Mr. S. A. Fisher, of Knowlton, Que., not a plant of this weed can be found, although it occurs all round his farm; and, more than this, a railway passes right through his land. This exemption is entirely due to regularly pulling every plant which shows its flowers. These are not pulled hap-hazard when they happen to be seen, but a systematic search is made for them every year in June.

Canadian Flea-bane (*Erigeron Canadense.*)

This is an annual weed, which may be readily recognized by its numerous very small greenish white flowers. It is a tall, erect, hairy plant, of a particularly weedy appearance. It is easily destroyed by hand-pulling, hoeing and cultivation.

Canada Thistle (*Cnicus arvensis*).

The name "Canada Thistle" has now become so well known that it would be useless to try and get it called by its proper name, Field Thistle. It is not a Canadian plant at all but like most of our worst weeds and injurious insects is an importation from Europe. Grindon in his "Botany" says: "Thistles, more than any other class of farm weeds, indicate habitual neglect, yet they accompany cultivation wherever practised by Englishmen and have now become an annoyance in Australia. Many a good old proverb makes use of them. First we have the timely warning: 'He that sows not corn, plants thistles.'"

The Thistle has a creeping perennial root-stock, which penetrates deep into the soil, and which if broken up will produce buds and roots at each joint. It also produces large quantities of seeds in the perfect flowers. There are two kinds of flowers, some smaller and paler than the others which are perfect and produce an abundance of seed. Some others which are twice the size of these have abortive stigmas and produce no seed.

The Canada Thistle is perhaps the most difficult plant to conquer that the farmer has to contend with; but with determined persistence the worst patch may be killed out entirely. The chief effort should be made by frequent hoeing or cultivation to prevent the plant from forming leaves; in this way the roots soon become exhausted and the plant must die. In heavy land, of course, it is more difficult to destroy both Thistles and Couch Grass; but two hoed crops well cultivated will generally be sufficient.

Couch Grass, "Quack," "Twitch," &c. (*Agropyrum repens*).

This is a perennial grass with a creeping root-stock and possessed of such vitality and vigour of growth that if neglected it very soon takes complete possession of land. The difficulty in eradicating the pest is undoubtedly great, particularly in heavy land; but at the same time it is very much magnified in imagination and I have never met the Canadian farmer yet who could not master it, if he attacked it systematically and observed its nature. Quack grass never sends its root-stocks deep into the soil; therefore in farm land what is called "deep ploughing" rather helps it than otherwise, because it merely breaks up the root-stocks and plants them deeper, and the young shoots soon appear from the bottoms of the furrows, even when the top has been harrowed over and the Quack burnt. In gardens deep digging and trenching bury the weed so deep that it is smothered, and if a few blades do succeed in getting through they are soon hoed off. I have found that

Quack Grass can be destroyed in one season by constant hoeing. This was on light sandy soil. A practice frequently recommended at farmers' institutes is the following, which although I have never tried it would to my mind certainly succeed: Plough lightly about 4 inches deep in autumn, and cross-plough in spring. In June sow with buckwheat and plough this under as green manure as soon as it is in flower; then sow again the same crop and plough it in. Follow the next year with a hoed crop. In the North-West Territories and Manitoba is a western variety of this pest which is called Colorado Blue-stem. (*Agropyrum glaucum* R. & S. var *occidentale* V. & S.) In low land this will doubtless be found troublesome and give the farmer some trouble, but it is also probably the most valuable fodder grass which grows on our western cattle ranches.

Wild Oats (*Avena fatua*).

This is an annual grass and is propagated entirely from seed. The seeds are said to have great vitality, and to lie dormant in the soil for many years if they be buried too deep to germinate. Any method adopted to clean land of this pest must ensure that no seeds are allowed to ripen. Sowing fall rye as a soiling crop, and following with a crop of buckwheat to be ploughed in, and then following the next season with a hoed crop, may be suggested. This plant has been sent to me but very seldom, and it is not found, as far as I know, in this part of Canada. Mr. A. M. Kinnear, of Paris, Ont., wrote to me, however, Sept. 3 : "I am interested in a farm in the township of Dunn, county of Haldimand. The farm has but lately come into my hands, and I find it has been allowed to run into a very dirty condition with various kinds of weeds, one of the fields particularly being infested with a plant known in the locality as "wild oats." In October, specimens of the seed were sent to me, and proved to be, as stated, the Wild Oat (*Avena fatua.*) The seed of this weed may be known by its brown husks, bristly at the base and the long twisted arm. When growing, Wild Oats closely resemble cultivated oats, but the panicle is larger and more spreading. The long awn when dry is much twisted, and when damp it uncoils quickly; for this reason, the name Animated Oats has been given to the seed. Sir William Hooker says: "The use of the Wild Oat, with its brown hairy seed and twisted awn, as an artificial fly is well known; the uncoiling of the awn when wetted causing those contortions by which it imitates a fly in trouble. It is of common use with rustic fishermen."

Chess (*Bromus secalinus.*)

I have many letters and enquiries from farmers with regard to the very remarkable but utterly mistaken idea that wheat can by any possibility change to Chess. This is quite impossible and the strange thing to me is that some of these farmers have not proved it for themselves, by trying to produce Chess experimentally from wheat by some of the causes which it is alleged will do so. A. A. Crozier in his charming little book "Errors about Plants" says on this subject: "No popular error has been more generally held in this country than that wheat will turn to Chess; there are signs, however, that interest in the question is dying out, which probably means that the better educated farmers have ceased to believe in the transmutation theory. None of the leading agricultural periodicals now advocate this theory and some of them decline to discuss it any longer. Nevertheless, the subject is by no means out of date." "The causes assigned for the alleged transmutation of wheat to Chess are numerous and varied: sowing shrunken seed; sowing in a certain time of the moon; injury by Hessian fly; eating off of the plants by stock or by fowls; trampling by animals, or injury by passing vehicles; drowning or freezing out during winter; cutting off the "tap" root in imitation of heaving during winter."

In this country Chess is generally supposed to grow only from fall wheat; but occasionally this faith is shaken by plants being found amongst spring wheat, oats and other crops. Many claim that although Chess seed will grow it will not reproduce itself. Upon informing one of my correspondents that a lady acquaintance had grown it as an ornamental grass in her garden for many years, he writes me as follows: "I believe that your friend has led you astray. My reasons for saying so are that I have experimented upon the Chess question here, and if Chess seed will grow and produce Chess at Springfield it will not do so here. I sowed good Chess seed at the same time I sowed fall wheat; it grew nicely, looked well in spring; but it never headed out, and it had every possible chance. It is a bastard grain, and as such will never produce seed."

This gentleman, however, is trying again the present season, and at his request I am also trying the same experiment with him; 100 grains each of Chess and fall wheat were sown last September and each grain is marked with a small picket. One quarter is to be trampled on in the spring, and one quarter to be eaten off; part was uncovered and exposed to the frost during the winter and the growth of every plant will be noted, and left standing where grown, to be examined by all visitors to the Farm, where it will convince at any rate those who see it. And even if the information gained has not much value in advancing the agriculture of the country, at least it may prevent the waste of so much valuable time at farmers' institute meetings. where this subject so frequently comes up for discussion. As a botanist, of course, I know there can be only one result from this experiment; every grain of Chess which grows will bear Chess and every grain of wheat will produce wheat. As an experimenter I shall record the result exactly as it turns out, and shall not now anticipate those results, but they will be published in the next report of the Botanist to the Experimental Farms. There is only one remedy for Chess—to sow clean seed-wheat in clean land.

A knowledge of weeds and the best way to eradicate them is patently of great benefit to farmers. I shall at all times be glad to identify specimens of weeds or their seeds if sent to me at Ottawa. Valuable articles on this subject are now appearing in the *Farmer's Advocate* by Prof. Panton, and it will well repay every farmer in Canada to procure a copy of the small work by Profs. Mills and Shaw of Guelph, the "First Principles of Agriculture." The following taken from it I endorse most heartily: "Weeds can be subdued, and if on any farm they are not subdued, the farmer's own apathy or indolence is to blame for it. If weeds that propagate themselves by their seeds (as all annuals and biennials) are prevented from ripening their seed, they must in the end all die out. If those which propagate themselves by their roots are kept from breathing the air by means of their leaves, they also must perish. Hence, if immediately when harvest is over all grain fields be gang ploughed once or twice, much is done towards destroying the weeds of a farm. A reference collection of the seeds of all Canadian weeds has been begun and will, I believe, be of interest to visitors to the Experimental Farm.

REPORT OF THE POULTRY MANAGER.

(A. G. GILBERT.)

To WILLIAM SAUNDERS, E q.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour of submitting to you the fourth annual report of the operations of the poultry department for the year ending 29th February, 1892. In the beginning of my report of last year a *formula* was given of a warm stimulating morning ration for winter, but varied so as to suit the Asiatic or Spanish families, for the stated reason "that the generous diet suited to the latter breed would tend to make the former too fat to lay well." The result of the treatment was considered satisfactory, so far as egg production was concerned, but it was thought that a ration just as effective, but a little more economical in its constituents, could be prepared. The importance of a cheap winter ration will be evident, for it is at this season when eggs are high in price—because they are scarce—that the margin of profit is greatest. Eggs are more difficult to obtain because the stock are confined to limited quarters, and they are more expensive to obtain because the layers require a more stimulating diet and more careful attention. Notwithstanding all that has been written on the subject of winter laying, correspondents write, visitors ask the questions: "What is the best method of feeding and caring for fowls in winter, so that I can obtain eggs?" From the North-West a correspondent writes: "Eggs are worth 60 cents per dozen here in winter. What kind of fowls are best, and how should I feed them to get eggs in paying quantities?" Again, a visitor says: "I can sell all my eggs at 40 cents per dozen in winter, but just as I am getting them in liberal numbers my fowls begin to lay eggs with soft shells." Another exclaims: "I am very much troubled with my fowls eating their eggs and one another's feathers."

These questions open up the whole subject of the proper winter treatment of laying stock, and they embrace three of the greatest and most discouraging drawbacks to the beginner's success in the shape of eggs laid with soft shells, and egg and feather eating. Answers can best be given by describing the rations fed this winter, and the reasons for so doing, other than that already mentioned.

THE RATIONS OF THE PRESENT WINTER.

The hot morning ration fed during the winter was composed of—

	Lbs.	ozs.
Bran	2	8
Shorts	2	8
Ground meat	1	8

Clover hay—steamed and mixed in liberal quantity.
Salt—very small quantity.
Coarse sand and fine ground oyster shells mixed—about three handsfull.

The whole was mixed with boiling water. Boiled potatoes and turnips were occasionally substituted for the clover hay, for variety in diet is beneficial. The hens did not eat the scalded clover hay when exposed to them by itself, but readily did so when mixed in the soft feed.

The results aimed at in feeding this ration were :—

1. Greater economy by the omission of cornmeal.

2. By supplying lime regularly in soft feed to prevent the laying of eggs with soft shells.

3. By avoiding too generous diet to prevent the hens from becoming so fat as to lay eggs with soft shells.

4. To avoid, by the omission of cayenne pepper or other condiments, a highly stimulating ration, often the cause of eggs being laid with soft shells, or without any shells.

5. To prevent egg-eating, which follows the laying of eggs with soft shells.

6. By the regular feeding of meat and keeping the fowls in active exercise to prevent feather eating, generally caused by the omission of both.

7. To prevent the acquiring of the bad practices named, the cure being very difficult.

8. To furnish the hens, as nearly as possible, with what they can pick up for themselves when running at large outside, such as: insects, in the shape of ground meat; grit (to aid digestion), in the shape of gravel and broken oyster shells; lime, in the shape of ground oyster shells; green stuff, in the shape of clover hay (steamed), cut short and mixed in soft feed, carrots, cabbage, turnips, &c.

At noon, when grain was given, oats were fed in small quantity.

For the afternoon ration wheat was given, with barley (occasionally), mixed in equal quantity. Vegetables, such as carrots, mangels and turnips, were kept always on the floor of the pens. Very little cabbage was fed during the winter.

The rations, as aforementioned, were fed to the following stock in the main building:—

	Pullets.	Hens.
Plymouth Rocks	11	12
Brahmas	—	10
Langshans	—	4
Buff Cochins	—	8
White Leghorns	10	9
Wyandottes	9	4
Andalusians	8	6

Among this stock will be noticed numerous hens, some of them old hens, so-called because they were over two years, and kept for breeders and sitters during the coming season. As there was no alternative, they were placed with the pullets, a practice to be avoided when possible, for the reason given in report of last year, "that the ration which would go to eggs in the pullets would likely make the hens too fat to lay."

The effect in eggs of the rations on the pullets and hens is given as follows:—

——	From 9th December.	January.	February.
11 Plymouth Rock pullets	74	105	50
5 do hens	25	18	15
9 White Leghorn pullets	81	112	124
8 do hens	16	20	18
9 Wyandotte pullets	29	50	99
4 do hens	15	22	15
5 Buff Cochin hens	17	40	22
4 Langshan hens	7	21	5
8 Brahma hens	4	13	11
9 Houdan hens	....	2	10

It may be said that the showing is not a good one for the number of stock, but it must be borne in mind that the feeding was only experimental. The result, however, is striking proof of the great value of pullets over old hens as revenue producers, under the same conditions as to housing, care and feeding. The superiority of young stock over old has long been known to experienced poultry keepers, but the fact is appreciated by comparatively few farmers. The conclusions to be arrived at from the experiment are:—

1. That no hens should be kept over two years. Because, after that age they moult so late that the prospective profit is eaten up before they begin to lay.

2. No soft-shelled eggs were laid by the pullets, showing that they are not as likely to do so as the old stock; that the daily mixing of coarse sand, fine gravel and sifted oyster shells in small quantities has a preventive tendency.

3. That no eggs nor feathers having been eaten, to date of writing, the regular supply of ground meat mixed in soft feed is to be recommended.

4. A small quanty of salt was mixed daily in the hot morning ration, but as it created looseness among the Brahmas, Cochins and several Plymouth Rock hens, its use was given up.

5. The feeding of vegetables, viz., carrots, mangels, turnips, &c., &c., in generous quantity, had the effect of keeping the hens in excellent condition, and is necessary for the production of eggs.

6. Scattering the grain food among the straw and chaff always on the floors of pens, kept the fowls (particularly the young ones) active. This grain food should not be fed in too great quantities.

As much Range or Room as possible.

While on the subject of winter laying it may be stated that the layers do better when they can enjoy as much freedom as possible. Many farmers have their poultry houses so situated that with very little trouble or expense they can so arrange as to allow their fowls, access to a barn, stable or enclosed shed, where gravel, sand, coal ashes or other substances may be found for the hens to scratch in. Fowls so situated are not likely to give trouble in the way of eating eggs or feathers or laying eggs with soft shells. But there are others, and perhaps the great majority, who can only allow their laying stock limited quarters from the time of shutting in until the warm spring sun makes bare the earth again. It is to such persons that the results of the experiments enumerated above and the experience gained as to the breeds which stand confinement best will be of most value.

Breeds which have laid best in Winter.

The experience of the past four winters proves that the breeds which are often stated to be the most unsuited to cold climates lay the best. It is often said by the inexperienced, or the prejudiced, that fowls with large combs are not suited for winter layers, because their combs will freeze. If any one wishes to make revenue from his winter eggs he must not keep his layers where their combs will freeze.

There is reason and intelligence to be exercised in the treatment of winter layers as there is in the winter caring of other stock. Of the hens with the large combs, such as Leghorns, Minorcas and Andalusians, no better winter layers or hardier fowls can be had than the White Leghorns. The weight of the eggs laid by this variety will be found elsewhere. The Andalusians and Minorcas are also excellent winter layers, but require to be kept active, as do all the Spanish class. Plymouth Rocks and Wyandottes are well known winter layers. Members of the Asiatic family, viz., Brahmas, Buff Cochins and Langshans require to be hatched out early in the season to make early layers. They require to be skilfully handled during the close confinement of winter to prevent them becoming too fat. A farmer will not make a mistake by choosing his winter layers from the Leghorns, Plymouth Rocks or Wyandottes. The Wyandottes, perhaps, come as nearly filling the bill as possible, having little or no comb, and are good layers. The Houdans did not seem to stand the confinement to winter quarters as well as other breeds. The following classification may serve as a guide in making a choice from the best known breeds:—

Breeds with large combs.—Leghorns, Minorcas, Andalusians, Black Spanish.
Breeds with small combs.—Wyandottes, Brahmas, Cochins, Houdans.
Breeds with medium-size combs.—Plymouth Rocks, Dorkings, Black Javas. Langshans.
Breeds with rose comb.—Leghorns, Hamburghs, Red-caps, White Dorkings, &c.

BREEDING PENS MADE UP.

The breeding pens were made up at the following dates:—

Breed.	Number in Pen.	When Mated.
Wyandottes	1 cockerel, 5 hens	March 12.
Plymouth Rocks	1 do 9 do	do 18.
Black Minorcas	1 cock, 6 do	do 19.
Black Hamburgs	1 do 7 do	do 19.
White Leghorns	1 do 15 do	do 21.

The male birds remained with the others breeds not mentioned, all winter.

Eggs set and Chickens Hatched.

When Eggs were Set.	No. of Eggs Set.	Description of Eggs.	No. of Chicks hatched.	When Hatched.	Remarks.
April 13	13	Plymouth Rocks	3	May 4	
do 18	11	Wyandottes	8	do 9	
do 18	13	do	8	do 9	
do 18	13	White Leghorns	11	do 9	
do 18	13	Plymouth Rocks	7	do 9	
do 18	13	White Leghorns	7	do 9	
do 21	13	Plymouth Rocks	6	do 12	
do 24	13	7 Plymouth Rocks, 6 Wyandottes	8	do 15	
do 24	11	Plymouth Rocks	6	do 15	
do 27	13	Houdans	6	do 18	
do 30	13	Andalusians	10	do 20	
May 1	13	do	6	do 21	
do 2	13	6 Langshans, 7 B. Cochins	5	do 22	
do 4	13	7 Brahmas, 6 do	3	do 24	
do 25	13	7 Houdans, 6 Black Minorcas	8	June 15	
do 28	13	6 Andalusians, 7 do	8	do 18	
June 1	13	6 do 7 do	9	do 22	
do 19	13	Mixed	10	July 10	

Two settings of eggs of the following breeds were purchased for the purpose of introducing new strains, viz., White Leghorns, Wyandottes, Plymouth Rocks and Andalusians. The chicks from these eggs with two or three exceptions were strong, vigorous and well marked. The majority of them are now used as breeding stock and with equally well-bred males should give good results.

As in previous years, the sitters were placed in comfortable nests, some on the damp earth of the cellar and others on the dry board floor of the upper compartment of the main building. The report of 1890, page 209, contains full particulars as to the proper management and treatment of sitting hens. Before giving the sitter valuable eggs it is better that she be placed on a nest made of short cut straw, and well dusted with carbolic acid disinfecting powder. Three or four china eggs should be placed in the nest and the sitter allowed to remain on these for two days. The valuable eggs should then be given to her. The probability is that the disinfecting powder has meanwhile driven away vermin that might have been on the hen and she will sit with comparative ease and quiet, which she could not do if annoyed by lice. Many settings of valuable eggs are lost every season from the lack of the necessary attention to the sitter.

Dry Boards *versus* Damp Ground.

The experiment of placing a certain number of eggs on the damp ground and dry boards, with a view of ascertaining hatching results, was continued, with less satisfactory results from the dry boards. The following will show the number of chickens obtained by the different methods:—

When Set.	Number of Eggs Set.	Kind of Sitter.	Number of Chickens Hatched.
		Dry Boards.	
April 21	13	Brahma	6
do 24	13	Black Russian	8
do 29	13	Cochin	6
May 1	13	Plymouth Rock	6
do 2	13	Mixed hen	5
do 4	13	Plymouth Rock	3
			34
		Damp Floor.	
April 18	11	Coloured Dorking	8
do 18	13	Wyandotte	8
do 18	13	Buff Cochin	11
do 18	13	do	7
do 18	13	Plymouth Rock	7
do 30	13	do	10
			51

In the eggs placed on the dry boards there were a number of chickens which had attained to full size but had died, apparently unable to break through the thick integument enclosing the chick inside the shell, and which was unusually dry and tough. In other cases the eggshells seemed to be dried on to the dead chicks so as to make it difficult to separate them, and the best way to do so was to soak both the chick and shell in warm water. It seemed as if it would have had a beneficial effect to have sprinkled the eggs with luke-warm water some times previous to the hatching period. The absence of moisture seemed to have had an injurious effect.

It may be interesting as another experiment to place eggs on the dry boards and sprinkle them occasionally during the hatching period.

Treatment of the Young Chicks.

After hatching, the chickens were allowed to remain in the nest for 18 or 24 hours, so as to become thoroughly "nest ripe." Their first meal consisted of stale bread soaked in milk and squeezed dry. This was continued for nearly a week, with dry bread crumbs for a change. As the chickens grew, a more substantial mixture of shorts, cornmeal and bran was fed, lightly at first and more frequently afterwards. It is most important that the chicks should be fed lightly but often. They should never be allowed to remain hungry for any length of time. A neglected chicken will never make a good market fowl. Full instructions as to the care and management of growing chickens will be found in report for 1890, page 212.

Progress of the Chickens.

The chickens grew rapidly, the Plymouth Rocks and Wyandottes making the most rapid headway, as follows:—

Plymouth Rocks.

Four Plymouth Rock cockerels, hatched on the 12th of May, weighed, on 21st of August following, 3 lbs. 14 ozs., 3 lbs. 8 ozs., 3 lbs. 8 ozs., 3 lbs. 5 ozs., respectively.

On the 7th of October the same birds weighed 6 lbs. 8 ozs., 5 lbs. 14 ozs., 5 lbs. 6 ozs., 5 lbs. 2 ozs.

On the 23rd November, 7 lbs. 4 ozs., 7 lbs. 2 ozs., 6 lbs. 14 ozs., 6 lbs. 12 ozs.

On the 5th December, 7 lbs. 8 ozs., 7 lbs. 4 ozs., 6 lbs. 12 ozs., 6 lbs. 12 ozs.

Wyandottes.

Four Wyandotte cockerels, hatched on the 8th of May, weighed, on the 21st of August following, 3 lbs. 13 ozs., 3 lbs., 2 lbs. 8 ozs., 2 lbs. 8 ozs. It will be noticed that the first mentioned Wyandotte was only one ounce behind the heaviest Plymouth Rock of very nearly the same age. This was a remarkably good result, and goes to show that the Wyandottes make a rapidly-maturing and heavy market fowl.

On the 7th October the same Wyandotte cockerel weighed 6 lbs. 2 ozs., as against 6 lbs. 8 ozs. of the Plymouth Rock, being only 6 ozs. behind.

On the 23rd November the Wyandotte weighed 6 lbs. 14 ozs., as against 7 lbs. 4 ozs. for the Plymouth Rock.

Buff Cochin.

A Buff Cochin cockerel, hatched on the 4th of May, weighed, on the 21st of August following, 4 lbs. 6 ozs.; on the 7th October, 7 lbs. 8 ozs.; on the 23rd November, 7 lbs. 8 ozs. As compared with the Plymouth Rocks and Wyandottes this, at first sight, may seem a good showing, but it must be borne in mind that a great part of the weight of the Buff Cochin was made by his large, bony frame, while the bones of the Plymouth Rocks and Wyandottes were smaller, and their weights were consequently more in flesh—a very important consideration when choosing a breed to produce early market chickens.

When the Pullets Laid.

A White Leghorn pullet, hatched on the 9th of May, was the first of the young stock to lay on the 21st October. A Wyandotte pullet, hatched on the 8th of May, laid her first egg on the 5th December, and she was followed on the 7th of the same month by a Plymouth Rock pullet, hatched on the 12th of May. An Andalusian pullet, hatched on the 21st May, laid on the 10th December, and others of the same breed soon after. The experience of every year goes to prove the advantage of early chickens. Late chickens are stunted by the cold weather, and never possess the vigour nor attain to the size the others do. The chickens that are put out on the first grass seem to thrive the best.

Shipment of Stock and Eggs.

The demand for eggs for hatching during the spring season was so large that it was impossible to fill all orders. At any time there can only be a limited number of eggs to sell, for there are the branch Experimental Farms to supply and the chickens to raise for our own purposes. On the 9th November the following stock was shipped to the Brandon, Manitoba, Experimental Farm: 1 cockerel, 3 hens, White Leghorns; 1 cockerel, 3 hens, Plymouth Rocks; 1 cock, 3 hens, Wyandottes. Several cockerels of the different breeds were purchased by—and shipped to—farmers in different parts of the country, for the improvement of their stock. As a general rule, the farmers of the country inbreed from one year to another, with a loss of vitality and size to their stock.

Commencement of Winter Laying.

The fowls were put into winter quarters on the 18th November, when the weather became cold, but on the 3rd of December it became warm again and the fowls were let out into their runs, and were able to be out daily until the 17th of the month, when they were shut in for the season. Moulting was got over early by most of the stock, and they went into winter quarters in good health. Winter laying began during the first week in December and continued during the winter. The first breeds to lay were the White Leghorns, Plymouth Rocks, Black Minorcas, Andalusians and Wyandottes.

Diseases of Poultry.

Except in the case of a very valuable fowl, it is not desirable for a farmer, or any one else, to lose time in attempting to doctor a sick fowl. In a case of roup it is better to at once kill the bird and burn its remains, as the disease makes rapid progress, and if once established in a flock is almost impossible to get rid of. Roup is known in its first stages by the fowl sneezing, wheezing or snuffling, sometimes accompanied by a discharge from the nostrils. Later on the discharge becomes thicker and has a very offensive odour. Sometimes the head swells so as to completely close the eyes, the fowl refuses to eat, and eventually dies in a very emaciated condition. There are several forms of roup, all of which are infectious and contagious. Should a fowl be running at the nostrils and escape detection the *virus* is conveyed to the others by the sick one dipping its beak into the drink water and so contaminating it. As showing the beneficial effects of killing off the affected fowls and thoroughly disinfecting the premises, in a case of a very stubborn nature, the following correspondence will be interesting:—

"Saskatoon, 19th September, 1891.

"Dear Sir,—I take the liberty of writing to you to see if you can inform me what is the matter with my fowls and what is likely to cure them. The disease has been amongst them for two years and we have lost from 50 to 100, and they are still going. I have written to the poultry papers and tried all remedies that I have heard of. The first sign of anything wrong is heavy breathing. Then they commence to rattle, as if breathing through phlegm. They show no sign of being sick until their combs begin to turn dark. Then they appear ill, and finally die. For some days before they die they smell very bad. If you could give me the needed information you would confer a very great favour.

"Yours very truly,

"DAVID LUSK.

"Saskatoon, N.W.T."

Mr. Lusk was informed in reply that his fowls had roup, and as it had been among them so long, energetic and immediate action was necessary. He was advised to kill all the ailing ones, and all those appearing the least sick; to burn or bury their remains and thoroughly disinfect the fowl-houses, and then whitewash liberally, with carbolic acid liquid mixed in the whitewash; meanwhile, to keep the remaining fowls away from the infected premises, if at all possible.

On the 5th of November Mr. Lusk wrote that he had found the remedies of the poultry papers a failure; that he was then killing the sick ones off, fumigating the house with sulphur and keeping it as clear as possible. Still, he says, they seem to take it.

In reply he was advised to keep killing the sick ones off as soon as symptoms showed themselves; to continue the disinfecting and thoroughly whitewash. Some pills prepared according to the formula found effective in the treatment of the farm fowls was sent to him, to try as an experiment on any cases that he might take the trouble of isolating and reporting on.

Some time afterwards the following letter was received, and tells of his success in staying the disease:—

"SASKATOON, N.W.T., 11th January, 1892.

"DEAR SIR,—I am glad to be able to report that, for some time before and since the arrival of your letter containing the pills, we have not had a case of roup amongst our hens.

"Having lost all faith in all known remedies about the time your second letter arrived, I acted upon the advice given therein, to kill all the affected ones, and appearances now are that the trouble is over. At present the hens look healthy and are beginning to lay.

"Many thanks for advice given and trouble taken by you for my benefit.

"Your obedient servant,

"DAVID LUSK.

"SASKATOON, N.W.T."

ANOTHER INTERESTING CASE.

The publication of the following case, and the treatment for it advised by Prof. Wesley Mills, of the Physiological Laboratory, McGill University, Montreal, may be useful to others:—

"STROMNESS, 18th January, 1892.

"Manager Poultry Department,
"Experimental Farm, Ottawa.

"DEAR SIR,—Having received the yearly report of the experimental farms, I notice that you aid farmers in curing the diseases of their poultry. I am much interested in poultry on the farm as a means of profit. My fowls are troubled with a disease that has caused me serious loss for three years past. The sick fowls get pale around the comb and dumpish. Some linger along for a month or two, and others die in a week or two from the time I notice they are attacked. I aim to get eggs in winter, and feed liberally. I get more eggs than any farmer around, considering the number of hens I keep, but they keep dying off. I kill them and bury them. Those that I have opened have all enlarged livers; in fact, their livers are so large as to fill the hen so full as to displace the other organs. Some have enlarged kidneys as well. One liver I weighed came to three-quarters of a pound. If the fowls were allowed to die all their livers would weigh the same. Some of the livers have whitish spots on them, appear to be very tender, and are much filled with water. My fowls are in too limited quarters, but will soon have more room. Hoping for your advice.

"Yours very truly,

"HENRY E. DICKHOUT.

"STROMNESS, ONT."

The case was deemed so important that the letter was forwarded to Professor Wesley Mills, asking his opinion and advice in the interests of the farming community. With his usual kindness, Dr. Mills returned the following reply:—

"PHYSIOLOGICAL LABORATORY, McGILL UNIVERSITY,
"MONTREAL, 13th February, 1892.

"Manager Poultry Department,
"Experimental Farm, Ottawa.

"DEAR SIR,—I have your favour of 11th February, enclosing Mr. Dickhout's letter. From the clear and intelligent account this gentleman gives, I have little doubt that the fowls are suffering from fatty degeneration of the liver, owing to overfeeding and lack of exercise, exaggerated possibly by inadequate ventilation from the 'limited quarters.' Whether there be also cystic disease from parasites or tubercle, it is impossible for me to say without seeing one of the livers.

The remedies are obvious—feeding on oats with vegetable food, scattering with chaff among straw on the floor and enlarging the quarters.

"Truly yours,
"WESLEY MILLS, M.D."

INCUBATOR TRIAL.

On the 13th May 96 eggs were put into an incubator purchased some years ago from A. W. Bessey, of St. Catharines, the manufacturer. The eggs were from the mixed hens which had been running outside for some time and were likely to be fertilized. Careful note was taken of the temperature of the incubator at 7 a.m., 12 noon, 4 p.m. and 8 p.m. The proper temperature to keep was 103. The greatest variations of temperature were on the 17th of May, when the thermometer in the egg chamber rose to 105 for a short time in the morning, and on the 16th May, when 97 was registered in the morning. The desired figure of 103, with these exceptions, was kept with remarkable regularity, but the result was very unsatisfactory. Four chickens only hatched. Examination of the remaining eggs showed five well-developed chicks dead in the shell; 39 ditto imperfectly developed; 17 just started, and 23 eggs with no sign of development, probably not fertilized. It should be stated that the incubator was constructed with two tanks, one on the upper and the other on the lower part of the egg chamber, with the eggs placed on a tray between the tanks. This principle of hatching eggs has received unstinted condemnation. All incubators are now constructed with one upper tank, the eggs being placed underneath and subject to the "top heat." The contention is that the eggs are hatched by the top heat of the hen. The numerous enquiries by letter as to the most improved method of incubation indicate increasing interest in the subject. It is beyond question that artificial incubation is more generally and successfully prosecuted at present than it ever was before in this country, and its advantages can hardly be overestimated.

EGGS KEPT IN DIFFERENT TEMPERATURES AND IN DIFFERENT SUBSTANCES.

The experiments with eggs kept at different temperatures and packed in different substances, in order to ascertain how long they would keep without spoiling, was continued from date of last test, 24th February, 1891, and numbered "Examination 26."

Examination No. 27.—On 14th March, 1891, examined an egg laid first week in August, 1890, and kept in drawer of table in office of main poultry building, placed there the same week it was laid. Contents quite sweet and free from all mustiness.

Examination 28.—On 14th March, 1891, examined an egg laid on the 27th October, 1890, and which had been packed in bran and kept in cellar. Yolk firm and round; quite sweet and free from odour; albumen clear and bright.

Examination 29.—On 14th March, 1891, examined an egg laid on the 29th October, 1890, and which had been kept in the incubator at temperature of 78 to 84 till 11th February, 1891, and afterwards in cellar. Free from odour or mustiness; albumen evaporated until 50 per cent was gone.

Examination 30.—On 14th March, 1891, examined an egg laid on 5th November, 1890, and kept part of the time in incubator at temperature of 78 to 84 and part of the time out. Contents lessened in volume about one-third by evaporation of albumen; yolk adherent to side and at point of adhesion of musty taste; otherwise contents perfectly sweet.

Examination 31.—On the 14th March, 1891, examined an unfertilized egg laid on 9th December, 1890, and placed in incubator on 23rd December, 1890, and kept there at temperature of 78 to 84 until 11th February, 1891, and afterwards kept in cellar. Contents quite sweet and free from odour; albumen a little cloudy; air space occupied about one-fifth of egg shell.

Examination 32.—On the 14th March, 1891, examined an egg taken from the lot greased with lard and packed in salt on the 10th November, 1890, and kept in cellar. Contents quite sweet; yolk firm; has every appearance of a fresh egg.

Examination 33.—On the 14th of June, 1891, examined an egg kept in drawer of table in office from 25th March, 1890. Air space double the natural size; yolk firm; white nearly transparent; contents perfectly sweet.

Examination 34.—On the 14th of June, 1891, examined an egg laid on 27th October, 1890, and put away in bran in a box, with others, in the cellar on the 29th October, 1890; yolk firm; white transparent; contents perfectly sweet; has every appearance of a fresh egg.

Examination 35.—On the 4th June, 1891, examined an egg laid on the 3rd November, 1890, greased and packed in salt with others and kept in cellar. Yolk moderately firm; white almost transparent; contents quite sweet, and free from all odour or mustiness.

Examination 36.—On the 4th June, 1891, examined an unfertilized egg laid on the 17th December, 1890, and kept in incubator from 23rd December, 1890, to 11th February, 1891, at a temperature of 78 to 84; afterwards kept in cellar. Air space occupied one-fourth of space of shell; yolk firm; white almost transparent; contents perfectly sweet and free from all mustiness.

Examination 37.—On the 14th of June, 1891, examined an egg laid on the 30th October, 1890, and kept constantly in incubator at temperature of 78 to 84 until 11th February, 1891, when it was afterwards left in an open basket in cellar. Egg evaporated so as to fill only half of shell; very little white remaining; surface of yolk covered with a coating of mould, giving the egg a musty odour; when the surface with the mould was removed the remainder of the yolk was found quite free from mustiness or any other odour, and quite sweet to the taste. The white, however, had a musty flavour, but not in any sense putrid.

Examination 38.—Examined on the 4th of June, 1891, an egg laid on the 3rd of January, 1891, and was probably in and out of the incubator till 11th of February following. Air space about twice natural size; yolk firm; white nearly transparent; contents perfectly sweet, and free from all mustiness.

On the 18th March, 1892, a final examination was made of the eggs packed away, or kept in the incubator and cellar, as above stated, and it was found that they had, in the great majority of cases, lost their fluid contents and had become musty; but only two or three out of the number could be put down as being positively bad.

Examination also was made of an egg which was laid in August, 1890, and left in the drawer of the table in the office of the poultry building until it was opened on the 18th March, 1892, when the contents were found to be dried up and the yolk quite solid and firm, but quite free from any offensive or musty odour.

Examination was made at the same time of other eggs which had been put in the drawer of the table in the office during the month of April, 1891, and left there since untouched, till date of opening, as given below, with date when laid and result of examination.

No. 1.—An egg laid on the 20th March, 1891, and opened on 18th March, 1892, was found as follows:—Air space fills one-third shell; yolk firm and natural in colour; white nearly transparent; slightly clouded; contents quite sweet, and free from all mustiness or unpleasant odour.

No. 2.—Laid 4th March, 1891. Yolk natural in colour; just like No. 1, but yolk partly adherent to shell.

No. 3.—Laid 27th March, 1891. Same as No. 2, but air space fills more than one-third of shell.

No. 4.—Laid 20th March, 1891. Same as No. 3.

No. 5.—Laid 22nd March, 1891. Quite sweet; white entirely evaporated; yolk firm and sticky, but natural in colour, and quite free from mustiness or any offensive odour.

No. 6.—Laid 18th March, 1891. Air space fills about half of egg; white more than half evaporated; nearly transparent, slightly clouded; yolk of natural colour, but much firmer than natural; contents quite sweet, and free from all mustiness.

No. 7.—Laid 18th March, 1891. Contents occupy about one-third of the shell; yolk very firm and sticky; quite sweet, and free from all mustiness.

Nos. 8, 9 and 10.—Same as No. 7, except No. 10, which has a small quantity of albumen, but quite sweet.

Weight of Eggs.

During the past year much attention has been directed to the size of eggs and the breeds that lay them. It is well known that the breeds which lay the most eggs do not always lay the largest—for instance, take the Black Hamburgs, which lay from 200 to 240 eggs per annum, under favourable conditions, but their eggs are much smaller than those of any other of the standard breeds. On the other hand, the Brahmas, which are credited with laying an egg of large size, only lay 80 to 100 per annum, while there are a number of breeds which lay eggs of medium size and number. Again, different strains of the same breed lay eggs of different size. Pullets do not lay as large eggs as they do when they are hens. Fowls which lay all winter do not lay, as a rule, as large eggs as the hens that have been idle during that time, and only begin to lay when the warm spring weather sets the egg machinery in motion. Eggs laid by hens in confinement are not as large as the eggs laid by the same hens when running at large. It will be said by one person that the White Leghorns lay a small egg as compared with those from the Plymouth Rock and Brahma. Soon after another person will be heard to express surprise at the small eggs laid by their Brahmas or Plymouth Rocks as compared with their neighbour's White Leghorns. Some of the eggs laid by the Farm Buff Cochin hens of the same age are remarkable in their difference of size, one hen laying during last month an egg weighing $2\frac{1}{4}$ ounces, while an egg laid about the same time by her full sister only weighed $1\frac{5}{8}$ ounces. Both hens were kept in the same pen under the same conditions.

In view of the differences noted above, the following table of the weights of eggs of different breeds will be read with interest. It may be stated that the weighing was done on one of the scales in the Chemist's laboratory.

Hens' Eggs.	Lbs.	Ozs.
Plymouth Rocks, single egg	....	2⅜
do per dozen	1	11
Brahmas, single egg. } Weighed in February when hens were confined to house.	....	2⅛
do per dozen.. } Weighed in February when hens were confined to house.	1	9½
do single egg, weighed May; hens out	....	2½
do per dozen do do	1	13
Buff Cochins, single egg	....	{ 1⅔ 2¼
do per dozen	{ 1 1	8 10
White Leghorns, single egg	....	2¼
do per dozen	1	10
Wyandottes, single egg	....	....
do per dozen	1	9
Andalusians, single egg	....	2¼
do per dozen	....	....
Black Minorcas, single egg	....	2⅔
do per dozen	1	11
Pullets' Eggs.		
White Leghorns, single egg	....	1 9/10
do per dozen	1	7⅛
Red Caps, single egg	....	2
do per dozen	1	7⅛
Plymouth Rocks, single egg	....	2
do per dozen	1	6⅛
Wyandottes, single egg	....	2
do per dozen	1	7
Houdans, single egg	....	2
do per dozen	1	8
Black Minorcas, single egg	....	2
do per dozen	1	7
Coloured Dorkings, single egg	....	2
do per dozen	....	....

The Poultry Show at the Industrial.

During the second week of the industrial fair held in Toronto in the month of September last a visit was paid to the poultry exhibit, which was up to a high standard of excellence. The same excellent arrangements for accommodation, care and feeding of the stock so conspicuous the previous year were again noticed. At a meeting of the Ontario Poultry Association, held in one of the rooms above the main offices, upon invitation of the president, a short address was made, in which the progress of the work carried on at the Central Experimental Farm was described.

The Wild Geese.

At the beginning of May the wild geese were removed to runs outside, where they had access to tanks of water. They had apparently "paired," and the two pairs were placed in separate runs. Soon after one of the geese laid an egg, which was followed by three others. Two of the eggs were placed under a large Brahma hen, which was broody at the time, and the goose was allowed to sit on the remaining two, but did not sit contentedly, the nest being evidently in too exposed a place, and the eggs did not hatch. One of the eggs under the Brahma hen proved unfertile, while the other, at the end of 28 days, was found to contain a full-sized gosling, but dead in the shell.

Acknowledgment.

In the month of February last the poultry department was presented by Mr. John Gray, the well known Wyandotte breeder of Todmorden, Ont., with a very fine Wyandotte cockerel. The bird is of beautiful shape and markings, and is a valuable addition to the breeding stock.

An Invitation Westward.

In the beginning of the month of January last an invitation was received from the Ontario Agricultural and Experimental Union to read a paper at the annual meeting of the association to be held at Guelph on the 28th and 29th of the same month. Having obtained leave, I was present at the meeting, which was well attended and was most successful, and read a paper entitled "Poultry in its relation to Agriculture," showing the magnitude and value of the poultry interests in this and other countries. Discussion followed, in which surprise was expressed that the farmers did not, as a rule, pay more attention to their poultry as a revenue maker, and manage so as to make their hens lay when eggs were at the highest price.

The Additions to Poultry Building.

The additions to the poultry building are now completed. They are composed of a building 78 by 12, divided into twelve pens, each 8 by 5 feet, with a middle compartment, with chimney for stove if necessary, and containing six feed bins. This building, which runs from east to west and is connected with the main house, contains twelve of the standard varieties to be used as breeding stock. At present the addition contains the following males and females, all of the highest order of excellence:—

Pen 1.—White Leghorns; 7 pullets, 1 cockerel.
2.—Black Minorcas; 5 hens, 1 cock.
3.—Andalusians; 5 pullets, 1 cock.
4.—Plymouth Rocks; 7 pullets, 1 cockerel.
5.—Wyandottes; 5 pullets, 1 cockerel.
6.—Houdans; 5 hens, 1 cock.
7.—Black Hamburgs; 6 hens, 1 cock.
8.—Langshans; 4 hens, 1 cockerel.
9.—Buff Cochins; 5 hens, 1 cock.
10.—Red Caps; 3 pullets, 2 hens, 1 cockerel.
11.—Coloured Dorkings; 4 pullets, 1 hen, 1 cockerel.
12.—Golden Polands; 3 hens, 1 cock.

To this building another is connected, which runs southward. This addition, 96 feet in length by 13 in breadth, is also divided into 12 pens, some of which are 9 x 6, and others 9 x 7. Some of these pens are intended to hold fowls for experimental crossing and the remaining divisions will probably be devoted to geese, ducks and turkeys. There is also a middle compartment, with bins and chimney for stove. Both additions have lofts for holding straw and chaff to let into the pens below. Ventilating shafts rnn up both sides of the buildings at regular intervals. The inside fittings are of the same style as in the older building. Both additions present a roomy and handsome appearance.

Visitors Increasing in Number.

The visitors to the poultry department continue to increase in number every season. Among the visitors of last fall were several who contemplated going into poultry on a large scale, and who were anxious to get all the information possible as to the best paying breeds, methods of treatment of stock and construction of buildings, incubators, &c., &c. As in previous instances, all the necessary information was cheerfully given, and the methods experience had proved the best shown to them.

Enquiries by letter from farmers are also much more numerous, and indicate an increasing interest in their poultry, a department of their farms which, if properly managed, will not fail to yield a gratifying percentage of profit in return.

A Few Useful Hints.

Farmers will do well to remember the following:—

1. Do not inbreed.
2. Keep no hen over two years.
3. The old hens eat the profit made by the younger..
4. Convert the waste of the farm into eggs and poultry.
5. Too many early chickens cannot be raised. They represent so much ready money.
6. Make hens lay when eggs are highest in price and not when lowest, as is the practice.

In the reports of 1889 and 1890 much information will be found that space will not permit repetition of in this report. These reports may be obtained on application.

I have the honour to be, Sir,

Your obedient servant,

A. G. GILBERT,

Manager Poultry Department.

Central Experimental Farm,

29th February, 1892.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF W. 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 1891.

WEATHER.

The winter was changeable, with light snowfalls followed in most cases with rain, and changing again to periods of extreme cold.

The spring was dry, with cold winds extending into June; from that time until the end of the year, with the exception of October, the weather was all that could be desired for farm work. The work on the Experimental Farm commenced on 27th April; seeding began on the 30th and continued, with slight interruptions, until 12th June, when the last of the turnips were sown. With fine harvest weather all the crops were secured in good condition.

MANURE.

In addition to the barnyard manure made on the farm, 580 loads of marsh mud were drawn during the winter months. This was supplemented by some special fertilizers of the following kinds:—"Ceres" superphosphate, from Jack and Bell, Halifax, N.S.; the Archibald phosphate, from Samuel Archibald, Truro, N.S., and a few bags of Reliance and Victor fertilizer from the Nichols Chemical Co., of Capelton, Quebec. All of these were found to increase the crops materially.

HAY LANDS.

Both the English and the Broadleaf hay on the marsh was a light crop, while that on the upland was very heavy. About 60 tons of the former and 35 tons of the latter were secured in good condition. It was found necessary to build another brush heap and strengthen those already built, in order to protect the dykes from the heavy swell of high tides, and for this purpose 75 loads of brush and stone were used.

WHEAT.

The following statement shows the quantity of seed used and the names of the different varieties of wheat sown, the size of the plots, height of grain when mature, the condition of straw, when harvested, date of harvesting, weight of grain both in straw and when threshed.

This grain was sown on land where roots and corn were grown last year.

WHEAT.

Seed Sown.	Names.	Date of Sowing.	Size of Plots.	Height of Straw when Mature.	Condition when Cut.	Date of Harvesting.	Weight of Grain and Straw.	Weight of Grain.	Weight per Bushel.	Yield per Acre of Grain in Bush. and Lbs.
Lbs.			Acre.	Inch.			Lbs.	Lbs.	Lbs.	
4½	White Fife	April 29	1/20	48	Strong, bright straw	August 26	200	80	52	26·40
4½	Indian Hard Calcutta	do 29	"	34	Stiff straw ; some rust	do 20	170	45	56½	15·00
4½	Indian Hard Karachi	do 29	"	36	do do	do 20	110	28	56	9 20
2¼	Colorado	do 29	1/40	55	Bright straw ; lodged	do 22	255	76½	61	
4¼	White Connell	do 29	1/30	45	do some lodged	do 24	310	106	57½	35·20
4¼	Rio Grande	do 29	"	54	Strong, bright straw	do 24	195	58½	58½	19·30
4¼	Defiance	do 29	"	50	do	do 26	260	70	55½	23·20
4¼	Australian	do 29	"	43	Weak straw ; lodged	do 26	360	115	57½	38·20
4¼	Gehun	do 29	"	42	Soft straw ; some lodged, and rust	do 22	310	103	57	34·20
4¼	Campbell's White Chaff	do 29	"	48	Strong, bright straw	do 25	345	112	56	37·20
4¼	Campbell's Triumph	do 30	"	42	do	do 22	315	104	58½	34·40
4¼	Ladoga	do 30	"	54	do	do 24	275	90	60	30·00
4¼	Red Fern	do 30	"	50	do	do 24	265	104	57	34·40
4¼	Judket	do 30	"	46	do	do 29	215	53	53	17·40
4¼	Russian Hard Tag	do 30	"	45	Soft straw ; some rust	do 29	220	59½	59	19·50
4¼	Saxonka	do 30	"	45	Bright straw	do 24	200	75	58	25·00
4¼	White Delhi	do 30	"	36	Short, rusty straw	do 20	175	75	57½	25·00
4¼	White Russian	do 30	"	48	Soft, bright straw	do 25	290	90	57½	30·00
......	Pringle's Champlain	do 30	"	48	do	do 25	360	132	55½	44·00
......	Wellman's Fife	do 30	"	54	do	do 24	265	106	55	35·20

In addition to the above, eleven varieties of winter wheat were sown on the 9th of September. This germinated well and made good growth before the first frost, but the absence of snow thus far during the winter and frequent changes of temperature are unfavourable for this crop.

OATS.

Twenty-five varieties of oats were sown in plots of one-twentieth of an acre each. A statement is given below of the results.

OATS.

Seed Sown.	Names.	Date of Seeding.	Size of Plots.	Height of Straw when Mature.	Condition when Cut.	Date of Harvesting.	Weight of Grain and Straw.	Weight of Grain.	Weight per Bushel.	Yield per Acre of Grain in Bush. and Lbs.
Lbs.			Acre.	Inch.			Lbs.	Lbs.	Lbs.	
4¼	American Triumph	May 4	1/20	50	Bright straw; some lodged	August 25	345	132	38	77·22
4¼	Banner	do 4	"	56	do	do 21	368	160	35	94·04
4¼	Black Tartarian	do 4	"	51	Some rust	do 22	335	149	35	87·22
4¼	Bonanza	do 4	"	50	Stiff, bright straw	do 18	375	132½	39½	77·32
4¼	Canadian Triumph	do 4	"	60	do do	do 15	377	146½	42	86·06
4¼	Egyptian	do 4	"	50	Soft do	do 22	365	119¼	39¾	70·05
4¼	Challenge (Webb's)	do 4	"	54	do straw; some rust	do 18	450	155¼	36½	91·11
4¼	Prolific Black Tartarian	do 4	"	54	do bright straw	do 25	420	165¾	34½	97·17
4¼	Early Blossom	do 4	"	50	Some rust	do 22	385	133	38	78·08
4¼	Early Racehorse	do 4	"	42	Bright, strong straw	do 20	358	126	42	74·04
4¼	Flying Scotchman	do 4	"	42	do	do 20	368	162	40½	95·10
4¼	Poland White	do 4	"	52	do	do 17	370	146¼	39	86·01
4¼	Giant Swedish	do 4	"	56	Some rust	do 28	376	156¼	33	91.31
3	Prize Cluster	do 4	1/30	51	Strong, bright straw.	do 17	298	118½	38½	104·19
4¼	Rennie's Prize White	do 4	1/20	52	do	do 15	327	123¼	40½	72·17
4¼	Victoria Prize	do 4	"	56	do	do 19	398½	150	40	88·08
4¼	White Russian	do 4	"	54	Soft straw; some lodged	do 22	460	161½	38	95·00
4¼	Early English White	do 4	"	42	Bright, strong straw	do 22	310	120	40	70·20
4¼	New Zealand	do 4	"	52	Soft, bright straw; some lodged	do 27	585	207	34½	121·26
4¼	Welcome	do 4	"	41	Bright straw; some lodged	do 22	350	105	35	61·26
4¼	American Beauty	do 4	"	45	Some rust lodged	do 25	465	216	38	127·02
4¼	Early Archangel	do 4	"	57	Soft, bright straw	do 19	415	192½	38½	113·08
4¼	Holstein Prolific	do 4	"	48	Strong do	do 22	370	171	36	100·20
4¼	Rosedale	do 4	"	57	Some rust	do 22	440	209	38	122·32
4¼	Hazlett's Seizure	do 4	"	54	Bright straw; some lodged	do 19	352½	138¼	39½	81·11

These oats were grown on well drained land that had a dressing of marsh mud, drawn during the winter, spread in the spring and worked up with the top soil into a seed-bed before sowing.

BARLEY.

EIGHTEEN varieties of Barley were sown on land that Roots and Corn were grown on last year, on plots of $\frac{1}{20}$ of an acre each, with the following results:—

Weight of Seed.	Names.	When Sown.	Size of Plot.	Height of Straw.	Condition when Grown.	Date of Harvesting.	Weight of Grain and Straw.	Weight of Grain.	Weight per Bushel.	Yield per acre in Bushels and Lbs
Lbs.			Acre.	In.			Lbs.	Lbs.	Lbs.	
$4\frac{3}{4}$	Prize Prolific	May 5	$\frac{1}{20}$	36	Some rust; lodged	Aug. 20	400	120	48	50·00
$4\frac{3}{4}$	Saale	do 5	"	38	do	do 20	300	124	50	51·32
$4\frac{3}{4}$	Golden Melon	do 5	"	39	Soft, bright straw	do 20	324	125	50	52·04
$4\frac{3}{4}$	Danish Chevalier	do 5	"	39	do some rust	do 21	265	106	47	44·08
$4\frac{3}{4}$	Improved Chevalier	do 5	"	38	do do do	do 22	310	107	47	44·28
$4\frac{3}{4}$	Peerless White	do 5	"	42	do do do	do 24	325	114	$45\frac{1}{2}$	47·24
$4\frac{3}{4}$	Thanet	do 5	"	41	do do lodged	do 21	250	109	$48\frac{1}{4}$	45·20
$4\frac{3}{4}$	Kinver (Webb's)	do 5	"	42	do do do	do 21	274	116	$51\frac{1}{2}$	48·16
$4\frac{3}{4}$	Duck-bill	do 5	"	48	Bright straw; lodged	do 18	451	185	$51\frac{1}{2}$	77·04
$4\frac{3}{4}$	Goldthorpe	do 5	"	48	do do	do 25	410	$152\frac{3}{4}$	47	63·31
$4\frac{3}{4}$	Baxter's Six-rowed	do 5	"	42	do	do 12	360	$112\frac{1}{2}$	45	46·42
$4\frac{3}{4}$	Rennie's Improved	do 5	"	40	do	do 13	384	138	46	57·24
$4\frac{3}{4}$	Odessa	do 5	"	40	Soft, bright straw; some lodged	do 12	402	146	45	60·40
$4\frac{3}{4}$	Oderbruch	do 5	"	42	do do	do 11	426	$171\frac{1}{2}$	49	71·22
$4\frac{3}{4}$	Mensury	do 5	"	48	do straw	do 11	376	$157\frac{1}{2}$	45	65·30
$4\frac{3}{4}$	New Golden Grains	do 5	"	40	do do	do 22	165	59	$47\frac{3}{4}$	24·28
$4\frac{3}{4}$	Guaymalaye	do 5	"	36	Some rust	do 22	100	$47\frac{1}{2}$	$47\frac{1}{2}$	19·38
60	Large Two-rowed Naked	do 5	$\frac{1}{3}$	30	Short, strong straw	do 13	......	658	$58\frac{1}{2}$	41·06

Early and Late Seeding.

Below is a statement showing the results obtained from sowing the same kinds of wheat, barley and oats at different periods, one week intervening between each seeding. The size of the plots was one-tenth of an acre.

WHEAT.

—	Quantity of Seed.	Names.	Date of Seeding.	When Harvested.	Weight of Straw and Grain.	Total Weight of Grain.	Weight per Bushel.	Yield per Acre in Bushels and Lbs.
	Lbs				Lbs.	Lbs.	Lbs.	
1st plots....	9	Campbell's White Chaff..........	April 30..	Aug. 22..	510	177	59	29·30
	9	White Connell....	do 30..	do 27..	450	171	57	28·30
2nd plots.....	9	Campbell's White Chaff....	May 7..	do 26..	500	204	58½	34·00
	9	White Connell....	do 7..	do 29..	550	196	56	32·40
3rd plots.....	9	Campbell's White Chaff..........	do 14..	do 29..	560	207½	55½	34·35
	9	White Connell.	do 14..	Sept. 4..	465	171	57	28·30
4th plots.....	9	Campbell's White Chaff..........	do 21..	do 8..	675	196	56	32·40
	9	White Connell..	do 21..	do 9..	586	199½	57	33·15
5th plots....	9	Campbell's White Chaff	do 29..	do 16..	600	196	56	32·40
	9	White Connell.	do 29..	do 18..	667	191¼	51	31·52
6th plots.....	9	Campbell's White Chaff..........	June 5..	do 18..	575	156	52	26·00
	9	White Connell.	do 5..	do 19..	576	162½	50	27·05

The Campbell's White Chaff had in all cases bright, strong straw. The Connell lodged somewhat.

BARLEY.

Plots of one-tenth acre each sown.

—	Quantity of Seed.	Names.	Date of Seeding.	When Harvested.	Weight of Straw and Grain.	Total Weight of Grain.	Weight per Bushel.	Condition when Cut.	Yield per Acre in Bushels and Lbs.
	Lb.				Lbs.	Lbs.	Lbs.		
1st plots..	9½	Baxter's Six-rowed..	April 30..	Aug. 14..	450	200	50	Bright straw....	41·32
	9½	Carter's Prize Prolific	do 30..	do 20..	600	220½	49	do ...	45·45
2nd plots.	9½	Baxter's Six-rowed..	May 7..	do 14..	490	206	48½	Some rust	42·44
	9½	Carter's Prize Prolific	do 7..	do 24..	460	242½	48½	Some lodged....	50·25
3rd plots.	9½	Baxter's Six-rowed..	do 14..	do 18..	445	188	47	Bright straw; some lodged...	39·08
	9½	Carter's Prize Prolific	do 14..	do 28..	530	200	50	do ..	41·32
4th plots.	9½	Baxter's Six-rowed..	do 21..	do 20..	450	185	46¼	Bright straw; some lodged..	38 26
	9½	Carter's Prize Prolific	do 21..	Sept. 2..	410	172½	46	do ..	35·45
5th plots.	9½	Baxter's Six-rowed..	do 29..	Aug. 26..	350	157½	45	Some rust, lodged	32·39
	9½	Carter's Prize Prolific	do 29..	Sept. 8..	346	153	43¾	do ..	31·42
6th plots.	9½	Baxter's Six-rowed..	June 5..	do 10..	320	143	44	Rust and lodged.	29·38
	9½	Carter's Prize Prolific	do 5..	do 11..	357	164	41	do ..	34 08

OATS.

In Plots of one-tenth of an acre each.

—	Quantity of Seed.	Names.	Date of Seeding.	Date of Harvesting.	Weight of Straw and Grain.	Total Weight of Grain.	Weight per Bushel.	Condition when Cut.	Yield per Acre in Bushels and Lbs.
	Lbs				Lbs.	Lbs.	Lbs.		
1st plots...	8½	Prize Cluster.	April 30..	Aug. 20..	457½	180	40	Bright straw	52·32
	8½	Banner.	do 30..	do 22..	675	245	35	do ..	72·02
2nd plots..	8½	Prize Cluster.	May 7..	do 22..	441	154	38½	do ..	45·10
	8½	Banner............	do 7..	do 26..	655	282½	36½	do ..	83·03
3rd plots..	8½	Prize Cluster	do 14..	do 26..	450	185	39½	do ..	54·14
	8½	Banner...........	do 14..	do 29..	750	288¾	35	do ..	84·31
4th plots..	8½	Prize Cluster..........	do 21..	do 29..	515	210	40	do ..	61·26
	8½	Banner................	do 21..	Sept. 3..	425	189	36	do ..	55·20
5th plots..	8½	Prize Cluster	do 29..	do 3..	410	168	39½	do ..	49·14
	8½	Banner....	do 29..	do 9..	427	209½	31	do ..	61·21
6th plots..	8½	Prize Cluster	June 5..	do 9..	381	105	35	do ..	30·30
	8½	Banner.........	do 5..	do 11..	402	159	26½	do ..	46·26

PLOTS FOR TESTING FERTILIZERS.

The testing of fertilizers was continued this year with oats on the same plots on as in 1889 and 1890 of one-tenth of an acre each, an explanation of which is given on page 118 of report of 1889, and on page 235 of report of 1890. A comparative statement of the results for each year is given below :—

—	Fertilizer.	Yield in 1889.	Yield in 1890.	Yield in 1891.	Yield per Acre, 1889, in Bush. and Lbs.	Yield per Acre, 1890, in Bush. and Lbs.	Yield per Acre, 1891, in Bush. and Lbs.
		Lbs.	Lbs.	Lbs.			
Plot No. 1..	Barnyard manure..........................	80	100	96	23·18	29·14	28·08
do 2..	Mussel mud.......................... .	47	92	153	13·28	27·02	45·00
do 3..	Bone meal	54½	117	101¾	16·01	34·14	29·31
do 4..	Fine ground phosphates....	44	72	102	12·32	21·06	30·
do 5..	Guano..................................	49	76	113½	14·14	22·12	33·13
do 6..	Corn fertilizer	62	115	111	18·08	33·28	32·22
do 7..	Superphosphate of lime.......	70	98	92½	20·20	28·28	27·07
do 8..	Nitrate of soda..	61	128	90¾	17·32	37·22	26·23
do 9..	Archibald fertilizer.....................	69	93	85½	20·10	27·12	25·05
do 10..	Ceres superphosphate...	68	77	74	20·00	22·22	21·26
do 11..	No fertilizer..............	42	79	42½	12·12	23·08	12·17

It must be borne in mind that in 1890 1 brl. of Ceres superphosphate was applied to the whole of the plots of one-tenth of an acre each, in addition to the fertilizer applied in 1889; but no fertilizers were added in 1891.

MIXED GRAINS.

Plots of one acre each were sown with different mixtures of grain, with the results given below :—

1st acre.—With 1 bushel of oats, 1 bushel of barley, 8½ bushels of pease; sown 16th May and harvested 25th August; gave 23 bushels, weighing 48 lbs. per bushel.

2nd acre.—With 2 bushels of barley and ½ bushel of pease; sown 16th May and harvested 25th August; gave 18 bushels, weighing 50½ lbs. per bushel.

3rd acre.—With 2 bushels of oats and ½ bushel of pease; sown 16th May and harvested 25th August; gave 27¾ bushels, weighing 48 lbs. per bushel.

4th acre.—With 1¼ bushels of wheat and ½ bushel of pease; sown 28th April and harvested 7th August; gave 33 bushels per acre, weighing 60 lbs. per bushel.

5th acre.—With a dressing of 100 loads of marsh mud, and sown with 3 bushels of oats on 16th May and harvested 25th August; gave 30 bushels, weighing 39 lbs. per bushel.

6th acre.—With a dressing of 1 brl. of Imperial fertilizer; sown 16th May, with 3 bushels of oats, and harvested 24th August; gave 35 bushels, weighing 41 lbs. per bushel.

POTATOES.

Twenty-eight varieties of potatoes were planted in two rows of 66 feet in length each. The date when planted, character of tubers, and yield, are given below:—

Names.	Date of Planting.		Date of Digging.		Sound Potatoes.	Rotted Potatoes.	Character of Growth.	Total Yield per Acre in Bush. and Lbs.
					Lbs.	Lbs.		
Vanguard	May	25	Sept.	22	65	16	Growth weak; tubers small; early	148·30
Beauty of Hebron	do	25	do	22	100	66	Growth weak; tubers medium; early	304·20
Rose's New Giant	do	25	do	22	115	50	Growth strong; tubers large; late	302·30
Halton Seedling	do	25	do	22	105	20	Growth medium; tubers medium; early	229·10
Brownell's Winner	do	25	do	22	101	27	Growth strong; tubers medium; late	234·40
Clarke's No. 1	do	25	do	22	190	29	Growth strong; tubers large; late	401·30
May Queen Early	do	25	do	22	72	20	Growth weak; tubers small; early	168·40
Early Eating	do	25	do	22	104	50	Growth weak; tubers small; very early	282·20
Chicago Market	do	25	do	22	44	110	Growth strong; tubers large; early.	282·20
Early Rose	do	25	do	23	55	50	Growth weak; tubers small; early	192·30
Early Ohio	do	25	do	23	10	87	Growth weak; tubers small; early	177·50
Empire State	do	25	do	23	102	57	Growth strong; tubers large; late	291 30
Algoma	do	25	do	23	25	44	Growth weak; tubers small; early	126·30
Lee's Favorite	do	25	do	23	75	84	Growth weak; tubers small; early	291·30
Thorburn	do	25	do	23	71	105	Growth strong; tubers large; early.	322·40
Early Maine	do	25	do	23	42	54	Growth weak; tubers small; early	176
White Star	do	25	do	23	107	69	Growth strong; tubers medium; late.	322·40
Rural New Yorker, No. 2, ½ plot	do	25	do	23	160	18	Growth strong; tubers large; late	
Early Puritan	do	25	do	23	61	38	Growth strong; tubers large; early	181·30
Richter's Improved	do	25	do	23	71	30	Growth strong; tubers large; late	185·10
Stray Beauty	do	25	do	23	136	30	Growth strong; tubers medium; early	304·20
Ohio Gunner	do	25	do	23	28	31	Growth weak; tubers small; early	108·10
Rural Blush	do	25	do	23	166	5	Growth strong; tubers small; md. early	313·30
Delaware	do	25	do	23	63	75	Growth strong; tubers med.; md. early	253
London	do	25	do	23	80	40	Growth weak; tubers small; early	220
Wonder of the World	do	25	do	23	90	148	Growth strong; tubers medium; early	436·20
Burbank's Seedling	do	25	do	23	91	120	Growth strong; tubers medium; late	386·50
Great Eastern	do	25	do	24	45	240	Growth strong; tubers medium; late	522·30

CORN.

Thirty-one varieties of corn were planted in two rows, 66 feet long each. The time of planting, stages of growth, time of cutting and weights are given below. The last of May and first of June were cold, and much of the seed planted failed to germinate, and the plots had to be replanted 21 days after the first planting, or on 18th June, thus interfering very much with the results of the experiments.

Names.	Planted.	Tasselled.	Cut.	Weight per Plot.	Condition when Cut.	Weight per acre in tons and lbs.
				Lbs.		
Blunt's Prolific	May 28	Sept. 22	Sept. 25 & 26	335	Early milk	18·850
Golden Dent	do 28	do 24	do 25 & 26	350	Ears just forming	19·500
Chester Co. Mammoth	do 28	do 24	do 25 & 26	375	Ears not formed.	20·1250
Virginia Horse Tooth	do 28	do 25	do 25 & 26	325	do	17·1750
Golden Beauty	do 28	do 25	do 25 & 26	340	do	18·1400
Red Cob Ensilage	do 28	do 23	do 25 & 26	330	Ears forming	18·300
Mammoth Southern Sweet	do 28	do 4	do 25 & 26	300	Soft glazed	16·1000
Giant Prolific Ensilage	do 28	do 26	do 25 & 26	420	Ears not formed	23·200
Salzer's Fodder	do 28	do 23	do 25 & 26	350	Early milk	19·500
King Philip	do 28	do 24	do 25 & 26	290	do	15·1900
Longfellow	do 28	do 22	do 25 & 26	360	do	19·1600
Long White Flint	do 28	do 21	do 25 & 26	300	do	16·1000
Long Yellow Flint	do 28	do 26	do 25 & 26	355	do	19·1050
Thoroughbred White Flint	do 28	do 30	do 25 & 26	445	do	24·950
Canada Yellow	do 28	do 24	do 25 & 29	340	do	18·1400
Pearce's Prolific	do 28	Aug. 16	do 25 & 26	430	Glazed	23·1300
Mitchell's Early	do 28	do 9	do 25 & 26	200	Hard glazed	11
Red Blazed	do 28	do 15	do 25 & 26	250	Glazed	13·1500
White Flint (Dakota)	do 28	do 14	do 25 & 26	300	do	16·1000
Yellow Flint	do 28	do 14	do 25 & 26	295	do	16·450
North Dakota	do 28	do 14	do 25 & 26	335	do	18·850
Dakota Gold Coin	do 28	do 21	do 25 & 26	270	do	14·1700
Eight-rowed Sugar	do 28	do 26	do 25 & 26	400	do	22
Egyptian	do 28	Sept. 4	do 25 & 26	395	Early milk	21·1450
Extra Early Cory	do 28	Aug. 10	do 25 & 26	155	Hard glazed	8·1050
Pee and Kay	do 28	do 20	do 25 & 26	310	Glazed	17·100
Early Mammoth	do 28	Sept. 4	do 25 & 26	380	Early milk	20·1800
Asylum Sweet	do 28	Aug. 26	do 25 & 26	375	Tasseling	20·1250
Potter's Excelsior	do 28	do 26	do 25 & 26	305	do	16·1550
Stowell's Evergreen	do 28	Sept. 5	do 25 & 26	350	Early milk	19·500
Cinquantine	do 28	Aug. 20	do 25 & 26	135	Glazed	7·850
N. S. Yellow	do 28	do 10	do 25 & 26	210	Hard glazed	11·1100

This corn, together with 2½ acres of a mixture of different varieties, was converted into about 36 tons of ensilage.

GRASSES.

The following grasses were sown on 8th and 9th May in small plots, and appear, up to the present time, to be hardy and suitable to our climate, but it is uncertain as to what the result of the changeable weather of our climate during the winter months will have upon them :—

Names.

Western Bunch Grass,	Southern Brome Grass,
Mexican Brome Grass,	Hard Fescue,
Fringed do	Meadow Fescue,
Western do	Tall Fescue,
Wild Timothy,	Orchard Grass,
Satin Grass,	Perennial Rye Grass,
Switch Grass,	Italian Rye Grass,
Reed Canary Grass,	Crested Dog's Tail,
Timothy from Calgary,	Red Top,
Late Meadow Grass,	Meadow Fox Tail,
Austrian Brome Grass,	

MANGELS.

Fifteen plots of mangels were sown on 26th May, consisting of three rows 66 feet long of each kind. Duplicate plots of the same size and same varieties were also sown on 9th June.

A table is given below of the results.

The first series of plots was sown on the 26th of May and pulled on the 12th and 13th of October. The second series was sown on the 9th of June and pulled 22nd October.

MANGELS.

Name.	1st plot. Sown 26th May, pulled 12th October.			2nd plot. Sown 9th June, pulled 22nd October.		
	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.
Mammoth Long Red	510	22·880	748·	630	27·1440	924·
Giant Yellow Globe	440	19·720	645·20	625	27·1000	916·40
Mammoth Long Red (Steele)	575	25·600	843·20	610	26·1680	894·40
New Giant Intermediate (Steele)	650	28·1200	953·20	675	29·1400	990·
Mammoth Long Red (Simmers)	565	24·1720	828·40	620	27·560	909 20
New Giant Yellow Globe (Bruce)	760	33·880	1114·40	510	22·880	748·
Carter's Warden Orange Globe	450	19·1600	660·	560	24·1280	821·20
Gate Post (Bruce)	590	25·1920	865·20	625	27·1000	916·40
Canada Giant (Pearce)	260	11·880	381·20	580	25·1040	850 40
Mammoth Long Red (Webb)	425	18·1400	623·20	405	17·1640	594·
Champion Yellow Globe	310	13·1280	454·40	560	24·1280	821·20
Yellow Fleshed Tankard	290	12·1520	425·20	430	18·1840	630·40
Mammoth Long Red (Evans)	460	20·480	674·40	460	20·480	674·40
Golden Tankard	400	17·1200	586·40	445	19·1160	652·40
Crimson Tankard	475	20·1800	696·40	480	21·240	704·

TURNIPS.

Fourteen varieties of turnips were sown on 26th May, consisting of three rows, 2½ feet apart and 66 feet in length, of each kind. Duplicate plots of the same size and same varieties were also sown on 9th June. A table of the results is given below.

Name.	1st plot. Sown 26th May, pulled 26th October.			2nd plot. Sown 9th June, pulled 26th October.		
	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.
Purple-top Swede (Rennie)	575	25·600	843·20	540	23·1520	792·
Carter's Elephant Swede	550	24·400	806·40	515	22·1320	755·20
Skirving's (Steele)	520	22·1760	762·40	555	24·840	814·
Elephant Swede (Steele)	615	27·120	902·	560	24·1280	821·20
Selected Purple-top (Steele)	575	25·600	843·20	535	23·1080	784·40
Bangholm (Simmers)	580	25·1040	850·40	605	26·1240	887·20
Highland Prize (Simmers)	590	25·1920	865·20	535	23·1080	784·40
Marquis of Lorne (Bruce)	590	25·1920	865·20	525	23·200	770·
Hartley's Bronze (Pearce)	550	24·400	806·40	555	24·840	814·
Imperial (Webb)	575	25·600	843·20	595	26·360	872·40
New Giant King (Webb)	605	26·1240	887·20	610	26·1680	894·40
Mammoth Purple-top (Evans)	590	25·1920	865·20	500	20·	666·40
Clyde Improved	595	26·360	872·40	590	25·1920	865·20
Monarch Swede (Pearce)	545	23·1960	799·20	550	24·400	806·40

CARROTS.

Fourteen varieties of carrots were sown on 26th May, consisting of three rows, 18 in. apart and 66 feet in length, of each kind. Duplicate plots of the same size and same varieties were also sown on 9th June. Below is a statement of the results:

Name.	1st plot. Sown 26th May, pulled 19th October.			2nd plot. Sown 26th May, pulled 22nd October.		
	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.
Giant Sht. White Vosges (Rennie)	400	29 666	977·46	245	17·1933	598·53
Half Long Scarlet Luc (Rennie)	350	25·1333	855·33	300	22·	733·20
Early Gem	410	30·133	1002·13	280	20·1066	684·26
Mammoth Intermediate White (Rennie)	370	27·266	904·26	310	22·1466	757·46
Improved Short White (Steele)	450	33·	1100·	240	17·1200	586·40
Guerande or Ox Heart (Steele)	310	22·1466	757·46	320	23·933	782·13
Large White Vosges (Simmers)	390	28·1200	953·20	295	21·1266	721·06
Chantenay (Bruce)	345	25·600	843·20	385	28·466	941·06
Large White Vosges (Bruce)	275	20·333	672·13	255	18·1400	623·20
Green-top Orthe (Pearce)	345	25·600	843·20	300	22·	733·20
James Intermediate (Pearce)	280	20·1066	684·26	200	14·1333	488·53
Mitchell's Perfection (Pearce)	180	13·400	440·	220	16·266	537·46
Scarlet Altringham (Webb)	200	14·1333	488·53	205	15·066	501·06
Yellow Intermediate (Webb)	345	25·600	843·20	210	15·800	513·20

GENERAL STATEMENT OF CROPS.

In addition to the hay already referred to, there were in all about 70 acres under crop in 1891. The total yield of grain was 1,158 bushels. Five and a-half acres of roots, chiefly turnips, gave 4,400 bushels, and from three acres of corn 36 tons of ensilage was prepared. There were about four acres devoted to the growing of green crops for summer use for stock, and about as much more in fruits and as plots of grasses.

Eight acres of land were drained this year, making in all over 60 acres of the farm now well drained. All the drains are giving good satisfaction.

BUILDINGS.

Some of the old buildings have been removed this year, which has improved the appearance of the surroundings, and as soon as the necessary buildings for storing carts, waggons and farm implements are built the other old buildings now used for store rooms can be removed.

ROADS.

Road-making has been carried on during the year as time from other work would permit. The roads have all been made with broken stone, and are firm and lasting.

WATER SUPPLY.

Some 900 feet of galvanized iron 1¼-in. water pipe has been laid. But owing to the lateness of the season before the work was commenced, it was found impossible to continue farther. A connection was made at this point with one of the main drains, which so far has given us a supply of good water in the barnyard, and unless we have some very dry, cold weather there will be sufficient for the stock until the dry weather of next spring or summer, when the balance of the pipe can be laid to a permanent supply further back on the Farm.

CATTLE.

The cattle bought last year for fattening purposes were sold in the spring for the St. John, N.B., market.

Experiments are being conducted this year with fattening steers. I may say that with few exceptions the cattle will eat turnips more readily than they will ensilage, and in making the selection the steers that appear to relish the ensilage the best were chosen to feed with that ration. The thoroughbred cattle bought last year have done well; we have several calves from them. When making a selection of cattle this autumn for fattening purposes 7 head of thoroughbred Short Horn females were offered for about the price of good grades, and concluding that it would be a prudent investment the offer was accepted. One of the cows has since dropped a fine bull calf, and they are all doing so well that I would suggest the propriety of keeping them for breeding purposes.

ORNAMENTAL TREES AND SHRUBBERY.

The work of planting trees and shrubbery for the double purpose of ornament and protection from winds was carried on this year; wind-breaks were planted along part of the north and south lines of the farm. A row of American elm was planted on each side of the main road that crosses the Farm, and clumps of trees and shrubbery at different points where needed, which, when grown, will be a source of pleasure as well as a protection to the crops and plants.

FRUIT TREES.

The orchard that was planted in 1890 came through the winter well. The trees have made a fair growth during the past summer. The plums and pears trees have not succeeded as well as the apple trees.

The trunks and larger limbs of the trees were washed in the spring with a solution made of soap and washing soda, which gave the bark a clear, bright green appearance. The Longfield, Wagener, Haas, Scott's Winter and Maiden's Blush had a few apples this year. Preparations are about completed to extend the orchard to 12 acres during the coming spring. For this purpose, in addition to the orchard now already begun, a field of 5 acres has been prepared by chopping down and burning the second growth of timber, care being taken to leave a heavy shelter belt of trees on every side for protection. On this plot a few trees were planted last spring. The land will be levelled as soon as the stumps are sufficiently rotted to be easily taken out. The soil immediately around the trees will be kept cultivated from the first.

SMALL FRUITS.

Strawberries.—These were badly winter-killed by the sudden and frequent changes from rain and mud to extreme cold during the winter. Raspberries and blackberries stand the climate well, and make strong growth and have fruited well. The Houghton, Downing and Smith's Improved gooseberries did well, and as usual fruited heavily. The red and white currants have not so far succeeded well here, while black currants are hardy and heavy croppers.

MEETINGS ATTENDED.

I attended a meeting of the Nova Scotia Dairymen's Association at New Glasgow on 25th and 26th March, as well as several meetings of farmers in Colchester, Cumberland and Westmoreland counties during the year.

EXHIBITIONS.

Some of the products of the Farm were exhibited at Charlottetown, P.E.I., exhibition, which was held on 6th, 7th, 8th and 9th October.

The exhibits consisted of 127 samples of grains and grasses in straw and 72 samples of grain in glass bottles, and 50 samples of potatoes. The latter were distributed at the close of the exhibition to those present.

Two hundred and eighty packages of grain and potatoes were distributed from here during the year, and some very satisfactory reports have been received from the parties who obtained the seed.

I have the honour to be, Sir,

Your obedient servant,

W. M. BLAIR,

Superintendent.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., 31st December, 1891.

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

SIR,—I have the honour to submit herewith my fourth annual report of the work done on the Manitoba Experimental Farm.

The past year has been a remarkable one from an agricultural standpoint. Spring opened up at about the usual time and by the first week in April seeding was general throughout the province. Through April the weather was unusually warm for that month and vegetation made an early and rapid growth, only to be checked by the severe frost of the middle of May, and in some instances where the grain plant was exposed by the spring winds the injury was severe and made re-sowing necessary. During the last three weeks of June abundant rain fell, and this month was quite favourable for all kinds of vegetation. The temperature during July was much below the average; this helped to fill the heads of wheat, but the number of cloudy, cool days encouraged a rank growth of straw and delayed ripening very much.

On the 6th of August a very heavy rain storm, accompanied by wind, passed over the centre and eastern parts of the province. This storm was of unusual severity, and next morning every acre of crop on this farm was perfectly flat. The effect of the storm was noticeable all through the balance of the season; the sun and wind being unable to penetrate through the lodged and matted grain, ripening was delayed and rust encouraged. The early part of August was warm, but on the 21st the wind veered to the north-west and the temperature dropped very suddenly to one below freezing. As the lowest reading of the thermometers on the experimental farm only recorded one degree of frost, I think no injury was done at that time, but on the 26th of the same month another drop occurred registering two degrees of frost on the uplands and seven degrees in the valley, and at this time all the uncut grain was more or less injured according to its stage of ripeness.

A field of Ladoga growing on the side hill was cut on the 13th of August, thirteen days before severe frost, and was of course uninjured.

A number of varieties of wheat growing on the upland were also cut before the 26th and were also free of injury from frost. Although a number of varieties of wheat grown on this farm have been somewhat injured by frost, you will notice that the yield has in all cases been fair and in many instances very large. The same remark might apply to this province generally, for although the injury by frost has been considerable the yield is much better than usual.

WHEAT.

In view of the importance of the wheat crop in this province and the general anxiety to obtain an early ripening variety, all plots of this grain were duplicated one set of plots being sown in the valley on strong loamy soil and the other set on higher and lighter land.

A number of the varieties sown on the upland were badly injured by wind storms in May; and the returns being inaccurate, are not given. It is worthy of notice that the uninjured plots were saved by a very slight protection of scrub on the south and west; this scrub was only from 6 to 12 feet high, but effectually protected the grain during the most severe storms, while the grain on the unprotected portion of the field was bared to the roots and severely injured, and in some cases killed outright.

A noticeable feature in these plots is the very slight difference in time between the ripening of the different varieties; as none were injured by frost all ripened fully, and were cut at the same degree of ripeness; the dates given are therefore accurate. All the varieties in these plots were cut before frost and were quite free from rust, smut, &c., and both grain and straw were as nearly perfect as possible, the light character of the soil just suiting the past season.

WHEATS sown on Upland Prairie, summer fallowed; size of plots, one-fifth acre, sown with Press Drill, 6 pecks per acre; soil, light sandy loam.

Variety.	Sown.	Headed.	Ripe.	Maturing.	Yield per Acre.		Weight per Bushel.
				No. days.	Bush.	Lbs.	Lbs.
Red Fife	April 8	July 22	Aug. 19	133	52	55	61¼
Old Red River	do 8	do 9	do 18	132	47	35	61
Pringle's Champlain	do 8	do 6	do 18	132	44	55	61⅓
Campbell's White Chaff	do 8	do 4	do 17	131	43	45	60½
Chilian White	do 8	do 3	do 19	133	43	..	60
Wellman's Fife	do 8	do 5	do 20	134	28	10	60

UPLAND Prairie; plots one-tenth of an acre; very light loam soil.

Variety.	Sown.	Headed.	Ripe.	Maturing.	Yield per Acre.		Weight per Bushel.
				No. days.	Bush.	Lbs.	Lbs.
Red Fife	April 8	July 5	Aug. 19	133	45	5	61⅓
Green Mountain	do 8	do 13	do 20	134	42	20	61¼
Hungarian Mountain	do 8	do 10	do 19	133	42	..	62
Assiniboine	do 8	do 5	do 19	133	38	10	60½
Hard Calcutta	do 8	June 30	do 15	129	30	20	61

Below will be found a list of wheats grown in the valley on clay loam, a soil not well adapted for a season like the last. It will be noticed by the weight of the grain that all suffered more or less from frost and many of them from rust as well. The heavy storm of 6th August badly lodged some of the varieties; this greatly encouraged rust. Owing to frost the exact date of ripening of some of the varieties could not be obtained and are only given as approximate. In view of the fact that wheat holds such an important place in the products of the country, and that so much attention has been drawn to the importance of securing early-ripening varieties, it has been thought advisable to give full notes of a few of the leading varieties.

Unfrozen Red Fife is no doubt the standard variety in this province, for both quality and productiveness; and if it were only a week or ten days earlier it would be almost impossible to improve on it, but it is certainly later by some days than many other sorts.

White Fife.—This excellent white wheat is being increasingly grown in the province. Its freedom from smut and rust, and the fact of it not readily showing the effect of a slight frost, have all tended to increase its cultivation; it matures with and yields about the same as Red Fife.

White Connell is very much like the White Fife, and may be only an improved strain of that variety. It is generally very productive, with bright strong straw, free of rust, and is not inclined to smut. It is like the White Fife in not readily showing the effects of a slight frost. We have reports from farmers of large yields from seed of this variety supplied by the Experimental Farm.

Red Fern or Eureka is a hard red-bearded wheat, generally maturing from four to six days earlier than Red Fife; being a very dark wheat it shows the effects of even a slight frost very quickly.

Saxonka is a Russian bearded wheat four to seven days earlier than Red Fife, and very vigorous generally, but rusted badly on the low land this year.

Golden Drop is a square-headed, bald wheat, much softer than Red Fife, but three to six days earlier, but scarcely as productive. This wheat was much sought after in this province 15 years age, but is too soft for present markets.

Defiance is a red bald wheat, very simiiar to the Red Fife, but with us very little earlier.

Ladoga has done remarkably well on this farm, when grown on high well drained land, a seven-acre field of this character the past season yielding 33 bushels of No. 1 wheat, weighing 60 lbs. per bushel, and ripening 13th August, or 13 days before frost, but the valley evidently does not suit it so well, the yield there being small and the grain frozen. On high, well-drained land it is certainly from seven to ten days earlier than Red Fife, but not quite so productive.

Indian Hard Calcutta.—This, like all Indian wheats, is short in the straw and early to ripen. It is not generally very productive and suffered badly by rust during the past season. It is bearded.

Gehun.—Another Indian wheat, but bald, with very short stiff straw. It matures early and was very productive at Indian Head last year, but has rusted both here and at Indian Head this season.

Campbell's White Chaff is a large-headed bald wheat, with about one-third of the grains hard; balance soft; evidently it is hardening here; it is a few days earlier than Red Fife and fairly productive; not thoroughly tested here yet.

WHEAT.

Variety.	Sown.	Harvested	Matured in.	Yield per Acre.		Weight per Bushel.	Character of Straw.	Rust.	Length of Straw.	Length of Head.
			Days.	Bsh.	Lbs.	Lbs.			Inch.	Inch.
Rio Grande.	April 13..	Aug. 31..	140	36	10	55	Weak ..	Blade only..	51	4½
Pringle's Champlain ..	do 13..	do 30..	139	34	40	54½	Fair....	do ..	52	3½
White Connell.	do 13..	Sept. 1..	141	34	30	53	do	do ..	50	3
Defiance....	do 13..	do 1..	141	34	10	54¼	Weak ..	do ..	51	3¼
Saxonka.....	do 13..	Aug. 24..	133	33	50	54	Lodged.	Badly.....	46	3
Red Fern or Eureka...	do 13..	do 31.	140	32	30	55	do ..	Slight ...	50	3½
Judket, ...	do 13..	Sept. 2..	142	32	20	54	do ..	Blade only..	50	3
Russian Hard Tag....	do 13..	Aug. 27..	136	32	10	58½	do ..	do ..	48	3
Red Fife.....	do 13..	Sept. 2..	142	29	40	47½	do ..	do ..	52	3
White Fife.........	do 13..	do 1..	141	29	10	50	do ..	do ..	51	3
Gehun..............	do 13..	Aug. 22..	131	29	10	57½	Strong..	Very badly.	36	2½
Indian Hard Calcutta.	do 13..	do 25..	134	27	20	54	Lodged.	Badly.....	47	3
Ladoga.............	do 13..	do 26..	135	22	30	49¾	Fair....	Partly......	52	3
Colorado............	do 13..	do 27..	136	20	30	47	Lodged.	Very badly.	48	3
Australian.......	do 13..	do 26..	135	15	50	47¼	Strong..	do ..	36	2½

NOTE.—Red Fife, White Fife and Ladoga slightly injured by winds.

TEST OF SOME NEW WHEATS

Some of the following varieties of wheat were received late and were sown separate from the above series on back-setting. For a comparison Red Fife was sown in the centre plot

Blue Stem, a variety grown extensively in South Dakota and Minnesota, is a handsome plant with a blueish tinted straw and velvet chaff. It is very productive, but it is no earlier than Red Fife, and the grain is softer. The very light weight of the Delhi and Kent wheat was, no doubt, caused by rust.

Variety.	Sown.	Headed.	Harvested.	Matured in.	Yield per Acre.		Weight per Bushel.	Remarks.
				Days.	Bush.	lbs.	Lbs.	
Blue Stem	April 18	July 17	Sept. 2	137	36	25	52	No rust.
French Imperial	do 18	do 14	Aug. 28	132	32	30	54	Some rust.
Red Fife	do 18	do 17	Sept. 2	137	33	45	54	No rust.
Waugh's Delhi	do 18	do 17	Aug. 24	128	28	00	50¼	Some rust.
Kent Wheat	do 18	do 19	do 25	129	22	20	51½	Rust'd badly

WHEAT—ONE-ACRE PLOTS.

Variety.	Sown.	Harvested	Matured in.	Yield per Acre.		Weight per Bushel.	Character of Straw.	Rust.	Length of Straw.	Length of Head.
			Days.	Bush.	lbs.	Lbs.			Inch.	Inch.
Old Red River	April 10	Aug. 31	143	35	45	55½	Fair	Slight	48	3
Red Fife	do 10	Sept. 1	144	35	30	52	do	do	50	3
Ladoga	do 10	Aug. 25	137	25	45	53½	do	do	53	2½
Golden Drop	do 10	do 29	141	21	35	50	do	Straw rusted	48	3¾
Australian	do 10	do 29	141	14	31	46	Weak	Very badly.	49	3¼

TEST OF CUTTING WHEAT AT DIFFERENT STAGES OF RIPENESS.

During the past four or five years the practice of cutting wheat more or less green has grown rapidly in this country, until at the present time there is scarcely a farmer who does not practice it to a greater or less extent. When cut at a too early stage the berry is much shrivelled and the yield reduced. To determine the extent of this reduction the following experiments were undertaken:—

Three adjoining plots were sown at the same time with Red Fife and cut at three different dates; the first two cuttings escaped the frost, but the grain was much shrivelled, especially from the first cutting. It will be seen by the following tables that in spite of the shrivelled appearance of the sample cut on the 24th of August it brought the highest price per bushel and yielded the most money per acre. It is almost unnecessary to explain that if the sample cut in September had escaped the frost the result would have been quite different; it would then have brought 75 cents per bushel, or $23.50 per acre.

Variety.	Cut.	Colour of Straw when Cut.	Stage when Cut.	Yield per Acre.		Weight per bsh.	Value per bsh.	Value per Acre.	
				Bush.	lbs.	Lbs.	Cts.	$	cts.
Red Fife	Aug. 19	Very green	In early milk	21	20	50½	42	8	96
do	do 24	Green	In late milk	28	00	54½	54	15	12
do	Sept. 6	Ripe	Cured, but frosted.	31	20	53½	35	10	96

TEST OF "DISC HARROW" CULTIVATION AGAINST "SPRING PLOUGHING."

During 1890 the different forms of disc harrows were largely used in preparing the seed bed for the different varieties of grain, also in some cases for covering the seed.

The reports concerning the success of this plan were very conflicting, some claiming that the shallow cultivation with the disc harrow hastened maturity; the work was done at a greatly reduced cost, and was equally efficacious in keeping the weeds in check, and the yield nearly if not quite as heavy as on ploughed land.

Others contend that disc harrow cultivation had nothing to recommend it in the way of hastening maturity, and that it greatly encouraged weeds, particularly couch grass.

To test the question on this farm four half-acre plots were selected in the higher portion of the valley; soil a rich sandy loam. The field was summer-fallowed in 1889 and sown to wheat in 1890. The plots were uniform and the test satisfactory.

On the 17th of last April each plot was sown with Red Fife at the rate of seven pecks per acre.

It will be seen by the following table that the spring ploughing not only gave the best returns, but matured earlier and was freer from weeds. The sample of wheat was equally good, being No. 2 hard from all the plots.

It was also noticeable that the disc-harrowed plots had a large number of short-strawed plants with poor heads, while the plants in the spring-ploughed plots were all equally vigorous and the heads all well developed.

Method of Cultivation.	Harvested.	Yield.	
		Bush.	Lbs.
Plot No. 1.—*Ploughed in spring*, harrowed with flat harrow and drilled; no weeds.	Aug. 25..	44	34
do 2.—Stubble burnt off; wheat *drilled in* and harrowed with flat harrows; some weeds	do 26....	40	00
do 3.—Stubble *burnt off;* wheat "Cuttaway Disc" harrowed in; quite weedy	do 27....	39	12
do 4.—Stubble *not burnt off;* wheat "Cuttaway Disc" harrowed in; quite weedy	do 27....	31	08

ONE OR TWO PLOUGHINGS FOR FALLOW.

A great difference of opinion exists regarding the proper treatment of summer fallow for wheats. To test this matter three adjoining plots, each one acre in area, were selected.

Plot No. 1 was ploughed once on 26th June, and the weeds kept down the balance of the season by means of the common and disc harrows.

Plot No. 2 was ploughed once on 26th July, and the after cultivation was the same as No. 1.

Plot No. 3 received one ploughing on 26th June and another on 1st August, and one harrowing afterwards.

Appended will be found the returns from each plot:

Variety.	How treated.	Sown.	Harvested	Yield per Acre.	
				Bush.	Lbs.
Red Fife..........	Ploughed once, 26th June..................	April 16..	Aug. 30..	30	41
do	Ploughed once, 26th July..................	do ..	do ..	25	46
do	Ploughed on 26th June and 1st August.....	do ..	do ..	27	57

SMUT.

Both farmers and grain-buyers report that smut is largely on the increase throughout the province, and that the direct loss to the farmer this year will reach thousands of dollars, besides the indirect loss arising from injury to the reputation of our wheats on the English markets.

In 1890 a number of experiments with bluestone and other preparations for killing smut were made and carried out successfully. Last spring these experiments were repeated, but owing to a wind storm in May the test was spoilt. This was disappointing, as additional experience on this subject would be valuable just now.

The question being a very important one, it was thought advisable to insert in this report a description of last years experiments as given in the 1890 report.

Four adjoining plots were set apart for this purpose. Plot No. 1 was sown with wheat not treated. Plot No. 2 was sown with wheat treated with bluestone—1 lb. of bluestone being dissolved in a pail of hot water, and applied to ten bushels of wheat, which was then left to soak for three hours. Plot No. 3 was treated with a salt brine sufficiently strong to float an egg, the seed being soaked in the brine three hours and then dried. Plot No. 4 was treated by the Jensen or hot-water method; the seed, placed in a gunny sack, was immersed in water heated to a temperature of 130 degrees, Fah., then removed to another boiler of water heated to 132 deg. and soaked in the latter for 15 minutes.

All were in adjoining plots and received similar treatment during growth and harvesting; when ripe 200 heads were taken from each plot and examined. Plot No. 1, or untreated, gave 6 per cent of smutty heads. Plot No. 4, or scalded, gave 1 per cent of smutty heads, while none of the 200 heads from the plots Nos. 2 and 3, (the bluestoned and salted) were smutty.

After threshing, the grain was again examined, and the bluestoned gave two smut balls to the thousand grains of wheat, the salted gave three and the scalded five, while the untreated gave 29.

These results would point to the conclusion that none of these methods can be depended upon to completely destroy the spores in badly smutted seed, but the bluestone treatment was one of the most successful; its application requires the least labour and leaves the seed in the best condition for sowing. Below will be found the yield and other particulars of this experiment.

Variety.	Sown.	Came up.	Headed.	Ripened	Yield per Acre. Bush.	Yield per Acre. Lbs.	Smutty Head.	Smut Balls in Grain.	Matured in. Days.
Red Fife, Untreated.........	April 23	May 9..	July 10.	Aug. 22.	23	18	6½ per c.	29 per 1,000	121
do Bluestoned....	do 23	do 9..	do 10.	do 22.	25	11	None.	2 do	121
do Salted	do 23	do 9..	do 11.	do 22.	22	9	do	3 do	121
do Scalded........ ..	do 23	do 9..	do 9.	do 22.	23	44	1 per c.	5 do	121

EXPERIMENTS WITH OATS.

The past season has been an exceptionally good one for oats, the yield throughout the province being much heavier than usual, but the weight per bushel is every where under the average; this is no doubt owing to the excessive and soft growth made during June and July. There was also much rust on oats grown on strong land, no doubt from the same cause, coupled with cloudy weather in July.

English White Oats have again given the largest yields, but they are this year much lighter in weight than usual.

Prize Cluster had the brightest straw and Early Race Horse gave the best sample of grain.

Among the earliest to ripen this season were Welcome, Early Race Horse, Winter Grey, Prize Cluster and Archangel.

Excellent reports have been received from farmers supplied with Black Tartarian seed, but this variety has not succeeded as well as usual on this farm.

TEST OF VARIETIES OF OATS.

Grown on summer fallow; soil, rich black loam; sown with 9 pecks seed, Press drill. Size of plots, one acre.

Variety.	Sown.	Headed.	Harvested.	Matured in	Yield, 1891, per Acre.		Lbs. per Bush.	Yield, 1890.		Quality of Straw.	Rust.
					Bush.	Lbs.	Lbs.	Bush.	Lbs.		
English White	May 8..	July 28.	Aug. 29.	113 days	83	05	34½	83	12	Fair ...	Slight.
Banner	do 8.	do 29.	Sept. 3.	118 do	81	33	....	73	18	do ...	do
Early Race Horse.	do 6..	do 22.	Aug. 22.	108 do	77	08	40½	51	00	do ...	do
White Russian....	do 6..	do 29.	Sept. 1.	118 do	74	14	36	73	04	Weak ..	Considerable.
Early Blossom...	do 6..	do 30.	do 4.	121 do	74	09	34	82	32	do ..	do
Early Archangel..	do 7..	do 21.	Aug. 25.	110 do	72	29	40	60	24	Fair ...	Slight.
Welcome.........	do 6..	do 23.	do 22.	108 do	72	27	40	72	00	do ...	do
Holstein Prolific ..	do 7..	do 28.	Sept. 5.	121 do	70	26	34	72	24	Strong..	do
Black Champion ..	do 6..	do 30.	do 5.	122 do	69	09	37	74	04	Weak ..	Considerable.
Giant Swedish....	do 7..	do 31.	do 9.	125 do	68	30	31	56	24	Strong..	do
Glenrothern	do 6..	do 31.	do 5.	122 do	67	25	....	77	04	do ..	Slight.
Black Tartarian...	do 6..	do 29.	do 5.	122 do	66	28	35½	78	22	Fair ...	do
Winter Grey.....	do 6..	do 21.	Aug. 22.	108 do	66	26	39	69	25	do ...	do
Prize Cluster......	do 8..	do 27.	do 26.	110 do	66	08	39	54	14	Weak ..	None.
American Triumph	do 7..	do 31.	Sept. 7.	123 do	64	02	....	69	10	Strong..	Slight.
Australian........	do 8..	do 29.	do 4.	119 do	59	26	....	72	02	Weak ..	Considerable.

EXPERIMENTS WITH BARLEY.

Two series of plots were sown with barley, one on light loam and the other on heavier land. The varieties sown on light loam were injured so badly by wind in May that the returns would be misleading and are not given.

The following varieties were sown on half and three-quarter acre plots on back-setting; soil, strong clay loam; nearly all were more or less lodged and the colour and plumpness of the samples somewhat injured.

California Prolific well deserves its name and is a very promising variety; the head is very similiar to the two-rowed Duckbill, and like it has good stiff straw.

Webb's Kinver Chevalier is a very promising variety from England, where it has taken the lead as a malting barley for some years; it had the stiffest straw of any of the Chevalier sorts sown.

Odessa Six-rowed is again much more prolific than the Rennie's Six-rowed.

All were sown with the Press drill, at the rate of 7 pecks per acre.

VARIETIES OF BARLEY.

Sown on clay loam soil, backsetting, with Press drill, 7 pecks per acre; size of plots, ½ and ¾ acre.

Variety.	Sown.	Headed.	Harvested	Yield per Acre.		Weight per Bushel.
				Bush.	Lbs.	Lbs.
Prize Prolific	April 23..	July 15..	Aug. 19..	75	34	50½
Two-rowed Duckbill	do ..	do 8..	do 14..	75	10	52¼
California Prolific	do ..	do 9..	do 14..	68	47	50½
Danish Chevalier	do ..	do 15..	do 19..	68	16	52
Odessa Six-rowed	do ..	do 2..	do 12..	66	14	53
Webb's Chevalier	do ..	do 8..	do 18..	61	17	52½
Goldthorpe	do ..	do 16..	do 18..	65	21	50
Beardless	do ..	do 16..	do 18..	58	34	50½
Rennie's Six-rowed	do ..	do 6..	do 12..	56	39	48
Two-rowed Naked	do ..	do 5..	do 16..	50	18	60

FALL AND SPRING PLOUGHING.

A test of the comparative merits of fall and spring ploughing for wheat and oats was made on the higher portions of the farm. The plots were one-half acre each; soil, a light gravelly loam. The previous crop was wheat on back-setting.

It will be seen from the following tables that fall ploughing has given the best results with both wheat and oats. This is an unexpected result and should not be acted upon until the experiment has been repeated a number of times. It is quite evident that the time of ploughing for, and the manner of sowing oats, largely affect the date of ripening. This was noticeable all through the experiment. Good results have been obtained during the past season by sowing oats a few hours after ploughing, before the soil has time to become dry. Further experiments on this line are needed, for it is thought that much loss is sustained in the drying out of the seed bed by the ordinary method, and the ploughing in of the seed apparently delays ripening.

Fall and spring ploughing. Soil, light gravelly loam; size of plots, one-half acre each.

Variety.	Sown.	Harvested.	Yield per Acre.	
			Bush.	Lbs.
WHEAT.				
Red Fife, ploughed in spring and sown with Press drill..	April 18	August 20	20	08
do in fall do ..	do 18	do 20	27	28
OATS.				
Black Tartarian, ploughed in spring, sown with Press drill	April 20	August 22	55	22
do ploughed in fall do ..	do 20	do 16	59	07
do sown broadcast and ploughed in	do 20	do 30	48	13

TEST OF DRILLS.

Arrangements were made to continue the test of drills begun two years ago, and nine plots were set apart for this purpose, but the late spring frost severely injured the oats, and the returns from that grain being inaccurate, are not given.

Below will be found particulars of this year's experiment; also the returns of a similar test for 1890. It will be noticed that this year's results confirm those of last year, and it is quite evident that on land similar to that of this farm drill sowing has a decided advantage over broadcasting.

TEST of Drills with Wheat and Barley on summer fallow; soil, clay loam.

WHEAT.

Method of Sowing.	Sown.	Sown per Acre.	Headed.	Harvested	Yield per Acre, 1891.		Yield per Acre, 1890.	
					Bush.	lbs.	Bush.	lbs.
Common drill	April 15..	7 pecks...	July 24...	Sept. 2...	33	20	30	24
Press drill	do 15..	6 do ...	do 24...	do 2...	28	50	29	31
Broadcast machine	do 15..	8 do ...	do 29...	do 5...	22	10	28	20
BARLEY.								
Press drill	April 24..	6 pecks...	July 16...	Aug. 19..	55	10	60	14
Common drill	do 24..	7 do ...	do 16...	do 19..	50	30	56	10
Broadcast machine	do 24..	8 do ...	do 18...	do 19..	42	14	50	46

Test of Thick and Thin Seeding.

The experiment undertaken in 1890 to determine the proper quantity of seed to be used with the different kinds of grain was repeated during the past season, with very similar results. Seven pecks of wheat again gave the largest yield, while the results with oats and barley vary little from last year's test. All the plots were sown with the common drill; soil, rich sandy loam.

WHEAT.

—	Sown.	Headed.	Harvested.	Yield per Acre.	
				Bush.	lbs.
Red Fife, 4 pecks per acre	April 16....	July 20.....	Sept. 1.....	33	20
do 5 do	do 16....	do 20.....	do 1.....	36	25
do 6 do	do 16....	do 20.....	do 1.....	38	55
do 7 do	do 16 ...	do 20.....	do 1.....	39	55
do 8 do	do 16....	do 20.....	do 1.. ..	39	05
OATS.					
Welcome, 8 pecks per acre	April 16....	July 14.....	Aug. 18....	86	01
do 9 do	do 16....	do 14.....	do 18....	87	12
do 10 do	do 16....	do 14.....	do 16....	87	02
do 11 do	do 16....	do 14.....	do 16....	78	13
do 12 do	do 16.. .	do 14.....	do 16....	88	23
BARLEY.					
Two-rowed Duckbill, 5 pecks per acre	April 24....	July 16.....	Aug. 16....	53	01
do 6 do	do 24....	do 16....	do 16....	57	14
do 7 do	do 24....	do 16.....	do 16....	59	33
do 8 do	do 24....	do 16.....	do 16....	58	31
do 9 do	do 24....	do 16.....	do 16....	51	67

EXPERIMENTS WITH SMUDGES.

Smudges were largely used during the past fall for the prevention of injury by frost, farmers in some districts forming organizations for this purpose, and in others depending on individual effort.

Although realizing the difficulty of obtaining reliable results from experiments in this line, it was thought advisable to obtain all the information possible.

Two nights were spent during the second week in August testing thermometers in and out of smoke, but owing to the wind being too strong no conclusion could be reached. All the nights of the 20th and 21st August were also spent by me in attending smudges, which were started at sundown, and testing thermometers; and it was thought that there was at least a difference of two degrees between the thermometers in and out of the smoke. It is, however, very difficult to test this matter fully. A difference of a few feet in the level of the ground where the two thermometers are placed, a difference in the current of air passing over either of the instruments (caused by a ravine, cultivated land, &c.), changes in the wind, &c., are all disturbing elements which must be taken into consideration in reaching accurate conclusions.

It would appear, however, that a small smudge started only a short time before frost has very little effect in checking it.

The beneficial effect of even a small amount of cloud was noticed on the night of the 21st. From 6 p.m. of that night to 1 a.m. on the 22nd the sky was perfectly clear and the thermometer fell from 2 to 4 degrees every hour; from that time to 4 o'clock a few clouds appeared and the thermometer remained stationary. At 4 the clouds cleared off and the temperature immediately fell 4 degrees. It would appear from this that a dense smoke kept suspended over the crop from sundown to sunrise should have an effect somewhat similar to clouds, and prevent the temperature from falling.

MIXED GRAIN GROWN FOR HAY AND GREEN FODDER.

Much interest having been shown in the experiments undertaken here during 1890 with mixed grain for fodder, the most promising of these mixtures were again tested during the past season, and with gratifying success, the yield in every case being even larger than in 1890.

The grain was sown on backsetting with a common drill on the 26th April, the oats or barley being first sown, and the pease were afterwards sown between the drills of the first sown grain; this plan gave the roots of each variety of grain room to spread, but when both kinds of grain are sown at the same time the oats or barley generally crowds out the pease, greatly reducing the yield.

Spring rye was also sown at the same time on an adjoining plot, but the yield of fodder from this grain was much lighter than from any of the others.

MIXED GRAIN grown for Hay or Green Fodder.

Varieties.	Pecks per Acre Sown.	Stage when Cut.	Height.		Weight, Green.		Weight, Dry.	
			Ft.	in.	Tons.	lbs.	Tons.	lbs.
Oats........Black Tartarian.........	8 pecks...	In early milk....	5	0	13	275	4	1,675
Pease...... Prince Albert.......	4 do ...	Podded	6	0				
Oats........Black Tartarian.........	8 do ...	In early milk....	5	0	13	650	5	510
Tares.......Large English...........	4 do ...	Podded	8	0				
Barley .... Danish Chevalier.........	8 do ...	In early milk....	0	40	12	1,375	3	1,725
Pease.......Prince Albert......	4 do ...	Podded	6	0				
Rye........Spring.	7 do ...	In early milk....	4	6	6	1,615	2	150

SEED DISTRIBUTION.

The distribution of seed grain in one and two-bushel lots has increased very much during the past year, and quantities are now sent from the farm to nearly every part of the province. Reasonable prices are charged, and farmers are thankful for the opportunity of buying pure seed grain near home.

Reports regarding the success of the different varieties of seed distributed are now coming in. Nearly all report success with White and Red Connell wheats, and Prize Cluster and Black Tartarian oats, and Duck-bill barley. Unusually large returns are reported from the White Connell wheat, Black Tartarian oats, and two-rowed Duck-bill barley; and all are pleased with the earliness of the Prize Cluster oats.

FODDER CORN.

I have great pleasure in reporting continued success with fodder corn, although the yield during the past season was not nearly equal to that of 1890. It was a very even and profitable crop, and proves conclusively that we need not depend solely on our wild meadows for fodder. With a yield of between 15 and 20 tons of excellent green fodder per acre, mixed farming is practicable even in our high-rolling prairie land, for corn is peculiarly suited to that class of soil.

A trial was made of cutting and binding corn with the common grain binder, and with corn from six to seven feet high it worked quite satisfactorily, and I have no doubt that with an open-backed machine similar to the one introduced this year by the Harris Co., even much taller corn might be cut and bound.

Among the varieties tested this year the most promising for this province, on account of their combining earliness with a fair yield, are North Dakota, White Flint, Red Blazed and Mitchell's Extra Early, the last named being an improved Squaw corn.

All were planted on backsetting 28th May in rows three feet apart and thinned out to six inches in the row. The crop was kept clean during the season of growth with a horse scuffler. All were cut on 29th August, previous to which a frost had injured the upper two feet of the plants, reducing the yield somewhat.

A large proportion of the corn was made into ensilage; the balance was made into stooks by tying the heads together and left in the field to be used dry during the winter. It is readily eaten both as ensilage and in the dry state.

FODDER CORN.

Variety.	Average Height.	Stage of Growth when Cut.	Condition of Ears.	Leafiness.	Yield per Acre.	
	Feet.				Tons.	lbs.
Golden Dent	6 to 6½	Not in tassel	None	Fairly leafy	20	1,250
Thoroughbred White Flint	6 " 6½	Just coming into tassel	do	Very leafy	18	960
Blunt's Prolific	6 " 7	Not in tassel	do	Fairly leafy	18	300
Golden Beauty	6 " 6½	do	do	Not very leafy	17	870
Chester County Mammoth	5 " 5½	do	do	Fairly leafy	17	650
North Dakota	6 " 6½	Silk, dry	Early milk	Very leafy	17	540
Long Yellow Flint	6 " 7	Coming into silk	Nearly formed	do	17	210
Stowell's Evergreen	5 " 5½	In tassel	None	do	16	1,010
King Philip	6 " 6½	In silk	Just formed	Fairly leafy	16	230
Egyptian	5½ " 6	In tassel	None	do	15	1,900
Asylum Sweet	5 " 6	Silk just appearing	Just forming	Very leafy	15	1,680
Red Cob Ensilage	5 " 6	Tassel just appearing	None	Not very leafy	15	1,680
Canada Yellow	5 " 6	In silk	Nearly formed	Very leafy	15	1,350

FODDER Corn—*Concluded.*

Variety.	Average Height.	Stage of Growth when Cut.	Condition of Ears.	Leafiness.	Yield per Acre.	
	Feet.				Tons.	lbs.
Mammoth Southern Sweet	6 to 6½	Just in tassel	None	Fairly leafy	15	800
Giant Prolific Ensilage	5½ " 6	Not in tassel.	do	do	14	1,590
Longfellow	5½ " 6	Silk just appearing	Not formed	do	14	1,590
Mitchell's Early	4½ " 5	Silk, dry	Early milk	Very leafy at bottom	14	1,260
Red Blazed	6 " 6½	In silk	Nearly formed	Fairly leafy	14	50
Pearce's Prolific	5 " 5½	Silk just appearing	Not formed	Quite leafy	13	1,610
Pee and Kay	5½ " 6	In silk	Formed	do	13	1,280
Long White Flint	5½ " 6	Silk just appearing	Not formed	Fairly leafy	13	840
Dakota Gold Coin	6 " 6½	Full silk	Early milk	do	13	400
White Flint, from Dakota	5½ " 6	Silk nearly dry	do	Very leafy	12	530
Yellow Flint	5½ " 6	In silk	Nearly formed	Quite leafy	12	420
Eight-rowed Sugar	5 " 5½	Silk nearly dry	Early milk	Fairly leafy	12	310
Early Mammoth	4½ " 5	In tassel	None	Very leafy	12	310
Livingstone's Gold Coin	5 " 5½	Just in tassel	do	Quite leafy	11	880
Potter's Excelsior	5 " 5½	In tassel	do	do	11	550
Virginia Horse Tooth	6 " 6½	Not in tassel	do	Not very leafy	10	1,120
Extra early Cory	4 " 5	Silk nearly dry	Early milk	Leafy at bottom.	9	920
Cinquantine	5½ " 6	In silk	Partly formed	Fairly leafy	8	720
White Flint, from Steele	5 " 5½	Silk, green	Just formed	Leafy at bottom.	15	800

FODDER PLANTS.

In addition to the Indian corn a number of varieties of corn-like millets, &c., were tested; owing, however, to the cool spring and summer, these did not give the yield they otherwise would have done. All were sown on grain stubble with the Planet Junior drill in rows three feet apart, and cut on 11th September, before which date the upper foot of the plants was injured by frost.

These plants have now been tried here on two greatly varying seasons, viz., in 1889, a hot dry summer, and the past season a wet and cool one, and in neither year were they equal to the early varieties of Indian corn, such as Mitchell's Early or North Dakota.

Below will be found particulars of yield, &c., of these plants.

Variety.	Stage of Growth when Cut.	Height when Cut.	Stalk to each Plant.	Yield per Acre of Green Fodder.	
		Inches.	Stalks.	Tons.	lbs.
White Millo Maize	Not yet in tassel	47	9	8	1,380
Large African Millet	do	51	11	7	1,620
Pearl Millet	do	43	12	7	740
Chana	Seed just appearing	61	6	7	80
Corn from India	In tassel	63	6	6	1,200
Mandawar	Not in tassel	32	14	5	1,440
Kaffir Corn	do	68	9	4	580
Egyptian Rice Corn	do	54	13	4	360
Yellow Millo Maize	do	49	8	2	1,500

GRASSES.

Great interest continues to be manifested in the experiments undertaken in connection with grasses, nearly every mail bringing inquiries as to the most promising hay and pasture grasses for this country, and the grass plots on the farm receive more attention from visiting farmers than any other department. During the past year large additions have been made to the collection of grasses and clovers undergoing test, and up to the present date 46 varieties of grasses and 10 of clovers have been sown. Of these, 20 of the grasses and 9 of the clovers have experienced a winter; the balance were sown during the past summer, and their hardiness has not been tested. A number of those sown in 1890 were killed out last winter, and no doubt others will succumb during the present severe weather; still, quite a number have proved both hardy and productive, and it is hoped that we shall find among them some varieties well adapted to this country.

CULTIVATED GRASSES SOWN IN 1890.

Below will be found full particulars of cultivated grasses sown with wheat in the spring of 1890. When the wheat was about 2 inches high the grass and clover seeds were sown broadcast and harrowed in, covering the grass seed and killing a lot of weeds at the same time. Nearly all the clover (Common Red) in the timothy and clover mixture was winter-killed and the yield from this plot was light.

Both Sainfoin and Lucerne made a good even stand and came through the winter without injury, but the light rainfall of May was especially severe on them, for both require abundant rainfall early in the season; for this reason the yield from these plots was light.

The Alsike made a good stand the first summer, but about one half of the plants were winter-killed; the remaining plants and the timothy sown with it covered the ground fairly well and the returns were good.

Mammoth Red clover is with us decidedly the most promising of the clovers, coming through the winter without the least injury, and both alone and mixed with timothy gave a good crop of excellent hay; the stalk of this clover grows much finer here than in Ontario, and for that reason makes better hay,

Common Red clover was too tender for the open prairie, the plot of this variety being completely killed out.

White Dutch clover proved to be perfectly hardy, and promises to be quite useful for pasture.

Bokhara or Sweet clover was also hardy, and made a luxuriant growth 7 feet high. Although of very little use for fodder it is an excellent honey plant, and the perfume from its blossom was quite noticeable for the greater part of the summer.

Trefoil and Crimson clover with us were both winter-killed.

Austrian Brome Grass (*Bromus inermis*) is a very promising grass here. This did not winter-kill the least, grew 32 inches high and yielded 2½ tons of excellent leafy hay.

Orchard Grass grew thick on the ground, but was rather short; it stood the winter, and keeps green quite late in the season, the aftermath from this variety being heavier than from any of the others.

Timothy covered the ground well, but failed to push up a proper proportion of stalks, and the crop was light; this is the general complaint from farmers regarding this grass, and for that reason its cultivation is not general.

All the Fescues proved hardy, but only the Meadow Fescue gave a fair return; this is a very promising grass, but should not be sown alone.

The following grasses were winter-killed:—Rough Meadow grass, Italian Rye grass, Perennial Rye grass and Meadow Fox-tail.

The plots were one-tenth of an acre in area; soil, rich sandy loam; all were cut about 15th July, but some of them should have been cut earlier.

GRASSES and Clovers sown with Wheat in 1890.

—	Height.	Yield, dry, per Acre.		Remarks.
		Tons.	lbs.	
Mixed native grass	43 inches.	2	1,058	Injured by wind; excellent hay.
Mixed cultivated grasses	34 do	1	625	Orchard and Timothy most prominent
Austrian Brome grass	32 do	2	1,105	Very promising; hardy.
Orchard grass	28 do	2	200	Heavy bottom.
Meadow Fescue	25 do	1	666	Good pasture grass.
Sheep do	12 do	Not cut.		Only fit for pasture.
Hard do	18 do	do		do do
Timothy and clover	34 do	1	1,942	Clover nearly all killed.
Mammoth clover and timothy	28 do	2	1,505	Quite hardy; nice crop.
do (alone)	28 do	2	1,117	do do
Alsike and timothy	24 do	2	529	One half Alsike killed.
Sainfoin	26 do	1	1,529	Even crop; hardy.
Lucerne	26 do	1	844	do do
Bokhara clover	7 feet	Not weighed.		Excellent bee plant.
White Dutch clover	12 inches.	Not cut.		Good pasture.
Common Red do				Winter-killed.
Trefoil				do
Italian Rye grass				do
Perennial do				do
Meadow Fox-tail				do
Rough Meadow grass				do

SOME NEW VARIETIES OF GRASSES.

A very interesting collection of grasses, many of them quite new to this district, was received in early spring from Mr. J. Fletcher, Botanist at the Central Experimental Farm. The seed of every variety grew and the collection was a source of interest to visiting farmers all through the season; many varieties made a large growth, and I trust some of them will prove hardy and worthy of cultivation in this province.

All were sown in double rows 25 feet long; the plants of desirable varieties will be pricked out and transplanted into beds during the coming season. Accompanying this will be found a table showing the percentage of germination, growth, &c., of these grasses.

GRASSES sown 2nd June, 1891; seed from Experimental Farm.

Variety.	Percentage Germinated.	Growth made in 1891	Remarks.
	Per cent.	Inches.	
Bromus segetum	100	24	Seed ripened.
Bromus inermis	100	20	do
Elymus dasystachys	10	2	
Muhlenbergia Mexicana	100	15	Seed ripened; bunchy.
Sporobolus heterolepis	30	2	
Bromus Pumpellianus	100	14	Bunchy.
Deyeuxia neglecta, var. robusta	90	9	
Deyeuxia Canadensis	60	2	
Poa nevadensis from N. W. T.	90	3	
Poa pratensis from Forres	100	9	
Poa compressa	100	14	Seed ripened.
Muhlenbergia sylvatica	100	16	Seed ripened; bunchy.

GRASSES sown 2nd June, 1891, &c.—*Concluded.*

Variety.	Percentage Germinated.	Growth made in 1891	Remarks.
	Per cent.	Inches.	
Muhlenbergia glomerata	100	16	Seed ripened.
Phalaris arundinacea	100	20	
Boutelouia oligostachya	100	6	do
Panicum virgatum	90	13	
Elymus Canadensis	100	6	
Hierochloa borealis	90	6	
Deyeuxia neglecta	90	9	
Deschampsia flexuosa	90	9	
Deschampsia cæspitosa	90	9	
Agropyrum tenerum	90	6	
Agropyrum glaucum	100	9	
Apluda aristata	40	....	From seed sent in 1890.
Panicum ciliare	90	....	do do
Panicum colonum	30	....	do do
Koeleria cristata	None.	....	do do
Andropogon pertusus and annulatus (mixed)	do	....	do do
Eleusine Indica	do	....	do do
Eragrostis poæordis	do	....	do do

NATIVE GRASSES GROWN UNDER CULTIVATION.

In the spring of 1889 eight small plots were sown with grass seeds gathered on the prairie here; these plots have not been re-sown since, and there is now no question as to the perennial character of these grasses, for they have improved every year since sown, and the yield from them this year was in most cases very large.

As all the seed obtainable was required to enlarge the work of this department none of the plots were cut in the green state, and the yields given are obtained from the ripe hay cut for seed. About 250 lbs. of seed was gathered and will be sown in large plots next spring.

About 2 acres was sown with the seed obtained from these plots in 1890; it made a good catch, and next fall we hope to have a quantity of seed for distribution among farmers.

As the plots from which the following returns were taken were small and kept perfectly free from weeds, such large returns must not be expected from ordinary field culture.

No manure was used on any of the plots.

NATIVE GRASSES.

Variety.	Height.	Hay Stage.	Seed Ripe.	Yield per Acre.
	Inches.			
Agropyrum tenerum, Vasey	41	July 4	August 7	2 tons, 1236 lbs.
Agropyrum caninum, R. and S.	43	do 4	do 22	2 do 827 do
Poa serotina, Ehrh	28½	do 1	do 1	Very thin, not cut.
Elymus Virginicus, L	40	do 26	do 22	3 tons, 306 lbs.
Elymus Americanus, V. and S.	48	do 15	do 28	3 do 618 do
Phalaris arundinacea	35½	do 6	do 1	2 do 100 do
Bromus ciliatus, L	50	do 24	do 22	2 do 1,833 do
Muhlenbergia glomerata, Trin.	31	do 26	do 22	2 do 1,621 do

I have also pleasure in acknowledging the receipt from S. Robinson, Esq., of a collection of clover and grass seeds brought by him from Scotland last spring. These proved to be of extra good quality, nearly all germinating. Many are, however, of tender varieties, and their survival through the present severe winter is doubtful.

Below will be found particulars of this collection.

GRASS and Clover Seed received from S. Robinson, Esq., Wawanessa, Man., sown 2nd June, 1891.

Variety.	Approximate Percentage Germinated.	Growth made in 1891.	Remarks.
	Per cent.		
Italian Rye grass (Scotch seed)	100	16 inches	Very vigorous.
do (Foreign seed)	100	16 do	do
Perennial Rye grass	100	14 do	
Cocksfoot	100	16 do	
English Red clover	100	20 do	Seed ripened.
English Cow Grass clover	100	20 do	do
Alsike clover	100	22 do	do
White do	100	Rank & close	do
Yellow do	100	30 inches	do
Large Scotch tares	100	40 do	Annual.

MILLETS AND HUNGARIAN GRASS.

Eleven plots were devoted to experiments with millets, as there is a difference of opinion regarding the merits of thick and thin sowing for this plant. Three sowings were made of each of the leading millets, one each of 15, 20 and 25 lbs. per acre. This test of the German and common millet was spoilt; that with Hungarian was complete, and points to 20 lbs. of seed per acre as the right quantity. Tests of rolling directly after sowing were also made with satisfactory results. All were sown on the 29th May and cut on the 29th August. The past summer was too cool for a large return from millets.

Variety.	Quantity of Seed per Acre.	Yield of Hay.		Remarks.
	Lbs.	Tons.	lbs.	
Hungarian grass	15	2	1,350	Rather thin.
do	20	2	1,850	About right thickness.
do	25	2	1,350	Too thick on the ground.
German millet	20	2	1,700	About the right thickness.
Common do	20	2	1,400	do do
Hungarian grass (rolled)	20	2	1,920	Came up first.
do (not rolled)	20	2	1,700	Slower to germinate than the above.

RENEWING OF OLD MEADOWS.

It is found in many parts of the province that natural hay meadows after a few years cutting become infested with useless and often bitter weeds, which crowd out the grasses, until the meadows have to be abandoned.

On this farm a portion of the natural meadow was so overgrown with Pennsylvanian wind flower (*Anemone dichotoma*), and small sage bush (*Artemisia Ludoviciana*), both native plants, that it is no longer cut with profit. This portion of the meadow has been broken up, and after growing one crop of grain will be re-seeded with different varieties of grasses, and the result noted and reported on.

SILOS.

The two silos built in the west end of the barn were filled during the past season, as follows:—The lower one-third of the north one with green oats and pease uncut, and the upper two-thirds with fodder corn cut in 1-inch lengths; the lower half of the south silo was filled with millet uncut, and the upper half with cut fodder corn.

For the corn a Watson cutting-box with elevating attachments was used, and gave entire satisfaction; the cutting-box was run by our Abell two-horse tread machine, and there was no lack of power, the corn being cut and elevated as fast as two men could feed it.

Although the sides and corners of the silos were well tramped, while being filled, the ensilage settled so much that it was necessary to fill it several times. After the last filling a 2-foot coating of wheat chaff was put on over the ensilage, but no weights were used. On the 15th December the north silo was opened, and the ensilage found to be of excellent quality, with scarcely any waste on the sides or in the corners.

There being no roof over the silos, some inconvenience was experienced from frost, when the chaff covering was removed; this was overcome by the use of a false roof made of loose boards, tar paper and about 2 feet of chaff; this was found effectual in excluding the frost, and since then the cattle have been fed regularly on the ensilage with satisfactory results.

CATTLE.

During October last I visited Ontario and brought back a selection of 15 head of cattle for breeding and experimental purposes on this farm. These consisted of Shorthorns, Galloways, Holsteins and Ayrshires; nine of them were taken from the herd at the Central Experimental Farm and the balance purchased from breeders in Ontario.

All reached here safely and have remained in good health and gained rapidly in flesh since their arrival. Already a large number of farmers have inspected the stock, and all have expressed their appreciation of the efforts being made through the experimental farms to improve the stock of the country.

SHORTHORNS.

From Mr. W. S. Hawkshaw, Glanworth, Ont.:

One bull, General H, =14574=; colour, red; calved 15th December, 1890; bred by W. S. Hawkshaw, Glanworth, Ont.; got by Aberdeen Hero, (imp.) dam, Countess of Hawkhurst, =8752=; by 3rd Duke of Rutland, =559=; Countess 2nd =784=.

From the Central Experimental Farm, and purchased originally from Mr. Thos. Guy, Oshawa, Ont.:

One cow, Rose of Sydenham =16031=; colour, red; calved 6th February, 1886; bred by Thomas Guy, Oshawa, Ont.; got by Samson, =8787=;—dam, Red Rose, =4450=; by Enterprise 2nd =1769=; Sally =4728=.

One heifer, Cowslip 4th; calved 7th March, 1890; bred at Central Experimental Farm, Ottawa; sire Rosy Prince 8th =9198=;—dam, Cowslip 3rd =16646=.

One heifer, Rose of Darlington; calved 24th July, 1890; bred at Central Experimental Farm, Ottawa; sire, Rosy Prince 8th =9198=;—dam, Countess of Darlington 12th =14193=.

One heifer calf, Fashion 9th; calved 5th March, 1891; bred at Central Experimental Farm, Ottawa; sire, Earl of Kinsale = =; got by Premier Earl (imp.);—dam, Fashion Book =15918=.

AYRSHIRES.

From D. Morton & Sons, Hamilton, Ontario:

One heifer, Jewell =2003=; calved 14th June, 1889; colour, white and brown; bred by Hugh Jack, Little Shewalton, Irvine, Scotland; sire, Dandy Jim (1579); dam, Judy (imp.) (5505); by Red Prince (1000); Mirley (2672).

From D. Morton & Sons, Hamilton, Ontario:

One heifer, Dandy 2nd =2004=; calved 6th April, 1889; colour, brown and white; bred by Hugh Jack, Little Shewalton, Irvine, Scotland; sire, Dandy Jim (1579);—dam, Dandy 1st (5502), by Red Prince (1000); Dandy of Shewalton (2688).

Dandy 2nd took second prize at Toronto in 1891.

From Kains Bros., Byron, Ont.:

One bull, Middlesex =1216=; calved 10th September, 1890; colour, red and white; bred by Kains Bros., Byron, Ont.; sire, Prince of Byron =583=;—dam, Jeanie of Auchenbrain (Imp.) =129=, by Duke 3rd =647=; Paisley, by Wallace of Doumlanrig =61=, Gray Kate by Rob.

HOLSTEIN FRIESIANS.

From A. E. Hallman & Co., New Dundee, Ontario:

One cow, Queen of Waterloo =14666=, H. F. H. B.; calved 12th April, 1888; colour, white with black markings; bred by A. E. Hallman & Co., New Dundee, Ont. sire, African Prince =1270=, H.F.H.B.;—dam, Mina Rooker 2nd =3742=, H.F.H.B.

Queen of Waterloo took 1st prize as a 2-year-old at London and Toronto in 1890.

From A. E. Hallman & Co., New Dundee, Ontario:

One cow, Princess Leda 2nd, H.F.H.B. =18510=; calved 6th January, 1889; colour, black with white markings; bred by Smith, Powell & Lamb, Syracuse, N.Y., sire, Netherland Monk =4424=, H.H.B.A.R.;—dam, Princess Leda 1st =7130=, H.F.H.B.

From the Central Experimental Farm, Ottawa:

One bull, Holland Prince; calved 31st August, 1890; colour, mostly black, with white markings; bred at the Central Experimental Farm, Ottawa; sire, Netherland Pythius =9167=, H.F.H.B.;—dam, Aaggie Cornelia, 2nd Netherland =12217=, H.F.H.B.

GALLOWAYS.

From the Central Experimental Farm, purchased originally from Mr. Thos. McCrae, Guelph, Ont.:

One bull, Chester (4472); calved 12th March, 1887; bred by Thomas McCrae, Guelph, Ont.; sire, Stanley III (1793);—dam, Chrissy (7099).

NOTE.—Stanley III, imported by Agricultural College, Guelph; and Chrissy imported by Thos McCrae.

One cow, Violet III, of Tarbreoch (9675); calved 30th March, 1886; bred by James Cunningham, Tarbreoch, Dalbeattie, Scotland; sire, Scottish Borderer (669); —dam, Maid III, of Tarbreoch.

NOTE.—This animal was a prize winner at the Highland Agricultural Society's Show in Scotland.

One cow, Hannah B., of Guelph (11080); calved 23rd February, 1888; bred by Thos. McCrae, Guelph, Ont.; sire, Stanley II (4473);—dam, Hannah III, of Castlemilk (7699); by Beaconsfield (1344);—dam, Hannah V (1421).

One bull-calf, "McCrae"; calved 14th March, 1891; bred at Central Experimental Farm, Ottawa; sire, ;—dam, Violet III, of Tarbreoch (9675).

EXPERIMENTS IN FEEDING STEERS AND SWINE.

Besides the cattle brought from Ontario, eight grade steers are being fed with different classes of food. These experiments will be continued during the winter and the results made known in the next report.

Experiments in feeding swine with barley and frozen wheat have also been undertaken, but are not yet completed.

HORSES.

The horses on the Experimental Farm are enjoying perfect freedom from disease. It is now over three years since they were brought to the province, and since that time none have died and no serious ailment has occurred among them. Their healthfulness is no doubt largely owing to the pure water found on the farm and the care taken in feeding, &c. When in full work, each horse is fed two meals per day of oats mixed with bran, and one meal (at night) of crushed grain, besides all the wild meadow hay they can eat up clean. On Sunday one-half the usual quantity of oats is fed.

EXPERIMENTS WITH TURNIPS.

Of the thirty-nine varieties of turnips tested during the past season the Mammoth Purple Top has given the largest yield and the best shaped turnip. Owing to the unfavourable season many of the varieties were very long in the neck, but the roots of the above variety were nearly all perfect in shape.

All were grown in rich loam soil in the lower portion of the valley. The sowing was done with the Planet Jr. drill, in level drills 30 inches apart.

Two sowings were made, one on the 15th May and the other two weeks later. The first sowing was nearly destroyed by cut-worms just as the plants appeared above ground. Several remedies were tried, and air-slacked lime applied near the plants appeared to do the most good, but in spite of all we could do the first sowing was nearly destroyed. The second sowing escaped injury from this cause, but the crop was somewhat late for the best results. All were pulled on the 22nd October.

The returns given were calculated from weighing three rows, each 66 feet long.

Variety.	Yield per Acre.	Yield per Acre.	
	Bush.	Tons.	lbs.
Highland Prize (Simmers)	$833\frac{48}{60}$	25	28
Imperial (Webb)	$805\frac{12}{60}$	24	312
Mammoth Purple Top (Evans)	770	23	200
Elephant or Monarch (Steele)	$765\frac{36}{60}$	22	1,936
Selected Purple Top (Steele)	$721\frac{36}{60}$	21	1,296
New Giant King (Webb)	$719\frac{24}{60}$	21	1,164
Marquis of Lorne (Bruce)	$719\frac{24}{60}$	21	1,164
Clyde Improved (Evans)	$712\frac{48}{60}$	21	768
Bangholm (Simmers)	$712\frac{48}{60}$	21	768
Hartley's Bronze (Pearce)	$688\frac{36}{60}$	20	1,316
Purple Top Swede (Rennie)	$677\frac{36}{60}$	20	656
Skirving's Swede (Steele)	660	19	1,600
Carter's Elephant (Bruce)	$576\frac{24}{60}$	17	584
Turnips—Garden Varieties.			
Long White Verties	847	25	820
Early White Stone	$843\frac{20}{60}$	25	600
Early Six Weeks	748	22	880
Orange Jelly	726	21	1,560
White Globe Strapleaf	$718\frac{40}{60}$	21	1,120
Red Top Strapleaf	$597\frac{40}{60}$	17	1,860
Burpee's Breadstone	$586\frac{40}{60}$	17	1,200
Extra Early Milan	$498\frac{40}{60}$	14	1,920
Sweet German	$454\frac{40}{60}$	13	1,280
Early White Flat Dutch	451	13	1,060
Lang's Improved Purple Top	396	11	1,760
Hasyard's Improved	$359\frac{20}{60}$	10	1,560

GROWN from Seed sent to the Farm by Mr. Stewart Robinson, Wawanessa.

Variety.	Yield per Acre.	Yield per Acre.	
	Bush.	Tons.	lbs.
Mammoth Purple Top	$975\frac{20}{60}$	29	520
Devonshire Grey Stone	$894\frac{40}{60}$	26	1,680
Old Muldrum Green Top Yellow	748	22	880
Wosterton Hybrid	$623\frac{20}{60}$	18	1,400
Aberdeen Green Top Yellow	528	15	1,680
Pomeranian White Globe	$498\frac{40}{60}$	14	1,920
Sutton's Champion Swede	$491\frac{20}{60}$	14	1,480
Drummond's Improved	418	12	1,080
Sharpe's Improved	$388\frac{40}{60}$	11	1,320
East Lothian Purple Top	374	11	440
Green Top Swede	374	11	440

From Seed sent to the Farm by R. Waugh, 1890.

Dads Improved East Lothian Swede, seed saved in Kent, England	$498\frac{40}{60}$	14	1,920
do do do East Lothian	$381\frac{20}{60}$	11	880
Purple Top Swede	$425\frac{20}{60}$	12	1,520

POTATOES.

One hundred and eleven varieties of potatoes were tested on the farm during the past season; of these, forty varieties were grown in such small quantities that returns are not available this year.

All were planted on 23rd May, in rows 3 feet apart, and 1 foot apart in the row, and all were dug on 12th October.

The following list of twenty-four varieties were selected from among the most promising of those grown at the Central Experimental Farm; the quality of nearly all of them was found to be good, and a number of them have under the circumstances given fair returns.

POTATOES.

Variety.	Growth of Plant.	Size of Tuber.	Quality.	Flavour.	Ripe.	Colour.	Yield per Acre.
							Bush.
Vanguard	Fair	Large	Very dry	Good	Late	Red	214
Early Puritan	Strong	do			do	White	209
Delaware	do	Medium	Dry	Good	do	do	203
Early Rose	Fair	Large	do	do	do	Red	192
Empire State	Strong	do	Wet	Poor	do	White	191
Halton Seedling	Fair	Medium	Dry	Good	Sept. 1	Red	183
Algoma No. 1	Weak	Large	Extra dry	do	Aug. 15	do	176
London	Fair	Medium	Dry	do	Late	do	172
Lee's Favourite	do	do	do	do	Sept. 1	Light red	170
Beauty of Hebron	Weak	do	do	do	do 1	do	168
May Queen Early	Strong	do	do	do	do 3	Red	168
Thorburn	Fair	Large	do		Late	do	163
Clarke's No. 1	do	Small	Fair	Fair	do	Light red	163
Early Eating	Weak	Large					154
Early Maine	Fair	do	Very dry	Good	Sept. 1		150
Rural Blush	Strong	Very large	Fair	do	Late	Red	148
Rural New Yorker No. 2	do	Large	Wet	Poor	do	White	137
Chicago Market	Fair	Very large	Dry	Good	do	Red	137
Rose's New Giant	do	do	Fair	do	do		133
White Star	Strong	Medium	Wet	Poor	do	White	133
Early Ohio	Fair	do	Dry	Good	Sept. 1		126
Ohio Gunner	Weak	Large	do	do	Aug. 15	Red	119
Brownell's Winner	Strong	Medium	Wet	Poor	Late	Dark red	102
Vermont	Fair	Large	Dry	Good	Sept. 1	Red	113

The location selected for potatoes this year was strong low-lying land, and unsuitable for a season like the past one. Although planted on 23rd May, many were not above ground by 15th June, and all were very backward in consequence; for that reason the dates given for their ripening would be different if grown under more favourable conditions. Those marked *late* were not ripe when cut down by frost.

The yields per acre are calculated from weighing the produce of two rows 66 feet long.

A number of the varieties tested last year were found undesirable and were discarded. The following list includes the most promising of the varieties tested in 1890, among them a number of seedlings raised on the Central Experimental Farm. One of them, No. 80, has again given much the largest yield of any potato grown on this farm. It is proposed to grow this variety more extensively next season.

POTATOES.

Variety.	Growth.	Size.	Quality.	Flavour.	Ripe.	Colour.	Yield per Acre.
							Bush.
C. E. Farm, No. 80	Strong	Fair	Fair	Fair	Late		335
Richter's Imperator	do	do	do	do	do	White	209
Alpha	Fair	Medium	do	Good	do	do	191
Rosy Morn	Weak	do	Wet	Poor	Sept. 10	Red	188
Stray Beauty	Fair	do				do	183
Crown Jewel	do	do	Dry	Good	Late	do	179
Richter's Schneerose	do	do	Fair	Fair	do	White	177
White Elephant	do	do	do	do	do	do	159
New Badger State	Strong	do	Wet	Poor	do	do	149
C. E. F., No. 188	Fair	Small	do	do	do	do	148
Thorburn's Late Rose	Strong	Large	Fair	Good	do	Red	146
Wonder of the World	Fair	Medium	do	Fair	Sept. 10	do	141
C. E. F., No. 94	do	do	Wet	Poor	Late	White	141
Early Callao	do	do	do	do	do	do	141
Amon's Early	do	Small	Dry	Good	do	Red	137
Jackson's Improved	Strong	do	Wet	Bad	do	White	135
C. E. F., No. 9	Fair	Medium	Fair	Good	do	do	135
Thorburn's Paragon	Weak	do	Dry	do	do	Red	132
Early Rose	Fair	do	do	do	do	do	130
C. E. F., No. 225	do	do	Wet	Poor	do	White	128
Brownell's Best	do	Large	do	do	do	do	126
Jumbo	Weak	do	Fair	do	do	do	121
C. E. F., No. 118	do	Small	Wet	Fair	Sept. 1	do	117
St. Patrick	do	Large	Very wet	Poor	Late	Red	110
C. E. F., No. 53	Strong	Medium	Fair	Fair	do	Blue	108
do 170	Fair	Small	do		do	do	108
do 54	Weak	Medium	Dry	Good	Sept. 10	Red	106
Taylor's Prolific	Fair	Large	Wet	Poor	Late	do	106
C. E. F., No. 195	do	Small	Fair	Fair	do	White	104
Pride of America	Weak	Medium	do	do	Sept. 10	Light red	100
Lady Finger	Strong	Small	do	Good	Late	White	100
C. E. F., No. 231	do	do	Wet	Poor	do	Blue	99
do 141	Fair	do	do	do	Sept. 15	White	97
Snow flake	do	Large	Fair	Fair	do 15	do	95
C. E. F., No. 263	Strong	Medium	Wet	Poor	Late	do	91
Genessee Seedling	Fair	Large	Dry	Good	do	do	91
C. E. F., No. 83	Strong	Small	Wet	Poor	do	Blue	81
do 209	Fair	do	do	do	do	White	81
do 153	Strong	do	do	do	do	R. blue	80
do 5	Fair	Medium	Dry	Good	do	White	77
do 73	Weak	Small					73
Lee's Favourite	Fair	Large	Dry	Good	Sept. 1	Red	71
C. E. F., No. 98	Strong	Medium			Late	White	58
do 73	Weak	Small	Fair	Fair	do	do	40
do 118 A	Fair	do	Wet	Poor	do	do	31
Asparagus	Weak	Very small	Fair	Fair	do	do	20

MANGELS.

Fifteen varieties of this useful vegetable were grown on this farm; the land selected for the purpose was a deep rich loam, but somewhat too moist for the season. Each variety was sown with a Planet Jr. drill, in level drills 30 inches apart. The first series of plots were sown on the 15th May, and were destroyed by the same cut-worm that worked among the turnips; the second sowing was made two weeks later; these were only slightly injured by the cut-worm.

All were pulled on the 4th October, and are being fed to the milking cows on the farm.

The yields given were calculated from weighing the produce of three rows, each 1 chain long.

EXPERIMENTS WITH MANGELS.

Variety.	Yield per Acre.		
	Bush.	Tons.	Lbs.
Carter's Warden Orange Globe.... (Bruce)	1012	30	720
Mammoth Long Red.... (Evans)	$950\frac{24}{60}$	28	1,024
Pearce's Canadian Giant.... (Pearce)	$822\frac{48}{60}$	24	1,368
Gate Post.... (Bruce)	$822\frac{48}{60}$	24	1,368
Mammoth Long Red.... (Simmers)	814	24	840
New Giant Intermediate.... (Steele)	$800\frac{48}{60}$	24	48
New Giant Yellow Globe.... (Bruce)	792	23	1,520
Mammoth Long Red.... (Steele)	$778\frac{48}{60}$	23	728
Champion Yellow Globe.... (Webb)	$748\frac{40}{60}$	22	880
Golden Tankard.... (Evans)	$730\frac{24}{60}$	21	1,824
Mammoth Long Red.... (Webb)	$739\frac{14}{60}$	22	352
Yellow-fleshed Tankard.... (Webb)	$695\frac{12}{60}$	20	1,712

EXPERIMENTS WITH CARROTS.

Fourteen varieties of carrots have been tested during the past season. The first series of plots were sown on 12th May and the second on the 26th May. All were pulled on 24th October. The seed was sown with a Planet Junior drill in level drills, 18 inches apart, in deep rich loam. The plots were on rather low land and were injured somewhat by heavy rains. The yields were calculated from weighing the produce of three rows, each 66 feet long.

Variety.	Yield of Plot sown May 12.			Yield of Plot sown May 26.		
	Per Acre.	Per Acre.		Per Acre.	Per Acre.	
	Bush.	Tons.	lbs.	Bush.	Tons.	lbs.
Improved Short White (Steele)....	$425\frac{20}{60}$	12	1,520	374	11	440
Large White Vosges (Bruce)....	418	12	1,080	396	11	1,760
Green Top Orthe (Pearce)....	$410\frac{40}{60}$	12	640	$381\frac{20}{60}$	11	880
Large White Vosges (Simmers)....	396	11	1,760	418	12	1,080
Mammoth Intermediate White (Rennie)....	$381\frac{20}{60}$	11	880	....	....	....
Chantenay (Bruce)....	$366\frac{40}{60}$	11	....	$366\frac{40}{60}$	11	....
James Intermediate (Pearce)....	$366\frac{40}{60}$	11	....	308	9	480
Guerande or Ox Heart((Steele)....	352	10	1,120	$381\frac{20}{60}$	11	880
Early Gem (Rennie)....	$344\frac{40}{60}$	10	680	$366\frac{40}{60}$	11	....
Giant Short White Vosges (Rennie)....	$337\frac{20}{60}$	10	240	$366\frac{40}{60}$	11	....
Yellow Intermediate (Webb)....	$322\frac{40}{60}$	9	1,360	....	....	....
Mitchell's Perfection (Pearce)....	$300\frac{40}{60}$	9	40	$293\frac{20}{60}$	8	1,600
Half Long Scarlet Luc (Rennie)....	$234\frac{40}{60}$	7	80	$432\frac{40}{60}$	12	1,960
Scarlet Altringham (Webb)....	200	6	1,200	$315\frac{20}{60}$	9	920

APPLES.

In the fall of 1890 all apple trees then living were wrapped in straw and tar paper for protection during the winter and early spring. On 15th April, 1891, this covering was removed, and it was found that most of the trees had come through the winter with little or no injury. From the 15th to the end of April the weather was warm, and caused the trees to swell their buds very rapidly. During the second week in May several very sharp frosts occurred, causing great injury to all the fruit trees in their then advanced stage of growth. From the effects of this severe check, nearly all lost a considerable part of their wood, and several trees were killed. Since then the season has been very favourable, and apple trees have all made good growth, and most of the wood is well ripened.

Four hundred apple trees, comprising 140 varieties, were planted in 1889; of these 272, of 102 varieties, are still growing. Although growing slowly, some of the trees are apparently quite hardy, and the severe cold of winter does not affect them. They are still very young and have not yet borne fruit.

These trees were procured from various sources, and it is noticeable that the farther north the trees have been raised the more hardy they are here. The seedlings raised at Ottawa from seed procured in Russia, and planted here in the spring of 1890, are very promising. Although unprotected, they came through last winter and spring without injury, aud it is hoped that from these some varieties may be obtained that will grow successfully in this province.

From the following tables it will be seen that very few apple trees have been lost during the past year. Where trees had died in the orchards, they have been replaced by others from the nursery rows, and an additional orchard has been planted with 100 trees, placed 10 feet apart.

APPLE Trees growing in Bush form, on low Stems.

Name of Variety.	No. of Trees Living. 1890.	No. of Trees Living. 1891.	Present Condition.	Season's Growth.
Anisim	4	4	Good	14 inches; hardy growth.
Autumn Streaked	5	5	do	20 do extra hardy.
Broad Green	2	2	Extra good	18 do hardy growth.
Blushed Calville	5	3	do	22 do do
Christmas	2	2	Fair	Small do
Cross	2	2	do	do do
Crooked Spice	1	1	Good	14 inches do
Duchess of Oldenburg	10	10	do	38 do extra hardy.
Grandmother	9	8	do	16 do do do
Krimskoe	2	1	Poor	Small.
Koursk Anis	3	3	Fair	do hardy.
Koursk Reinette	1	1	Good	14 inches do
Karabovka	2	1	Fair	Small.
Kruder	1	1	do	do
Kremer's Glass	1	1	do	do
Lejanka, or Liebig	13	13	Extra good	18 inches; very hardy growth.
Osimoe	1	1	Good	14 do hardy growth.
Orel, No. 5	1	1	do	11 do do
do 11	1	1	do	16 do do
Ostrokoff's Glass	4	3	Fair	10 do
Pineapple	3	3	do	14 do
Plikanoff	9	9	Good	22 do extra hardy.
Russian Green	1	1	Fair	Small.
Repolovka	2	2	do	do hardy growth.
Red Repka	4	4	do	14 inches do
Romna	8	6	Good	11 do do
Red Anis	14	14	Very good	30 do extra hardy growth.
Sandy Glass	1	1	Poor	Small, killed back.
Sugar Sweet	2	2	Fair	10 inches.
Silken	4	4	Good	16 do hardy growth.
Simbirsk, No. 1	2	2	do	10 do do

APPLE Trees—*Continued.*

Name of Variety.	No. of Trees Living. 1890.	1891.	Present Condition.	Season's Growth.
Simbirsk, No. 2	2	1	Good	14 inches ; hardy growth.
do 6	2	0		
do 9	2	2	Good	11 do do
Tashkin	2	2	do	16 do do
Tiesenhausen	1	1	Very good	20 do do
Titovka	8	8	do	18 do extra hardy growth.
Ukraine	4	3	Good	14 do hardy growth.
Vargulek	4	3	do	12 do do
White Pigeon	1	1	do	14 do do
Yellow Arcadian	2	2	do	10 do do
Yellow Anis	9	9	Very good	16 inches ; extra hardy.
Yellow Sweet	1	1	Poor	Small.
Zusoff	2	2	Good	10 inches ; hardy growth.
Russian Seedlings	340	340	Very promising	24 do extra hardy.

The following were tall standard trees, nearly all of which are now being grown in bush form from lower part of stem, as the bare stems in the standard form were found to suffer severely from sun-scald :—

Antonovka	6	5	Good	16 inches ; hardy growth.
Arabka, summer	2	2	Very good	22 do do
do winter	2	2	Fair	10 do do
Anis	3	2	Good	14 do do
do red	1	1	do	18 do do
do mottled	2	1	Poor	Small.
Aport	4	4	Good	30 inches ; hardy.
Alexander	6	4	Fair	18 do kills back.
Blue Pearmain	1	1	do	8 do do
Ben Davis	4	3	Good	14 do
Borovinka	2	2	do	28 do hardy growth.
Canada Baldwin	4	3	Fair	26 do kills back.
Duchess of Oldenburg	4	4	do	18 do do
Fameuse	3	3	Poor	Small do
Gipsy Girl	4	3	Good	16 inches ; hardy growth.
Grand Duke Constantine	2	1	Fair	30 do
Golden White	2	2	Good	15 do do
German Calville	1	1	Poor	12 do kills back.
Golden Russet	3	2	Fair	32 do do
Grimes Golden	1	1	do	28 do do
Hibernal	4	4	Good	16 inches ; hardy growth.
Herren	3	1	Fair	10 do
Haas	1	1	Good	38 do do
Enormous	2	1	Fair	Small.
Bogdanoff's Glass	2	1	Good	40 inches ; kills back.
Kellogg Russett	2	1	Poor	10 do do
Lead	2	2	Good	24 do
Livland Raspberry	1	1	do	24 do
Longfield	4	4	Fair	16 inches ; hardy growth.
Mann	2	1	do	27
McIntosh Red	4	2	Poor	10
Pointed Pipka	2	2	Very promising	19 do extra hardy growth.
Peach	2	2	Fair	34 inches ; kills back.
Red Bietigheimer	1	1	do	16 do do
Red Astrachan	2	2	do	16 do do
Steklianka	2	2	Good	30 do
Serinkia	1	1	do	40 do
Scott's Winter	2	1	do	40 do kills back.
Switzer	2	2	Fair	26 do do
Stettin Yellow	1	1	Poor	11 do do
Shaker Pippin	2	2	Fair	16 do do

APPLE Trees—*Continued.*

Name of Variety.	Trees Living.		Present Condition.	Season's Growth.
	1890.	1891.		
Tetofsky	3	3	Good	10 inches.
Titovka	2	2	do	30 do
Talman's Sweet	1	1	Fair	24 do kills back.
Ukraine	2	2	Good	32 do hardy growth.
Vargul	1	1	Fair	Small.
White Borodovka	1	1	Good	34 inches.
Winter St. Lawrence	2	2	do	16 do
Wallbridge	2	1	Poor	Small.
Wealthy	2	2	Good	17 inches.
Yellow Transparent	5	2	Fair	14 do

CRAB APPLES.

Thirty-five crab apple trees were planted in 1889, of which 26 are still living, and are now making a promising, hardy growth.

So far as tree-growth is concerned, the Transcendant, Hyslop, Whitney's No. 20, and Orange varieties of crab apples will eventually succeed in this province, but our trees being very young have not yet borne fruit.

The following are growing as tall Standards on single upright stems :—

Name of Variety.	Trees Living.		Present Condition.	Season's Growth.
	1890.	1891.		
Transcendant	9	9	Very good	28 inches; hardy and very promising.
Whitney's No. 20	3	3	do	24 inches; very hardy.
Hyslop	7	7	do	24 do do
Orange	2	2	do	27 do hardy and very promising.
Early Strawberry	2	2	Fair	14 inches; kills back.
Queen's Choice	2	1	do	18 do do
Lou's Favourite	1	1	Good	18 do hardy.
Martha	1	1	Fair	16 do

CHERRIES.

Of 13 cherry trees planted in 1889, all have been winter-killed, excepting two trees of the Ostheim variety, which are still growing from roots.

Twenty trees of Russian varieties were planted in the spring of 1890, and of these 12 are still living, and appear to be of a more hardy class than those first planted.

Name of Variety.	Trees Living.		Present Condition.	Season's Growth.
	1890.	1891.		
Bessarabian	4	2	Good	Small.
Lutovka	5	5	do	10 inch.
6m. Cherry	4	2	do	12 in.; hardy growth.
12m. do	2	1	Fair	Small.
Koslov Bush Morello	5	4	Good	10 inch.; hardy growth.

PLUM TREES.

Although it has come under my notice that some of the improved wild varieties of plums are being successfully grown in parts of this province, the result of our trials with this fruit so far have not been satisfactory.

The standard trees planted in 1889 were all killed back to the snow line, and although they made good growth again during the summer of 1890, the new wood was again killed back last winter.

A few small northern-grown trees of the De Soto and Early Red varieties, planted in 1889 and 1890, have been more successful; their growth being hardier, they have not suffered so much from the effects of winter.

Name of Variety.	Trees Living in Fall of		Present Condition.	Season's Growth.
	1890.	1891.		
Bradshaw	2	2	Growing from roots	30 inches from roots.
Coe's Golden Drop	1	1	do do	34 do do
De Soto	2	2	Good.	18 inches.
Early Red	7	7	do	16 do
Late Red	2	1	Growing from roots	Small.
Marianna	2	2	do do	$4\frac{1}{4}$ inches from roots.
Moore's Arctic	2	1	do do	18 inches.
Nicholas	3	3	do do	40 do
Otschakoff	2	2	Good	Fair.
Yellow Gage	1	0		
Trabische	1	1	Growing from roots	Small.
Native Wild Plum	7	7	Good.	Good.

PEAR TREES.

Of 27 pear trees planted in 1889, 4 trees of the Russian varieties are still living, and, although making a slow growth, appear to be hardy. With the exception of a few trees which are growing from the roots, all other varieties have been winter-killed.

Fifty seedlings raised from seed imported from Russia were planted in rows in the spring of 1890. Of these 30 are living and making good growth, and at present are very promising.

Name of Variety.	Trees Living.		Present Condition.	Season's Growth.
	1890.	1891.		
Bessemianka	1	1	Good.	14 inches; hardy.
Clapp's Favorite	2	1	Poor	Small; kills back.
Flemish Beauty	2	1	do	do do
Howell	1	0		
Gakovsk	1	1	Good.	10 inches; hardy.
Kurskaya	3	2	do	16 do do
Pomeranovka	1	0		
Sapieganka	1	0		
Seckel	2	1	Poor	Small.
Thin Twig	1	0		
Russian Seedling	30	30	Promising	12 inches; hardy.

RASPBERRIES AND BLACKBERRIES.

In the fall of 1890 a portion of the canes of each variety then living were covered with earth or manure as a protection against the winter, while the remainder were left unprotected. In April, 1891, they were uncovered, and it was found that, owing to the warmth of the soil, those covered were in an advanced stage of growth, and suffered more from the cold weather which followed than those unprotected. In the case of the red raspberries no difference was observable during the summer between the protected or unprotected, but with the Black-cap varieties there was a marked difference in favour of protection.

The following varieties are doing well, and have fruited during the past season:—

Philadelphia (red), "from plants procured in the province," is very hardy, and does well without protection, is a good bearer, and very early; fruit ripening with us from July to September.

Turner (red), is also very hardy; fruiting on both old and young canes; fruit ripened from early in August to end of September.

Hilborn (Black-cap), although very hardy, is the better for a little winter protection; bears well; fruit ripening during August and September.

The Marlboro', Cuthbert, Reider, Heebner, Golden Queen and Caroline, in the red and yellow varieties; Gregg, Black-cap and Snyder, Wachusett's, Thornless and Agawam blackberries grew well, and fruited with us during the past season, but having only a few plants of each variety, we cannot yet speak with certainty as to their hardiness.

STRAWBERRIES.

The strawberries planted in 1889, in a sheltered plot on the hill-side, came through the winter in good shape, and during the past season yielded a fair crop of fruit. The Crescent variety again fruited well, and commenced to ripen the first week in July, followed closely by Captain Jack and Wilson. Bubach and Manchester with lighter yields ripened in the middle of July. Sharpless and Daniel Boone fruited very heavily, but being later, only ripened a part of their fruit.

In May a new plot was planted with runners from the old bed, and in August the old bed was thinned out, and allowed to make runners for another season.

GOOSEBERRIES.

With the exception of one variety, the "Houghton," all of the gooseberry bushes suffered severely from the effects of the trying weather experienced last spring. Coming safely through the winter, the warm weather of April brought them rapidly into leaf, and being very tender, when sharp frosts and winds occurred in May a great many were killed, and those surviving lost their blossom and were badly frozen back. During the past season they have grown again very rapidly, the result being that the new wood is weak and straggling, lying on the ground instead of growing into bush shape. Tests of different modes of training and pruning are being made in the endeavour to overcome this straggling habit.

Name of Variety.	Plants Living.		Remarks.
	1890.	1891.	
Houghton	156	143	Hardy; appears to be the best for this province.
Downing	133	10	Doubtful.
Smith's Improved	65	22	do
Native	31	31	Useful, but requires training; fruit small.

CURRANTS.

Although the currant bushes suffered from the spring weather in the same manner as the gooseberries, they were not injured so badly, scarcely any being killed. The effect on their growth during the season has, however, been precisely the same; the young shoots and blossoms were destroyed, and much of this season's growth has been lost, it being necessary to cut away all straggling shoots.

Name of Variety.	Plants Living.		Remarks.
	1890.	1891.	
Black Currants, Lee's Prolific.....	426	426	Perfectly hardy.
do Blk. Champion...	10	10	do
do Blk. Naples......	100	100	do
Red Currants, Fay's Prolific......	24	16	Hardy; lost from effects of roots washing bare.
do Raby Castle.......	202	202	do
do Red Cherry........	140	140	do
do Red Grape.........	10	6	do
do Victoria....... ..	13	9	Doubtful.
White Currant, White Grape......	170	170	Hardy.
Native Black....................	39	39	Bears well, but fruit does not ripen evenly.
Native Red.....................	11	9	Tests not satisfactory.

GRAPE VINES.

In my last report mention was made of the planting in a well-sheltered plot during 1890 of 100 grape vines; although all were living in the fall and were very carefully covered before severe weather, none survived the winter.

We have now tested most of the hardy varieties of cultivated grapes, and experiments are being undertaken with the native grape found growing wild in many parts of the province.

FRUIT TREES PLANTED IN 1891.

In May last a fresh collection of trees were received from the Central Experimental Farm at Ottawa. This collection consisted of 103 trees of large fruits and 318 plants of small fruits. These were planted in rows, and were all living when winter set in. They will be reported on after they have passed the ordeal of a winter here.

FOREST TREES AND SHRUBS.

As considerable interest is taken in this branch of the farm work, it is thought advisable to give results of another year's testing, so as to show the growth and hardiness of the different varieties of trees and shrubs.

It will be observed that a large percentage of trees have been lost, but these should not be charged altogether to the climate, as many of those lost are of varieties which although desirable to test were never expected to be hardy so far north.

Again, as most of our trees came from distant points and were a long time in transit, a number have been lost from the effect of heating, etc. It is also noticeable that a very large percentage of loss has been incurred with seedling trees. This tends to show that young seedlings of some varieties of trees are at too tender a stage of their growth to bear transplanting in this climate. The greatest success appears to have been obtained so far with trees of from two to four years' growth.

It will be seen from examination of the following tables that with careful selection and planting, followed by judicious cultivation, it is possible to grow in the province a large variety of trees and shrubs. Some trees are especially worthy of notice for hardiness, as the native ash-leaf maple, native ash, oak and white elm, the Russian poplars and willows, cottonwoods, Russian olive, mountain ash, alder, Caragana, Scotch pine and white spruce; whilst for quick growth and length of season in leaf the Russian poplars and willows and birch of all varieties are very noticeable. On this farm we have the Petrovsky poplar 8½ feet high from cuttings planted in 1889, and the Voronesh willow 7½ feet high from cuttings planted in 1890. Some small birch planted in 1889 are now 7 feet high and have made a bushy growth 6 feet across.

A number of trees were planted in the spring of 1890, in gravelly and light soil, on the exposed prairie at the north end of the farm; of these, only 8 per cent have died. The trees doing best in this soil are cottonwoods, Russian poplar, Voronesh willow, Russian olive and native maple and elm. It will be seen by this that the above trees will succeed on all classes of soil in this province.

Forest Trees planted in 1889 and 1890, with number living in Fall of 1891.

—	Planted.	Living.	Planted.	Living.	Present Height.	Season's Growth.	Remarks.
	1889.	1891.	1890.	1891.	Inch.	Inch.	
Ash, white	....	....	2,886	....	36	28	Hardy.
do do seedlings	250	....	....	....	....	....	Too young to transplant.
do pubescens or red	....	....	500	363	38	26	Half hardy.
do do seedlings	349	39	....	....	....	....	Too young to transplant.
do Acuminata	....	....	61	4	44	16	Hardy.
do green	285	156	2,000	1,911	26	24	Kills back.
do black	....	....	134	15	....	....	
do European mountain	51	26	31	11	68	14	Half hardy.
do American do	22	16	111	104	76	18	Very hardy.
Alder, European	50	30	100	....	36	20	Hardy.
do white	10	4	100	18	50	28	do
Arbor Vitæ or Cedar	1,066	362	68	5	24	10	Doubtful.
Birch, yellow	105	89	....	....	78	34	Hardy.
do white	50	48	42	16	84	39	do
do canoe	40	28	....	....	....	....	do
do sweet	10	6	....	....	....	....	do
Coffee tree, Kentucky	....	....	250	38	....	....	Kills back.
Cherry, black	153	4	....	....	....	....	Not hardy.
Chestnuts, sweet and Spanish	....	....	50	....	....	....	
Black walnut	....	....	1,000	....	....	....	Too tender.
Butternut	....	....	900	356	20	10	
Black locust	....	....	500	80	....	....	Too tender.
Elm, American	1,082	361	5,389	5,021	62	34	Half hardy; kills back.
do from native seed	1,087	954	....	....	75	34	Hardy.
Hemlock	42	....	....	....	....	....	
Honey locust	....	....	500	....	....	....	
Hickory	....	....	15	....	....	....	
Oak, burr	100	5	100	62	....	Small...	Hardy.
Larch, European and American	522	20	138	....	....	....	Received too late in spring.
Linden seedlings	....	....	500	31	....	Small...	Too young to transplant.
Maple, ash-leaf, native	503	500	175	175	65	47	The native maple.
do Norway	536	68	110	85	56	28	Only half hardy.
do soft, A dasycarpun	76	29	2,000	1,443	50	38	Half hardy.
Pine, Scotch	258	37	175	129	24	10	Hardy.
do Austrian	439	....	120	....	....	....	
do Riga	67	16	500	30	....	....	Too young to transplant.
do mountain	....	....	150	....	....	....	do
Red cedar	....	....	100	7	....	....	do
Russian olive	....	....	100	76	50	26	Ornamental and hardy.
Russian mulberry	....	....	1,050	143	....	....	Kills back; doubtful.
Cottonwood	308	291	1,000	272	100	40	Northern grown; hardy and useful; southern, tender.

Forest Trees—*Continued.*

—	Planted.	Living.	Planted.	Living.	Present Height.	Season's Growth.	Remarks.
	1889.	1890.	1890.	1891.	Inch.	Inch.	
Spruce, Norway	532	00	378	126	....	....	Not hardy.
do white	65	25	75	62	21	10	Hardy.
do blue	....	....	10	00	....	....	
Russian poplars	8	8	....	....	110	45	Hardy; useful and ornamental.
do Pyramidalis	1	1	....	....	....	....	Not hardy.
do certinensis	5	4	....	....	102	44	Hardy; useful and ornamental.
do Petrovsky	36	36	....	....	100	33	do do
do bereolensis	11	9	....	....	91	28	do do
do Wobstii Riga	2	2	....	....	....	....	Hardy and very early in the spring.
do Siberica	2	2	....	....	92	46	
do Aurea	3	3	....	....	....	....	Not hardy.
do Alba Argenta	2	2	10	10	50	34	A hardy white-leaved variety.
do bolleana	2	2	....	....	58	42	Hardy and ornamental.
Russian Willow, Voronesh	5	5	....	....	94	53	do wood, a golden colour, useful for trees.
do Acutifolia	3	3	....	....	91	35	Hardy, quick-growing.
do basket	7	7	2	2	100	95	do useful for hedge.
do Wisconsin weeping	8	8	....	....	96	72	Not hardy.
do Brityensis	3	2	....	....	....	Small..	do
do Fragilis	4	2	....	....	....	do ..	do
do yellow	7	7	....	....	69	39	Hardy; ornamental for hedge.
do white	7	7	....	....	66	37	Hardy.
do Norway and purple	8	8	....	....	92	63	do
Symphoricarpus, snow berry	....	....	3	2	....	....	A native shrub.
Viburnum opulus, snow ball	....	....	3	3	27	10	Hardy.
do lantana	....	....	4	4	....	....	do
Weigelia lavallei	....	....	3	2	....	....	Half hardy.
Amelanchier, Canadensis	....	....	2	2	....	....	
do Alpinum	....	....	2	1	....	....	
Spirea opulifolia	60	16	50	44	38	30	Hardy hedge plant.
do douglasii	6	1	....	....	....	....	Hardy.
do van Houtte	6	2	....	....	....	....	do
do prunifolia	2	0	....	....	....	....	
do bullata	2	0	25	5	....	....	Hardy flowering plant.
do billardi	6	6	....	....	....	....	Hardy.
do callosa	3	1	....	....	....	....	
do californica	7	0	....	....	....	....	
do nobleana	2	2	....	....	....	....	
do Superba	....	....	10	4	....	....	
do hypericifolia	....	....	2	2	....	....	Hardy; of weeping habit.
Climbers	....	....	....	....	....	....	
Lycium Europeum	1	1	....	....	....	84	Hardy.
Clematis Flammula	7	3	....	....	....	75	do
Rosa Rugosa	1	1	....	....	22	14	do upright form.

SHRUBS and Ornamental Trees Planted in 1889 and 1890, with Number Living in Fall of 1891.

—	Planted, 1889.	Living, 1891.	Planted, 1890.	Living, 1891.	Present Height.	Season's Growth.	Remarks.
Birch, cut-leaf weeping	3	2	.. ..	......	11½ feet.	29 inch..	A valuable ornamental tree.
Asiatic maple (Acer ginnala).	2	2	.....	......	36 inch..	10 " ..	A hardy ornamental shrub.
Caragana	44	24	105	94	50 " ..	17 " ..	Very hardy and early.
Lilacs, vulgaris...........	4	4	10	10	32 " ..	11 " ..	Hardy.
do alba................	77	65	8	7	31 " ..	18 " ..	
do josikea.	1	1	.	.....	....	Small. .	
do de marley..........	4	3	17	17	28 inch..	8 inch..	
do purpurea..........	2	1	....		....	....	
do rothamagensis	2	2	....	.....	....	....	
Laurel-leaved willow.	2	2	......	......	42 inch..	34 inch..	Hardy and ornamental.
Pyrus baccata auruntiaca...	1	1	......	......	36 " ..	22 " ..	do
Cornus Siberica...	1	1	......	......	42 " ..	38 " ..	do do
Artemisia (southernwood) ..	4	4	25	23	60 " ..	60 " ..	Hardy, early and quick growth.
Berberis, vulgaris..	150	98	50	36	24 " ..	14 " ..	Useful for low hedge.
do elegans	12	.....	.. ...	... .	....	... .	
do purpurea........	......	......	30	13	....	....	Purple leaves, ornamental.
Flowering currants........	3	3	7	6	32 inch..	20 inch..	Hardy.
Cytisus capitatis....	10	6	......	....	36 " ..	34 " ..	A hardy flowering shrub.
Deutzia candidissima......	......	.....	7	3	....	....	Half hardy.

A LIST OF HARDY, HALF HARDY AND TENDER TREES.

As many enquiries are received from persons contemplating tree-planting, regarding different trees and shrubs, it is thought advisable to give a classified list, so as to show as near as can be given with present experience the relative hardiness of the trees and shrubs under trial here since 1889.

Hardy and Safe to Plant.	Half Hardy, of which a Percentage Live, but are Liable to Kill back.	Trees which Appear to be too Tender for Planting in this Province.
Ash, native, white and green.	Ash, red and black.	Black cherry.
American mountain ash.	European mountain ash.	Catalpa.
Alder (white) oak (native).	Alder (European), larch (European).	Hemlock.
Birch (all varieties) Scotch pine.	Arbor vitæ or white cedar.	Austrian pine.
Cottonwoods (northern grown).	American elm (imported).	Honey locust.
Native ash-leaf maple and white elm.	Norway and soft maples.	Black do
Russian poplars, Bereolensis, certinensis.	Cottonwoods (southern-grown).	Black walnut.
———, Petrovsky, Sibirica, silver leaf.	Russian poplars, aurea.	Rock elm.
Spruce, native, white.	Lindleyana, pyramidalis, bolleana.	Russian mulberry.
Russian willows.	Spruce, white (imported).	Sycamore.
Asiatic maple (dwarf), Acer ginnala.	Wisconsin weeping willow.	Beech.
Caragana.	Kentucky coffee tree.	Black locust.
Yellow flowering currant.	Norway spruce.	
Lilacs, barberry.		
Russian olive.		

A large quantity of native tree seeds were collected, and a part of them sown in the fall of 1890. Seeds of the native maple and ash germinated early in spring, but the seedlings were all killed by the spring frosts and cold winds.

As the same result was also experienced with maple and ash seed sown in the fall of 1888, it is evidently not advisable to sow these seeds in the fall or too early in the spring.

A quantity of oak nuts and other native tree seeds sown at the same time did not germinate till late in the spring, and a large number of seedlings from these were living when winter set in, but were too small to allow of an exact account being taken.

In May of this year another lot of maple seed was sown in rows 3 feet apart, and covered lightly with the plough; these germinated at once, with the result, that about 50,000 seedlings have been obtained from this sowing.

Seeing the hardiness of the native trees, and realizing the importance of securing a large supply for the purpose of wind-breaks and for distribution, a large number of elm and other seedlings were procured in the fall of 1890, and of these 13,000 were sent to the Experimental Farm at Ottawa and Indian Head, and 5,000 were distributed amongst farmers in different parts of the province, in answer to applications from them.

In the spring of 1891 a further supply of seedlings of birch, spruce, etc., was secured from the bush near here, and, with the remainder of those gathered in the fall of 1890, were planted out in nursery rows. In addition to these, the most hardy and desirable of the Russian poplars and willows have been propagated so as to yield a large supply of cuttings, which, together with the native seedlings mentioned above, will form a stock available for planting and distribution during the coming season.

The following is a list of the tree seedlings raised from seed and otherwise procured during the past year:—

Maple, ash-leaf (native), grown from seed	51,955
Elm, white (native), transplanted from bush near river	9,773
Birch (native), transplanted from natural bush	2,100
Spruce (native) do do in sandhills	127
do seedlings (native), transplanted from natural bush in sandhills	569
Tamarack (native), transplanted from swamp	39
Buffalo berry, transplanted from river flats	128
do (seedlings), grown from seed	400
Cherry (Choke), transplanted from bush	11
do ground or sandhill, transplanted from sandhills	27
Oak, grown from seed (about)	2,000
Virginia creeper or American ivy, transplanted from bush at Oak Lake	150
Russian willows, grown from cuttings	469
Caragana, grown from seed	2,000
Furze, Scotch do	100
Small fruits bushes from cuttings	100

Total number of trees, seedlings, etc., growing on the Experimental Farm in the fall of 1891, or grown from seed planted in—

——	1889.	1890.	1891.	Total.
Forest trees and shrubs	3,481	13,417	1,791	18,689
Native trees and seedlings	4,073	14,731	69,950	88,754
Avenue trees				919
Large fruits, apples, etc	343	574	74	991
Small fruits				1,963
				111,316

HEDGES FOR WIND-BREAKS.

In 1889 a hedge of ash-leaf maple was planted near the western boundary of the farm; this has now reached a height of 7 feet, and is found very useful in protecting more tender trees, shrubs, &c., from our severe south-west winds.

To thoroughly test the suitability of the different varieties of trees for this purpose, and to ascertain the proper distance to plant them, ten plots have under your directions been laid out, and several varieties of trees planted at varying distances around each plot. By this means it is expected that some light may be thrown on the question of suitable wind-breaks for this country.

AVENUE TREES.

The planting of avenue trees on the roads as far as made was completed this year by the setting out of 59 ash-leaf maples on the main avenue. I have pleasure in reporting that only one out of the 919 ash-leaf maple avenue trees planted on the farm died during the past year; all are in perfect health, and making a large growth each year.

As many enquires are made as to the proper manner of setting out large trees for avenue purposes, the method which has been adopted here will be given. Trees about six years old and 8 feet high were purchased from the nurseries near Brandon, but dug by our own men, so as to get as much root as possible, care being taken to protect the roots from wind and sun until planted. In planting, a hole a foot deeper than is actually required and somewhat larger than the roots require is dug; the bottom foot of the holes is then filled with surface soil, the tree planted and surface soil packed around the roots. Unless the season is unusually dry no water is used, but all weeds are kept down for 4 feet on each side of the trees. If the above method is adopted the loss should not in an ordinary season exceed 3 per cent.

FREE DISTRIBUTION.

Last winter a large number of applications for trees were received from farmers throughout the province.

In early spring over 20,500 trees and tree-cuttings were distributed by mail. They were sent in packages containing 100 trees, as follows :—

Variety.	Number.	Variety.	Number.
White elm, native	10 trees.	Artemesia Abrotans	5 cuttings.
Buffalo berry, native	2 do	Populus Pyramidalis	1 do
Ash-leaf maple do	10 do	do Petrovsky	1 do
Green ash do	10 do	do Lindleyana	1 do
White spruce do	10 do	Salix, 122 vor	7 do
Poplar Siberica	1 cutting.	Willows, Wisconsin weeping	7 do
do Nolesti	1 do	do Norway	7 do
do Beno	3 do	do Purple	1 do
do Certinensis	2 do	do Basket	1 do
do Bereolinsis	1 do	do Golden	1 do
do Wobstii Riga	1 do	do Yellow	1 do
do Alba Argenta	1 do	do Acutifolia	2 do
do Aurea	1 do	do Voronesh	5 do
do Bolleana	1 do	Northern cottonwood	6 do

EXPERIMENTS WITH VARIETIES OF CABBAGE.

As no test of the relative merits of the different varieties of cabbage for this climate had been published, it was thought advisable to test a number of the leading sorts. The seed of twenty-eight varieties was obtained last winter and sown in a hot-bed in early spring. The season here was very unfavourable for this vegetable and the returns small, but all were treated alike, and the experiment as a comparison of varieties may be considered fairly reliable.

EXPERIMENTS WITH CABBAGE.

Variety.	When ready for use.	Percentage headed.	Average weight.	Remarks.
		Per cent.	Lbs.	
Marblehead Mammoth (Steele)	Sept.	90	14	Large; firm.
do (Robinson)	do	90	13	do
Trotter's Early Drumhead	Aug. 20	100	13	Very good; firm.
Henderson Early Summer	do 5	100	12	Firm head.
Vandergaw	Sept.	90	12	Open head.
Late Drumhead	do	100	11½	Firm head.
Hendersons' Succession	Aug. 7	100	11	do
Quintal Drumhead	Sept.	100	9½	Open head.
Large Flat Dutch	do	90	9½	Firm head.
St. Denis	do	100	9	Open head.
Premium Flat Dutch	Aug. 10	100	9	Firm head.
Early Jersey Wakefield	do 1	90	9	do
All seasons	do 15	90	9	do
Filderkraut	Sept.	60	6	Open head.
Early Winningstadt	Aug. 5	70	6	Firm head.
Savoy Drumhead	Sept.	60	6	do
Early Sugar	Aug. 20	60	5	Open head.
Early Etamps	July 26	90	5	Head soft.
Early Deep Red	Sept. 10	60	5	Firm.
Early Oxheart	July 26	90	4½	Firm head.
Large Red Drumhead	Sept.	90	4½	Soft head.
Savoy Improved American	do	90	4½	Open head.
Savoy Green Globe	do	50	4½	Firm head.
Savoy Early Dwarf Ulmn	Aug. 10	90	3	do
Early York	July 26	100	3	do
Savoy Early Dwarf	Aug. 25	90	3	do
Scotch Kale			4	Good quality.
Brussels Sprouts			2 sprouts.	Open.

GARDEN PEASE.

Results of tests with garden varieties of pease. All varieties were sown on the same day, 8th April, side by side, in single rows, 3 feet apart; all had germinated and were growing by 20th April. No trellis or sticks were used:—

Varieties.	Ready for Use.	Length of Straw.	Pods.	Remarks.
Kentish Invicta	July 13	Short.	Medium length and full	Yielded well.
Blue Peter	do 13	20 inches	Medium length and full	Yield heavy.
Extra Early	do 16	24 do	Medium	Yield fair.
Little Gem	do 16	Short.	Short and full	do
Stratagem	do 20	24 inches	Large and full	Good yield.
Pride of the Market	do 20	20 do	do	Heavy yield.
Horsford's Market Garden	do 21	20 do	Medium length	Good yield.
Yorkshire Hero	do 22	24 do	do	do
Mummy Pea	do 22	4 feet	Medium length and full	Very heavy yield; ripened 20th Aug.; made very strong growth during spring season.
Telephone	do 24	3 do	Large pods but not well filled	Good yield.
Champion of England	do 28	33 inches	Large pods	do
Emperor	do 28	30 do	Large and full	do
Laxton's Omega	Aug. 1	24 do	Long do	Good yield; an excellent late variety, keeping green and sweet.
Grey Pease	Late	Long	Did not form	A novelty, but of no value here.

FLOWERS.

As very great interest has been taken by the majority of visitors in the cultivation of flowers, considerable attention has been given to the growth of hardy and popular flowering plants and bulbs, with the object of showing what plants and varieties are best adapted for successful cultivation in this province.

The result has been that from 24th April, when the first flower appeared until winter set in, some variety or other of plant or bulb was in flower the whole season, and during the months of August and September produced such a mass of bloom as to be a great source of attraction to visitors to the farm.

In the fall of 1890 a number of bulbs were procured and planted 4 inches deep, and the ground covered during the winter with about 6 inches of short manure.

The bulbs planted and the results were as follows:—

Scilla Amœna.—Flowered 24th April and continued in flower two weeks.

Bulbocodium vernum.—Flowered 6th May to 20th May.

Tulips (single and double).—Flowered from 14th May to 10th June.

Lilium candidum.—Flowered from 15th July to 4th August.

Lilium tigrinum.—Flowered from 28th August to 8th September.

Iris Hispanica.—A few bulbs only; flowered during August.

Gladiolus Lemonei.—Planted 11th April; flowered 8th August.

Gladiolus gadavensis.—Planted 20th April; flowered 28th August to 15th September.

Paeonia Sinensis.—Grew well, but did not flower this season.

The following bulbs all started to grow, but gradually died off and did not flower: *Hyacinth,* single and double; *Colchicum autumnale, Crocus, Galanthus* or snowdrops, *Narcissus, Hemerocallis.*

The following plants are mentioned in the order in which they bloomed; those marked perennials were planted the previous summer, and had survived the winter out in the open.

Pansies (perennial).—A mass of bloom from 13th May till winter set in.

Linum perenne, or Flowering Flax.—Bloom from 15th May till winter set in.

Candytuft.—In flower from 19th June till winter set in.

Linaria Safferina.—In flower from 24th June till winter set in.

Sweet William (Dianthus barbatus) (perennial).—In flower 21st June; very showy.

Dianthus Imperialis (perennial).—In flower 24th June; a mass of bloom.

Dianthus Heddewigi do do 21st do do

Portulaca, Mimulus Callirrhoe and *Calliopsis.*—All came into flower in July.

Larkspur (Delphimum).—In flower 1st August; very showy.

Clarkia.—In flower 4th August till frost came.

Verbenas.—In flower 28th July till 25th October; very hardy.

Phlox Drummondi.—In flower 1st August to 15th October; very hardy and showy.

Petunias.—In flower 1st August to 20th September; very showy.

Marigolds.—In flower 6th August to 15th September; very showy but tender.

Stocks.—In flower July and August.

Antirrhinum (snap dragon).—In flower August and September; showy and hardy.

Chrysanthemum carinatum.—In flower August and September; succumbs to first frost.

Lobelia.—In flower July, August and September.

Double Daisy.—In flower do

Sweet Pease do do

Escholtzia's, white and yellow.—In flower August and September.

Aster's.—In flower 10th August to 30th September.

Salpiglosis.—In flower 16th August to 30th September; very showy.			
Zinnia	do	4th do	very showy, but tender.
Balsams	do	18th do	do
Godetia	do	20th July to August;	very showy, but tender
Mignonette	do	July to September.	

Lupins.—Blooms very late; plants showy.
Gilia, Cosmos, Aguilegia and *Wallflower.*—Plants grew well, but did not bloom.

ROADS.

I take great pleasure in reporting that the grading and gravelling done in 1889 on the road running from east to west through the farm has proved a success, the very heavy traffic of the past year having no perceptible effect on it.

About 800 yards of additional grading and gravelling has been done during the past year on the avenues running north and south, and a number of culverts put in.

BUILDINGS.

The superintendent's house, mentioned in my last year's report as being finished, is now occupied, and the vacated building used as a boarding house for the employees on the farm. The new house is quite warm, and having an office attached is very convenient.

The horse and cattle stables in the basement of the barn are also warm and well adapted to the purposes intended. The upper portion of the barn is nearly all occupied with grain, leaving very little room for fodder, &c. A separate building for grain and implements is greatly needed.

EXHIBITIONS.

During the year just passed the following agricultural fairs were attended and samples of the products of the farm shown:—

Brandon summer fair was held on the 22nd and 23rd of July. This fair was a decided success, the weather being fine and the attendance large. Coming early in the season, only immature grain in the sheaf and threshed grain of the previous year could be shown, but opportunity was taken to make a large display of horticultural and arboricultural products of the farm, something impossible at the fall fairs. During the two days of this fair over 400 farmers visited the experimental farm.

At the Winnipeg industrial exhibition, held in Winnipeg in the week ending 3rd October, Mr. Angus Mackay, of the North-West Territory experimental farm, joined me in making a united exhibition of the products of the two farms. The exhibition was largely attended, and we were able to illustrate the work of the farms to a large number of people who would not have been easily reached by any other means.

Exhibits were also shown at Portage la Prairie and Neepawa fall fairs; at both places large numbers of farmers expressed an interest in the work of the farms.

SAMPLES OF EXHIBITS FOR THE EAST.

Besides the samples of farm products used at the several agricultural fairs in this province, a set of samples in the straw was sent to the Central Experimental Farm for exhibiting at some of the eastern fairs.

The Manitoba Government was also supplied with collections for the following purposes: one collection for exhibition purposes at Toronto and other eastern fairs; one for England, and another for their Winnipeg immigration office.

The work in connection with the preparation of these samples occupied the time of a portion of our staff during the busiest season of the year, but they will help to draw attention to the work of the farms, and will, I trust, also be useful in attracting immigrants to this province.

FARMERS' INSTITUTES.

A large number of invitations to attend meetings have been received by me from institutes throughout the province. It was found impossible, owing to press of work, to accept all of them, but the following meetings were attended and papers read: Wawanesa Institute, 6th February, "Some of the experiments undertaken by the Experimental Farms"; Wawanesa Institute, 20th February, "Varieties of Grain and manner of sowing them"; Brandon Institute, 23rd February, "Smut"; Bradwardine Institute, "Varieties of Wheats suitable for Manitoba"; Birtle Institute, "Some of the varieties of Grain tested on the Experimental Farms"; Alexander Institute, "Seed Grain and manner of sowing it"; Rapid City Institute, "Wheats for Manitoba"; Brandon Institute, "Fodder Plants for Manitoba"; Crystal City Institute, 30th June, "Grasses and Fodder Plants"; Brandon Institute, "Seed Grain." In many cases samples of grain, both threshed and in the straw, were shown at the meetings, which assisted materially in illustrating the work of the farm.

VISITORS TO THE FARM.

Judging by the largely increased number of visitors, the interest taken by the farmers of the province in the work of the experimental farm is in nowise abating. During the summer months of 1889 only 560 visited the farm; in 1890 the number reached 1,510, and in the same months this year 3,520; this is exclusive of the large number of Brandon citizens, many of whom visit it several times a week.

During the past year a number of the farmers' institutes organized excursions for the special purpose of examining the work on the farm, and over one hundred farmers from Portage la Prairie alone visited it at one time.

Every effort is made by the farm staff to explain the work being undertaken and to make all visitors welcome, and perhaps a better idea of the usefulness of the farm can be given by this means than by any other which could be devised.

The North-West Central Railway is now in operation from this place, and farmers living in the fine farming district to the north-west will have an opportunity of visiting the farm another year.

CORRESPONDENCE.

Not only has the number of visitors to the farm increased surprisingly, but the correspondence has also grown rapidly; from 467 letters received in 1889, and 842 in 1890, the number increased to 1,423 in the past year, and 1,468 letters were sent from the farm.

The building and equipping of an office on the farm has greatly assisted the carrying on of this department of the work.

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

S. A. BEDFORD,
Superintendent.

BRANDON, MAN., 26th January, 1892.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF A. MACKAY, SUPERINTENDENT.

INDIAN HEAD, N.-W. T., 31st December, 1891.

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

SIR,—I have the honour to submit to you herewith my fourth annual report of the work done on the North-West experimental farm, being for the year 1891. The year just passed, like all its predecessors, has been exceptional. While some years have been dry, others dry and warm, this has been wet, cold and backward. The growth of straw over the whole country has been enormous; grain also has yielded very largely, and although a portion was partially injured by frost on the 12th September the quantity secured by every settler has never before been approached in the history of the North-West. Forty to fifty bushels of wheat and eighty to one hundred bushels of oats per acre are common returns, while in many instances these figures are exceeded.

Rains in June and July caused an immense growth of straw. The cool weather in August retarded the ripening process and the harvest consequently was later than usual. The crop was a very tedious one to take off, and the threshing is proving very expensive from the great amount of work to do. On the experimental farm, the result in grain-growing has not been as satisfactory as could be desired; heavy winds and a severe frost in the first week in May, after most of the early-sown grain was up, entirely destroyed a good many varieties of barley and oats and greatly injured many of the wheats, by thinning them to such an extent that ripening was delayed until frost came in September. Grain on summer fallow also was very late in ripening, on account of the large amount of moisture and cool weather during the growing season, and though all varieties not entirely destroyed returned good yields, except the Indian wheats, yet with many the sample is very poor.

For roots and vegetables the season has been favourable, though hardly long enough to secure a full crop of all kinds.

For tree culture last winter and spring were anything but favourable, but since May no season has ever caused such a good, healthy growth in young trees as the past one. While the large growth is often injurious and apt to cause their destruction by our winter cold or spring thaws and winds, it is hoped on account of many of the varieties ripening their wood well, the loss this winter will be less than usual. The winter of 1890-91 was especially fatal to almost everything in the tree line; even many of our native sorts, such as maple, ash, elm, &c., were badly cut back in seedlings and two-year-old trees, while foreign varieties, if not entirely killed, were cut back to the ground wholesale.

Special attention was given to fodder and grass cultivation during the past season, and although many failures ensued some successes have been obtained. Winds in many instances destroyed varieties of grass and a few mixtures sown for fodder, but many pulled through and gave gratifying returns.

In growing mixtures of grain for hay four important points require to be observed: 1st. To sow sufficiently thick to ensure the stalks not being too coarse. 2nd. To sow varieties together that head out or ripen at about the same time. 3rd. To cut early; and 4th. To allow plenty of time after being cut to properly cure. Two good mixtures are rye and 6-rowed barley, and 2-rowed barley and oats.

A fodder plant that has never failed on this experimental farm is rape. This year it exceeded all previous records. It must of course be used in a green state, either by pasturing or cut and fed green.

In Grain—Wheat was given a large acreage and more attention than any other cereal. Thirty-seven varieties were sown in plots or fields from $\frac{1}{10}$ acre up to 30 acres. Nine hybrids, besides 16 other varieties, were sown in small plots. Various experiments were made, including the sowing of two varieties each week for six weeks; sowing several sorts on same date under same conditions; sowing different quantities per acre; sowing at different depths; sowing by Press drill and broadcast; sowing several grades of frozen seed; different treatment for smut, &c. While some of these tests for various reasons were unsatisfactory, the attention of every settler is called to the result obtained from treating smutty seed with bluestone before sowing. I am told by a grain buyer that every 3rd bushel he buys is damaged by smut, and that to such an extent that while he pays 40 to 50 cents for frozen grain, this smutty wheat realizes to the grower only 30 to 35 cents. When it is considered that at a cost of a few cents per bushel seed can be successfully treated for this serious evil, it is reasonable to expect that no farmer will sow wheat next spring without being treated with bluestone. The season was favourable for poor seed, and the result of sowing frozen seed, as shown in test, should not be an inducement for settlers to sow their poor worthless grain. The good showing was caused by sufficient grains germinating in the favourable spring to cause the crop to be thick enough, but not to lodge, while in the better grades so much germinated that the crop was altogether too heavy, resulting in lodged straw and shrunken grain.

Ladoga wheat again this year proved early, although badly injured in May by winds. It was ripe, and cut ten days before Red Fife, and escaped all damage by frost, which the bulk of our Red Fife did not.

Two promising wheats were tried the past season: Campbell's White Chaff and Campbell's Triumph. The former, a soft variety, but much harder than last year, promised well during the entire season. The latter, a hard variety, though not so promising in the early stages as the White Chaff and some other varieties, gave the finest sample of grain on the farm.

The India wheats without an exception did poorly the past season. The winds and frosts in May had a far more injurious effect on them than on the Red Fife, and although sown on same date and everything in same condition, the India sorts had from one-third to one-half the young plants killed; the Red Fife had none.

The barley crop was greatly injured by winds in May. All sown prior to the 15th April was killed. That sown from 25th April to the 11th of May did best. Many of the wheat tests were repeated with barley. The Duck-bill variety proved, as in previous years, its adaptability for the North-West. It stands severe weather in spring, all sorts of weather in the growing months—June, July and August—and invariably gives the best yield when threshed. A variety called California Prolific, tried the past season for the first time on the experimental farm, proved very good. Straw heads and grain all point to this variety being the same as Duck-bill.

Oats suffered even more by winds and frost in May than the barley crop. Many varieties covering about fifty acres had to be re-sown with Feed oats. These gave a fine crop but were hurt by frost before being quite ripe. Prize Cluster though not first in yield is first in earliness and a first class oat, and is proving very successful wherever distributed in the North-West.

Pease were a very poor crop; while our field lots were entirely killed, the smaller plots were injured by winds and heavy dashes of rain flooding out portions of the plots.

In respect to these winds which injure us so greatly on the experimental farm, and which from reading this report may convey very erroneous impressions to any one not knowing the country, it may be said that the damage done to the generality of farmers is very small in comparison to that done on the experimental farm. On this farm nearly all sorts of grain are sown for trial on fallow very early in the spring. Farmers only sow Red Fife, and it has been proven that Red Fife will stand sowing almost at any time. Again, three-fourths of the varieties of grain tested on the experimental farm are new or foreign sorts that cannot be expected to stand as well as Red Fife, the one variety almost universally sown all over the country. It is safe to say that if Red Fife, White Fife or any other proved variety was alone used on the Experimental Farm a very small proportion only of this injury would be done. Again, take oats. A farmer sows his oats in almost every case on stubble land which never is injured by wind, no matter how severe. On this farm we cannot use stubble land for any kind of grain and keep the sorts pure or give fair results from such a test, as the returns from such land would contain at least a portion of the preceding crop, as it is well known that fallen grain remains perfectly good until turned under the following spring, when it readily germinates. Other reasons might be given why the wind storms in spring are more injurious to crops on the experimental farm than to the country at large, and while it is not asserted that the farmer receives no damage, those who may read this report are asked to consider the wonderful crops raised in the North-West the past year, and in that year was experienced the most severe wind storms known for years.

SMUDGES.

For some years past smudges as a means of preventing grain being injured by frost have been believed in by many; others have found them ineffectual. To as thoroughly test this matter as it was possible to do, a circular flower garden, 100 feet in diameter, was chosen as being the most susceptible to frost, and a piece of ground that could be most easily and most effectually smudged. A pile of dry straw and coarse manure was heaped on the windward side of this garden. Two thermometers were placed in this plot, one in the centre, 2 feet above the ground, the other on the outer edge, on the ground; two other instruments were in their stand, 200 feet away, and out of the direct course of the smoke. On the night of the 12th of September everything indicated frost. At sundown the thermometer began to go down rapidly, and at nine o'clock 33 degrees was recorded. The smudges were at this point started, and for two and a-half hours one continual volume of smoke enveloped the garden. So dense was the smoke that when the thermometer in the centre of the garden was examined a lantern had to be used to find it. Every fifteen or twenty minutes all the instruments were examined, and no difference whatever was observed in any one of them. The smoke, on leaving the flower bed, enveloped or passed over a field of oats; these, with the flowers, were all frozen. You will remember when here on the 26th of August how rapidly the temperature fell on that evening, and that while you attended to the thermometers men and teams were piling up straw in heaps in a large field of grain containing between seventy and eighty experimental plots. These piles of straw, though happily not required that night, were on the 12th of September in the right place, and part of them added their gusts of smoke in the attempt to save the grain from injury. Unfortunately no house was in front of these piles as there was in front of the flower garden, and instead of settling over the plots the smoke took a direct line upwards, and was practically of no use.

The temperature fell on this occasion to 23, or 9 degrees of frost. Whether smoke with only three or four degrees of frost would be of any use is doubtful, though believed in by many. The fact of our four thermometers going down together seems to me to point to only one conclusion, namely, that smoke is ineffectual in saving grain from frost.

From the test made on the 12th September, I would strongly advise farmers not to place much reliance on smoke in saving their wheat, but rather to trust in good seed early sown.

WHEAT TESTS.

RESULT of sowing on different dates; one-tenth acre plots; 9 lbs. of seed (or at rate of 1½ bushels per acre); sown by drill; land in same condition.

Variety of Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight, Grain and Straw.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Lbs.	Bush.	lbs.
White Connell	April 6	April 23	July 27	Sept. 14	161	4¼	830	61¼	34	00
	do 13	do 28	do 27	do 14	154	4¼	740	61¼	32	00
	do 20	May 3	do 27	do 14	147	4½	780	61¼	32	50
	do 27	do 11	do 25	do 14	140	4½	955	61¼	34	30
	May 4	do 15	do 29	do 14	133	4¼	805	60	32	30
	do 11	do 21	do 29	do 14	126	4¼	835	60	33	00
Campbell's White Chaff.	April 6	April 24	do 23	do 8	155	4¼	845	63	30	26
	do 13	do 28	do 23	do 8	148	4¼	800	63	35	30
	do 20	May 4	do 23	do 9	142	4½	855	63	34	00
	do 27	do 11	do 22	do 9	135	4½	935	63	37	46
	May 4	do 15	do 24	do 9	128	4¼	870	62¼	35	30
	do 11	do 21	do 24	do 9	121	4¼	882	62¼	36	10

RESULT of sowing different varieties on same date; half-acre plots; 1½ bushels per acre; sown by drill on fallow. All varieties, except Red Fife, were injured by wind in May. The Indian sorts were badly hurt.

Variety of Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Condition of Grain	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.		Lbs.	Bush.	lbs.
Gehun	April 13	April 28	July 16	Sept. 7	147	3½	Good...	65¾	22	40
Club Bombay	do 13	do 28	do 16	do 7	147	3	do .	60	24	30
Blue Stem	do 13	do 28	do 29	do 14	154	4¾	Frozen..	54¼	28	20
Green Mountain..... ...	do 13	do 27	do 29	do 14	154	4½	do ..	55¼	24	48
Imp. Summer Cob....	do 13	do 27	do 28	do 14	154	4½	do ..	56½	30	16
Azima Russian.........	do 13	do 28	do 27	do 14	154	4¼	do ..	57	31	16
Russian Ghirka.........	do 13	do 27	do 27	do 14	154	4½	do ..	59½	32	00
Old Red River...	do 13	do 27	do 27	do 14	154	4½	do ..	57¼	35	12
French Imperial........	do 13	do 27	do 27	do 14	154	4¾	do ..	55½	27	16
Colorado............ ...	do 13	do 24	do 24	do 14	154	4¼	do ..	57¾	33	36
Hard Red Calcutta.....	do 13	do 27	do 13	do 7	147	3¼	Good...	63¼	21	40
White Delhi.........	do 13	do 28	do 6	do 7	147	3	do ..	61½	22	00
Pringle's Champlain.. .	do 13	do 24	do 25	do 12	152	4¾	Frozen..	58	34	00
Red Fife..............	do 13	do 28	do 25	do 12	152	4½	do ..	60	38	20
Chilian White	do 13	do 28	do 24	do 14	154	4¼	do ..	59½	29	36
Golden Drop..........:	do 13	do 27	do 25	do 14	154	4¼	do ..	57¾	37	00
Red Connell......... .	do 13	do 28	do 25	do 14	154	4½	do ..	57½	33	20
Karachi........... .	do 13	do 26	do 16	do 11	151	3½	Good...	58	22	00
Assiniboia..	do 13	do 27	do 23	do 14	154	4¾	Frozen..	58	32	38

Result of sowing different varieties on the same date; one-tenth acre plots; 9 lbs. seed; sown by drill; fallow land. Colorado destroyed by winds and the India varieties greatly injured.

Variety of Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight, Grain and Straw.	Weight per Bushel.	Yield per Acre.
					Days.	Feet.	Lbs.	Lbs.	Bush. lbs.
Campbell's White Chaff	April 11	April 27	July 21	Sept. 5	147	4¾	730	63¼	33 56
Campbell's Triumph	do 11	do 27	do 25	do 11	153	4¼	630	63½	33 30
Red Fife	do 11	do 27	do 25	do 12	154	4¾	810	62	44 20
White Fife	do 11	do 27	do 27	do 12	154	4¾	750	62	39 20
Ladoga	do 11	do 27	do 25	do 5	147	4½	680	63¼	33 20
Anglo-Canadian	do 11	do 27	Aug. 1	do 14	156	4¾	490	53¼	25 56
*Colorado	do 11	do 24	....	....	....	....	....	....	....
Indian Hard Calcutta	do 11	do 27	July 16	do 5	147	3½	482	63¼	27 10
Red Fern	do 11	do 28	do 27	do 11	153	4¾	680	60½	35 50
Judket	do 11	do 28	do 27	do 11	153	4¾	698	61	32 40
Rio Grande	do 11	do 28	do 27	do 12	154	4½	590	60½	30 00
Russian Hard Tag	do 11	do 27	do 25	do 12	154	4½	550	61¾	31 15
Saxonka	do 11	do 28	do 25	do 12	154	4¾	690	60½	32 30
White Delhi	do 11	do 28	do 15	do 5	147	3	250	61½	24 40
White Russian	do 11	do 27	do 24	do 11	153	4¼	590	61¼	34 30
Wellman's Fife	do 11	do 28	do 27	do 11	153	5	760	60	33 50
Pringle's Champlain	do 11	do 27	do 24	do 11	153	4¾	800	58	38 50
White Connell	do 11	do 28	do 25	do 12	154	4½	870	61¼	38 40
Defiance	do 11	do 28	do 27	do 12	154	4½	610	60	33 10
Australian	do 11	do 28	do 23	do 12	154	4¾	695	61¼	38 30
Gehun	do 11	do 27	do 16	do 5	147	3¼	300	65¾	34 40
Genessee	do 11	do 28	do 23	do 12	154	4¼	600	64	33 00

*Destroyed by winds.

Result of sowing at different dates; 1½ bushels per acre; sown by drill on fallow.

FIELD PLOTS.

Variety of Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Bushel.	Yield per Acre.
					Days.	Feet.	Lbs.	Bush. lbs.
Ladoga	April 6	April 23	July 21	Sept. 1	148	5	63¼	36 46
do	do 7	do 24	do 21	do 1	147	5	63¼	36 40
do	do 8	do 24	do 24	do 5	150	5	63¼	32 00
Red Fife	do 6	do 24	do 25	do 11	158	4¼	62½	51 10
do	do 7	do 25	do 25	do 11	157	4¼	62½	48 10
do	do 8	do 27	do 28	do 11	156	4¼	62½	48 10
White Fife	do 11	do 27	do 28	do 12	154	4¼	62	33 00
White Connell	do 11	do 25	do 28	do 12	154	4¼	61¼	39 40
Campbell's White Chaff	do 17	May 1	do 23	do 4	140	4¾	63¼	52 00
Red Fern	do 17	April 30	do 23	do 4	140	5	60½	32 20
Eureka	do 17	do 30	do 23	do 4	140	5	60	23 15

LADOGA *vs.* RED FIFE.

Sown same date; land fallowed, and in same condition and same quantity of seed.

Ladoga	April 6	April 23	July 21	Sept. 1	148	5	63¼	36 46
do	do 7	do 24	do 21	do 1	147	5	63¼	36 40
do	do 8	do 24	do 24	do 5	150	5	63¼	32 00
do	do 11	do 27	do 25	do 5	147	4½	63¼	33 20
Red Fife	do 6	do 24	do 25	do 11	158	4¼	62½	51 10
do	do 7	do 25	do 25	do 11	157	4¼	62½	48 10
do	do 8	do 27	do 28	do 11	156	4¼	62½	48 10
do	do 11	do 27	do 25	do 12	154	4¼	62½	44 20

RESULT of sowing different quantities of seed per acre; land in same condition; one-tenth acre plots.

Variety of Wheat.	Quantity per Acre.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Acre.	Yield per Acre.
						Days.	Feet.	Lbs.	Bush. lbs.
Red Fife	1 bush.	April 17	May 2	July 24	Sept. 14	150	4½	61½	33 40
	1¼ do	do 17	do 2	do 24	do 14	150	4½	61½	34 10
	1½ do	do 17	do 2	do 24	do 15	151	4½	61	31 40
	1¾ do	do 17	do 2	do 24	do 15	151	4½	60	29 15

RESULT of sowing different depths; same quantity of seed; land in same condition.

Variety of Wheat.	Depth.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Acre.	Yield per Acre.
						Days.	Feet.	Lbs.	Bush. lbs.
Red Fife	1 in.	April 17	May 2	July 24	Sept. 15	151	4½	61½	36 00
	2 in.	do 17	do 3	do 24	do 15	151	4½	61	31 00
	3 in.	do 17	do 4	do 24	do 15	151	4¾	60	32 40
	4 in.	do 17	do 13	do 24	do 15	151	4¼	57	28 20

RESULT of different ways of seeding; same quantity; land in same condition.

Variety of Wheat.	Sown with.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.
						Days.	Feet.	Lbs.	Bush. lbs.
Red Fife	Broadcast	April 17	May 4	July 28	Sept. 15	151	4½	57	38 20
	Drill	do 17	do 4	do 24	do 15	151	4½	58	32 40
	Press....	do 17	do 5	do 24	do 15	151	4¼	58	30 10

RESULT of different grades of seed sown; same quantity per acre; land in same condition; one-tenth acre plots.

Variety of Wheat.	Kind of Seed.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.
						Days.	Feet.	Lbs.	Bush. Lbs
Red Fife	No. 1 hard ...	April 17	May 4	July 24	Sept. 12	148	4½	59	32 40
	No. 1 frozen...	do 17	do 4	do 24	do 12	148	4½	61	31 50
	No. 2 do ...	do 17	do 4	do 24	do 12	151	4	59	31 10
	No. 3 do ...	do 17	do 4	do 24	do 12	151	4	62	38 10

RESULT OF FALL PLOUGHING *vs.* FALLOW.

Red Fern.......	Fall ploughed.	April 17	May 3	July 23	Sept. 4	140	5	60½	32 40
	Fallow	do 17	do 4	do 23	do 4	140	5	60½	34 20

ROOT LAND *vs.* FALLOW.

Red Fife.......	Root land	April 8	April 24	July 25	Sept. 9	154	4¼	63½	51 10
	Fallow	do 8	do 27	do 25	do 11	156	4¼	63	48 10

RESULT of cutting grain before being ripe. One-twentieth of an acre, in a field of five acres of Red Fife wheat, was cut on the 19th, of August, or 20 days before being ripe. Every fourth day, until ripe, the same quantity was cut. All were threshed and results carefully weighed, and are given below.

Variety of Wheat.	Sown.	Came up.	Headed.	Cut.	Before Matured.	Height.	Weight per Bush.	Yield per Acre.	
					Days.	Feet.	Lbs.	Bush.	lbs.
Red Fife....................	April 8	April 24	July 25	Aug. 19	20	4¼	50	14	40
do	....	....	....	do 23	16	4¼	51½	16	00
do	....	....	....	do 27	12	4¼	54	25	20
do	....	....	....	do 31	8	4¼	56	30	20
do	....	....	....	Sept. 4	4	4¼	58	36	50
do	....	....	....	do 8	0	4¼	63	42	10

RESULT of tests of cross-bred wheat produced by Prof. Wm. Saunders at the Central Experimental Farm, Ottawa. The returns obtained were very fine samples.

Variety of Wheat.	Bald or Bearded	Sown.	Quantity Sown, Kernels.	Came up.	Quantity came up, Kernels.	Quantity Killed after coming up, Kernels.	Ripe.	Height.	Matured in.	Cross between.		Yield.	
								Feet.	Days.	Female.	Male.	Lb.	oz.
Alpha......	Bald ...	April 21	48	May 9	33	6	Sept. 1	4½	134	Ladoga...	White Fife	0	9
Beta	Bearded	do 21	50	do 9	42	12	do 2	4½	135	do	...Red do	0	9
Abundance.	do	do 21	48	do 9	30	10	do 5	4½	138	do	... do do	0	6
Prince......	do	do 21	50	do 9	37	3	do 4	4½	137	do	...White do	1	1
Ottawa.....	do	do 21	50	do 9	36	0	do 4	4¼	137	do	...Red do	1	2
Carleton....	do	do 21	50	do 9	36	1	do 4	4½	137	do	...White do	0	13

RESULT of treatment for Smut, one-tenth acre plots. Treatment:—1 lb. bluestone, dissolved in warm water; 1 pail of water added, and mixed with 10 bushels of wheat. Same quantity bluestone and one-half the quantity of water, mixed with 5 bushels of wheat. Seed all black with smut. Six feet square of each plot cut and every head counted.

Variety of Wheat.	Quantity Bluestone.	Quantity Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Pure Heads.	Smut Heads.	Weight per Bush.	Yield per Acre.
	Lbs.	Bush.					Days.	Feet.			Lbs.	Bush.
Red Fife....	1	5	April 17	May 3	July 24	Sept. 12	148	4¼	2,038	17	62	32·00
do	1	10	do 17	do 6	do 24	do 12	148	4¼	1,789	270	61	29·30
do	Untreated...		do 17	do 3	do 24	do 12	148	4¼	1,011	1,010	57	24·10

RESULT of Treatment for Smut, plots 10 feet square. These wheats were sent to Ottawa and treated by F. T. Shutt, M.A., Chemist of Experimental Farm. All were more or less affected with smut, the Judket badly so. Every head in each plot was counted.

Variety of Wheat.	How Treated.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Pure Heads.	Smut Heads.
						Days.		
White Connell......	Untreated	Apl. 8.	Apr. 25.	July 18.	Sept. 10.	155	3,479	6
do	Sulphate of copper........	do 8.	do 25.	do 18.	do 10.	155	3,423	7
do	Agricultural bluestone.....	do 8.	do 25.	do 18.	do 10.	155	3,942	3
do	Sulphate of iron.........	do 8.	do 25.	do 18.	do 10.	155	3,575	6
Red Fife	Untreated	do 8.	do 25.	do 20.	do 12.	157	3,789	164
do	Sulphate of copper..	do 8.	do 25.	do 20.	do 12.	157	4,420	1
do	Agricultural bluestone.....	do 8.	do 25.	do 20.	do 12.	157	3,973	7
do	Sulphate of iron..........	do 8.	do 25.	do 20.	do 12.	157	3,722	168
White Fife	Untreated	do 8.	do 23.	do 20.	do 12.	157	3,690	10
do	Sulphate of copper..	do 8.	do 23.	do 20.	do 12.	157	3,840	0
do	Agricultural bluestone. ...	do 8.	do 23.	do 20.	do 12.	157	3,810	0
do	Sulphate of iron..........	do 8.	do 23.	do 20.	do 12.	157	3,595	2
Judket...	Untreated	do 8.	do 23.	do 18.	do 15.	160	3,905	49
do	Sulphate of copper..	do 8.	do 23.	do 18.	do 15.	160	3,761	1
do	Agricultural bluestone.....	do 8.	do 23.	do 18.	do 15.	160	3,850	0
do	Sulphate of iron	do 8.	do 23.	do 18.	do 15.	160	3,960	38

RESULT of Grain sown in fall. Fall wheat, spring wheat and rye sown in fall, 1890.

Variety of Wheat.	Fall or Spring Grain.	Sown.	Came up.	Headed.	Ripe.	Weight per Bushel.	Yield per Acre.	Remarks.
						Lbs.	Bus. lbs	
Canadian Velvet Chaff	Fall......	Oct. 27.	Apr. 20.	July 24.	Sept. —	55	....	Cut Sept. 12, but not ripe; frozen; 3 lbs. sown, 20 lbs. yield.
Saxonka..........	Spring....	do 27.	do 24.	do 24.	do 12.	60¼	20 27	
Giant Reading Rye	Fall......	do 27.	do 24.	do 24.	do 12.	54½	....	3 lbs. sown; 70 lbs. return.

The following varieties of fall and spring wheats sown the past fall, 1891, will be reported on in next annual report:—

Variety.	Sown.	Came up.
Early Red Clawson..........	September 9....	September 19.
Jones's Winter Fife..........	do 9....	do 19.
Tasmania	do 9....	do 19.
Fall Wheats.		
Martin's Amber..........	do 9 ..	do 22.
Golden Cross..........	do 9....	do 22.
Early Red Clawson..........	October 28.....	Did not germinate.
Canadian Velvet Chaff..........	do 28.....	Did not germinate.
Royal Prize..........	do 28.....	Did not germinate.
Spring.		
Democrat..........	do 28.....	Did not germinate.
Manchester..........	do 28.....	Did not germinate.
Ladoga..........	do 28.....	Did not germinate.

BARLEY TESTS.

RESULT of sowing at different dates; one-tenth acre plots. Two varieties of barley were sown on 6th April, and continued each week up to 11th May. The first two sowings were destroyed by wind and frost, and the third a good deal injured. The condition of land, quantity of seed (9½ lbs.), &c., were exactly the same; land fallowed year previous; crop very heavy, but badly lodged.

Variety of Barley.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight, Grain and Straw.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Lbs.	Bush.	lbs.
Prize Prolific	April 6	April 23	Destroyed by frost and winds.							
	do 13	do 27								
	do 20	May 2	July 22	Sept. 2	135	4¼	500	52	40	30
	do 27	do 9	do 20	do 2	128	4	710	53	54	28
	May 4	do 13	do 22	do 2	121	4	670	53	54	00
	do 11	do 19	do 22	do 2	114	3¾	680	53¼	50	40
Baxter's Six-rowed	April 6	April 23	Destroyed by frost and winds.							
	do 13	do 27								
	do 20	May 1	July 18	Sept. 15	148	4¼	305	51	27	40
	do 27	do 9	do 16	Aug. 27	122	4	540	53	40	00
	May 4	do 13	do 18	do 27	115	4	589	53½	44	18
	do 11	do 19	do 18	do 27	108	3¾	660	53½	50	10

RESULT of sowing different varieties on same date; one-half acre plots; land fallowed; same quantity seed sown, 1¾ bushels per acre.

Variety of Barley.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Bush.	lbs.
Peerless	April 15	April 27	July 24	Sept. 9	147	4¼	54	36	21
Danish Chevalier	do 15	do 28	do 24	do 9	147	4½	52	44	20
Danish Printice Chevalier	do 15	do 28	do 24	do 9	147	4½	52	40	00
Prize Prolific	do 15	do 28	do 24	do 9	147	4½	53¾	45	00
Thanet	do 15	do 28	do 24	do 9	147	4½	52¾	49	00
Golden Melon, 2-rowed	do 15	do 28	do 24	do 9	147	4½	54	42	10
Selected Chevalier, 2-rowed	do 15	do 28	do 24	do 9	147	4	54	50	36
Duck-bill, 2-rowed	do 15	do 28	do 17	do 1	139	5	50¾	60	00
New Zealand, 2-rowed	do 15	do 28	do 18	do 2	140	4	52¼	37	18
Sharp's Improved	do 15	do 28	do 22	do 9	147	4	53	47	10
Large 2-rowed Naked	do 15	do 28	do 14	do 2	140	3½	63¼	26	35
Mensury, 6-rowed	do 15	do 28	do 17	do 2	140	4¼	50¼	43	00
Rennie's Improved, 6-rowed	do 15	do 28	do 18	do 2	140	4½	51¾	46	33
Spiti Valley Feed	do 15	do 28	do 4	Aug. 11	118	3½	57¼	24	33

Eighteen plots of one-tenth acre each were sown on the 13th April, on fallowed land, with a similar quantity of seed per acre. The grain came up on the 27th and 28th of April, but they were destroyed by wind and frost during the first week of May.

RESULT of sowing at different dates; land fallowed; 1¾ bush. seed per acre; field plots.

Variety of Barley.	No. Acres Sown.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.	
						Days.	Feet.	Lbs.	Bush.	lbs.
Duck-bill..............	3	April 8	April 23	July 24	Sept. 3	147	5	53½	43	10
Chevalier.	1	do 15	do 30	do 27	Aug. 31	137	4¼	50¾	37	10
California Prolific....	1	do 27	May 13	do 15	do 27	121	5	53¼	65	00

Eight other varieties were sown on the 14th, 15th and 16th April, but all were so badly injured in May as to be of no value for comparison; similar results attended the sowing of Duck-bill barley, where different quantities of seed were sown per acre, varying from 1¼ to 2 bushels.

RESULT of different methods of seeding land fallow; 1¾ bush. per acre; one-tenth acre plots.

Variety of Barley.	How Sown.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Bushel.	Yield per Acre.	
						Days.	Feet.	Lbs.	Bush.	lbs.
Duck-bill	Broadcast	April 17	May 4	July 24	Sept. 15	151	4½	53	42	00
	Drill	do 17	do 4	do 24	do 7	143	5	53	32	44
	Press.	do 17	do 4	do 24	do 7	143	5	53	35	30

FALLOW *vs.* ROOT LAND.

Duck-bill	Kind of land—									
	Root....	April 8	April 23	July 24	Aug. 31	144	5	53	43	10
	Fallow.........	do 15	do 28	do 17	Sept. 1	139	5	53¼	60	00

SPRING PLOUGHING *vs.* FALLOW.

Chevalier........	Kind of land—									
	Spring ploughed.	April 15	April 30	July 27	Aug. 31	131	4¼	50¾	37	10
	Fallow	do 15	do 30	do 24	Sept. 9	147	4½	52	44	20

EARLY *vs.* LATE SEEDING.

Prize Prolific.....	....	April 6	April 23	Destroyed by frost and winds.						
	....	do 13	do 27							
	... .	do 20	May 2	July 22	Sept. 2	135	4¼	53½	40	30
	... .	do 27	do 9	do 20	do 2	128	4	53¾	54	28
	....	May 4	do 13	do 22	do 2	121	4	53¾	54	00
	....	do 11	do 19	do 22	do 2	114	3¾	53¾	50	40
	... .	June 2	June 10	Aug. 5	Aug. 15	105	3½	49	38	00

OAT TESTS.

Thirty-two varieties of oats were sown; all but 12 of these were destroyed by wind. The only kind not injured was Winter Grey; all those sown previous to the 16th April were too much injured to admit of comparison.

RESULT of sowing at different dates; fallow land; sown with drill, 8½ lbs. seed used, equal to 2½ bush. per acre; one-tenth acre plots.

Variety of Oats.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight, Grain and Straw.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Lbs.	Bush.	lbs.
Prize Cluster	April 6	April 27	Destroyed by frost and winds.							
	do 13	May 4								
	do 20	do 7	July 28	Sept. 1	134	5	830	48¾	84	30
	do 27	do 12	do 23	do 1	127	5¼	855	48¾	86	24
	May 4	do 16	do 25	do 1	120	5	830	48¾	82	04
	do 11	do 21	do 25	do 1	113	5	835	48¾	86	20
Banner	April 6	April 26	Destroyed by frost and winds.							
	do 13	May 4								
	do 20	do 7	July 28	Sept. 15	148	5¼	815	43¼	86	24
	do 27	do 12	do 24	do 7	133	5¼	995	43¼	88	04
	May 4	do 16	do 27	do 7	126	5¼	950	43¼	84	22
	do 11	do 21	do 27	do 7	119	5¼	840	42¼	77	22

RESULT of sowing different varieties on same date; fallow land; sown by drill; 2½ bush. per acre; one-tenth acre plots.

Variety of Oats.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Bush.	lbs.
Winter Grey	April 17	May 4	July 20	Aug. 27	131	5	46½	102	00
Early Gothland	May 4	do 21	do 24	Sept. 10	122	4½	44¼	51	00
Archangel	April 17	do 4	do 24	do 1	136	4½	40	61	00
Swedish	do 17	do 4	do 30	do 19	155	4½	39	60	00
Bonanza	do 17	do 4	do 30	do 2	137	4¾	47	72	22
Am Beauty	do 17	do 4	do 30	do 10	146	4½	42¼	89	16
Rosedale	do 17	do 4	Destroyed by winds.						
White Russian	do 17	do 4							
Black Champion	do 17	do 4							

RESULT of sowing at different dates; fallow land; 2½ bush. per acre; field plots.

Variety of Oats.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bus.	Yield per Acre.	
					Days	Feet	Lbs.	Bush.	lbs.
Cream Egyptian	May 13	May 23	July 29	Sept. 8	118	5	45¾	86	00
Welcome	do 13	do 22	do 25	do 3	113	5	44¾	78	18
Black Tartarian	do 25	June 8	Aug. 3	do 17	115	5	41	89	20
Potato	do 25	do 8	do 3	do 10	108	5	44	80	00
Black Tartarian	do 29	do 10	do 7	do 18	112	5	41	89	00

RESULT of sowing different quantities per acre; land fallowed; one-tenth acre plots.

Variety of Oats.	Quantity per Acre.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Bush.	Yield per Acre.
						Days	Feet	Lbs.	Bush. lbs.
Prize Cluster	1½ bushels	April 17	May 4	Destroyed by winds.					
do	2 do	do 17	do 4	Destroyed by winds.					
do	2½ do	do 17	do 4	July 24	Sept. 10	146	4¾	48¾	85 24
do	3 do	do 17	do 4	do 24	do 9	145	4¼	47½	80 10

RESULT of different methods of sowing; fallow land; 2½ bush. per acre; one-tenth acre plots.

Variety of Oats.	How Sown.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Bush.	Yield per Acre.
						Days	Feet.	Lbs.	Bush. lbs.
Prize Cluster	Broadcast ..	April 17	....	Destroyed by winds.					
do	Drill	do 17	May 6	July 24	Sept. 7	143	5	48	79 16
do	Press	do 17	do 4	Destroyed by winds.					

STUBBLE *vs.* FALLOW.

Cream Egyptian was sown on stubble and fallow. That on fallow was destroyed. On stubble drilled in it yielded 86 bush. per acre on 5 acres.

TESTS OF DIFFERENT VARIETIES SOWN ON SAME DATE.

Land fallowed; sown with drill, 2½ bush. per acre; one-tenth acre plots. Twenty-five different plots were included in this test. All were sown on the 14th April; were up from the 27th April to 1st May, but all were too much injured by wind and frost in first week in May to admit of comparison.

PEA TEST.

Pease, like the barley and oats, were greatly damaged by the winds. The field lots were entirely killed. The one-tenth acre plots were somewhat protected by buildings and did not suffer so much, but were subsequently injured by heavy rains which flooded part of the plots.

RESULT of sowing on same date; land fallowed and in good condition. Black Eyes and White Marrowfat, sown at the rate of 3 bushels; the remainder, 2½ bushels per acre; one-tenth acre plots.

Variety.	Sown.	Came up.	Podded.	Ripe.	Matured in	Length of Straw.	Weight per Bushel.	Yield per Acre.
					Days.	Feet.	Lbs.	Bush. lbs.
Black Eyes..........	April 17..	May 11..	July 28..	Sept. 5..	141	4½	65	19 40
Multiplier	do 17..	do 11..	Aug. 4..	do 5..	141	5	64½	18 30
Extra Early..........	do 17..	do 11..	July 18..	Aug. 21..	126	3¾	64	15 04
Prince Albert.........	do 17..	do 11..	Aug. 1..	Sept. 5..	141	6	64	25 00
White Marrowfat.....	do 17..	do 11..	July 24..	do 5..	141	4	65	21 40
Crown..............	do 17..	do 11..	Aug. 1..	do 5..	141	6	65½	30 10
Prussian Blue.........	do 17..	do 11..	July 28..	do 5..	141	6	65	24 00
Mummy........	do 17..	do 11..	Aug. 1..	do 2..	138	4	65½	20 37

FODDER TESTS.

Five mixtures of grain were sown on fallow, 6th April. Five mixtures and rye alone were sown on stubble land on 16th and 18th April. Three of those sown on fallow were destroyed, and re-sown 1st June. The yield of cured hay in each case is given.

RESULT of sowing on fallow; seed drilled in.

Fodder.	Sown.	Came up.	Cut.	Remarks.
Wheat and rye	April 6	April 24	Aug. 10	Yield per acre, 8,000 lbs.
Oats and pease	do 6	do 24	do 10	do 7,900 do
Rye and barley	do 6	do 24		Re-sown with barley and oats 1st June; cut, 10th August; yield, 5,200 lbs.
Barley and oats	do 6	do 24		
Oats and rye	do 6	do 24		

RESULT of sowing on fall ploughing, spring ploughing (gang ploughed), and on stubble randled in.

Fodder.	Sown.	Came up.	Cut.	Remarks.
Wheat and oats, fall ploughed	April 18	May 1	Aug. 6	Yield, 4,700 lbs. per acre.
do spring do	do 18	do 1	do 6	do 6,200 do
do randled	do 18	do 1	do 6	do 6,000 do

RESULT of sowing on spring ploughing; stubble land; stubble burned; seed gang-ploughed in.

Fodder.	Sown.	Came up.	Cut.	Remarks.
Oats and rye	April 16	May 1	Aug. 6	Yield, 6,900 lbs. per acre.
Wheat and oats	do 16	do 1	do 3	do 7,200 do
Pease and oats	do 18	do 1	do 5	do 7,000 do
Rye and barley	do 18	do 1	do 3	do 5,200 do
Rye, wheat and oats	do 16	do 1	do 4	do 5,640 do
Rye	do 18	do 1	do 4	do 4,830 do

RESULTS of Millets and Rape sown on fallow; cut and put in silo green.

Variety.	Sown.	Came up.	Cut.	Remarks.
Common Millet	June 2	June 15	Aug. 18	Yield, 6,000 lbs. per acre.
German do	do 2	do 15	do 18	do 6,230 do
Hungarian Grass	do 2	do 15	do 18	do 2,940 do
Rape	do 3	do 12	do 29	do 24,000 do
Chana	do 18	do 26		Attained a height of 3 feet when frozen on Sept. 12.
Marsa	do 18	do 26		6 inches high when frozen on Sept. 12.

FODDER CORN.

Thirty-one varieties of corn were sown by drill in rows of 3 feet apart for fodder. The land was fallowed the year before, and in good condition. All the sorts came up well, except Dakota Gold Coin, the seed of which was bad. When about 6 inches high, cold, wet weather set in and the plants continued to make slow progress until the end. For fear of frost the corn was cut on 7th September, and put in silo in a green state. The weight per acre is computed from two rows of each sort, 66 feet long in green state. North Dakota and Red Blazed gave much the best yield; both seemed to stand the cool nights better than the other sorts.

Variety.	Sown.	Came up.	Tasselled.	Silk.	Early Milk.	Cut.	Height.	Yield per Acre.	
							Ft.	Tons.	lbs.
Blunt's Prolific	May 23.	June 15.				Sept. 7.	4½	8	720
Golden Dent	do 23.	do 15.				do 7.	5	9	920
Chester Co. Mammoth	do 23.	do 16.				do 7.	3	5	450
Virginia Horse Tooth	do 23.	do 18.				do 7.	3¾	4	360
Golden Beauty	do 23.	do 16.				do 7.	4	6	540
Mammoth Southern Sweet	do 23.	do 15.				do 7.	4¼	4	1900
Giant Prolific Ensilage	do 23.	do 16.				do 7.	4½	8	1380
Salzer's Superior Fodder	do 23.	do 16.				do 7.	3½	5	1990
King Philip	do 23.	do 17.	Aug. 18.			do 7.	4¼	8	60
Longfellow	do 23.	do 17.	Sept. 2.			do 7.	4¼	9	1140
Long White Flint	do 23.	do 17.	Aug. 18.			do 7.	4½	6	1200
Long Yellow Flint	do 23.	do 17.	Sept. 2.			do 7.	4½	7	1180
Thoroughbred White Flint	do 23.	do 17.	do 2.			do 7.	4½	7	1400
Early Yellow Dutton	do 23.	do 15.				do 7.	3¾	7	1950
Canada Yellow	do 23.	do 15.	Sept. 2.			do 7.	3¾	6	1330
Pearce's Prolific	do 23.	do 17.	do 2.			do 7.	3¼	5	450
Mitchell's Early	do 23.	do 15.	Aug. 3.	Aug. 10.	Sept. 2.	do 7.	3½	4	1460
Yellow Flint	do 23.	do 15.	do 13.	Sept. 2.		do 7.	4¾	7	1180
North Dakota	do 23.	do 15.	do 18.	do 2.		do 7.	5	10	1670
Dakota Gold Coin	do 23.	do 22.				do 7.	3¼	3	270
Eight-rowed Sugar	do 23.	do 17.				do 7.	3¾	6	210
Egyptian	do 23.	do 18.				do 7.	3½	6	870
Extra Early Cory	do 23.	do 17.	Aug. 3.	Aug. 10.	Sept. 2.	do 7.	3¾	6	1310
Pea & Kay	do 23.	do 15.	do 18.	Sept. 2.		do 7.	4¼	6	1090
Early Mammoth	do 23.	do 18.				do 7.	3¾	5	1330
Asylum Sweet	do 23.	do 17.				do 7.	3	5	670
Potter's Excelsior	do 23.	do 20.				do 7.	3½	6	650
Stowell's Evergreen	do 23.	do 15.	Sept. 2.			do 7.	3¼	5	670
Cinquantine	do 23.	do 18.	Aug. 18.	Sept. 2.		do 7.	3¾	5	1220
Red Blazed	do 22.	do 15.	do 18.			do 7.	5¼	10	20
Red Cob Ensilage	do 23.	do 15.				do 7.	4¼	5	1990

CORN.

Fourteen varieties were planted on a piece of ground that had been fallowed and well manured, with a view of testing their earliness. Everything was done possible to force the plants, in the way of hoeing and cultivating. No weight is given of the yield, as the frost on 12th September was severe enough to cut the corn to the ground.

Variety.	Sown.	Came up.	Tasselled.	Silk.	Early Milk.
Squaw Corn	May 19.	June 8.	July 30.	Aug. 3.	Sept. 2
Yellow Flint	do 19.	do 10.	do 30.	do 3.	do 2
White Flint	do 19.	do 10.	Aug. 3.	do 3.	do 2
Mitchell's Extra Early	do 19.	do 10.	do 3.	do 10.	do 2
Extra Early Cory	do 19.	do 12.	do 3.	do 10.	do 2
Mammoth Southern Sweet	do 19.	do 12.			
Pearce's Prolific	do 19.	do 15.	Aug. 18.		
Perry's Hybrid	do 19.	do 20.	do 18.		
Red Blazed	do 19.	do 20.	do 18.	Sept. 2.	
Giant Prolific	do 19.	do 20.			
Large Eight-rowed	do 19.	do 20.			
Potter's Excelsior	do 19.	do 20.			
Asylum Sweet	do 19.	do 20.	Sept. 2.		

EXPERIMENTS WITH BUCKWHEAT, FLAX AND RYE.

Variety.	Sown.	Came up.	Headed.	Cut.	Weight per Bushel.	Yield per Acre.
					Lbs.	Bush. lbs.
Rye	April 6	April 20	June 22	Aug. 25	56	27 00
Buckwheat	June 3	June 12	....	Sept. 7	54	19 17
Flax	do 3	do 12	....	do 15	......	14 00

GRASSES AND CLOVERS.

A good deal of attention was given to this important subject the past season; besides sowing in small plots at different times and in different ways, larger plots were sown in the fields, both on bare land and with grain. Many of the small plots were blown out, and a good deal of that sown among the grain was injured, but on the whole the season has been the most favourable one since the farm started for a fair catch.

Nineteen varieties of cultivated grasses and clovers and 33 native grasses were sown in small plots 10 feet square. Meadow Fescue, sown 16th April, was 3 feet high when cut on 3rd September; Orchard Grass, 2 feet 9 inches; Meadow Oat Grass, 3 feet 2 inches; Perennial Rye, 20 inches; Timothy, 23 inches; Bromus inermis, 38 inches, and Red, Mammoth and Scarlet Clovers, 20 inches; Native grasses sown in April, cut on 3rd September, were: Bromus segetum, 26 inches; Bromus ciliatus, 27 inches; Bromus Pumpellianus, 36 inches; Elymus Canadensis, 36 inches; Muhlenbergia sylvatica, 18 inches; Muhlenbergia glomerata, 22 inches; Muhlenbergia Mexicana, 24 inches. All the above native sorts are very fine grasses and well worthy of cultivation.

The following, sown in spring of 1889, were cut for hay 1890, and the past season gave as follows:—

Timothy, 4,800 lbs. per acre of cured hay; Meadow Fescue, 4,600 lbs.; Orchard Grass, 4,000 lbs.; Lucerne, 5,000 lbs.; Alsike, 3,500 lbs., and Mammoth Clover, sown in 1890, gave 3,600 lbs.

A second cut of Timothy was 28 inches high; Lucerne, 24 inches; Orchard Grass, 36 inches; Sanfoin, 18 inches. In addition to the above, which have lived two winters and produced a good crop the past season, are the Pasture Grasses, Hard and Sheep Fescue, Red Top, Kentucky Blue Grass and White Clover, the latter doing especially well.

Phalaris Canariensis (Canary Seed Grass) sown in April attained a height of 26 inches and ripened its seed by 3rd September. Without giving the names of all the varieties sown this year, it may be said that the cultivated and native sorts mentioned above are all suitable for this part of the North-West. In cultivated sorts, Meadow Fescue, Orchard Grass, Lucerne and Alsike appear to do the best.

ROOTS.

Turnips.—A large and satisfactory crop of this root was obtained, gesides two large plots for testing yields of varieties. Several acres were sown, so as to have a large supply for the stock. Plots were sown on the 11th and 23rd of May on land fallowed the previous year. Before sowing a good ploughing, harrowing and rolling was given the land. Drills were made with plough, and seed sown by turnip drill. After the plants came up they were hoed or scuffled each week until covering the ground.

A difference will be observed in yield in favour of early sowing. Purple Top varieties were the finest in shape, quality, evenness on ground, weight, and were the easiest to pull. The weight per acre of turnips, mangels, carrots and beets is computed from weighing three drills, 66 feet each, of each sort.

TURNIPS.

Variety.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Purple Top Swede (Rennie)	May 11	May 20	Oct. 23	1,086
Carter's Elephant do	do 11	do 20	do 23	871
Elephant (Steele)	do 11	do 20	do 23	1,069
Selected Purple Top (Steele)	do 11	do 20	do 23	1,086
Bangholm (Simmers)	do 11	do 20	do 23	1,086
Highland Prize Purple Top (Simmers)	do 11	do 22	do 23	1,086
Marquis of Lorne (Bruce)	do 11	do 22	do 23	959
Hartley's Bronze (Pearce)	do 11	do 22	do 23	871
Imperial (Webb)	do 11	do 21	do 23	1,056
New Giant King (Webb)	do 11	do 20	do 23	960
Mam. Purple Top (Evans)	do 11	do 21	do 23	941
Clyde Improved do	do 11	do 20	do 23	1,047
Monarch (Pearce)	do 11	do 20	do 23	928
Clyde Improved (Evans)	do 23	June 6	do 23	906
Bangholm (Simmers)	do 23	do 6	do 23	950
Imperial (Webb)	do 23	do 6	do 23	871
Mam. Purple Top (Evans)	do 23	do 6	do 23	800
Elephant (Steele)	do 23	do 6	do 23	812
New Giant King (Webb)	do 23	do 6	do 23	686
Highland Prize Purple Top (Simmers)	do 23	do 10	do 23	907
Purple Top (Rennie)	do 23	do 6	do 23	809
Purple Top (Steele)	do 23	do 6	do 23	811
Hartley's Bronze (Pearce)	do 23	do 10	do 23	656
Elephant Giant King (Rennie)	do 23	do 6	do 23	683
Marquis of Lorne (Bruce)	do 23	do 10	do 23	634
Yellow Aberdeen (Rennie)	do 23	do 6	do 23	894
Purple Top Stubble (Sutton)	do 23	do 6	do 23	1,175
Champion Purple Top do	do 23	do 6	do 23	872
Elephant Purple Top (Rennie)	June 1	do 11	do 24	836
Skirving's Improved (Steele)	do 1	do 11	do 24	690
Lord Derby (Webb)	do 1	do 11	do 24	792
Large White Globe	do 1	do 11	do 24	781
Greystone	do 1	do 11	do 24	982

Mangels.—Mangels were sown on the 9th and 23rd of May. The land was in the same condition as the turnip land, and the same attention was paid to it before and after seeding as was given the turnips. The seed was sown on the flat and the plants thinned out to 14 inches. A good catch was obtained, and the plants did extra well until a hail storm, on the 20th July, riddled the leaves. This put them back greatly, and when frost came on the 12th September and stopped all further growth they had hardly attained half their size.

A difference in yield will be observed in favour of early sowing.

MANGELS.

Variety.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Mammoth Long Red (Rennie)	May 9	May 23	Sept. 28	572
do (Steele)	do 9	do 23	do 28	572
do (Webb)	do 9	do 23	do 28	440
do (Evans)	do 9	do 23	do 28	550
do (Simmers)	do 9	do 23	do 28	576
Giant Yellow Globe (Rennie)	do 9	do 23	do 28	475
do (Bruce)	do 9	do 23	do 28	493
Canada Giant (Pearce)	do 9	do 23	do 28	585
Gate Post (Bruce)	do 9	do 23	do 28	554
Champion Yellow Globe (Webb)	do 9	do 23	do 28	475
Yellow Tankard (Webb)	do 9	do 23	do 28	422
Golden Tankard (Evans)	do 9	do 23	do 28	492
Carter's Orange Globe (Bruce)	do 9	do 23	do 28	497
Giant Intermediate (Steele)	do 9	do 23	do 28	615
Mammoth Long Red (Webb)	do 23	June 11	do 28	360
do (Evans)	do 23	do 11	do 28	484
do (Rennie)	do 23	do 11	do 28	299
do (Steele)	do 23	do 11	do 28	361
do (Simmers)	do 23	do 11	do 28	418
do (Sutton)	do 23	do 11	do 28	361
Gate Post (Pearce)	do 23	do 11	do 28	334
Carter's Orange Giant (Pearce)	do 23	do 11	do 28	352
Yellow Intermediate (Steele)	do 23	do 11	do 28	295
Giant Yellow Globe (Bruce)	do 23	do 11	do 28	294
Giant Orange Globe do	do 23	do 11	do 28	303
Yellow Globe (Webb)	do 23	do 11	do 28	352
do (Rennie)	do 23	do 11	do 28	360
Yellow Tankard (Webb)	do 23	do 11	do 28	290
Gate Post (Bruce)	do 23	do 11	do 28	378

CARROTS.

This crop was, as in all previous years, very poor. The hail storm which injured the mangels greatly hurt the carrots also, but their slow growth while young and our short season is very much against a good return. All the conditions of land and attention were the same as for turnips, except that the carrots were sown in drills 18 inches apart on the flat.

Variety.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Improved Short White (Steele)	May 9	May 23	Oct. 6	308
Early Gem (Rennie)	do 9	do 23	do 5	220
Large White Vosges (Rennie)	do 9	do 23	do 6	352
do (Simmers)	do 9	do 23	do 6	279
Half Long Scarlet (Rennie)	do 9	do 23	do 6	271
Mam. Intermediate White (Rennie)	do 9	do 23	do 6	294
Green Top Orthe (Pearce)	do 9	do 23	do 6	367
Oxheart (Steele)	do 9	do 23	do 6	278
Large White Vosges (Bruce)	do 9	do 23	do 6	293
James's Intermediate (Pearce)	do 9	do 23	do 6	248
Mitchell's Perfection (Pearce)	do 9	do 23	do 6	183
Chantenay (Bruce)	do 9	do 23	do 6	248
Short White (Pearce)	do 9	do 23	do 6	366
Orange Giant (Pearce)	do 9	do 23	do 6	300
Yellow Belgian	do 9	do 23	do 6	110
Yellow Intermediate (Webb)	do 9	do 23	do 6	293
Scarlet Altringham (Webb)	do 9	do 23	do 6	117

Sugar Beets.—Three sorts were tested under the same conditions as the mangels.

Variety.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bushels.
Red Top Sugar	May 9	May 23	Sept. 28	345
German Sugar Beet (Bulteau Desprez)	do	do	do	374
do do do (Klein Wanzleben)	do	do	do	343

Potatoes.—Seventy-six varieties of potatoes were planted in May; 15 of these were seedlings from the Central Experimental Farm at Ottawa. The land had been fallowed the year previous, and was deeply ploughed, harrowed, and a good coating of well-rotted manure put on before planting. Drills 3 feet apart were opened and the sets dropped 14 inches apart. The ground received a good harrowing as the young plants came up, and each week the scuffler was used until the plants covered the ground, when they were ridged up with the plough.

When taken up two drills of each sort 66 feet long were weighed, and the yield per acre computed from these.

The first 36 varieties had marketable or eatable potatoes on the 4th of August; the balance had none. Among the later sorts three varieties, Empire State, White Star and Richter's Gem are very fine, and, as shown, gave much better returns than many of the earlier sorts. The largest yield obtained was from a seedling, No. 80, of the Central Farm. The tubers were very large but rough, and of a poor quality. Two seedlings, No. 20 and 21, are very fine potatoes, having few eyes, very shallow, with smooth skin, good size, are early and good croppers.

Each week, commencing on the 4th of August up to the 27th, one hill of each sort was lifted and counted. From the 27th August up to lifting, 1st October, two hills were taken up, counted and weighed.

The number and weight of each sort from the two hills on 27th August are given in table below, as well as yield per acre when they were all taken up.

Variety.	Planted.		Came up.		Growth.	*Marketable (2 hills.)	*Small (2 hills.)	*Weight		Taken up.		Yield per Acre.
								Lbs.	oz.			Bush.
Rosy Morn	May	15	June	18	Strong	9	1	1	6	Oct.	1	294
Clarke's Triumph	do	15	do	15	do	16	2	3	2	do	1	304
Early Rose	do	15	do	15	do	11	3	2	8	do	1	309
Sharpe's Seedling	do	15	do	15	do	7	2	3	2	do	1	297
Early Puritan	do	15	do	15	do	12	11	3	2	do	1	293
Chicago Market	do	15	do	15	do	12	2	4	2	do	1	339
Beauty of Hebron	do	15	do	15	do	16	....	2	8	do	1	298
Vanguard	do	15	do	18	Fair	11	6	2	12	do	1	227
Algoma, No. 1	do	15	do	18	do	10	2	1	14	do	1	196
Early Maine	do	15	do	18	do	9	3	1	10	do	1	236
Rose Valley	do	15	do	18	Strong	13	4	3	12	do	1	396
Ohio Gunner	do	15	do	22	Fair	9	1	1	8	do	1	150
Halton Seedling	do	15	do	15	Strong	10	5	2	3	do	1	258
Lizzie's Pride	do	15	do	15	do	12	3	3	8	do	1	348
London	do	15	do	18	Fair	9	5	2	3	do	1	218
Brownell's Best	do	15	do	18	Strong	9	2	1	12	do	1	293
Early Summer	do	15	do	18	do	13	2	2	13	do	1	348
Early Ohio	do	15	do	20	Fair	8	2	1	12	do	1	194
Empress Belle	do	15	do	23	Strong	6	3	2	10	do	1	311
Snowflake	do	15	do	18	do	10	2	2	8	do	1	322
Seedling, No. 20	do	15	do	18	do	28	7	3	7	do	1	350
Late Rose	do	15	do	15	do	13	4	3	2	do	1	348
Prolific	do	15	do	18	do	6	....	1	14	do	1	194
Jumbo	do	15	do	18	Weak	8	2	1	12	do	1	168

NUMBER and Weight of different varieties of Potatoes, &c.—*Concluded.*

Variety.	Planted.	Came up.	Growth.	*Marketable (2 hills.)	*Small (2 hills.)	*Weight (2 hills.) Lbs.	oz.	Taken up.	Yield per Acre. Bush.
Assiniboia	May 15	June 16	Strong	12	2	4	4	Oct. 1	366
Lee's Extra Early	do 15	do 20	do	10	3	2	13	do 1	275
Seedling, No. 21	do 15	do 22	do	8	1	2	5	do 1	306
Wonder of the World	do 15	do 21	do	15	3	3	12	do 1	293
White Elephant	do 15	do 19	Weak	9	....	2	14	do 1	381
Bliss' Triumph	do 15	do 22	do	7	2	1	2	do 1	173
Queen of the Valley	do 19	do 10	Strong	9	2	4	..	do 1	395
Crown Jewel	do 19	do 10	do	11	4	3	12	do 1	385
Stray Beauty	do 19	do 10	Fair	14	2	3	4	do 1	280
Goodrich	do 23	do 24	Strong	9	....	2	4	do 1	175
Rose's New Giant	do 15	do 18	do	15	1	3	6	do 1	377
Early Conqueror	do 15	do 18	do	9	3	2	..	do 1	286
Later Varieties.									
Empire State	do 15	do 15	do	9	....	2	14	do 1	374
White Star	do 15	do 15	do	11	2	2	6	do 1	326
Marigold	do 15	do 18	Weak	5	....	..	10	do 1	157
Richter's Elegant	do 15	do 18	Fair	8	2	1	..	do 1	216
Brownell's Beauty	do 15	do 23	do	10	3	1	12	do 1	220
Thorburn	do 15	do 18	Strong	12	5	2	6	do 1	216
Count Moltke	do 15	do 18	do	13	7	2	8	do 1	311
May Queen	do 15	do 17	Fair	9	1	1	12	do 1	238
Richter's Gem	do 15	do 18	Strong	22	13	3	6	do 1	396
Surprise	do 15	do 15	do	9	4	1	7	do 1	275
St. Patrick	do 15	do 15	do	16	4	2	12	do 1	348
Lee's Favourite	do 15	do 18	Weak	5	5	1	3	do 1	183
Early Eating	do 15	do 15	Fair	8	2	2	1	do 1	217
Delaware	do 15	do 18	Strong	9	9	3	8	do 1	330
Brownell's Winner	do 15	do 18	Fair	9	1	1	8	do 1	188
Clarke's No. 1	do 15	do 18	do	7	7	3	..	do 1	306
Rural Blush	do 15	do 18	Strong	9	7	2	8	do 1	306
Seedling, No. 2	do 15	do 18	Fair	9	....	3	3	do 1	297
Stonewall Beauty	do 15	do 18	Weak	6	2	1	6	do 1	280
Seedling, No. 18	do 15	do 18	Fair	16	8	1	9	do 1	188
do No. 53	do 15	do 15	Strong	13	1	1	12	do 1	196
Early Bird	do 15	do 15	do	7	....	1	8	do 1	201
Seedling, No. 5	do 15	do 23	Fair	7	1	1	4	do 1	236
do No. 15	do 15	do 15	do	7	2	1	9	do 1	220
Seedling, No. 9	do 15	do 18	Strong	5	5	1	6	do 1	280
Harrison	do 15	do 20	do	11	2	3	9	do 1	253
Manhatten	do 15	do 18	Fair	9	6	2	4	do 1	293
Seedling, No. 98	do 15	do 22	Strong	7	12	1	5	do 1	123
do No. 80	do 15	do 15	do	10	3	3	4	do 1	463
do No. 141	do 15	do 22	do	19	2	3	3	do 1	240
do No. 209	do 15	do 22	do	11	1	1	9	do 1	201
do No. 83	do 15	do 28	Fair	8	4	1	6	do 1	232
Telephone	do 15	do 22	do	13	7	2	7	do 1	220
Seedling, No. 170	do 15	do 26	do	14	3	1	12	do 1	256
Sugar	do 15	do 27	do	9	2	1	10	do 1	220
Vermont	do 23	do 24	do	8	5	1	6	do 1	213
Member of Parliament	do 23	do 24	do	7	2	1	8	do 1	205
Seedling, No. 10	do 23	do 24	do	5	0	1	6	do 1	225
Rural New Yorker	do 23	do 24	do	4	3	1	0	do 1	220
Large Callao	do 23	do 24	Weak	8	2	1	5	do 1	210

* 27th August.

GARDEN VEGETABLES.

Several sorts of each kind of vegetable were sown last spring in hopes of finding the earliest and best for the North-West. In cabbage, 13 sorts were tested; in cauliflower, 7 varieties; in onions, 10; pease, 8, &c. Some of these were destroyed by winds and could not be replaced in time to be of any use...

The kinds recommended are not given as absolutely the best varieties to grow in the North-West under all circumstances. These have done best on the experimental farm where everything is exposed to severe wind storms and might, with protection, either natural or artificial, be worthy of only 2nd or 3rd place.

BEETS.

Three varieties were tested—Eclipse, Lentz and Long Red.

Eclipse and Lentz are recommended.

BEANS.

Sixteen varieties of beans were planted. Six were much earlier than the others, and though none matured before frost cut them down, these can be recommended: Dwarf Mohawk, Early Refugee, Giant Wax, Golden Wax, Kidney and Date ditto. The following also were planted on the 23rd May but did not mature, being cut down by frost: Golden Eye Wax, Sugar Podded, Hundred-to-One, Ne Plus Ultra, Sion House, Negro Black, Black Speckled, Chevrier, Nettle-leaved White, Lima.

The English Horse Bean was also planted, grew 3 feet 6 inches in height and produced a most abundant lot of pods, but was cut down with frost before maturing.

CARROTS.

Five sorts were sown on the 9th April; all were destroyed. Three varieties were sown again on 16th April. These were Early Gem, Peer of All and Intermediate. Peer of All was injured, but all three did well and are recommended.

CABBAGE.

Thirteen varieties of cabbage were tried, mostly all early sorts. Early Epping and Early Summer were the two earliest and best, Vandergroff 2nd; Jersey Wakefield and Extra Early Etampes take 3rd place. Henderson's Early Summer was the best cabbage grown.

The following were sown in hot-bed 30th March, transplanted in hot-bed 19th April, transplanted in garden 11th May, and were fit to use 20th July: Early Epping and Early Summer.

The following were sown and transplanted same dates as above and ready to use as follows: Vandergroff, 25th July; Early Etampes, 30th July; Jersey Wakefield, 30th July.

The following were sown and transplanted in hot-bed same date as above, transplanted in garden, 29th May, and ready to use, as follows: Extra Early Eclipse, 30th July; Bo-Peep, 5th August; Red Erfurt, 15th September. Autumn King and Savoy were sown 18th April and transplanted 29th May, and ready to use 15th September.

CAULIFLOWER.

Five varieties were tested: Dwarf Erfurt, Giant White Pearl, Early Snow Ball, Algerian and Le Normand.

The first three sorts proved much the best, Snowball being first in all respects.

Seed was sown in hot-bed 30th March, transplanted in hot-bed 19th April, and in ground on the 11th May. Snowball was fit to use on the 9th July, Dwarf Erfurt and Giant White Pearl soon after.

CELERY.

White Plume, Giant White, Golden Yellow and Giant Pascal were sown in hot-bed 1st April; transplanted in hot-bed 1st May and in garden 17th June. White Plnme was the earliest in use and the best variety, Giant White 2nd, Giant Pascal and Golden Yellow about equal. The trench and flat system were both tried. The celery on the flat was very poor, while in the trench it was very good.

CUCUMBERS.

Early Cluster, Medium Green, Giant Pera and White Pearl were sown in hot-bed 19th May and transplanted on 5th June. Early Cluster and Medium Green were first in bearing, but none matured.

CITRON

Was sown in hot-bed 19th May, transplanted 5th June. Destroyed by frost 12th September, with fruit very small.

LETTUCE.

Seven sorts were tried. Toronto Gem, Big Boston and Black-seeded Simpson were sown 9th April and destroyed by winds.

Sure Head and Big Boston were also sown 22nd April. White Romain, Golden Queen and Nonpareil sown 29th May.

Big Boston proved by far the best, and while all the others may be pronounced good this is specially recommended for the North-West.

ONIONS.

Yellow Danvers, Mammoth Pearl, Southport, White Globe, Red Wethersfield, White Barletta and Spanish King were sown in ground from 16th April to 9th May.

Yellow Danvers and Red Wethersfield gave a fair crop. The remainder gave very poor returns.

White Pearl, Giant Roca, White Gargons and Spanish King were sown in hot-bed on 27th March, transplanted in garden 1st June. Not a plant was lost in transplanting and all grew from the first. White Pearl and Giant Roca gave the largest yield and were the best onions. White Gargons was the earliest. Spanish King not so good as the two first, which are recommended.

PEASE.

Champion of England, American Wonder, Yorkshire Hero and Pride of the Market were sown 22nd April. These gave pease fit to use and were ripe in the following order:—

American Wonder, 12th July, 14th August.
Yorkshire Hero, 20th July, 25th August.
Pride of the Market, 1st August, 1st September.
Champion of England, 1st August, 1st September, respectively.

On the 9th May the above varieties and Ex. Early Premium Gem, Stratagem, Heroine and McLean's were sown. American Wonder proved again the earliest, giving green pease on 18th July and ripe 13th August, Ex. Early Premium Gem being second, and gave green pease 20th July, ripe 13th August. Stratagem, Yorkshire Hero and Pride of the Market gave green pease 4th August and ripe 1st September, while Heroine, McLean's and Champion gave green pease 8th August and ripe 5th September. In quality Stratagem, Yorkshire Hero, Heroine and Champion of England were sweet and large, and better liked than the others.

PARSNIPS.

Hollow Crown was sown 9th and 22nd April; the first sowing was destroyed; the second was a fair crop.

RADISH.

Seven varieties of radish were sown from 9th April to 1st July. They were Olive Gem, Rosy Gem, Olive Shaped and Scarlet Button as summer sorts, and Black Spanish California White and China White winter varieties. The four summer varieties were all good, and can be safely recommended. Of the winter sorts, Black Spanish alone came to anything; the other two went entirely to seed.

RHUBARB.

Rhubarb of any variety does well. The rankest grown is Stott's Mammoth. This with Paragon, Victoria, Myatts, Linnæus and Carleton Club are the five sorts growing on the farm. Stott's Mammoth did best. Myatts Linnæus and Victoria did next best, and are about equal.

SPINACH.

Round Summer and Savoy Leaved were sown 16th April and 9th May. The early sown were destroyed by wind, but both sorts sown 9th May did well and were first in use 15th June.

SQUASH.

Boston Marrow-White. Bush scalloped and short green Bergin were sown 2nd June; grew fairly well, but did not mature; frost on 12th September destroyed them.

TURNIPS.

Five varieties of turnips were sown in garden. Imported Purple Top Swede, Marquis of Lorne, Six Weeks, Greystone and Breadstone. Six Weeks was the earliest to mature or come in use, but the Imported Purple Top is by far the best quality for cooking, though correctly speaking, not a garden turnip.

TOMATOES.

Dwarf Champion, Early Ruby, General Grant, Conqueror and Strawberry were sown in hot-bed 30th March, transplanted in hot-bed 30th April, and into garden 3rd June. Fruit formed on Early Ruby on 3rd July, and ripened 27th August. Fruit formed on the other sorts from the 5th to 15th July, but none ripened.

FLOWERS.

A circular flower garden, 100 feet in diameter, was planted in the fall of 1890 with a variety of flowering bulbs, and last spring 34 varieties of other flowers were planted or sown. Many of these made fine bloom during the season, but were cut down by frost 12th September. Pansies and Verbenas revived somewhat after the frost.

The following are the bulbs set out:—Those that flowered: Double Early Tulips, Single Early Tulips, Parrot Tulips, Lilium Umbellatum, Scilla Amœna; Iris Hispanica of the following varieties: Belle Ardine, Rigobettu, Ogyges, Tantalus, L'Aimable, La Perle, Sappho, La. Sicilum, Iris Wm. George; Lilium Incomparable, Lilium Multiflorum, Lilium Grandiflorum, Lilium Thunbergianum, Lilium Atrosanguineum, Lilium Thunbergibnum Aureum, Colchium Autumnale.

Those that did not flower: Bulbocodium Vernum, Double Late Tulips, Lilium Candidum, Narcissus Incomparabile, Narcissus Poeticus, Narcissus Phœnix, Narcissus Stella, Narcissus Polyanthus, Iris Hispanica, Lagaite, Single Hyacinth, Mixed Crocus.

Those that died were: Double Hyacinth, Polyanthus Narcissus Gloriosa Superba, Galanthus Elwesü.

The following were sown or planted in the spring. Those are extra good and are suitable for the North-West: Pansy, Godetia, Carnation, Mignonette, Petunia, Dianthus Imperialis, Dianthus Heddewigi, Phlox Drummondü, Grandiflora, large flowering fringed, Grandiflora, single flowering fringed, Superbissima, Chrysanthemum, Gladiolus, Sweet Peas, Poppies, Dwarf Alyssum, Verbenas, Sweet William, Abronia, Candytuft, Stocks, Pyrethrum, Nemophila, Flowering Flax, Pinks and Asters.

The following were only fair: Scabiosa White and Royal Purple, Salpiglossis Nigella. Globe Amaranths did not do well.

FRUIT TREES.

In May, 1890, 500 Russian seedling apple trees were planted all lived, made a good growth, and came through the last winter in good condition. During the past season they made very gratifying progress and it is hoped and expected that they will stand the present winter. Last spring 42 named Russian varieties were put out and have made a good growth.

Of the apple trees set out prior to the spring of 1890 very few survive. A few Russian varieties of dwarf trees are still in existence, but not very promising.

Red Siberian Crab is the only variety of crab apple that stands. One tree of this sort, planted in 1888, is still living, grows a little each year, but very little.

PEARS AND CHERRIES.

A Russian seedling variety of pear planted in spring of 1890 succumbed to last winter's severity; as also did the Koslov Morello Cherry, White Black Hill Cherry and a variety not named but marked "M. No. 6" are living but were cut back.

GRAPES.

Nineteen varieties of grapes were planted in May, 1890. Each root was put down 18 inches below the surface, and as growth took place earth was filled in until the level of the surface was reached, in hopes that the roots being so far down would be out of harm's way. Before winter set in a heavy covering of coarse manure was heaped over each root, but all of no avail; every root was dead last spring.

CURRANTS.

Currant bushes came through the winter in good condition, and made an early start in the spring. But winds and frost in May destroyed all early-formed blossoms and only one sort, Black Naples, was at all well fruited. Fay's Prolific and Lee's Prolific had a few berries. Victoria, Raby Castle, Red Dutch, White Grape, White Dutch and Champion had none. Last spring 12 additional seedling varieties were planted.

GOOSEBERRIES.

Gooseberries, like the currants, were injured by the early frosts and had little or no fruit. Smith's improved had a few very fine berries. Houghton or Downing were nearly fruitless.

RASPBERRIES.

Up to the present 21 named varieties of raspberries have been tested on this farm besides 6 hybrids. Of the sorts tried Turner and Philadelphia have made the largest growth of cane, stand the winter and spring the best and produce the most fruit. Caroline and Cuthbert for the first time made a fine growth of cane and gave a few fine berries the past season. The canes are laid down before frost comes each fall, and covered with earth, and after the ground freezes up are covered with coarse manure.

Last spring 11 new seedling varieties were planted.

STRAWBERRIES.

Two varieties of strawberries bore fruit last season; these were New Dominion and Capt. Jack. The Wilson, though living through three winters, has never borne fruit. Frost in May killed all early blossom.

FOREST TREES.

Very little was done in foreign trees last spring. A few shrubs were set out and made a good growth.

In our native sorts 14,075 were transplanted, being either seedling or 2-year-olds. They were chiefly planted in a wind-break along the north boundary of farm or in wind-breaks near the buildings. These wind-breaks were planted 65 feet apart, between which fruit trees, roots, grain, &c., will be grown. A few hundred of our native poplar were also planted. In the fall of 1890 tree seeds of maple, ash, oak, elm, cherry, hazel and saskatoon were sown in large quantities, in all two acres, and in May last nine acres of maples and ash were sown. Of the fall sowing, maple, ash, oak, elm, hazel and saskatoon came up. The maples were entirely killed soon after appearing above ground, but the rest, especially the young oak, made a satisfactory growth. Of the spring sowing about ⅛ of the maple came, but none of the ash. The maples have made a good growth. 14,450 forest trees from Nebraska were set out in May 1890. These made a fair growth during that season, but this spring all the cottonwoods, locusts, walnuts, butternuts and Russian mulberry were found to be dead. White ash, green ash, soft maple, white elm and coffee tree, Russian olive and red cedar, were all badly cut back, the great majority to the ground.

The favourable season caused a good growth from the ash and elm, but the maples and coffee trees, olive and cedar made little or no progress. Besides the trees from Nebraska, 4,947 were received from the Central Experimental Farm, Ottawa. Many of the pines died soon after being set out, and of those living only about one dozen Scotch pine came through the winter and are living now. All the spruce, larch, arbor vitæ, juniper, hickory, chestnut, butternut, Russian mulberry and linden were killed. A few Norway maples are living. White, black and green ash and the elm were badly cut back, many entirely killed. White birch and mountain ash coming out best and did well all the past season.

SHRUBS.

Of the shrubs planted, the *Caragana arborescens* has done extra well, and of all foreign trees or shrubs this seems to stand our climate by far the best, and may be put down as very suitable for the North-West. *Syringa alba* (*lilac*) also stands the climate well, and though little growth is made in a season none so far have died and some progress is being made. *Spiræa opulifolia* and *Ribes aureum* (flowering currant) stood last winter and did well the past season. All the other shrubs, such as Syringas Berberis, &c., have all or nearly all been killed. *Artemisia abrotans* planted on the farm in May, 1890, stood last winter, and being a very fast and thick grower, makes the best hedge or wind-break of anything so far tried, and promises to be very suitable for wind-breaks around gardens or for small enclosures.

WILLOWS AND POPLARS.

In willows *Salix Voronesh* and *Salix acutifolia* stand the climate well, and every spring start to grow from the tips. All other sorts, such as white willow, yellow willow, purple willow, Norway willow, Wisconsin weeping willow and Salix *laurifolia* are cut back each winter and are not suitable. In poplars, *Populus* Wobstii, Riga and *Populus aurea* start each spring from the tips.

SUMMER FALLOWS.

In my last report I stated that two plans were being tested in working fallow on the experimental farm. One was gang ploughing in the fall, as soon after harvest as possible, so as to start weeds, and plough and complete the work the following season; the other to do all the work in the one season—that is, from May to November. So far as the crop was concerned no difference could be detected the past season between the two modes of working. On both the grain was very heavy and greatly lodged; the piece of land gang-ploughed in the fall was very full of weeds the previous year. The past season not one appeared, while on land worked in one season weeds in great numbers came up where the crop was at all blown in the spring.

For this reason, and on account of the fall system being much the easiest managed, as it does away with all volunteer grain, it should be more frequently followed. The land on the experimental farm was worked in several ways the past season. Part was ploughed deeply early in the spring and afterwards the weeds and volunteer grain kept down by harrow or gang-plough.

Another part was first gang-ploughed 3 inches deep and afterwards ploughed 6 inches deep with walking plough. Another portion was gang-ploughed twice with one harrowing between. On account of the great amount of stubble on the ground and of the risk of damage by fire if the attempt was made to burn it no gang-ploughing was done this fall.

STOCK.

As stated in my last report, four pure breeds of stock were secured last year for the farm. These were: Durhams, 1 male and 4 females; Holsteins, 1 male and 3 females; Aberdeen Polled Angus, 1 male and 2 females; and Ayrshire 1 male and 3 females—in all, 16 animals. 12 grade animals were also obtained in this neighbourhood.

Shortly after the arrival of the stock a Polled Angus and Durham cow aborted, and during the winter the Holstein cow, "Bonnie Ethels Mercedes," a Polled Angus calf and a grade heifer died, it is thought from drinking very cold water which had to be drawn in tanks daily from the dam.

During the winter and spring 11 head have been added to the herd by births: 1 Durham bull and heifer, 2 Ayrshire bulls, 1 Polled Angus heiter, 1 Holstein heifer and 5 grades. Up to 1st January, 1892, there have been added 2 Polled Angus heifers, 1 Holstein heifer and 3 grades.

During the season farmers availed themselves of the use of the 4 bulls to a considerable extent, considering the limited number of cows in this locality.

Three young bulls, 1 Durham and 2 Ayrshire, will be ready for service this coming season and will be sold to settlers.

STALLION.

In the latter part of May last the Percheron stallion "Clement" reached the farm from Montreal for service in the neighbourhood. Although rather late in arriving, 40 mares were served, giving good satisfaction. A Clyde or Shire stallion would prove much more acceptable to the farmers in the Territories than a Percheron, no matter how good the Percheron may be.

SILO.

Early last spring a silo was built in the barn. Though not very large, it is quite large enough to test the practicability of making and keeping ensilage in the North-West.

The silo is 10x12 ft., inside measurement, and runs from basement floor 12 ft. above barn floor, a height of 22 feet; the portion above the barn floor is exposed to very severe cold.

Green fodder was cut and placed in silo as follows:—

Aug. 3rd and 4th, rye, wheat and oats.
" 5th, rye and oats.
" 6th, wheat.
" 6th, rye and oats.
" 13th, barley and oats.
" 18th, millets and Hungarian grass.
" 29th, rape.
Sept. 3rd and 4th, corn.
" 5th, corn.

In all 43 tons. At present the corn is being fed to the stock, which eat it readily. For 8 inches on top and a little on sides, the ensilage is found bad, but all inside that is good and well preserved.

A coating of hay was placed over the corn, which has been the only protection or covering from the cold it has had.

IMPROVEMENTS.

In addition to the silo above mentioned, an underground hen-house has been built and material obtained for an internal fence to enclose about one hundred acres of the farm. This fence will be erected early next spring and will do away with the herding of the stock, which had to be done last season. A windmill was put up on the barn last summer, which draws water from a reservoir nearly 1,000 feet away, grinds grain, cuts straw and is found a very great convenience, especially in furnishing a plentiful supply of water during the winter months. The pipes from the reservoir were put down 7 feet deep to protect them from frost, and when cold weather came on a thick covering of coarse manure was spread on the ground the entire distance.

POULTRY.

Having no hen-house last spring or any other place in which the breeds of fowls could be kept separate, they did very poorly. In fact, except an increase of half a dozen, our flock is the same now as then.

With the new and comfortable building now in use, it is hoped better success will be had in future.

METEOROLOGICAL.

Temperature and rainfall, maximum and minimum, for 12 months; rainfall during the growing season.

TEMPERATURE.

Months.	Maximum.	Minimum.
January	43° on 19th	— 27° on 15th and 31st.
February	29° on 4th	— 41° on 2nd.
March	39° on 30th	— 38° on 6th.
April	87° on 23rd	5° on 2nd and 3rd.
May	89° on 17th	12° on 4th.
June	79° on 18th	28° on 3rd.
July	83° on 30th	40° on 24th and 25th.
August	88° on 4th	37° on 22nd.
September	85° on 9th	23° on 13th.
October	70° on 8th	12° on 26th.
November	56° on 5th	— 16° on 17th and 27th.
December	41° on 12th	— 41° on 25th.

RAINFALL.

	Inches.
April	0
May	— 97
June	6 — 19
July	3 — 84
August	2 — 14
September	·86
October	·03
Total	14·03

EXHIBITIONS ATTENDED.

Products of the farm were sent to the Winnipeg industrial exhibition, and shown there in connection with those from the Manitoba experimental farm. The exhibit from this farm consisted of 55 varieties of wheat in straw, 3 varieties in bags and 7 in bottles; 18 varieties of barley in straw, 8 in bags and 8 in bottles; 14 varieties of oats in straw, 6 in bags and 7 in bottles; 15 varieties of field and garden pease in bottles, besides samples of buckwheat, rye and tares in straw, and cabbage and turnip seed in bottles. There were also exhibited 55 varieties of named native grasses, many of which are being cultivated on the farm; 16 sorts of cultivated grasses and clovers, all grown on the farm last season; 75 varieties of potatoes and 4 varieties of onions. A collection of 15 sorts of turnips were sent down, but on account of want of space were not shown.

The exhibitions at Saltcoats and Yorkton, in the northern part of the province, were also attended. As these exhibitions were held at the same time as others along the line of the Canadian Pacific Railway, it was impossible to reach more than the above.

I have the honour to remain,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 31st December, 1892.

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

SIR,—I have the honour to submit herewith my report for 1891, being the third annual report of the work done on the experimental farm at Agassiz.

The weather during January was very mild and rainy, but in February it turned colder, and there were sharp frosts at night with bright sunshine during the day. The previous rains had left the land very wet, and the freezing and thawing heaved the small fruits, strawberries, currants, raspberries, &c., out of the ground, and caused the loss of quite a number of those which were newly planted, but did not injure anything that had been planted the spring previous.

The spring did not open quite so early this year as in 1890. In that year we began seeding on 3rd April; this year the first grain was sown 8th April. The season was cold and wet during April and the first half of May, and in consequence the early sown-grain did not make much progress during that time, showing less difference in time of heading and ripening than is usually the case where there is so much difference in the time of sowing.

About 25 acres of new land has been grubbed and ploughed this summer, and 8 acres of the old land manured and summer fallowed and sown with fall wheat, and will be seeded to timothy and clover next spring.

About 5 acres of new land has also been summer fallowed, having been ploughed several times and harrowed frequently with the disc and drag harrows, to see what effect this treatment will have in exterminating the ferns, and it is to be hoped that there will be but little trouble with this weed in that piece of ground in future.

A new fence has been put up on the west side of the farm and about three-quarters of a mile on the north and south sides is levelled and graded, and the fence will be built before spring.

The total area of land now broken up and ready for crop on the experimental farm is 105 acres, and may be summarized as follows:—

	Acres.
Planted in orchard	26
Under crop in 1891	51
Summer fallow	13
New land broken up during summer of 1891	15
Total	105

Notwithstanding the rather unfavourable weather in the spring of 1891 the area under crop in this province was considerably greater than ever before, and the crop generally was a good average.

The number of fruit trees and small fruit plants planted this year is far in excess of any previous year, and the prospects are that before long British Columbia will have not only enough fruit for home consumption but also a large surplus for export.

FALL WHEAT.

Fourteen varieties of fall wheat were sown last fall. Owing to the freezing and thawing in February they all suffered, and were a much lighter crop than the previous year; but the summer and harvest being dryer and hotter than that of 1890, the berry of both fall and spring wheat is much harder and brighter than the crop of that year.

Below will be found a report of the date of sowing, heading, ripening, and the yield of $\frac{1}{20}$ of an acre of each variety tested.

In this connection I wish to explain that owing to lack of barn accommodation our grain had to be stacked, and in this climate, where there is so much wet weather, especially in autumn, the grain in small stacks gets damp and it is difficult to thresh. This entails a loss, which in small plots materially reduces the yield.

Variety.	Sown.	Headed.	Harvested.	Length of Straw.	Yield.	No. of Days to Mature.	Remarks.
				Feet.	Lbs		
Carter's Hybrid A.	Oct. 30	June 10	July 25	4½	46½	268	Straw rather soft; did not stand up well; no smut.
do B.	do 30	do 13	Aug. 3	4 to 5	45¼	277	Straw bright and standing up well; very little smut.
do C.	do 30	do 7	July 25	3½ to 4	39½	268	Straw short and soft; badly crinkled down; very little smut.
do D.	do 30	do 11	do 25	4½ to 5½	43¾	268	Straw stood up fairly well. No smut.
do E.	do 30	do 7	Aug. 10	5 to 5½	21½	284	This variety was sown in the spring of 1890, and did not ripen. We saved a few heads, and sowed it in the fall of 1890, but had not enough to sow the $\frac{1}{20}$ of an acre. I give the produce of 2½ lbs. This appears to be one of the best of Carter's Hybrids, although the grain is very small.
do F.	do 30	do 8	July 27	5 to 5½	35½	270	Straw crinkled down; a little smut.
do G.	do 30	do 3	do 25	5	55¾	268	Straw bright and fairly stiff; standing up well; no smut.
do H.	do 30	do 13	do 27	5 to 6	63¾	270	Straw stands up well; no smut.
do J.	do 30	do 9	Aug. 3	5 to 5½	49¾	277	Straw stands up fairly well; no smut.
do K.	do 30	do 14	do 3	5 to 5½	62½	277	Stands up well; straw bright and stiff; no smut.
Democrat	do 30	do 7	July 25	4 to 4½	45	268	Straw soft; did not stand up well; considerable smut.
Tasmania	do 30	do 14	Aug. 3	4 to 5	51	277	Straw soft; all down; very smutty.
Manchester.......	do 30	do 10	do 8	4½ to 5	55	282	Straw bright, and stands up well; no smut
Velvet Chaff	do 30	do 16	do 10	4 to 5	45	284	Straw bright; stands up well; no smut.

SAUNDERS' CROSS-BRED WHEATS.

Samples consisting of 20 grains each of the following varieties were planted. Beds 10 feet long and 4 feet wide were prepared, and the cross-bred wheats were planted in rows 1 foot apart in the row and the rows 3 feet apart, one row of 10 grains of some of the well-known varieties being planted in centre of each bed for comparison.

Variety.	When Sown.	When up.	Length of Straw.	Headed out.	Ripe.	Amount Produced.	No. of Grains Sown.	No. of Grains Grew.	Remarks.
Bed No. 1.			Feet.			Oz.			(Alpha, 20 grains; Judket, 10 grains.)
Alpha	Apr. 24	May 4	3½ to 4	July 4	Aug. 24	12½	20	15	Only 17 grains of Alpha germinated, and two of these, when headed out, proved to be a different variety, being strongly bearded. The Alpha is bald.
Bearded Alpha..	do 24	do 4	4	do 4	do 24	1¾	..	2	Alpha stooled well; heads medium length, and fairly compact; berry bright, clear amber; medium long, but not plump; no smut. The bearded variety made a vigorous growth; straw long, bright and harder than the bald or Judket, which was in the same bed.
Judket..........	do 24	do 4	4½	do 6	do 27	5	10	8	Judket—8 kernels germinated; straw long, coarse and soft; laying down badly; heads long and very open, the breasts being very far apart.
Bed No. 2.									(Abundance, 20 grs.; Rio Grande, 10 grs.)
Abundance......	do 24	do 4	3 to 3½	do 5	do 23	4¾	20	9	Abundance—15 grains of this variety grew, but later on 6 were cut off by worms, leaving 9 to come to maturity. This variety did not stool out well, and the heads were very uneven in length; some were over 5 inches long, but not well filled; some of the heads were much shorter, but better filled. Straw fairly bright and stiff, standing up very well. Grain bright and clear, and a much plumper berry than Alpha.
Rio Grande.....	do 24	do 4	3	do 7	do 20	1¼	10	3	Rio Grande—Only 3 feeble plants came to maturity, the cut-worms taking all the others, and injuring those left.
Bed No. 3.									(Beta, 20 grains; Red Fife, 10 grains.)
Beta...........	do 24	do 4	3½	do 5	do 28	10½	20	13	Beta—All the grains of this variety germinated, but 7 were destroyed by cut-worms. Straw bright and stiff; medium in length; stooled fairly well; heads medium in length; compact and well filled to tips with bright, plump berries of medium size.
Red Fife.......	do 24	do 4	2½ to 3	do 9	do 28	3¾	10	7	Red Fife—All the grains of this variety germinated; 3 were taken by cut-worms; straw medium in length; bright and hard; standing up well; heads compact; of medium length; well filled.
Bed No. 4.									(Ottawa, 20 grs.; Anglo Canadian, 10 grs.)
ttawa.........	do 24	do 4	4	do 9	do 26	6¾	20	10	Ottawa—15 grains of this variety germinated, but only 10 reached maturity; straw long, but rather weak, laying down before heading out, and did not fill well; stooled well; heads medium in length and compact, but not filled out; grain small but plump.

SAUNDERS' CROSS-BRED WHEATS—*Concluded.*

Variety.	When Sown.	When up.	Length of Straw.	Headed out.	Ripe.	Amount Produced.	No. of Grains sown.	No. of Grains grew.	Remarks.
Red No. 4—Con.			Feet.			Ozs.			
Anglo Canadian.	Apr. 24	May 4	4½	July15	Sept. 3.	8¼	10	9	Anglo Canadian—10 grains of this variety germinated and 9 came to maturity; straw long and soft; all down before heads were filled; heads long and very open, but fairly well filled out to tips; berry long but not plump.
Bed No. 5.									(Carleton, 20 grains; Ladoga, 10 grains.)
Carleton........	do 24	do 4	3 to 3½	do 6	Aug. 20	11½	20	11	Carleton, 13 grains of this variety came up but only 11 reached maturity. Headed out seven days before Ladoga, which was sown with it, and kept in the lead, ripening six days before that variety. Straw medium length and stood up well. Heads medium and well filled out. Grain plump, bright and fairly hard. A promising variety.
Ladoga.........	do 24	do 4	3½ to 4	do 13	do 26	3¼	10	4	Ladoga—6 grains of this variety germinated; only 4 matured. Straw long, and stood up well. Heads good length and fairly compact. Considerable smut. This was the only one of the twelve varieties in this test that had any smut. None were treated in any way for smut.
Bed No. 6.									(Prince, 20 grs. ;. White Russian, 10 grs.)
Prince.........	do 24	do 4	3 to 3½	do 6	do 27	3¼	20	6	Prince—This variety did not germinate well, only 10 grains coming up, and only 6 came to maturity. Straw long; stood up well. Heads long and very well filled. Grain medium in size, but somewhat shrunken.
White Russian..	do 24	do 4	3 to 3½	do 12	do 29	2¼	10	4	White Russian—6 grains of this variety germinated, but only 4 came to maturity. Straw medium in length and stood up well. Heads long, but very open.

WHEAT, BARLEY AND OATS, ONE-TWENTIETH OF AN ACRE PLOTS.

Tests of one-twentieth of an acre plots of wheat, oats and barley. The land chosen for these tests was ploughed for the first time in July, 1890. There was a number of fir trees grubbed out of this piece, and considerable levelling done which brought the subsoil to the surface in many places, and although the ground was ploughed twice afterwards and thoroughly worked up with the disc and drag harrows the yield was considerably reduced. None of the varieties made vigorous growth where the stumps had been or where knolls had been levelled off. The soil was a clay loam, and in every respect, except as above mentioned, all the plots were alike.

The plots of wheat were sown at the rate of 90 lbs., or 1½ bush. per acre; barley 96 lbs., or 2 bush. per acre, and oats 85 lbs., or 2½ bush. per acre. Following will be found a record of the date of sowing, heading and ripening, with other notes as to conditions of growth, &c.

Although the seed was not treated for smut there was very little in this series of test plots. Those that suffered most from inequality in the soil caused by the grubbing and levelling are marked by a star.

WHEAT.

Variety.	Sown.	Headed.	Mature.	Harvested	Weight.	Yield per Acre.		Length of Straw.	No. of Days to Mature.	Remarks.
					Lbs.	Bush.	lbs.	Feet.		
Plot No. 1, Anglo Canadian...	April 17..	July 7..	Aug. 20..	Aug. 20..	62½	20	50	3½ to 4½	125	Heads long but very open; stands up well; stools fairly well; no smut.
Plot No. 2, Ladoga..............	do 17..	June 28..	do 15.	do 15..	55	18	20	2½ to 4	119	Heads short and compact; straw very uneven in length; did not stool well; stands up well; no smut.
Plot No. 3, White Fife........ ...	do 17..	do 29..	do 18..	do 18..	63½	21	10	3 to 3½	123	Heads long and medium compact; well filled out to tip; did not stool; straw stiff and stands up well; no smut.
Plot No. 4, Red Fife.....	do 17 .	do 29..	do 18..	do 18..	65	21	40	3 to 3½	123	Heads good length and compact; well filled out to tips; stands up well; stools fairly; no smut.
Plot No. 5, Campbell's Triumph...	do 17..	do 27..	do 15..	do 15..	71	23	40	3½ to 4½	119	Heads medium in length and compactness; stooled well; stands up well; no smut.
Plot No. 6, Campbell's White Chaff	do 17..	do 27..	do 13..	do 13..	63½	21	10	4½ to 5	117	Heads good length and fairly compact; stands up well; no smut.
Plot No. 7, Russian Hard Tag.....	do 17..	do 29..	do 18..	do 18..	55	18	20	3 to 4	123	Heads and straw very uneven in length; heads fairly compact; does not stand up well; a little smut.
Plot No. 8, Rio Grande	do 17..	do 28..	do 20..	do 20..	68	22	40	4½ to 5	125	Heads long but open; straw bright and stiff; a very little smut.
Plot No. 9, Judket.	do 17..	do 30..	do 19..	do 19..	62½	20	50	3½ to 4	124	Heads medium in length but not compact; straw hard and stiff; no smut.
Plot No. 10, Red Fern	do 17..	do 30..	do 18..	do 18..	55½	18	30	2½ to 3½	123	Very uneven in length of head; fairly compact; no smut.
Plot No. 11, Indian Hard Calcutta.	do 17..	do 15..	do 10..	do 10..	30½	10	10	2 to 3	115	Did not stool; heads very short and open; a poor stand.

WHEAT.

Variety.	Sown.	Headed.	Mature.	Harvested.	Weight.	Yield per Acre.		Length of Straw.	No. of Days to Mature.	Remarks.
					Lbs.	Bush.	lbs.	Feet.		
Plot No. 12, Colorado..	April 17..	July 6..	Aug. 15..	Aug. 15..	43½	14	30	2½ to 3½	120	Very poor stand; seed did not germinate well, and it did not stool; head short and open; no smut.
Plot No. 13, Pringle's Champlain ..	do 17..	June 30..	do 18..	do 18..	46	15	20	3½ to 4	123	Did not stool, and very uneven in length of head, ranging from medium to very short; fairly compact; no smut; straw soft.
Plot No. 14, Gehun	do 17..	do 27..	do 15..	do 15..	41	13	40	2 to 3	120	A very poor stand, and short in head and straw; heads fairly compact; straw bright and hard; no smut.
Plot No. 15, Australian...	do 17..	do 29..	do 18..	do 18..	67	22	20	4½ to 5	123	Heads long and compact; straw weak; five per cent smut. This is the smuttiest wheat grown here this season.
Plot No. 16, White Russian...	do 17..	do 30..	do 18..	do 18..	73	24	20	3 to 4½	123	Uneven in growth of straw and heads, but stooled well; heads rather open; stands up well; no smut.
Plot No. 17, White Delhi	do 17..	do 30..	do 20..	do 20..	64	21	20	3 to 4	125	Very uneven in growth of heads, ranging from long to very short and very open; straw bright and hard.
Plot No. 18, Saxonka	do 17..	do 29..	do 18..	do 18..	59½	19	50	3 to 4½	123	Stooled out very well; heads short and compact, but not well filled out; straw soft, and crinkled down; no smut.
Plot No. 19, White Connell	do 17..	do 30 .	do 18..	do 18..	65½	21	50	3 to 4	123	Considerable levelling had been done on this plot, and the stand was poor; did not stool; heads medium in length, and compact; no smut.
Plot No. 20, Defiance	May 25..	July 13..	Sept. 9..	Sept. 9..	39¼	13	05	3½ to 4½	107	The seed for this plot and No. 21 was not received in time to sow at the time the others were sown, and the rains in autumn injured the crop; heads good length; straw bright and hard; no smut.
Plot No. 21, Wellman's Fife	do 25..	do 20..	do 9..	do 9..	34	11	20	4½ to 5	107	Heads long and fairly compact; straw bright and stiff; as in plot No. 20, this suffered from the rains in harvesting, losing over half the grain by shelling and sprouting.

BARLEY.

Two-rowed.									
Plot No. 22, Golden Melon	April 18 .	July 1..	Aug. 14..	Aug. 14..	86½	36 02	3 to 3½	118	Stands up fairly well, but not an even crop either in heads or straw; no smut.
Plot No. 23, Saale.	do 18..	do 4..	do 14..	do 14..	80½	33 26	3 to 3½	118	Straw a little weak; heads medium; no smut.
Plot No. 24, Prize Prolific.........	do 18..	do 4..	do 14..	do 14..	78¾	32 39	3 to 3½	118	Did not stool well; a thin stand and heads short; no smut.
Plot No. 25, Thanet..............	do 18..	do 2..	do 6..	do 6..	57¾	24 03	2½ to 3	106	Straw short and soft; did not stool out; heads short.
Plot No. 26, Duck-bill.	do 18..	do 2..	do 14..	do 14..	58½	24 08	2½ to 3	118	Straw stiff, and heads very fine, but crop injured as explained above.*
Plot No. 27, Kinver..............	do 18..	do 5..	do 16..	do 16..	50	20 40	2 to 3	120	Straw very uneven in length and short heads; did not stool.
Plot No. 28, Peerless White..... .	do 18..	do 2 .	do 10..	do 10..	69½	28 46	2 to 3½	114	Very uneven in length of straw and head, ranging from very short to very long; straw weak.*
Plot No. 29, Improved Chevalier...	do 18..	do 4..	do 14..	do 14..	79	32 44	3 to 3½	118	Fairly even crop; straw stands up fairly well.
Plot No. 30, Danish Chevalier.. ...	do 18..	do 1..	do 10..	do 10..	81	33 36	2½ to 3½	114	Very patchy and uneven; a portion of plot very fine; crinkled down pretty badly*.
Plot No. 31, Goldthorpe.....	do 18..	do 2 .	do 14..	do 14..	101	42 04	4 to 4½	118	Very fine in spots; straw long, and stands up well; heads long and fine.*
Plot No. 32, Golden Grains.......	do 18..	do 2..	do 8..	do 8..	66½	27 34	3 to 4	112	Uneven in length of straw and head; straw stiff.
Six-rowed.									
Plot No. 33, Baxter's Six-rowed....	do 20..	June 18..	July 27..	July 30..	90	37 24	3 to 3½	98	Straw bright and hard, standing up well; well stooled out and even; no smut.
Plot No. 34, Rennie's Improved....	do 20..	do 18..	do 24..	do 25..	86½	36 02	3 to 3½	92	Straw medium stiff, standing; standing up fairly well; well stooled; fully 3 per cent smut.
Plot No. 35, Odessa.............	do 20..	do 19..	Aug. 7..	Aug. 10..	75½	31 17	2 to 3½	109	Very uneven in length of straw and head; did not stool, and made a thin stand; very little smut.
Plot No. 36, Oderbruch...........	do 20..	June 22..	July 27..	July 31..	54¾	22 39	2 to 3½	98	Straw soft and weak, lying down when ripe; very patchy.*
Plot No. 37, Common Six-rowed....	May 6..	July 2..	Aug. 18..	Aug. 18..	137½	57 14	3 to 3½	105	The seed of this plot was procured from Mr. Robert Carson, of Pavillion Mountain, 3,000 ft. above sea level. It was an extra fine stand, straw standing up well and very even, with extra long heads; no smut.
Plot No. 38, Six-rowed wheat.... .	April 20..	June 25..	July 30..	do 1..	100½	41 42	2½ to 3	100	Stand even, and straw bright and stiff; heads long and well filled.
Plot No. 39, Mensury............	do 20..	do 19..	do 30.	do 1..	86	35 40	2 to 2½	100	Stands up well; did not stool, and is not an even crop; heads very uneven; a little smut.
Plot No. 40, Spiti Valley..........	do 20..	do 13..	do 24..	July 25..	54	20 24	1 to 1½	95	Seed did not germinate well, but where it did grow it stooled out well; straw was very short.

OATS.

Variety.	Sown.	Headed.	Mature.	Harvested.	Weight.	Yield per Acre.	Length of Straw.	No. of Days to Mature.	Remarks.
					Lbs.	Bush. lbs.	Feet.		
Plot No. 41, Black Tartarian	April 20..	June 15..	Aug. 21..	Aug. 22..	93	54 24	2 to 2½	123	Stands up well, but very poor stand; seed did not germinate well; no smut.
Plot No. 42, Bonanza	do 20..	July 6..	do 18..	do 19..	64	37 22	3 to 3½	120	Straw soft, and badly down when ripe; heads short and not well filled; no smut.
Plot No. 43, Canadian Triumph....	do 20..	do 10..	do 17..	do 18..	46	27 2	2½ to 3	119	Very thin stand; did not stool; heads very short; no smut.
Plot No. 44, Egyptian	do 20..	do 14..	do 20..	do 22..	80½	47 12	2 to 3½	122	Straw hard and bright, standing up well, and well headed, but very uneven in growth; no smut.
Plot No. 45, Challenge	do 20..	do 11..	do 20..	do 22..	62½	36 26	3 to 3½	122	Stands up pretty well, but a very poor stand; seed did not germinate well; no smut.
Plot No. 46, Prolific Black Tartarian	do 20..	do 15..	do 21..	do 22..	82	48 8	2½ to 3½	123	Very uneven in length of straw and head; stands up well; no smut.*
Plot No. 47, Banner........... ...	do 20..	do 11..	do 22..	do 22..	124	73 32	3½ to 4½	124	Stands up well; long, well-filled heads of plump grain; no smut.
Plot No. 48, Early Blossom........	do 20..	do 6.	do 17..	do 19..	87	51 6	3 to 5	119	Considerably broken down; straw soft; no smut.*
Plot No. 49, Early Racehorse......	do 20..	do 8..	do 16..	do 19..	90½	53 8	4½ to 5½	118	Straw long and coarse, but soft, and fell down before ripe; no smut.
Plot No. 50, Flying Scotchman ...	do 20..	do 9..	do 18..	do 19..	99	58 8	3½ to 4½	120	Did not stand up well, but well headed, and grain plump; a little smut.
Plot No. 51, Giant Swedish........	do 20..	do 16..	do 22..	do 22..	82½	48 18	3 to 3½	124	Stands up well; straw strong and bright; no smut.
Plot No. 52, White Poland	do 20..	do 8..	do 18..	do 19..	63½	37 12	2 to 4	121	Very uneven in straw and head; does not stand up well; a little smut.*
Plot No. 53, Prize Cluster.........	do 20..	do 9..	do 16..	do 19..	49	28 28	2 to 2½	118	Straw short and heads poor; no smut.
Plot No. 54, Rennie's Prize	do 20..	do 11..	do 19..	do 19..	41½	24 14	2 to 2½	121	Very poor in straw and head; seed did not germinate well; a very poor stand.*
Plot No. 55, Victoria Prize White..	do 20..	do 12..	do 21..	do 22..	44	25 30	2½ to 3½	123	Stands up well; heads short and very open; no smut.
Plot No. 56, White Russian	do 20..	do 15..	do 19..	do 19..	60	35 10	2½ to 3½	121	Straw soft; lodged when cut; heads short but compact; no smut.
Plot No. 57, Early Archangel......	do 20.	do 10..	do 18..	do 19..	73½	43 8	3½ to 4	120	Stands up well; heads long and compact, but seed did not germinate freely, and did not stool out.
Plot No. 58, Holstein Prolific......	do 20..	do 13..	do 20..	do 21..	76½	45 0	3½ to 4	123	Straw bright and hard; heads short but compact; a poor stand.*
Plot No. 59, Rosedale	do 20..	do 16..	do 18..	do 19..	95½	56 4	4 to 5	120	Straw soft, and crinkles down; heads long and compact; a poor stand.

Plot No. 60, Hazlett's Seizure	do 20..	do 10..	do 18..	do 19..	72	42	18	3½ to 4	120	Straw bright, and stands up well; did not stool out; very thin stand, but fine compact heads; no smut.*
Plot No. 61, Welcome............	do 20..	do 9..	do 17..	do 17..	66	38	28	3½ to 4	119	Straw bright and stiff, standing up well; a little smut.
Plot No. 62, American Triumph ...	do 20..	do 18..	do 17..	do 17..	67½	39	24	3 to 3½	119	Straw bright, and stands up well; no smut.
Plot No. 63, Early Gothland	do 20..	do 12..	do 15..	do 17..	50	58	28	4 to 4½	117	There was only 2 lbs. of this variety sown on half a plot, or one-fortieth of an acre. Stands up well; good, long, well-filled heads; bright, plump grain.
Plot No. 64, Golden Side	do 20..	do 18..	do 19..	do 22..	67½	39	24	3½ to 4	121	Stands up well, but heads short and not well filled out. Not a desirable oat.

EARLY AND LATE TESTS OF ONE-TWENTIETH OF AN ACRE OF WHEAT, BARLEY AND OATS.

The land for these tests had been first broken up in the fall of 1889 and cropped with grain in 1890; it was ploughed in the fall of 1890 and thoroughly harrowed in the spring of 1891, and the ground for each series of plots was carefully harrowed just before sowing.

The weather up to the third sowing had been very wet and cold, and the grain did not make much progress during that time.

Plot No. 6, in each case, was threshed from the stook, and the others had to be stacked. This accounts for much of the difference in yield in favour of Plot No. 6 of barley, wheat and oats.

Below will be found the date of each sowing, heading, maturing and harvesting, &c. :—

WHEAT.

Variety.	Sown	Headed.	Mature.	Harvested	Weight.	Yield Per acre.	Length of Straw.	No. of Days to Mature.	Remarks.
White Connell.					Lbs.	Bush.	Ft.		
Plot No. 1	April 15..	June 27..	Aug. 16..	Aug. 17..	64	21·20	3½ to 4	123	Straw strong and stands up well. Did not stool well. No smut.
do 2	do 22..	July 2..	do 20..	do 20..	60	20·00	2½ " 3½	120	Very uneven in straw and head. No smut.
do 3	do 29..	do 8..	do 22..	do 22..	49	16·20	2 " 2½	115	Very short in head and straw. A little smut.
do 4	May 6..	do 14..	do 24..	do 24..	51½	17·10	2½ " 3	110	Short in straw and head. Did not stool out. Considerable smut.
do 5	do 13..	do 17..	do 27..	do 28..	67	22·20	3 " 3½	176	Even crop. A fairly good stand. Very smutty.
do 6	do 20..	do 23..	Sept. 1..	Sept. 1..	75	25·00	3½ " 4	104	Straw soft and lodged before ripe. No smut.
Campbell's White Chaff.									
Plot No. 1	April 15..	June 29..	Aug. 10..	Aug. 12..	66½	22·10	3 to 3½	119	Straw bright and hard. Heads short but well filled out. No smut.
do 2	do 22..	July 2..	do 16..	do 17..	59½	19·50	2 " 3½	116	Stands up well, but very uneven in length of straw and head. No smut.
do 3	do 29..	do 8..	do 20..	do 20..	59½	19·50	2 " 3½	113	Very uneven in head and straw. Heads well filled. No smut.
do 4	May 6..	do 13	do 22..	do 22..	45½	15·50	2 " 2½	108	Straw short and head poor. A very thin stand. No smut.
do 5	do 13..	do 17..	do 24..	do 24..	56	18·40	3 " 3½	102	Straw medium. Heads long and well filled out. No smut.
do 6	do 20..	do 22..	do 27..	do 28..	81½	27·10	3½ " 4	99	Straw stiff and bright. Heads long and well filled out. No smut.

BARLEY.

Baxter's Six-rowed.									
Plot No. 1	April 15	June 25	July 24	July 25	50	20·40	2 to 2½	101	Stands up well. Considerable smut. Heads short.
do 2	do 22	do 28	Aug. 2	Aug. 3	54	22·24	2 " 2½	103	do More smut than Plot No. 1.
do 3	do 29	July 6	do 5	do 10	50	20·40	2 " 2½	99	Broken down by storm. No smut.
do 4	May 6	do 9	do 10	do 10	53	22·4	2 " 3	96	Very uneven in straw and head. Considerable smut
do 5	do 13	do 11	do 16	do 17	56	23·16	2½ " 3	95	Stands up well, very smutty.
do 6	do 20	do 16	do 20	do 22	68	28·16	3 " 3½	92	do Medium long heads. A little smut.
Prize Prolific Barley.									
Plot No. 1	April 15	July 2	Aug. 10	Aug. 11	56½	23·26	2 to 2½	118	Straw stiff, but crop very thin. Heads medium. No smut.
do 2	do 22	do 10	do 15	do 17	57½	23·46	2 " 3	116	Straw uneven in length, but stands up. No smut.
do 3	do 29	do 13	do 17	do 17	56	23·16	2 " 2½	111	Stands up, but a light crop. Heads medium. No smut.
do 4	May 6	do 17	do 20	do 20	55	22·44	2 " 2½	106	Very thin stand. Heads long and filled out. No smut.
do 5	do 13	do 18	do 22	do 22	70	29·8	2½ " 3	101	Stooled very well, but heads poor.
do 6	do 20	do 22	do 30	Sept. 1	75	31·12	3½ " 4	102	Straw soft and badly lodged. Stooled well, but did not fill out well. No smut.

OATS.

Prize Cluster.									
Plot No. 1	April 15	July 3	Aug. 10	Aug. 10	65½	38·18	3½ to 00	117	Stands up well. Heads short. No smut.
do 2	do 22	do 8	do 16	do 17	68	40·0	3½ " 4	116	Straw bright and stiff. Heads only medium. No smut.
do 3	do 29	do 12	do 17	do 17	64	37·22	3 " 3½	110	Did not stool out, but straw stands up well. No smut.
do 4	May 6	do 14	do 20	do 20	55½	32·22	2 " 2½	106	Heads short and stand very thin. No smut.
do 5	do 13	do 18	do 22	do 22	70	41·6	3 " 3½	101	Stands up well. Grain plump and fairly long heads. No smut.
do 6	do 20	do 23	do 27	do 29	80	47·2	3½ " 4	99	Stands up well. No smut.
American Banner.									
Plot No. 1	April 15	July 8	Aug. 12	Aug. 12	73½	43·8	3 to 3½	119	Stands up well. No smut.
do 2	do 22	do 11	do 17	do 17	81½	47·32	3 " 3½	117	Straw bright and hard. No smut.
do 3	do 29	do 14	do 20	do 20	86	50·20	3½ " 4	113	do bright and stiff. No smut.
do 4	May 6	do 18	do 22	do 22	67	39·14	2½ " 3	109	do short and stand very thin. No smut.
do 5	do 13	do 24	do 28	do 29	76	44·24	3 " 3½	107	do strong and bright. Did not stool out. No smut.
do 6	do 20	do 29	do 31	Sept. 1	112½	66·6	3½ " 4	103	do strong and bright. Stands up well. No smut

CORN.

Variety.	Planted.	Up.	Tasselled.	Early Milk.	Late Milk.	Height.	Cut.	Weight.		Remarks.
						Feet.		Tons.	Lbs.	
Blunt's Prolific	May 22	June 1	Aug. 28			14	Oct. 13			Corn did not form.
Weight in hills per acre								27	1845	
do drills do								27	1467	
Golden Dent	May 22	June 1	Aug. 29			13	Oct. 13			Ears formed, but did not come to early milk
Weight in hills per acre								24	1912½	
do drills do								23	1905	
Chester Co. Mammoth	May 22	June 4	Aug. 24			13	Oct. 13			Ears formed, but no corn; very green when cut.
Weight in hills per acre								24	601¼	
do drills do								24	464	
Virginia Horse Tooth	May 22	June 3	Aug. 26			10	Oct. 13			Ears formed; no corn; very green when cut.
Weight in hills per acre								19	1930	
do drills do								20	1937½	
Golden Beauty	May 22	June 5	Aug. 26	Roasting ears. Oct. 11		11½	Oct. 13			Ears in good roasting condition when cut.
Weight in hills per acre								23	1038¾	
do drills do								21	1367½	
Red Cob Ensilage	May 22	June 2	Aug. 22	Sept. 20	Oct. 12	10	Oct. 13			Beginning to glaze when cut.
Weight in hills per acre								22	1828¾	
do drills do								21	762½	
Mammoth Southern Sweet	May 23	June 4	Aug. 16			11	Oct. 13			Ears formed, but not to early milk; stalks slender.
Weight in hills per acre								19	417	
do drills do								18	1400	
Giant P. E. Sweet	May 23	June 4	Aug. 26			12	Oct. 13			Ears just formed; very green when cut.
Weight in hills per acre								22	131¼	
do drills do								21	927½	
Salzer's Superior Fodder	May 23	June 3	Aug. 23			11	Oct. 13			Not in early milk when cut.
Weight in hills per acre								19	1266	
do drills do								18	1537½	
King Philip	May 23	June 3	Aug. 15	Sept. 20	Oct. 10	8	Oct. 13			Good condition; corn nearly all glazed.
Weight in hills per acre								13	771¼	
do drills do								12	1877½	
Longfellow	May 23	June 4	Aug. 14	Sept. 11	Oct. 3	8	Oct. 13			Good condition; corn glazed; ears well formed, and filled out to tips.
Weight in hills per acre								12	1107½	
do drills do								11	1595½	
Long White Flint (Steele Bros).	May 23	June 3	Aug. 6	Sept. 20	Oct. 11	8½	Oct. 13			Good condition; commencing to glaze; ears large and well filled to tips.
Weight in hills per acre								15	89¾	
do drills do								14	572½	

Long Yellow Flint (Dakota)	May 23	June 4	Aug. 9	Sept. 20	Oct. 6	8½	Oct. 13			Late milk when cut; ears large, but not well filled out to tip.
Weight in hills per acre								15	1308¾	
do drills do								13	1802½	
Thoroughbred White Flint	May 23	June 4	Aug. 18			10	Oct. 13			Nearly in roasting ear when cut; stalk rather coarse.
Weight in hills per acre								20	1593¾	
do drills do								19	170	
Livingstone's Gold Coin	May 23	June 2	Aug. 26			7	Oct. 13			Very early milk when cut; not to roasting stage.
Weight in hills per acre								13	1830	
do drills do								14	352½	
Canada Yellow	May 23	June 3	Aug. 2	Sept. 18	Oct. 13	7	Oct. 13			Good condition; glazed; ears medium long and well filled out.
Weight in hills per acre								12	1107½	
do drills do								11	1952½	
Pearce's Prolific	May 23	June 4	Aug. 3	Sept. 2	Sept. 22	8	Oct. 13			Some ears ripe, remainder glazed; ears medium long and well filled to tip; one of the best.
Weight in hills per acre								12	525	
do drills do								11	1980	
Mitchell's Early	May 23	June 3	July 27	Aug. 17	Sept. 15	5½	Oct. 13			Ripe Oct. 1; ears small and not well filled out to tip.
Weight in hills per acre								7	1073¾	
do drills do								6	575	
Red Blazed	May 23	June 4	July 27	Aug. 19	Oct. 1	7½	Oct. 13			Ripe Oct. 13; ears medium long, well filled to tip; several vacant spots, where trees had been taken out the previous fall.
Weight in hills per acre								9	1360	
do drills do								8	197½	
White Flint (from Dakota)	May 23	June 3	July 28	Sept. 11	Oct. 11	5	Oct. 13			Corn short and stalks slender; ears very small.
Weight in hills per acre								4	1326¼	
do drills do								4	1460	
Yellow Flint (from Dakota)	May 23	June 3	July 27	Sept. 4	Oct. 6	5½	Oct. 13			Glazed; ears medium and well filled.
Weight in hills per acre								10	570	
do drills do								7	272½	
North Dakota	May 23	June 4	July 30	Sept. 8	Oct. 8	6	Oct. 13			Glazed; ears medium; well filled out to tips.
Weight in hills per acre								10	1175	
do drills do								7	1042½	
Dakota Gold Coin	May 23	June 3	Aug. 6	Sept. 17		6½	Oct. 13			Roasting ears when cut; ears medium large, but not very well filled out to tips.
Weight in hills per acre								11	1897½	
do drills do								11	110	
Large Eight-rowed	May 23	June 7	Aug. 3	Sept. 27		8	Oct. 13			Roasting ears when cut; ears short but thick, and well filled.
Weight in hills per acre								19	115	
do drills do								18	190	
Egyptian	May 23	June 6	Aug. 11	Oct. 1		10	Oct. 13			Large, well-formed ears, but not good roasting ears when cut.
Weight in hills per acre								19	115	
do drills do								17	1860	
Extra Early Cory	May 23	June 8	July 14	Aug. 7	Aug. 27	4½	Oct. 13			Good roasting ears Aug. 10; ears well filled to tip.
Weight in hills per acre								4	772½	
do drills do								4	1157½	
Pee and Kay	May 25	June 5	Aug. 4	Sept. 4	Oct. 4	10½	Oct. 13			Roasting ears when cut; did not germinate well.
Weight in hills per acre								10	1628¾	
do drills do								11	1650	
Early Mammoth	May 25	June 5	Aug. 11	Sept. 22		10½	Oct. 13			Roasting ears when cut; stalks slender; ears good size, but not well filled to tips.
Weight in hills per acre								16	972½	
do drills do								14	902½	
Asylum	May 25	June 8	Aug. 9	Sept. 1	Sept. 24	11½	Oct. 13			Glazed Oct. 4; ears long and well filled.
Weight in hills per acre								17	1846½	
do drills do								15	1212½	

Variety.	Planted.	Up.	Tasselled.	Early Milk.	Late Milk.	Height.	Cut.	Weight.		Remarks.
						Feet.		Tons.	Lbs.	
Potter's Excelsior	May 25	June 8	Aug. 17	Sept. 20	Roasting, Oct. 1	12	Oct. 13			Nearly glazed when cut; ears medium and fairly well filled out to tip.
Weight in hills per acre								19	1325	
do drills do								20	1580	
White Flint (Dakota)	May 25	June 8	July 25	Aug. 29	Sept. 29	7	Oct. 13			Glazed when cut; ears medium long, but slender; not well filled to tip.
Weight in hills per acre								10	570	
do drills do								9	1360	
Stowell's Evergreen	May 25	June 10	Aug. 17	Sept. 30	Roasting, Oct. 12	$13\frac{1}{2}$	Oct. 13			Roasting ear when cut; ears large and fair length, but poorly filled.
Weight in hills per acre								23	1975	
do drills do								20	480	
Cinquantine										Did not germinate.

CORN.

This has been a very favourable season for corn; there was sufficient moisture, and more than the usual amount of summer heat. There were thirty-three varieties tested, both in hills and drills. The hills were planted 3 feet apart each way, and four plants to a hill; the drills were 3 feet apart, and the plants about 6 inches apart in the row. All made a strong growth, except the Cinquantine, which did not germinate. Quite a number of the early varieties ripened corn. This was the second crop on the land, and all were treated alike—clean cultivation, without any fertilizer. The corn that was glazed was husked, and kept for chicken feed, but was too much mixed to be of use for seed.

Above is the weight of each variety, with other particulars as to date of planting, tasselling, &c.

PEASE AND TARES.

One variety of tares and five of field pease have been tested. Six pounds of seed of each variety were sown. All were sown broadcast. Soil, gravelly loam; first broken fall of 1889; produced a crop of roots in 1890. The yield, as will be seen, is an extraordinary one. The area sown, date of sowing and yield is as follows:—

Variety.	When Sown.	No. of Lbs. Sown.	Rate per Acre Sown.	Area Sown.	Harvested.	Yield.	Yield per Acre.		No. of Days to Mature.
			Lbs.	Acres.		Lbs.	Bush.	lbs.	
White tares	April 28....	6	90	$\frac{1}{15}$	August 28..	282	70	30	140
Crown pease........	do 28....	6	150	$\frac{1}{25}$	do 20..	279	116	15	132
Prussian Blue.......	do 28....	6	150	$\frac{1}{25}$	do 20..	269½	112	17½	132
Mummy.......	do 28....	6	150	$\frac{1}{25}$	do 28..	309¼	128	51¼	140
Prince Albert.	do 28....	6	150	$\frac{1}{25}$	do 20..	277	115	25	132
White Marrowfat....	do 28....	6	180	$\frac{1}{30}$	do 21..	210	105	00	133

LATHYRUS SYLVESTRIS WAGNERI.

One hundred plants of this new fodder plant were received and planted in the fall of 1890. Only about 60 plants lived through the winter, owing to the heaving of the ground, but these made a strong, vigorous growth and fruited this year, and the plants being now thoroughly rooted are not likely to suffer from frost this winter. Owing to the scarcity of the plant and seed, it was thought best to leave ours to mature the seed, and we have now about 20 ounces of seed.

The straw was still green and succulent when the seed was harvested, and we cut it and offered some to our cattle and horses, but they would not eat it, and we were unable to cure it owing to continued rainy weather. Next year it is proposed to try it in a silo. If it makes good ensilage it will be valuable on account of the large quantity which can be taken off the land. The vines this year averaged from 4 to 6½ feet in length.

TURNIPS.

Fourteen varieties of turnips were sown, two sowings of each sort being made, the first on 29th May and the second on 12th June. The soil was a sandy loam, which had been seeded to timothy many years since, but was grown up to brush and weeds. Ploughed in the fall of 1889 and cropped in 1890; ploughed again in the fall of 1890, and thoroughly harrowed before seeding last spring. This land has had no manure. The turnips were sown in drills 30 inches apart and kept clean, all being treated alike. There were no extra large roots, but a fair average size over all, and uniformly smooth. The following is the result in each case:—

Variety.	Sown.	Harvested.	Weight per Acre.		Yield per Acre.	
			Tons.	lbs.	Bush.	lbs.
Highland Prize (Simmers)	May 29	Nov. 11	32	1,002	1,083	22
	June 12	do 11	28	1,684	961	24
Hartley's Bronze Top (Pearce)	May 29	do 11	26	96	868	16
	June 12	do 11	20	975	682	55
Elephant (Bruce)	May 29	do 11	35	400	1,173	20
	June 12	do 11	26	1,592	893	12
Elephant (Pearce)	May 29	do 11	36	512	1,208	32
	June 12	do 11	26	1,328	888	48
Selected Purple Top (Steele)	May 29	do 11	48	448	1,607	28
	June 12	do 11	35	400	1,173	20
Clyde Improved (Evans)	May 29	do 11	38	1,616	1,293	36
	June 12	do 11	28	788	946	28
Imperial Swede (Webb)	May 29	do 11	36	600	1,210	00
	June 12	do 11	26	624	877	04
Giant King (Webb)	May 29	do 11	32	1,064	1,084	24
	June 12	do 11	27	472	907	52
Mammoth Purple Top (Evans)	May 29	do 11	49	1,440	1,657	20
	June 12	do 11	34	992	1,149	52
Elephant (Steele)	May 29	do 11	35	1,623	1,193	43
	June 12	do 11	33	1,854	1,130	54
Marquis of Lorne (Bruce)	May 29	do 12	34	1,784	1,163	04
	June 12	do 12	32	1,208	1,086	48
Skirving's Improved (Steele	May 29	do 12	36	1,128	1,218	48
	June 12	do 12	30	1,072	1,017	52
Prize Purple Top (Rennie)	May 29	do 12	40	1,136	1,352	16
	June 12	do 12	30	1,424	1,023	44
Bangholm (Simmers)	May 29	do 12	33	704	1,111	44
	June 12	do 13	29	1,840	997	20

These weights show a marked difference in each case in favour of early sowing.

MANGELS.

Fourteen varieties of mangels were sown, in drills $2\frac{1}{2}$ feet apart. The land selected for this test was a sandy loam of uniform quality and condition. It received a light dressing of stable manure in the spring of 1890, followed by a hoed crop. Was ploughed in the fall of 1890, and well harrowed previous to sowing last spring. All were treated alike in every respect.

A second sowing of each variety was made two weeks after the first.

Although there was a short drought in mid-summer, yet the season was a favourable one for root crops.

The results in this case indicate that for this season, although the crop was heavy, the first sowing was too early. It is probable that the cold, wet weather of early spring injured the seed first sown.

Variety.	Sown.	Harvested.	Weight per Acre.		Yield per Acre.	
			Tons.	lbs.	Bush.	lbs.
Long Red (Steele)	April 9	Nov. 13	45	1,232	1,520	32
	do 23	do 13	48	1,328	1,622	08
Long Red (Simmers)	do 9	do 13	45	904	1,515	04
	do 23	do 13	50	1,376	1,689	36
Yellow Intermediate (Steele)	do 9	do 13	39	1,200	1,320	00
	do 23	do 13	37	976	1,249	36
Canadian Giant (Pearce)	do 9	do 13	43	196	1,436	36
	do 23	do 13	50	276	1,671	16
Long Red (Rennie)	do 9	do 13	49	208	1,636	48
	do 23	do 13	52	720	1,745	20
New Giant Yellow (Bruce)	do 9	do 13	31	900	1,048	20
	do 23	do 13	26	800	880	00
Gate Post (Bruce)	do 9	do 14	51	960	1,716	00
	do 23	do 14	57	1,632	1,927	12
Carter's Warden (Bruce)	do 9	do 14	48	800	1,613	20
	do 23	do 14	44	1,408	1,490	8
Yellow Globe (Rennie)	do 9	do 14	69	862	2,314	22
	do 23	do 14	61	144	2,035	44
Golden Tankard (Evans)	do 17	do 14	52	1,776	1,762	56
	do 29	do 14	52	1,248	1,754	18
Mammoth Long Red (Evans)	do 17	do 14	51	1,488	1,724	48
	do 29	do 14	52	896	1,748	16
Mammoth Long Red (Webb)	May 8	do 14	61	232	2,037	12
	do 22	do 14	55	1,954	1,865	54
Champion Yellow Globe (Webb)	do 8	do 14	56	376	1,872	56
	do 20	do 14	48	1,264	1,617	44
Yellow Tankard (Webb)	do 11	do 14	41	16	1,366	56
	do 25	do 14	38	566	1,276	00

CARROTS.

Fourteen varieties of carrots were sown. Two sowings of these were made in rows 1 foot 6 inches apart. Soil a sandy loam; manured in the spring of 1890 and produced a crop of potatoes. Was ploughed in the fall of 1890 and thoroughly harrowed last spring before the carrots were sown. The soil and treatment was the same in each case.

The yield of each variety is given below.

Variety.	Sown.	Harvested.	Weight per Acre.		Yield per Acre.	
			Tons.	lbs.	Bush.	lbs.
Vosges (Bruce)	April 9	Nov. 16	26	1,093	884	53
	do 23	do 16	16	1,146	552	26
Vosges (Simmers)	do 9	do 16	22	1,906	765	6
	do 23	do 16	18	1,693	628	13
Vosges (Rennie)	do 9	do 16	31	513	1,041	53
	do 23	do 16	21	1,266	721	6
Guerande (Steele)	do 9	do 16	30	1,560	1,026	00
	do 23	do 16	26	213	870	13
Guerande (Rennie)	do 9	do 16	26	1,386	889	46
	do 23	do 16	21	240	704	00
Improved Short White (Steele)	do 9	do 16	18	746	612	26
	do 23	do 16	19	1,306	655	6
Half Long Luc (Rennie)	do 9	do 16	15	1,808	530	8
	do 23	do 16	10	1,706	381	46
Green Top Orthe (Pearce)	do 9	do 16	20	1,213	686	53
	do 23	do 16	20	40	666	40

CARROTS—*Concluded.*

Variety	Sown.	Harvested.	Weight per Acre.		Yield per Acre.	
			Tons.	lbs.	Bush.	lbs.
Chantenay (Bruce)	April 9	Nov. 16	25	1,773	862	53
	do 23	do 16	15	1,533	525	33
White Intermediate (Rennie)	do 9	do 16	19	133	635	33
	do 23	do 16	20	1,800	696	40
James Intermediate (Pearce)	do 9	do 16	22	440	740	40
	do 23	do 16	15	506	508	26
Mitchell's Perfected (Pearce)	do 9	do 16	14	1,920	498	40
	do 23	do 16	15	1,385	556	25
Selected Altringham (Webb)	do 9	do 16	24	722	812	2
	do 23	do 16	16	256	537	36
Yellow Intermediate (Webb)	do 9	do 16	27	333	905	33
	do 23	do 16	20	1,444	690	44

In these also, with two or three exceptions, the results are largely in favour of early sowing.

SUGAR BEETS.

Owing to the season being well advanced when the seed was received only one sowing was made. It was sown in rows 2½ feet apart and the plants thinned to about 5 inches in the row. The soil was a gravelly loam. The land was broken up in the fall of 1889 and planted with fodder corn in 1890, but has not had any manure. Yield per 3 rows of 66 feet:—

	Lbs.
German	455
French	515

Yield per acre:—

	Tons.	Lbs.	Bush.	Lbs.
German	19	1,640	660	40
French	22	320	755	20

The difference in yield may, perhaps, be accounted for by the French beets having been sown alongside of a row of apple trees which had received a light dressing of burned clay and ashes in the fall of 1890.

POTATOES.

There were 23 varieties of potatoes planted for testing.

The seed was cut to two eyes to the set and planted 1 foot apart in the row, and rows 3 feet apart. Two rows 90 feet long of each variety were planted. The soil, a dry sandy loam, had produced a crop of beans in 1890, and had received a light dressing of manure in the fall after the bean crop was harvested, which was thoroughly worked into the land with the disc and drag harrows.

The potatoes were planted 25th May. Each variety was tested from time to time, beginning 28th July, and the size and quality noted; also the percentage of merchantable potatoes and of rotten, if any.

Sixty-six feet of two rows of each variety was dug from 17th to 24th October, and the produce weighed. Below will be found the weight of sound and rotten potatoes of each variety; also the percentage of merchantable potatoes at each digging for testing purposes, as well as at the final digging, with note of table qualities of each variety.

POTATOES.

Variety.	Planted.	Mature.	Harvested.	Sound Tubers.	Rotten Tubers.	Total.	Yield per Acre. Bush.	Yield per Acre. lbs.	Per cent Marketable at each Test.	Rotten.	Remarks.
				Lbs.	Lbs.	Lbs.	Bush.	lbs.		p. c.	
Vanguard	May 25	Sept. 14	Oct. 16	68	82½	150½	275	55	50	......	Medium growth of tops; large tubers; very rough and knotty, and uneven in size.
									40	......	First test, 28th July; soft and watery; rough and uneven.
									40	5	Second test, 5th August; quality, poor.
									40	10	Third test, 19th August; quality better, but not good.
											Fourth test, 22nd December; wet and soft when cooked; a good many rotted since digging.
Rural Blush	May 25	Sept. 20	Oct. 16	170	35	205	375	50	75	......	Strong growth of tops; tubers of a large average size; 75 per cent marketable at digging.
									50	......	First test, 3rd August; too soft for table use.
									60	......	Second test, 17th August; good average size; quality, poor.
									70	......	Third test, 29th August; large average size; dry and fairly good for table, but many hollow in heart.
											Fourth test, 19th December; quality not as good as before digging; many turning black in centre; 25 per cent rotted since digging.
White Star	May 25	Sept. 24	Oct. 16	127	51	178	326	20	45	......	Medium growth of tops; tubers very knotty and uneven in size.
									25	......	First test, 8th August; flavour good, but rather soft and immature; size, medium to small.
									35	......	Second test, 24th August; improving in size and quality.
									45	25	Third test, 31st August; quality fair, but undesirable on account of rough, knotty shape.
											Fourth test, 20th December; quality, poor; a good many rotten.
Clarke's No. 1	May 25	Sept. 19	Oct. 16	141	38	179	328	10	90	......	Medium growth of tops.
									25	......	First test, 8th August; quality, poor; size, small to medium.
									30	......	Second test, 21st August; improving in size and quality.
									80	15	Third test, 2nd September; average size; dry and mealy; good flavour.
										25	Fourth test, 21st December; medium in quality; rotting since digging.
Early Maine	May 25	Aug. 30	Oct. 16	78½	45	123½	234	40	70	......	Medium growth of tops; tubers fair average size, but shape rough and knotty.
									20	......	First test, 28th July; too green and soft for table use; size, small average.
									35	2	Second test, 17th August; quality, fair; size, fair average.
									60	3	Third test, 2nd September; quality, good; boiled dry and mealy; fair average size.
											Fourth test, 27th December; good quality; dry and mealy when cooked; good flavour.

Variety.	Planted.	Mature.	Harvested.	Sound Tubers.	Rotten Tubers.	Total.	Yield per Acre.		Per cent Market-able at each Test.	Rotten.	Remarks.
				Lbs.	Lbs.	Lbs.	Bush.	lbs.		p. c.	
Halton Seedling.....	May 25	Sept. 4	Oct. 16	136¾	47¼	184	337	20	70	......	Growth of tops medium strong; tubers fair average size and good shape.
									35	......	First test, 3rd August; good average size; smooth tubers; when cooked, pretty dry.
									50	2	Second test, 21st August; good average size; dry and mealy.
									55	3	Third test, 2nd September; good average size; good flavour; cooked dry and mealy.
											Fourth test, 21st December; cooked dry and mealy; keeping well.
London............	May 25	Aug. 23	Oct. 16	106¼	47¾	154	282	20	50	......	Feeble growth of tops; smooth, even-shaped potatoes.
									35	......	First test, 4th August; medium size and very even; cooked dry and mealy.
									40	.....	Second test, 18th August; smooth, even tuber, and of average size; cooked dry.
											Third test, 4th September; fair average size; cooked dry.
											Fourth test, 22nd December; good table potato; keeping well.
Algoma	May 25	Sept. 15	Oct. 16	144	56¾	170¾	312	72	75	......	Growth fair; medium tops.
									35	......	First test, 11th August; poor flavour; very uneven in size.
									40	2	Second test, 20th August; very uneven in size; poor flavour.
									50	7	Third test, 14th September; not a desirable potato; flavour poor; does not cook dry; large tubers, hollow in the heart.
										25	Fourth test, 4th December; rotting rapidly at this date, and does not cook dry; a very poor potato.
Ohio Gunner........	May 25	Sept. 1	Oct. 20	43¼	40¾	84	154	..	40	......	Weak growth of tops; size, from large to very small; the large tubers are frequently hollow hearted.
									20	.....	First test, 6th August; good flavour and pretty dry.
									25	...	Second test, 20th August; good flavour and dry, but very uneven in size.
									30	3	Third test, 13th September; dry and mealy; good flavour.
											Fourth test, 10th December; very good.
Lee's Favourite.	May 25	Sept. 10	Oct. 20	133¼	45¼	183½	336	25	75	.....	Tubers, medium to large; fair growth of tops.
									60	1	First test, 2nd August; large average size; cooked dry and floury; good flavour.
									65	3	Second test, 21st August; medium to large; good flavour; dry and floury.
									75	4	Third test, 2nd October; large, good quality.
											Fourth test, 12th December; good; keeping well.
Delaware...........	May 25	Sept. 25	Oct. 20	140	88½	228½	427	15	80	......	Strong growth of tops, and even.
									30	......	First test, 7th August; tubers, small to medium, and numerous not dry or of good flavour.

									50	3	Second test, 22nd August; improving in size, but not in quality; commencing to rot.
									60	10	Third test, 15th September; not good in quality.
										25	Fourth test, December; not dry or mealy, and poor in flavour; rotting rapidly.
Rose's New Giant...	May 25	Sept. 27	Oct. 20	138½	52¾	191¼	350	37½	80	.....	Strong growth of tops; tubers very uneven, rough and knotty.
									50	1	First test, 6th August; not dry; poor in quality.
									50	3	Second test, 23rd August; tubers large and soft; poor in quality.
									60	5	Third test, 20th Sept.; tubers large, rough and knotty; quality, poor.
										10	Fourth test, 31st December; cooked dry, but inferior in flavour.
Early Eating........	May 25	Sept. 20	Oct. 20	197¾	33	230¾	423	2½	85	....	Growth of tops, fair; tubers medium in size and a large number in the hill.
									40	.....	First test, 8th August; tubers small to medium; not dry when cooked, but good flavour.
									60	1	Second test, 30th August; improving in size and dryer when cooked
									75	....	Third test, 23rd September; medium in size, but very uniform; dry and floury when cooked and good flavour.
											Fourth test, 25th December; a good potato.
Thorburn...........	May 25	Sept. 27	Oct. 20	187½	30½	218	399	40	90	.....	Nearly all large and smooth; fair growth of tops.
									75	1	First test, 9th August; large average; smooth, fine-looking potato, but does not cook dry.
									80	2	Second test, 24th August; large, smooth, but not dry; poor flavour.
									85	5	Third test, 17th September; large, smooth, fine-looking potato; poor for table.
											Fourth test, 3rd December; not good; large number rotten.
Early Rose........	May 25	Sept. 7	Oct. 20	174	30¼	214¼	374	27½	90	......	Fair growth of tops.
									60	......	First test, 2nd August; dry and mealy; large average in size.
									75	1	Second test, 25th August; dry and mealy; good flavour.
											Third test, 22nd October; dry and good flavour; large, smooth potato.
											Fourth test, 19th December; keeping well.
Early Puritan	May 25	Sept. 20	Oct. 20	100¼	23¾	122	223	40	80	....	Strong growth of tops; fair average size; even, smooth potato.
									60	.....	First test, 8th August; fair size; very few; too small for table; dry and good flavour.
									75	......	Second test, 26th August; fair size; dry and good flavour.
											Third test, 4th December; good flavour; dry when cooked; keeping well.
Chicago Market.....	May 25	Sept. 27	Oct. 21	95	9½	104½	191	35	75	......	Growth of tops, fair.
									60	....,	First test, 9th August; few in a hill, but even in size and smooth; quality, fair.
									60	...	Second test, 24th August; large average in size; flavour good, but not dry when cooked.
									75	1.	Third test, 27th October; good average size; flavour good; quality, fair.
											Fourth test, 26th December; good size; quality, good,
Empire State..	do 25	do 20	do 21	169	24	193	353	50	85	....	Vigorous growth of tops.
									25	2	First test, 11th August; tubers small to medium; not a good potato,
									35	8	Second test, 21st August; improving in size and quality.
									60	20	Third test, 31st August; quality fair; flavour medium.
										20	Fourth test, 25th November; fairly good, but rotting.

Variety.	Planted.	Mature.	Harvested.	Sound Tubers.	Rotten Tubers.	Total.	Yield Per Acre.		Per cent Marketable at each Test.	Rotten.	Remarks.
				Lbs.	Lbs.	Lbs.	Bush.	Lbs.		p. c.	
Brownell's Winner..	May 25	Sept. 23	Oct. 21	97	50½	147½	270	25	60	....	Vigorous growth of tops.
									30	2	First test, 10th August; tubers small to medium; quality poor.
									35	5	Second test, 27th August do do do
									50	......	Third test, 1st October; small average size; quality poor.
											Fourth test, 29th December; quality poor.
Rochester Favourite. In row, 66 ft.; seed given by Mr. F. Passingham, of Agassiz.	do 25	do 26	do 21	120	13	133½	244	45	85	......	Vigorous growth of tops.
									70	....	First test, 30th July; too young to be dry, but quality fair; size small to medium.
									75	......	Second test, 19th August; improving in size and quality.
									75	2	Third test, 31st August; large to medium in size; flavour good, but not dry when cooked; the large tubers very rough and knotty.
											Fourth test, 7th January; quality good; keeping very well.
Green Mountain.... 1 row, 66 ft.; seed given by Mr. F. Passingham, of Agassiz.	do 25	do 27	do 21	120	34	154	282	20	80	.....	Fair growth of tops.
									30	1	First test, 18th August; small to medium in size; cooks dry and floury; good flavour.
									75	......	Second test, 1st September; dry and mealy; good flavour; improving in size.
									80	....	Third test, 25th September; improving in size; smooth; fine cooking potato.
											Fourth test, 30th November; a good potato.
Ohio Gunner.. .... 1 row, 66 ft.; seed given by Mr. F. Passingham, of Agassiz.	do 25	....	....	27¼	3½	30¾	120	5	75	....	Fair growth of tops; size of tubers, large to medium small.
									30	....	First test, 1st August; medium in quality; not very dry.
									50	......	Second test, 3rd September; quality fair; not very dry.
									60	.....	Third test, 8th October; improving; medium in flavour.
											Fourth test, 1st December; fairly good.
Lee's Favourite..... From Judge Porter, Quebec.	do 25	Sept. 10	do 21	40	6½	46½	170	30	85	....	Fair growth of tops; tubers medium to large.
									50	1	First test, 3rd August; fair average size; dry and floury when cooked.
									60	2	Second test, 22nd August; size medium; quality good.
									75	2	Third test, 1st October; good quality; dry, and good flavour.
											Fourth test, 10th December; good potato; keeping well.

FRUIT TREES.

Apples.

When the report for 1890 was issued there were 97 varieties of apples and 321 trees on the experimental farm. Since then two have been destroyed by cattle and five have died from other causes. The remaining 314 have made a strong vigorous growth. From the Central Experimental Farm and other sources there have been added to the list 79 varieties of standard apples, and four of crabs, making a total of 176 varieties of standard apples, and 10 varieties of crabs, in all 582 apple trees at present growing on the farm. A few of these have been received this fall; the greater part were received and planted last spring, and like those planted the previous year, have made a strong, healthy growth.

The following is a list of those received this year:—

Hominy,
Summer Queen,
American Summer Pearmain,
Carter's Blue,
Ortley,
Buckingham,
Red Winter Pearmain,
Bradford's Best,
Winesap,
Missouri Pippin,
Paradise Sweet,
Huntsman's Favourite,
Southern Limbertwig,
Shirley,
Lincoln,
Bledsoe,
Loy,
Steward,
York Imperial,
Yate (crab),
Martha (crab),
Bieloe Naliv (Solovieff),
Skrisch (Grell),
Putim (Tchernigov),
Extra (Solovieff),
Borovinka (Solovieff),
Golden Stone (Niemitz),
Gruschevka (Solovieff),
Gremuch,
Skvosnina (G.ell),
Gul Pembe,
Lebedka,
Plikanoff,
Borodovka,
Niemitz,
Steklianka,
Kara Synap, B.
Paperovka,
Dvinnœ,
Sklanka.
Skrut (Grell),
Sara Synap.
Jacob Sweet,
Whenercy's Late Red,
Glowing Coal,
Scarlet Cranberry,
Ruby Gem,
Ivanhoe,
Turnbull Sweet,
Munson's Sweet,
Danver's Sweet,
Maverick's Sweet,
Nickajack,
Arkansas Black,
Lowell,
Benoni,
Dominie,
Flory Bellefleur,
Forest,
Willow Twig,
Carlough,
Van Wycke (crab),
Gideon (crab),
Plodovitka, (Solovieff),
Hara Synap, A.,
Arkad (Grell),
Titovka Koslov,
Koritchnevoe,
Somnitelnoe,
Plodovitka (Koslov),
Miron (Grell),
Stone Antonovka (Tchernigov),
Russian Tyrol,
Arkad (Solovieff),
Zolotoreff,
Titovka (Solovieff),
Lapough (Koslov),
Naliv, Ausjutin,
Chelebi (Niemetz),
Miron (Solovieff),
Aport (Grell),
Borovinka (Koslov),
Plodovitka (Solovieff),

Pears.

One standard pear tree died since my last report; all others, both standard and dwarf, have made a vigorous growth.

This year there were received 69 standard and 28 dwarf pear trees; a number of the standards are of varieties already planted in the pear orchard, but these are for testing on the bench lands, where they will be planted as soon as spring opens.

The collection of standard pears consists now of 54 varieties and 248 trees, and dwarf pears of 22 varieties and 66 trees.

Plums and Prunes.

All the plum trees mentioned in my report of last year are alive, and have made a very vigorous growth, and two trees, one each of the Damson and Moore's Arctic, fruited this year, and if no unfavourable conditions arise, there is likely to be quite a crop of plums next season.

There has been added to this orchard a number of new varieties, among them, four of the newly introduced Japanese plums. The collection now comprises 188 trees and 68 varieties.

The following are those received this year:—

Lone Star,	Transparent,
Wooten,	Quaker,
Forest Garden,	Golden Beauty,
Wayland,	Wild Goose,
Deep Creek,	Mariana,
De Soto,	Robinson,
Pottawattamie,	Garfield,
Yosobe,	Hattankio,
Shiro Smomo,	Clyman.

Cherries.

Since my last report three cherry trees have died. All others have made a strong healthy growth. The Elton, Yellow Spanish, Montmorency and Willamette produced a few cherries each. The robins did not allow them to remain long enough on the trees to ripen. An effort will be made to protect the fruit next year. Ten trees, 2 each of 5 varieties, have been added to the collection of cherry trees this year. There are now 46 varieties and 144 trees.

The new varieties are: Luelling, Belle de Choisy, Centennial, Ohio Beauty and Belle Magnifique.

FRUIT TREES PLANTED ON THE BENCH.

Figs, peaches, apricots, nectarines, grapes and cherries planted on the bench land, have made very satisfactory progress.

The Japanese orange was frozen to the snow line in February, but it threw out shoots from the ground, and has made a fair growth during the past season.

The peach trees were in bloom, from five to seven days earlier on the bench land than the same varieties planted in the valley, and were not affected by the cold wave in the beginning of May, which blighted the fruit prospects of peach trees in the valley.

Notes have been kept of the curl leaf, in 1890 and 1891, on the peaches, and nectarines, both in the valley, and on the bench. It has not been very severe in either place.

Below is a list of the varieties that have been free from curled leaf in both years, on the bench and in the valley. Many sorts were only slightly affected—from 5 to 10 per cent of the leaves. Several varieties were only slightly affected in one place, but not in the other. These are noted, as well as some that were healthy, but were not planted in both localities.

Variety.	Free in the Valley.	Free on the Bench.
	Year.	Year.
Foster	1890 and 1891	1890 and 1891
Early Crawford	do do	do do
Schumaker	do do	do do
Coolidge's Favourite	do do	do do
Stump	*do do	do do
Surprise Melocoton	do do	None planted on bench.
Malta	do do	do do
Alexander	do do	1890 and *1891
Early Barnard	do do	*1890 do
Lemon	do do	1890 do

*Slightly curled.

Peaches.

The peaches have done extra well this year. Only one tree died, and each one living has made a strong, healthy growth, and with a favourable season in 1892 we expect most of those planted in 1890 to fruit.

There have been 31 varieties, 205 trees, added to our collection of peaches, making 116 varieties and 412 trees.

In an account of trees planted on the bench will be found a list of the peach trees affected by curl leaf. The attack was not so severe this summer, either on the bench or in the valley, as in 1890.

Below is a list of the names of the new peaches:—

Chinese Cling,
William's Favourite,
Miss Lolo,
Mamie Ross,
Bishop,
Eldred,
Minnie,
Amelia,
June Rose,
Family Favourite,
Jennie Worthen,
Gen. Taylor,
Gen. Lee,
Sylphide,
Bequett Cling,
Orange Cling
Columbia,
Scruggs,
Gaylord,
Crothers,
Walker,
Infant Wonder,
Levys Late,
Husted's Early.
Williamson's Choice,
Early Charlotte,
Mrs. Brett,
Gov. Briggs.
Old Mixon, Cling,
Bequett Free,
Onderdonk,

The peach trees, Mountain Rose, Hilborn, Wager, Foster and Waterloo, blossomed and bore fruit. In most cases not more than two peaches were allowed to mature.

The following is the order of their ripening:—Hilborn, 12th August; Waterloo, 25th August; Mountain Rose, 31st August; Foster, 1st September.

Nectarines.

No new varieties of nectarines have been added to the collection this season. There are now in the orchard 12 varieties and 26 strong, healthy trees. Downton and Early Violet were entirely free from curl leaf; all the others were affected a little, but it did not appear to injure them for all have since made a vigorous growth.

Apricots.

The soil and climate at Agassiz appear to be very suitable for a healthy growth of this tree. All those planted have done remarkably well.

A severe wind storm struck the apricot orchard on 23rd July, breaking two very promising trees off at the ground, entirely destroying them. This is the only loss which has yet occurred in this fruit. Two varieties have been added to the orchard during the past season, making 45 trees and 19 varieties in all. Myers Early and Eureka are the newly-added sorts.

Quinces.

The quinces have made a healthy growth. No new varieties have been added this year, and none have died. There are now on the farm 6 varieties and 13 trees.

FIGS.

The two varieties of figs reported on last year have made an extra fine growth this season. The frost of last February did not injure even the terminal buds. In the spring two each of the following varieties were planted and have done well:—

Angelique,	Brown Ischia,
Castle Kennedy,	Col. Signora de Bianca.

This fall the following varieties have been received. They are "heeled in" and will be planted in the spring:—

Adriatic,	Black California,
Blue Celestial,	Marseilles,

San Pedro.

making a total of 22 trees and 11 varieties.

The following other new fruits have been received and "heeled in," ready for spring planting:—

Pomegranate—2 Spanish Ruby.
Citrus Trifoliata—2 Hardy Orange.
Dwarf Juneberry—6 Success.
Japanese Persimmons, 2 each of the following sorts:—Daidai Maru, Hachija, Hyakume, Kurokume, Tane Nashi, or seedless; Yedoichi, Yemon, Zin Ji Maru.

GRAPE VINES.

All of the grape vines planted are alive, and almost all have made a healthy growth. There are now on the farm 224 vines of 85 varieties. The following varieties have been added this year:—2 Clinton, crossed with Muscat Hamburgh; 1 Abyssinia (Haskins); 1 Seedling No. 1, crossed with Muscat Hamburgh; 2 Improved Wild Grape (Gibb); 2 Janesville.

STRAWBERRIES.

The plot chosen for the small fruits, when there is long-continued heavy rains, receives a considerable quantity of water from the mountain, and when the frost came in February last the land was so full of water that it heaved very badly, and the strawberries and other small fruits which had been set out in the fall of 1890 were thrown out of the ground and many of them killed.

Those alive this fall are well-rooted, vigorous plants, and will furnish material for a new plantation, which will be made next summer.

The following is a list of those planted, the number of each kind, and the number alive in May:—

Variety.	Planted.	Alive.	Variety.	Planted.	Alive.
May King	200	51	Pine Apple	100	13
Hathaway	200	64	Captain Jack	200	46
Black Giant	200	28	Wilson	200	98
Bubach	200	98	Sharpless	200	61
Seneca Queen	200	73	Norman	200	10
Manchester	200	106	Itaska	200	42
James Vick	200	124	New Dominion	200	30
Woodruff	200	43	Jessie	200	23
Jumbo	200	54	Warfield No. 2	100	5
Emerald	200	91	Haverland	100	0
Chas. Downing	200	96	Connecticut Queen	200	51
Photo	200	9	Prince of Berries	100	15
Cumberland Triumph	200	28	Osceola	100	16
Windsor Chief	200	29	Old Ironclad	200	25
Atlantic	200	91	Crescent	200	40
Wonderful	200	72	Mary Fletcher	200	54
Maggie	200	21	Jersey Queen	100	45
Belmont	100	4	Green Prolific	100	1
Bordelaise	100	11	Mrs. Garfield	200	81
Gandy	100	9			

RASPBERRIES.

The following list comprises the raspberries now growing on the Experimental Farm, showing the number planted in 1890 and alive in 1891. Most of these have since made vigorous growth and are expected to fruit well next season:—

Variety.	Planted.	Alive in May, 1891.	Variety.	Planted.	Alive in May, 1891.
Cuthbert	136	48	Brinckle's Orange	34	12
Marlboro'	34	18	Souhegan	34	1
Turner	34	17	Golden Queen	68	39
Caroline	34	30	Shaffer's Colossal	68	7
Brandywine	34	27	Mammoth Cluster	34	7
Hebner	34	29	Clark	34	10
Saunders' Seedlings, 6 varieties	33	23	Hornet	34	10
Hansell	34	26	Franconia	21	2
Gregg	34	12	H. R. Antwerp	34	2

The following have been received this fall and will be planted in the spring, making in all 33 varieties of red raspberries and black caps:—

Variety.	Number.	Variety.	Number.
Kansas Black Cap	12	Jackson's May King	12
Older	12	Palmer	12
Lovett	12	Ada	12
Thompson's Early Prolific	12	Cromwell	13
Smith's Prolific	12	Progress	12

BLACKBERRIES.

Like the strawberries, these suffered considerably last winter from heaving out, and those not killed were so feeble that but few made a vigorous growth.

Variety.	Planted.	Alive 9th May.	Variety.	Planted.	Alive 9th May.
Snyder	26	23	Wilson Jr.	204	94
Agawam	26	24	Wilson's Early	168	54
Taylor's Prolific	16	14	Lawton	68	63
Gainor	34	1	Erie	68	65
Western Triumph	34	0	Early King	68	62
Stone's Hardy	22	5	Minnewaska	22	4
Early Cluster	24	2	Early Harvest	24	32
Tecumseh	10	2	Crystal White	16	2
Kittatinny	136	23	Lucretia Dewberry	50	23

The part of the plot where Wilson Jr., Wilson's Early, Lawton, Erie and Early King were planted was a little the highest and dryest, which is probably the reason why a larger percentage of these sorts lived.

The following new varieties were received this year:—Lovett's Best, Thompson's Early, Evergreen, Dallas, Child's Tree, Brunton.

BLACK CURRANT.

The black currant does not appear to have suffered from the heaving of the ground as the other small fruits did, as all have made a healthy, vigorous growth. Last spring 15 new varieties of Saunders' Seedlings were received from the Central Experimental Farm, which makes the collection of this fruit fairly large, numbering nearly 200 bushes and 29 varieties.

RED AND WHITE CURRANTS.

The currants stood the winter better than the berries. Very few of them died, but all were considerably enfeebled, and did not make a very vigorous growth. As they are now well rooted they will, it is hoped, come through this winter in good condition.

Only one new variety has been received this year, viz., 12 plants of North Star.

The number of plants of each variety planted in the fall of 1890 and alive now is as follows:—

Variety.	Planted Fall of 1890.	Alive Fall of 1891.
White—		
White Grape	31	31
White Dutch	18	18
Red—		
Red Cherry	10	10
Fay's Prolific	46	43
Versillaise	28	28
Moore's Ruby	29	28
Victoria	36	36
Red Dutch	18	18
North Star	....	12
	216	224

GOOSEBERRIES.

The Transparent was the only variety which was entirely free from mildew last summer.

The Triumph suffered slightly, the others severely, owing perhaps to the feeble condition of the bushes, on account of the frost heaving them out of the ground during the winter.

They were given a dressing of ashes in summer and late in the autumn mulched heavily with manure, and it is hoped they will winter without injury.

The nursery firm of McKenzie & McDonald, of Salem, Oregon, very kindly sent for test a dozen bushes of the Oregon Champion gooseberry, said to be exempt from mildew on this coast.

We have also to thank them for two fine peach trees of the Early Charlotte variety.

The collection of gooseberries now consists of 11 varieties and over 100 bushes.

NUT-BEARING AND OTHER USEFUL AND ORNAMENTAL TREES AND SHRUBS.

The nut-bearing trees, such as American, English and Japanese walnut, American, Japanese and Spanish chestnut, butternut, hard and soft shelled almond, peccan and filbert, have made satisfactory growth.

Also the forest trees of Eastern Canada, such as maple, ash, elm, beech, larch, pine and spruce, have done remarkably well, some of them having made, for the past season, a growth of over 7 feet, and give promise of being a gratifying success in this province.

The useful and ornamental trees and shrubs from France have, in most cases, made a vigorous growth. The mild spring-like weather of December and January caused some of the shrubs and small fruits to throw out buds, and the frost of February, combined with the cold and wet weather of March and April, had a damaging effect upon them; but when warm growing weather came they, with one or two exceptions, recovered and made a strong, healthy growth, and, as they are now well rooted, are, I hope, safely acclimated.

Within the last year there has been added to the collection, nearly 200 varieties of trees and shrubs, making now in all about 600 varieties.

Several hundreds of Manitoba ash and box elder have been raised from seed received from the Central Experimental Farm last spring.

This fall there was received from the Central Experimental Farm a supply of butternut, hickory and pig nut, hickory nuts, also beech and maple seed. These, it is expected, will make quite an addition to the stock of trees next year.

BULBS AND FLOWERS.

In addition to the bulbs noted in my report of 1890 as having been received and planted last fall, there were quite a number of bulbs and annuals planted and sown this last spring. These, together with the flowering shrubs, gave us a succession of beautiful flowers from March until the frost which came early in December.

LIVE STOCK.

There are four heavy draft and two general purpose horses on the farm.

The cattle consists of the cow and bull of the Shorthorn breed bought in 1889, and their increase. The heifer calf of 1890 has developed into a fine heifer, and this year the cow had a bull calf, which is now a very fine animal.

There has been no sickness of any kind among the stock this last year.

POULTRY.

The hens have done fairly well this year, but are in need of better accommodations than the temporary building put up for them in the fall of 1889.

After two years' experience witb flocks of Houdans, Wyandottes, White Leghorns and Wbite-faced Black Spanish, I bave no hesitation in recommending tbe Wyandottes as by far the best of the four breeds tested for this climate, being good layers of medium-sized eggs, and the chicks are bardy and healthy, and they mature early. The young pullets begin to lay early and are gojd winter layers.

Tbe fall exhibitions at Victoria, New Westminster and Asbcroft were attended and an exhibit of grains and roots made. A contribution of grain in the straw was also made to tbe exhibit made by British Columbia at tbe sbows in Eastern Canada, and a small collection of fruit from the old orcbard sent to be exhibited at some of tbe exhibitions in Manitoba and tbe North-West Territories.

Since my last report a very comfortable residence bas been built for the superintendent, and the contract for a barn awarded. It is to be boped it will be completed in time for next harvest, the old building at present in use being only large enough to shelter our stock, and furnishes no accommodation for grain. The want of such accommodation in tbis climate adds very considerably to the difficulty of harvesting and securing the crops.

I have tbe honour to be, Sir,

Your obedient servant,

THOS. A. SHARPE.

STATEMENT of Expenditure on the Dominion Experimental Farms, for the Year ending 30th June, 1891.

CENTRAL EXPERIMENTAL FARM.

EXPENDITURES, 1st July, 1890, to 30th June, 1891.

	$ cts.
Horses, harness, &c	200 23
Cattle	538 97
Implements, tools, hardware	1,582 56
Draining and drain tiles	372 87
Grading and roadmaking	675 35
Cattle and horse feed	609 69
Blacksmithing and repairs	352 40
Seed grain, trees and shrubs	1,556 98
Stable manure, ashes and fertilizers	1,215 79
Exhibition expenses	380 81
Books, periodicals and newspapers	168 75
Printing and stationery	2,353 84
Telegrams and telephones	223 81
Travelling expenses	755 71
Chemical department	473 35
Poultry department	248 41
Seed testing and care of propagating houses	627 16
Seed grain distribution	2,177 92
Tree distribution	1,280 61
Salaries	11,350 23
Wages, farm work, including experimental work with grain and other farm crops	4,045 53
do care of stock	1,128 08
do horticultural department	1,841 13
do botanical department	365 22
do care of grounds, shrubbery and ornamental trees	753 63
do office help with correspondence, distributing reports and bulletins, and messengers services	1,284 56
Water account, including excavations, &c	230 82
Contingencies	543 42
	37,337 83

EXPERIMENTAL FARM, MARITIME PROVINCES.

EXPENDITURES, 1st July, 1890, to 30th June, 1891.

	$ cts.
Harness	12 47
Cattle	2,621 95
Implements, tools, hardware	210 21
Draining and drain tiles	346 39
Grading, roadmaking, clearing	313 24
Cattle and horse feed	29 70
Blacksmithing and repairs	49 96
Seed grain, trees, shrubs, &c	101 24
Stable manure and fertilizers	370 60
Exhibition expenses	77 08
Travelling expenses	162 17
Salaries	1,200 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,615 57
do care of stock	887 64
do office help	120 00
Contingencies	55 83
	8,174 05

EXPERIMENTAL FARM, MANITOBA.

EXPENDITURES, 1st July, 1890, to 30th June, 1891.

	$ cts.
Harness	78 45
Implements, tools, hardware	704 70
Grading, roadmaking, &c	441 46
Horse and cattle feed	307 43
Blacksmithing and repairs	180 95
Seed grain, trees, shrubs, &c	254 87
Exhibition expenses	238 22
Books, periodicals and newspapers	43 10
Telegrams and telephone	127 89
Travelling expenses	78 60
Forestry	755 87
Salaries	1,200 00
Trees and plant distribution	44 58
Office assistance	53 25
Farm wages, including experimental work with farm crops, fruit trees, vines, &c	3,957 50
Contingencies	347 70
	8,814 57

EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

EXPENDITURES, 1st July, 1890, to 30th June, 1891.

	$ cts.
Harness, &c	45 99
Cattle	3,374 37
Implements, tools, hardware	784 90
Cattle and horse feed	743 26
Blacksmithing and repairs	149 95
Seed grain, trees, shrubs, &c	273 32
Exhibition expenses	236 35
Books, periodicals and newspapers	31 10
Travelling expenses	100 60
Forestry	419 63
Salaries	1,200 00
Grading and roadmaking	21 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	4,460 46
do care of stock	762 05
do office help	120 00
Contingencies	771 62
	13,494 60

EXPERIMENTAL FARM, BRITISH COLUMBIA.

EXPENDITURES, 1st July, 1890, to 30th June, 1891.

	$ cts.
Harness, &c	20 50
Implements, tools, hardware	426 23
Clearing, grading, &c	2,345 96
Cattle and horse feed	903 84
Blacksmithing and repairs	51 25
Seed grain, trees, shrubs, &c	198 37
Books, periodicals and newspapers	28 90
Travelling expenses	126 25
Salaries	1,200 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,025 34
do office help	100 00
Exhibition expenses	6 00
Contingencies, including house-rent	317 60
	7,750 84

SUMMARY.

TOTAL EXPENDITURE for Experimental Farms, 1890-91.

	$ cts.
Maintenance account—	
Central Experimental Farm, Ottawa	37,337 83
Experimental Farm for Maritime Provinces, Nappan, N.S.	8,174 05
do Manitoba, Brandon	8,814 57
do North-West Territories, Indian Head	13,494 60
do British Columbia, Agassiz	7,750 84
	75,571 89
Capital account—	
Erection of dairy building and piggery at Central Experimental Farm, Ottawa	3,967 02
Paid for land, Experimental Farm, Indian Head	7,680 00
Land account, Experimental Farm, Nappan, N.S., legal expenses and surveys	145 14
do do Agassiz, B.C.	135 95
	11,928 11

In the sum charged to the Central Experimental Farm in the foregoing summary, many items are included which should be shared, to some extent, by each of the other farms. The amount paid for the salaries of the chief officers who devote a large part of their time to the branch farms and to the interests of farmers residing in the provinces where these farms are located, should be divided between the Central and other experimental farms. The following accounts should also be apportioned in a similar manner. Printing and stationery, office help for the distribution of bulletins and for conducting the correspondence with farmers all over the Dominion; the purchase of seed grain, trees and shrubs, the distribution of grain for test, also young forest trees and tree seeds. The cost of the special experiments in seed testing with grasses and grain, and the outlays connected with the botanical chemical and much of the horticultural work, should also be divided since these are all of a general nature in the benefits of which all the experimental farms share. If these accounts were divided and apportioned as suggested the sum charged against the Central Experimental Farm would be very much reduced.

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